OVERSIGHT HEARING ON SALTON SEA STABILIZATION AND WATER QUALITY IMPROVEMENT

OVERSIGHT HEARING

BEFORE THE

SUBCOMMITTEE ON WATER AND POWER

OF THE

COMMITTEE ON RESOURCES
HOUSE OF REPRESENTATIVES

ONE HUNDRED FIFTH CONGRESS

FIRST SESSION

OCTOBER 3, 1997, PALM DESERT, CALIFORNIA

Serial No. 105–60

Printed for the use of the Committee on Resources

U.S. GOVERNMENT PRINTING OFFICE

45–367 CC ≈ WASHINGTON : 1998

For sale by the U.S. Government Printing Office
Superintendent of Documents, Congressional Sales Office, Washington, DC 20402
ISBN 0-16-056198-1

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OVERSIGHT HEARING ON SALTON SEA STABILIZATION AND WATER QUALITY IMPROVEMENT

FRIDAY, OCTOBER 3, 1997

U.S. HOUSE OF REPRESENTATIVES, SUBCOMMITTEE ON WATER AND POWER, COMMITTEE ON RESOURCES, *Palm Desert, California.*

The Subcommittee met, pursuant to notice, at 10:09 a.m., in the Palm Desert Multi-Agency Library Community Room, College of the Desert, Palm Desert, California, Hon. John T. Doolittle (chairman of the Subcommittee) presiding.

Members present: Representatives Doolittle and Calvert.

Also present: Representatives Brown, Hunter, Lewis, and Bono.

Staff present: Robert Faber, Staff Director/Counsel.

Mr. DOOLITTLE. The Subcommittee on Water and Power will come to order. Part of the thrill of having a field hearing is that we have these interesting situations with the logistics.

In conjunction with that, ladies and gentlemen, although this is a Federal hearing, we're on state property and subject to the state fire regulations, and the people blocking the door back there are in violation of this code.

We apologize for not having a bigger facility, but we're glad to have this kind of interest.

A speaker is in the process of being set up out there in the lobby, but I'll have to ask that we can only have lined up one person deep along the walls. You're fine, but those in the back are going to have to clear that door, in order to be in compliance.

So I would ask those of you who cannot find a space against the wall if you will go out there into the lobby. Hopefully, they've got a speaker set up so that you can hear the hearing, but we cannot have the door blocked, and I would ask those of you standing there to give way and go out into the foyer, so that we can be ready to go through the hearing.

The Subcommittee is meeting today to hear testimony concerning Salton Sea stabilization and water quality improvement.

I would like to commend Mr. Calvert for his efforts to bring this issue to my attention. Frankly, to get peace, I had to agree to yield and have a hearing here. So he did a good job in making that possible. He's a wonderful member of our Subcommittee, in addition to being chairman of his own Subcommittee, within the Science Committee of the House.

I realize that this is an issue of great importance to all of the members of the Salton Sea Task Force, and I want to welcome them in participating with the Subcommittee this morning.

Mr. Calvert, of course is—all of these gentlemen, except for me, are local representatives of the area. I want to especially express my appreciation to Mr. Bono and his staff for their assistance in providing logistical support to this hearing.

And, of course we have with us today the co-chairmen of the Salton Sea Task Force, Mr. Bono and Mr. Hunter.

Then, as fate would have it, in addition to being distinguished local representatives, Mr. Lewis and Mr. Brown are the respective deans of the California Republican and the California congressional delegations.

So you have a good group of influential people to help you solve this problem.

Before we get further into the hearing, I would like to recognize the presence of State Senator Dave Kelley and Assemblyman Jim Battin, local representatives in the state legislature, and invite them, if they would care to step forward and make any comments they would wish.

Senator Kelley.

Mr. KELLEY. Mr. Chairman, I would like to take this opportunity to welcome all of you here with this collective wisdom, and the interest that you see with all the parties out here in the audience today. You can see the importance of the issue that you're going to be discussing.

I've been involved with the Salton Sea for quite a number of years, having served for a rather lengthy time in the legislature, and I know that you, Duncan, and the rest of you, George and Jerry Lewis, you've all been involved, and now Sonny Bono is getting involved, and now you, Mr. Doolittle, are getting involved in all of this, to try and come to some resolution to the problem.

The problem is complex. We've known it for a number of years—many, many years, as a matter of fact—and we welcome you here today. My comments are just to welcome you, not to present any testimony. You have all the experts lined up out here.

I'm sure, by 2 o'clock this afternoon, you'll have a solution to the problem and we'll be able to walk out of here with everything concluded, and we will be very happy with everything that you've done here today.

Thank you, and I welcome you here.

Mr. DOOLITTLE. What a setup.

Mr. KELLEY. What a setup, that's exactly right. Thank you very much, and we appreciate you coming here to the desert, to solve this problem. Thank you.

Mr. DOOLITTLE. Thank you. Mr. Battin, I recognize you for your comments.

Mr. BATTIN. Thank you very much. I would just like to echo my Senator's welcome to the Coachella Valley. I'm glad that we are having a nice day for you to come down and visit us.

I think it is paramount that all agencies come together on this, whether it's local agencies or state and Federal, because that, I believe, is the only way that we will find a solution to the challenge of the Salton Sea.

It is such a beautiful site, and it can be a mecca for tourism and all sorts of other recreational activities, and I really look forward to that day.

I read in the paper the other day where Sonny Bono was talking about his days of waterskiing on that, and I would like to see my son be able to do that again.

I think, with the effort by both of the Congressmen that represent my district—Mr. Bono and Mr. Hunter—I think that we're going to see great things out of this, and I applaud you, Mr. Chairman, for coming down, and the task force. Anything that we can do, I'm sure that we will definitely try.

Again, thank you very much for coming.

Mr. DOOLITTLE. Thank you.

STATEMENT OF HON. JOHN T. DOOLITTLE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. DOOLITTLE. Our objective today is to consider some of the issues affecting the water quality and lake levels of the Salton Sea. This hearing will not be a point of final resolution on the issue. It would be nice. But the issue, I think, is bigger than that.

However, a great deal of work has been done to evaluate the causes of poor water quality, as well as the periodic inundation and exposure of land around the Sea. More importantly, there have been scores of alternatives offered to solve these problems.

If we are ever to find and implement the solutions, the time for action is upon us. Water quality is at a all-time low. The Sea can no longer serve as the recreation resource it once was, and wildlife populations continue to be affected adversely.

Finding a practical and economic solution is going to be a great challenge. The Salton Sea, as it now exists, is an artificial phenomenon created in 1905 as the result of high water and a break in a temporary levee along the Colorado River.

For a period of about 16 months, the Colorado River flowed into the Salton Sink, filling it to a depth of more than 80 feet.

After the levee break was fixed, water levels declined rapidly as evaporation greatly exceeded inflow. The water level continued to decline until the 1920's, when increased runoff from imported water used in the Basin began to increase the Sea's surface.

Since 1905, the salinity of the Sea has also changed. At the time of the levee break, the salinity of the Sea was roughly that of the Colorado River, but the existing dry lakebed salts have been supplemented by the introduction of a continuous inflow of salt-laden water.

Each year it receives about 4 million tons of additional salt. At the same time, evaporation has concentrated all of the salt that has been introduced since the original levee break, since it is the only way that water leaves the Sea. Today, the Sea's salinity is about 25 percent higher than ocean water.

Land, recreational, and ecological values associated with the Sea have declined over the last decade due, in large part, to the rising salinity and surface elevation.

Without efforts to reduce and stabilize the salinity levels, they will continue to rise and will have severe impacts on surrounding landowners, on individuals who wish to use the Sea for recreation, and on the existing wildlife species.

I look forward to hearing from the witnesses who have had an opportunity to evaluate these problems and to consider the alter-

natives. I commend the members of the congressional task force who are helping us to find a solution.

[The prepared statement of Hon. John T. Doolittle follows:]

STATEMENT OF HON. JOHN T. DOOLITTLE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Our objective today is to consider some of the issues affecting the water quality and lake levels at the Salton Sea. This hearing will not be a point of final resolution on this issue. However, a great deal of work has been done to evaluate the causes of poor water quality as well as the periodic inundation and exposure of land around the Sea. More importantly, there have been scores of alternatives offered to solve these problems. If we are ever to find and implement the solutions, the time for action is upon us. Water quality is at an all-time low. The Sea can no longer serve as the recreation resource it once was, and wildlife populations continue to be adversely affected.

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I look forward to hearing from the witnesses who have had an opportunity to evaluate these problems and consider the alternatives. I commend the members of the Congressional task force who are helping us find a solution.

Mr. DOOLITTLE. I would like now to turn to my colleagues. We don't really have a ranking minority member of this Subcommittee, because none is in attendance, but I'm going to recognize the dean of the California congressional Democratic delegation, Mr. Brown, for his comments.

Mr. BROWN. Thank you very much, Mr. Chairman. I do not wish to make an opening statement, but I will add my own thanks to the others that you have heard for coming down here.

This may be a crucial development in moving us toward a solution of the problems of the Salton Sea, the recognition that there is a high level of congressional interest, including interest on the Resources Committee, which I think probably has the primary jurisdiction over this situation.

So I am very grateful to you and, while I hate being in the Minority, working with a group of Republicans, it's been a very rewarding experience for me, and I'm beginning to like it.

[Laughter.]

Mr. DOOLITTLE. Thank you. Mr. Lewis, our dean of the California congressional Republican delegation, I recognize you for any comments you may wish to make.

Mr. LEWIS. Thank you very much, Chairman Doolittle. I'd just like to express my appreciation to the representatives from River-

Mr. DOOLITTLE. Thank you. Mr. Lewis, our dean of the California congressional Republican delegation, I recognize you for any comments you may wish to make.

Mr. LEWIS. Thank you very much, Chairman Doolittle. I'd just like to express my appreciation to the representatives from Riverside County, Sonny Bono and Ken Calvert, for their very active involvement in this task force on the Salton Sea and inviting us here to the valley.

Further, the other portion of the Salton Sea, represented by Imperial County, Duncan Hunter, to say the least, has been banging us over the head to see where we can find every dollar possible, over a length of time.

George and I are somewhat outriders here. Our district is largely in San Bernardino County. Some years ago, I had the privilege of representing this area. For many, many years, George and I have been talking about the Salton Sea.

I, too, believe that this could be a turning point. Indeed, it takes a little bit of money to bring all the stakeholders together, to see some serious commitment on the part of the state and the Federal Government, the local water agencies, et cetera.

If we can take the time to take a step back, recognize that there's been a lot of years involved in taking us to today, and where we are, if we are willing to refocus, take a broad view of the potential of this asset, indeed, we can revolutionize the Salton Sea and return it to every bit of that which we have hoped for in the past, maybe a lot more than we've hoped for.

So I'm very privileged to be involved. John, I appreciate your bringing your Subcommittee here, and all the members who are participating.

Mr. DOOLITTLE. Thank you very much. Mr. Bono, you are recognized for your comments.

Mr. BONO. Thank you, Mr. Chairman. I just want to say that this is a dream come true for me, and unexpected, as far as moving in this direction so fast.

Dealing with bureaucracies, things don't move this fast, but we have a task force that all were very interested in achieving a goal, and it was like magic. We all got together and we all got to work, and it's just rolling along.

For me, being in this area, it's the first time I've seen this kind of energy go into a project that is dearly needed to prevent an environmental disaster.

To have this kind of energy, this kind of momentum, not only by the task force, but by the communities and by everybody involved, and now the state and the representatives from the state, is thrilling.

Getting this far and seeing this come to fruition, I somehow feel certain that we will bring the whole thing to a goal that we all see easily, a vision that I'm sure we all see and understand. It can be so exciting, not just from an environmental standpoint, but from a productive standpoint for the economy of the entire area.

So it's very exciting. I'm thrilled. I can't thank my colleagues enough because, without them, this wouldn't have happened, and we all got together and they all championed this issue and then moved it to the point.

George probably knows the Salton Sea better than anybody here. He knows every single thing about it. I was delighted, when I started talking to him, to know the depth of information that he has on it. He has researched it and researched it, so if we had a question, he could answer it. His contribution has been just fabulous.

I'm sorry that we had to make you a surrogate Republican.

[Laughter.]

Mr. BONO. But you do a good job.

[Laughter.]

Mr. BONO. I mean, maybe you should think about—no, no, no.

[Laughter.]

Mr. BONO. Anyway, it's great. And our intention is to not just stop here, but to take it all the way home, and we're going to do that. Just keep your energy up with ours, so that we have this kind of momentum, and just let it grow. Your contribution is very important.

Again, Duncan Hunter, thank you. I first went to Duncan with this and said, "Let's go." And this is what's happened. So we have a great coalition and a great task force.

Mr. Chairman, I thank you for getting involved, and I appreciate it deeply.

Mr. DOOLITTLE. Thank you very much. Mr. Calvert, you are recognized.

STATEMENT OF HON. KEN CALVERT, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. CALVERT. Thank you, Mr. Chairman, for having this hearing. I, like the rest of us, most of us here, have fond memories of the Sea. I also went waterskiing down there 30 years ago, and spent many happy weekends with my family and friends. Unfortunately, many people choose not to take on recreational activities today.

Some 25 years ago, I worked as an intern for former Congressman Vic Veysey, who is here in the audience with his wife, Janet, and even then we were talking about the Salton Sea, and here we are today.

Today, I think we're beyond talk, to the point where we need to start talking about the potential solutions. And we'll be hearing from Vic's son today, Tom, later on, to talk about the impact of the Salton Sea.

This is an issue that's extremely important to all of us in Southern California. Even though I don't live down here, it's important, because there's very few recreational activities for all of us, the 18 or 20 million who live in the Southern California Basin.

This is an opportunity for all of us to hopefully come up with a solution and, somewhere down the line, we can all go back waterskiing in the Salton Sea.

Mr. DOOLITTLE. Thank you. Mr. Hunter, you are recognized.

Mr. HUNTER. Thank you, Mr. Chairman, and thanks a lot for being here.

You know, I think the folks who are here are beginning to understand that this going to represent the best in American politics. Maybe you see the worst sometimes on C–Span, but this is a lot of people getting together to solve a problem, a very complex prob-

lem, and a problem that could cost some substantial dollars, but we need to do it.

I want to thank George and Jerry and Sonny. You've been fantastic, really a leader in this program, and John Doolittle. John Doolittle, folks, for those who don't know him, is a real doer. He's a guy that gets things done. And, Ken, what a great friend and ally on this thing you've been.

Folks, you may not see us doing this, because this isn't on the stage, it's not on the television. But we get together on the House floor. We say, "OK, what are we going to do on the Sea, how are we going to move out, what's our meeting next week?"

This is an action team, and we are going to take action. The statistics that we're going to be seeing shortly show the urgency and the exigency of this situation. We have to move out quickly. We're going to do that.

Thank you, Mr. Chairman.

Mr. DOOLITTLE. Thank you. Let me invite our first panel of witnesses just to approach, and then remain standing. As is customary in this Subcommittee, we place all witnesses under oath. I would like to ask the panel to come up now, as your names are being distributed, and I'll administer the oath of office to you.

Excuse me. I'm thinking oath of office. Oath for testimony.

[Laughter.]

Mr. DOOLITTLE. Some of you may be taking the oath of office in the future.

We have on our first panel Mr. Tellis Codekas, Mr. Robert Johnson, Mr. Michael Spear, Mr. Wayne Hardie, and Mr. Tom Veysey. Gentlemen, will you remain standing and raise your right hands? And, oh, yes, Mr. Clark Bloom is going to testify, as well. I had asked him to be here.

[Witnesses sworn.]

Mr. DOOLITTLE. Thank you. Let the record reflect that each answered in the affirmative. Please be seated, gentlemen. We will begin with Mr. Tellis Codekas, who is chairman of the Salton Sea Authority.

Let me, before you begin, Mr. Codekas, for a guide, we have these three lights set there in front of you—the red, yellow, and green.

We would ask you to, since we have many witnesses today, and we do have a time certain by which the hearing must conclude, try to keep your comments to 5 minutes.

The yellow light goes on at the beginning of the final minute. You don't have to stop in mid-sentence when the red light is on. It's a guide. But just be mindful, in order to complete the Subcommittee's business, we will need to be expeditious.

For Mr. Hardie, in that he is evaluating the proposals, will have 10 minutes for that purpose.

And, with that, Mr. Codekas, I'm pleased to welcome you here, sir.

STATEMENT OF TELLIS CODEKAS, CHAIRMAN, SALTON SEA AUTHORITY

Mr. CODEKAS. Mr. Chairman, members of the Subcommittee, and members of the congressional Salton Sea Task Force:

On behalf of the Salton Sea Authority, I want to express our thanks that you came all the way out here to convene this hearing on the future of the Salton Sea.

The Authority has been working hard on this issue, and now it is good to see a national interest. We welcome this recognition by Congress.

There is no doubt that the Salton Sea needs to be saved, both for economic and environmental reasons. As a drainage reservoir, the Sea is crucial to the agricultural economies of the Imperial, Coachella, and Mexicali Valleys.

In addition, there are extensive recreational and geothermal developments around the Sea that need to be protected from impacts of rising salinity and fluctuating elevations.

From an environmental perspective, the Sea provides important and diverse habitat for resident and migratory waterfowl, marsh, and shore birds. These are magnets for birders, hunters, and boaters to the state and Federal refuges and parks.

In my written testimony, I have provided you a history of the Sea and background information on the Salton Sea Authority. I would like to now address the substance of the Authority's recommendations.

Even though this is the first congressional hearing on the Salton Sea, saving the sea is not a new idea. When I make reference to saving the Sea, I am talking about saving the beneficial uses of the Sea.

The Salton Sea Authority has worked intensively over the past two years, in a very formal process. We have looked at dozens and dozens of ideas to save the Sea and we have selected what we believe is a feasible option.

We have been guided all along by this set of fundamental principles: the project must be practical, affordable, and effective in lowering salinity levels.

The No. 1 problem of the Sea, you can see on this chart what increasing or decreasing levels of salinity will do to the fishery.

As you sit here today and hear these comments, and when you return to Washington to hopefully continue your work with us on a solution, we ask that you be guided by the same basic principles: practicality, affordability, and ability to reduce salinity.

First things first. Any project to reduce salinity must be practical. You may hear varied concepts during this hearing, some that include high expectations, but be cautious. Aim for solutions that are achievable, and not out of reach.

Even if we were to implement the perfect solution tomorrow, there still would be problems with the Sea for some years to come. It took a while for the Sea to get to its present condition, and it will take a while to clean it up.

Any project to reduce salinity will be expensive. It's an artificial body of water, and it will take an artificial project costing millions of dollars to fix. The people of this region can't do it by themselves. I am encouraged, by the Committee's appearance here today, that you understand this is a national responsibility, as well.

To be effective, the project must reduce the salinity of the Sea to approximately that of the ocean, but forget about turning the Sea into a freshwater lake. It will still be a highly productive in-

land sea which, during summer months, will occasionally have episodes of odors, but it nevertheless is a great resource. We need to reduce the salinity levels now.

We are concerned about spending previous time taxpayers' money to study biological processes. We don't know exactly the biological mechanism of how and why the birds and fish are dying, but we are convinced that high salinity is the major problem. We need to act now.

After studying many possibilities and alternative solutions, the Authority believes that constructing some type of diked impoundment in the Sea would best meet the guidelines of being effective, practical, and affordable, and will get us to a reduced salinity level faster than any other proposed solution.

We believe the Salton Sea Authority should continue its leadership role to plan and build the project. We shall, of course, do this in collaboration and coordination with local, state, and Federal agencies.

In closing, Mr. Chairman, I sincerely want to thank you and your colleagues here today for taking time and showing the interest you have in our Sea.

I will answer any questions you or the Committee wish to ask. Thank you.

[The prepared statement of Mr. Codekas may be found at end of hearing.]

Mr. DOOLITTLE. Thank you, sir. Our next witness will be Mr. Robert Johnson. Mr. Johnson is the regional director of the Lower Colorado Region of the Bureau of Reclamation. I think I last left you in Boulder City, Mr. Johnson. I am pleased to have you back here again today.

STATEMENT OF ROBERT JOHNSON, REGIONAL DIRECTOR, LOWER COLORADO REGION, BUREAU OF RECLAMATION, DEPARTMENT OF THE INTERIOR

Mr. JOHNSON. Thank you, Mr. Chairman. It was a pleasure to see you again, too.

Mr. Chairman and members of the Subcommittee, I would like to thank you for the invitation to be here today. With your permission, I would like to summarize my remarks and have the full text of my prepared statement entered into the hearing record.

Mr. DOOLITTLE. So ordered.

Mr. JOHNSON. The Congress, throughout the years, has established many study programs the Bureau of Reclamation has been involved in related to the Salton Sea. Our involvement dates back to the late 1960's and early 1970's, when we and the State of California jointly prepared a feasibility study and an environmental impact statement for a salinity management project on the Sea.

In 1985, the Congress created the National Irrigation Water Quality Program to identify the nature and extent of irrigation-induced water quality problems that may exist in western states, including the Salton Sea.

In 1992, Congress enacted Title XI of Public Law 102–575, which authorized the Bureau of Reclamation to participate in a research project to develop methods to reduce and control salinity, provide

endangered species habitat, enhance fisheries, and protect recreational values at the Salton Sea, and report to Congress.

In fiscal year 1998, the President requested $400,000 in the Bureau of Reclamation's budget for this purpose. Reclamation anticipates that the Congress will be provided a report later this year. We have a draft report that's currently undergoing public review.

In addition to the roughly $2.6 million provided through the National Irrigation Water Quality Program, Congress has provided about $8.5 million more since fiscal year 1986 for Salton Sea efforts conducted by the Bureau of Reclamation, the U.S. Fish and Wildlife Service, and the U.S. Geological Survey.

The Bureau of Reclamation is participating with the State of California and local entities, including the Salton Sea Authority, in an effort to address Salton Sea concerns. Presently, there are more than 50 separate potential solutions.

Reclamation, however, is not recommending Federal participation in any specific alternative at this time. However, I would like to provide a brief description of some of the alternatives that are under consideration in our report.

One is diked impoundments. A number of alternatives for diked impoundments are variations of the concept of diking off portions of the Salton Sea to create evaporation ponds within the Sea.

These alternatives range from impounding different sizes of closed areas within the Salton Sea that would act as an evaporation pond to compartmentalizing larger portions of the Sea into separate zones with dikes. Some alternatives would create fresher water in portions of the Sea and allow other portions to become highly saline.

Pump-out option is also something that's been evaluated by Reclamation in the study, along with the Salton Sea Authority.

Various proposals along these lines would create an outlet by pumping water out of the Salton Sea. Some alternatives would pump the seawater to onshore evaporation ponds. Other alternatives would pump seawater to Laguna Salada, a dry lakebed north of Mexico's Gulf of California. Still others would pump the water to a desalting plant or even to the Pacific Ocean.

Construction costs for various proposed solutions are estimated to range from $40 million to more than $2 billion. Additionally, there would be significant costs associated with conducting related studies, such as developing the most appropriate construction techniques, completing biological research, and performing basic geologic hazard studies.

In conclusion, the Bureau of Reclamation has participated in a number of studies over the years to address Salton Sea problems. At the present time, Reclamation and other state, local, and Federal agencies are evaluating various proposed solutions.

Reclamation does not have enough information to recommend a proposed solution or Federal participation in any of the proposals at this time.

However, Deputy Secretary Garamendi has asked Reclamation to include a broader range of agencies and participants, consistent with our study authority provided under Public Law 102–575. Our goal would be to sort through all of the various options and make specific recommendations at some point in the future.

Thank you for the opportunity again to be here today, and I would be pleased to answer questions.

[The prepared statement of Mr. Johnson may be found at end of hearing.]

Mr. DOOLITTLE. Thank you very much. Our next witness is Mr. Michael Spear, Regional Director of the Pacific Region, U.S. Fish and Wildlife Service. Mr. Spear, you are recognized.

STATEMENT OF MICHAEL J. SPEAR, REGIONAL DIRECTOR, PACIFIC REGION, U.S. FISH AND WILDLIFE SERVICE, DEPARTMENT OF THE INTERIOR

Mr. SPEAR. Thank you, Mr. Chairman, members of the Committee.

I am Mike Spear, West Coast Regional Director of the Fish and Wildlife Service. With me today, on my right, is Clark Bloom, Refuge Manager for the Salton Sea National Life Refuge Complex.

Mr. DOOLITTLE. You probably have to hold that microphone closer to your mouth.

Mr. SPEAR. First, I would like to thank you all for allowing the Service this opportunity to address the Committee.

I want to underline the need for continued support for the Salton Sea Task Force in addressing the failing Salton Sea ecosystem. Without your support, it would be difficult to address the numerous complex issues which face us as we search for solutions.

Fish and Wildlife Service has been in the Salton Sea since 1939, when the first manager assumed the job of running the 35,000 acre Salton Sea National Wildlife Refuge located on the south shore of the Sea. The management emphasis in those early years included protecting and enhancing migratory bird habitat, and providing opportunities for hunting and fishing.

We still manage for these purposes. However, today, we also manage for endangered species and facilitate ecotourism, which generates over $3 million annually, principally from birdwatchers.

According to a 1988 report, Problems and Solutions at Salton Sea, developed for the California Resources Agency, early studies conducted in 1969 and 1972 found that, although considerable efforts and discussion have occurred to address the Salton Sea's problems, no effective remedial strategy had yet been established.

As a result, recreational participation, land values, general levels of economic activity around the Sea have declined considerably over the past two decades. It is safe but sad to say that three decades have now passed since the problem was diagnosed, and the situation is worse.

Since this report was prepared, the Sea's water level continues to rise. Its salinity still exceeds the salinity of the ocean. Raw sewage and industrial pollutants from Mexico continue to flow down to the New River and into the Salton Sea along with nutrients, selenium, and other chemicals from agricultural drain water. The Sea is officially considered as the ultimate sink for all drainage in the Coachella and Imperial Valleys.

In 1992, national attention was focused on the troubled Sea when over 150,000 eared grebes and ruddy ducks died. The National Wildlife Health Center has determined that some of the

ducks died from avian cholera, but the cause of most of the duck deaths and all of the grebe deaths remains unknown today.

Fish and bird kills have continue to occur. An estimated 20,000 birds died in 1994. The cause was never determined. Avian botulism killed over 14,000 birds in 1996, including more than 1,400 endangered brown pelicans.

As a side note on the issue of the brown pelican is a good example of the spinoff problems that result from this. In our Pacific region, we have a large endangered species workload, as you all know. One of the things we are criticized for is not taking things off the list.

We were ready to recommend, in 1996 and again this year, that the brown pelican be delisted. What has happened in the Salton Sea has, unfortunately, stopped that process of delisting, in other words; so a very specific impact which, of course, then has impacts along the coast, where it is also protected.

But there is a bird that, other than what is happening here, would be in a position likely to be delisted.

Thousands of tilapia, a species of fish, died of vibrio infections that allowed botulism to develop in their blocked intestines. Birds which consumed the sick fish were infected with the botulism and died.

In 1997, Newcastle disease wiped out a breeding colony of cormorants, and the refuge staff witnessed a raft of dead fish three miles long.

These losses hold great significance for the Pacific flyway, one of the main corridors over which migratory birds travel between their winter and summer homes. Since the Salton Sea serves as a substitute for flyway wetlands lost elsewhere in Southern California, its health is essential for the long-term viability of the migratory bird population of the West Coast.

Several Federal, state, and private agencies and contractors have been working on numerous efforts to address isolated problems associated with the Salton Sea. Nonetheless, signs of ecosystem distress still appear through fish and bird die-offs.

The Service itself has made a major effort to manage these incidents in concert with the California Fish and Game, by removing dead birds, destroying infected carcasses, to prevent the spreading of disease and rehabilitating birds, if possible.

Largely due to complex jurisdiction questions, no one entity has been in a position to take the lead to develop a comprehensive program to resolve the numerous problems, such as potential water diversions from the Sea, wildlife diseases, human health risks, increasing salinity, along with the related items, such as loss of cultural resources.

We need a unified approach. Decisions are being made now which are going to affect the Sea.

The EPA is working with Mexico to construct a second sewage treatment plant, something we all want but, of course, could lead to diminished flows into the Sea.

The ongoing negotiations of transferring water from Imperial Valley Irrigation District to the city of San Diego could result in less water going into the Sea.

All of these things will affect the eventual plan to restore the health of the Salton Sea. So the timing of this effort to find a solution is not too early.

Finally, the fate of endangered species, given last year's significant losses, we are obliged to seek and implement an effective answer, not only to these drastic losses, but to restore the ecosystem as a whole.

My final comment is about a report that just came off the press a few days ago, and I believe you all have a copy.

Eight weeks ago we cosponsored a symposium on research needs in the Salton Sea with the Bureau of Reclamation and the Geological Survey, both Biological and Water Resources Division, along with California Fish and Game. The purpose was to say, let's bring together the best scientists and say what research is needed.

Of course, facing the criticism that we're always asking for more research, I think you will hear from a lot of people, there are things we don't know.

In 8 weeks, we got the report from the scientists. They put together their recommendations, and have printed the report. I believe that the $35 million recommended over 3 years, of course, is a lot of money. $12 million per year for research is a lot of money.

Whether we have 3 years is a big question that I have, and I don't think we can necessarily say that every one of these studies must be done. But I think in 8 weeks we get a good sense of the nature of the studies and, you know, we're open to, obviously, lots of discussion about what should be done. But we can put together a program, as people look for more answers.

Finally, I would have to say I would be remiss if I did not point out that, for right now, and for the short-term future, the Fish and Wildlife Service can do no more than put a bandaid on the problem.

We burn dead birds and fish in an effort to stop the spread of disease and help in the efforts to rehabilitate sick birds. This is what we do. Needless to say, this leads to serious frustration and stress, particularly in our refuge staff.

To fully appreciate the efforts, you must realize that people come to the Fish and Wildlife Service to protect and enhance fish and wildlife and their habitat, not to spend their days picking up and burning dead fish and birds.

Clark Bloom and his staff are performing heroically under incredibly adverse conditions. You know what summertime temperatures are like around here. I want to publicly recognize this. But that's what we must do, for the time being, while we wait for the solution.

Thank you for the opportunity to appear here today.

[The prepared statement of Mr. Spear may be found at end of hearing.]

Mr. DOOLITTLE. Thank you very much. Let me recognize accompanying Mr. Spear is Mr. Clark Bloom, the refuge manager of the Salton Sea National Wildlife Refuge. Mr. Bloom will not present direct testimony, but will be available to assist Mr. Spear in answering specific questions pertaining to the refuge.

With that, let me recognize our next witness, Mr. R. Wayne Hardie, who is the group leader of energy and environmental analysis for the Los Alamos National Laboratory.

Mr. Hardie.

STATEMENT OF R. WAYNE HARDIE, GROUP LEADER, ENERGY AND ENVIRONMENTAL ANALYSIS GROUP, TECHNOLOGY AND SAFETY ASSESSMENT DIVISION, LOS ALAMOS NATIONAL LABORATORY

Mr. HARDIE. Thank you, Mr. Chairman.

I work at Los Alamos National Laboratory, which is in Los Alamos, New Mexico, and operated for the Department of Energy by the University of California.

In May of this year, the Laboratory was asked by the Congressional Salton Sea Task Force to provide technical support for the remediation of the ecological problems in the Salton Sea. Today, I'm going to report on some of our work in evaluating various concepts for remediating the Sea.

Our results are preliminary, in some cases qualitative, but they can be used to help guide decisionmakers such as yourselves in your deliberations.

Environmental issues related to the Salton Sea include: industrial and municipal waste, selenium concentrations, high salinity, and variable water levels. Today, I am going to briefly discuss each of these issues.

The primary source of industrial and municipal waste to the Salton Sea is untreated sewage from Mexicali. However, although the amount of industrial and municipal waste discharged to the New River is large, plans are in the works for a Mexicali treatment facility which, when completed around the year 2000, will help alleviate this problem.

Consequently, we feel that the issue of industrial and municipal waste pollution in the Salton Sea is already being addressed.

Because the agricultural drain water entering the Salton Sea contains selenium, there is concern that this may cause selenium poisoning problems in the Salton Sea and may be contributing to the bird and fish die-offs.

Information provided to us on measurements of selenium concentrations in the drain water, Sea water, and sediments in the Salton Sea indicate levels that are below the existing EPA recommendations in the case of the Salton Sea water, and are typically a factor of 10 or more below those experienced at the Kesterson National Wildlife Refuge.

Therefore, we do not view selenium in the Salton Sea as a pressing problem and think that additional research on selenium and its impact on the environment of the Salton Sea is needed before any actions are undertaken.

Also, the selenium levels in the Salton Sea and its sediments need to be carefully monitored so that any trends toward increasing selenium levels will be detected early.

The remaining two issues, high salinity and variable water levels, are complicated and most solutions will impact both these problems to varying degrees.

Regarding salinity, the Salton Sea Authority has set a goal of 35 parts per thousand, which is equal to the salt content of ocean water, and a decrease of about 9 parts per thousand from the current level. The Authority would like to stabilize the water level at between 230 and 235 feet below sea level, which is a slight decrease from today's elevation of about 227 feet below sea level.

Los Alamos has examined the cost, salinity, and Sea level changes of three remediation concepts—desalinization; pump-in, pump-out; and diked impoundment—and compared these results with no action, or doing nothing. We have concentrated on performance and economic issues and have not evaluated ecological or institutional factors in this analysis.

First, if no action is taken, the Salton Sea will, of course, continue to increase in salinity from today's level of 44 parts per thousand. The Sea would reach a salinity level of about 60 parts per thousand in about 15 years. This is important, because some believe that most fish can no longer live in water around this salinity level. Therefore, there isn't much time if the Salton Sea is to be saved.

If there were an inexpensive filtering or distillation method to remove salt from high salinity water, desalinization would be an obvious solution to the problems of the Salton Sea.

The process could be used to reduce the salinity of the water already in the Salton Sea or to desalinate ocean water being pumped from the Gulf of California as part of a pump-in, pump-out scheme.

If desalinization is used to freshen the water in the New, Alamo, and Whitewater Rivers, and the water allowed to flow into the Salton Sea, this reduces the quantity of salt going into the Sea, but does not solve the salinity problem, because salt is not being removed from the Sea.

Furthermore, if the desalinated water is diverted instead of flowing into the Salton Sea, this will lower the Sea's elevation and increase its salinity, thereby making the problem worse.

One desalinization proposal was developed earlier this year by U.S. Filter. They propose treating New and Alamo River water prior to entering the Salton Sea and diverting about 160 thousand acre feet per year for recycle.

The impact of the above proposal on the Salton Sea is an increase to about 120 parts per thousand in 30 years, which is 20 parts per thousand higher than doing nothing. Furthermore, the surface area of the Sea would decrease by over 30 percent.

Another proposal, by the Metropolitan Water District, would divert approximately 450,000 acre feet of Alamo and Whitewater River water. Once again, from the point of view of remediating the Salton Sea, this makes the Sea smaller and saltier.

In summary, desalinization can be used to produce fresh water for urban use, but proposals that divert inflow water will make the Salton Sea salinity and elevation problems worse.

Another concept that has received attention consists of pumping water from an external source to the Salton Sea and pumping water from the Sea to an external location. The advantage of such a concept is it has the potential to allow simultaneous control of salinity, elevation, and surface area.

The obvious source for pump-in water is the Gulf of California, which, of course, is at ocean water salinity. However, for this concept to be practical, the salinity of the pump-in water needs to be considerably less than that of ocean water in order for the Salton Sea to eventually reach ocean water salinity.

If the pump-in water is at ocean water salinity, very large quantities of water must be pumped both in and out.

For example, pumping in 400,000 acre feet per year of ocean water and pumping out 500,000 acre feet of Salton Sea water is required for the Salton Sea to approach ocean water salinity. That is a lot of water.

Since it is unlikely there will be a source of low-salinity pump-in water, a variation of this concept is pump-out only. Pumping out a relatively small 150 thousand acre feet per year of Salton Sea water will allow the Salton Sea to reach ocean salinity. This would create a smaller Salton Sea by about 35 percent, in terms of area.

Our estimate of the capital cost for this system is about $300 million, with operating costs being approximately $5 million per year. Therefore, pump-out achieves nearly the same results as pump-in, pump-out, and at a much lower cost.

Providing that a smaller Salton Sea is acceptable, pump-out should be considered as a viable option for the Salton Sea. One important issue that needs to be resolved with this concept is the destination of the pumped water. One frequently mentioned area is the Laguna Salada in Mexico. Technically, this is feasible, but would entail reaching an agreement with Mexico.

Another concept that has the potential for controlling salinity and elevation is the creation of in-Sea impoundment areas by diking. This could result in a Salton Sea with the same elevation as now and a salinity level comparable to that in the ocean.

The primary disadvantage with diked impoundment is that part of the surface area in the Sea would be in an impoundment area which would contain very saline water. Fish would not be able to survive in the impoundment and, in time, this brine would precipitate salt.

Eventually, this salt would have to be removed from the impoundment area—the cheapest way probably being to pump out the brine. When this has to be done is uncertain and will depend on the criteria for pumping out the brine.

A lower bound would be when the brine first reached saturation while the upper bound would be when the impoundment area fills up with solid salt.

Using our assumptions on inflow volumes, an impoundment area of approximately 65 square miles, which is about 17 percent of the area of the Salton Sea, would allow the Salton Sea to reach ocean salinity. Depending on the pumping criterion, the impoundment would be able to operate from 10 to 75 years before the brine needs to be pumped out.

Our estimate of the capital cost of such a system is about $300 million for an earthen dike and about $700 million for a concrete dam. Operation costs would be between $1- and $2-million per year.

If having part of the Salton Sea at a high salinity level is acceptable, we feel that diked impoundment is also a viable option for the Salton Sea.

Based on our analysis, we conclude:

First, that industrial municipal water in the Salton Sea will be reduced considerably once the Mexicali facility is operational around the year 2000;

Second, there is time to address the selenium issue, allowing for further research and more information to be gathered;

Third, desalinization is not a viable concept for salinity and elevation control of the Salton Sea;

Fourth, pump-out is a feasible method for salinity control, but the size of the Salton Sea would decrease; and

Fifth, diked impoundment will control salinity and elevation, but the impoundment area will have high salinity water.

Diked impoundment appears to be the solution that would best meets the salinity and elevation requirements, and at a similar cost to pump-out. More detailed and optimized designs need to be developed in order to better predict cost and performance. Finally, the ecological and institutional consequences of the various concepts need to be better analyzed before a final selection is made.

Thank you.

[The prepared statement of Mr. Hardie may be found at end of hearing.]

Mr. DOOLITTLE. Thank you. Our final witness in this panel will be Mr. Tom Veysey, who is testifying as an Imperial County farmer, but he is also a distinguished member of the Imperial County Board of Supervisors. Mr. Veysey.

STATEMENT OF TOM VEYSEY, REPRESENTING THE SALTON SEA AUTHORITY BOARD OF DIRECTORS

Mr. VEYSEY. Thank you, Mr. Chairman. My name is Tom Veysey and I'm a resident of Brawley in Imperial County, where I have farming interests and also engage in public service as a member of the Salton Sea Authority and serve the voters in District 4 on the County Board of Supervisors. District 4 encompasses all of Imperial County's portion of the Salton Sea.

I wish to visit with you today as an agricultural producer. Agriculture is far and away the cornerstone of the Imperial Valley economy and its destiny is dependent on the Salton Sea for drainage as it is dependent on the Colorado River for water.

Producers are anxious for the Salton Sea's restoration for reasons beyond the role of an irrigation drain water repository. We take pride in our participation as community builders who are vitally interested in the quality of life beyond our families and communities.

We look on the Salton Sea as a tremendous asset, with vast economic opportunities for all the desert southwest and the so-called Inland Empire. Indeed, the Sea is sick but, given its restoration and renewed vitality, it will be a magnet for enterprise facilitating recreational activities and environmental gratification.

In its restored state, the Sea will be embraced by the Inland Empire and Southern California as a major recreational and environmental resource.

In its revitalized state, the Salton Sea will partner with agriculture to support the region's economy in ways that will not undermine its infrastructure of services.

I envision a healthy Sea as adding greatly to our tourism and visitor market and vastly enlarging the region's business opportunity base. This will provide new initiatives that should continue to expand qualitative employment opportunities, contributing to better prosperity for rural and city life.

When it is restored, the Sea will be essentially reliant on agriculture for drain water inflow to help maintain its elevation. The development of the Sea into a healthy, thriving recreational mecca will bring greater understanding of its relationship to our region's agricultural system.

The business of food production is fiercely competitive and increasingly fraught with high cost, risk, and calamity. Farmers have to farm smarter and manage more effectively with each new crop ear, in this changing world.

It is challenging for agriculture to sustain a role into the new millennium as a principal job-producer and wealth-maker of the County.

Our cropping patterns are now in the throes of major change from the traditional ones, as we seek newer crops and methods to sustain agriculture's economic engine. However, the necessity to force the salts through the soils and the resulting drainage will continue.

Some of this change is due to pests and disease from such indomitable foes as the Silverleaf Whitefly that throttled our melon deal and afflicted numerous other crops. Some is due to market price decline in what used to be a bellwether of economic vitality—vegetables.

Some of this is due to bad luck, such as occurred in our tremendously promising durum wheat industry that was dealt a crushing blow with the unjustifiable imposition of a quarantine following the discovery of Karnal bunt in Arizona.

Multi-faceted industries, such as cotton, that once was a hubbub of activity, with its production, harvesting, ginning, warehousing, and shipping, long has been in decline from natural pests.

Cattle production, another major leg of the County's stool of economic vitality, has waned significantly in need of meet and slaughter facilities.

Producers are struggling to find crops they can depend on, that will yield a return. It might appear that we are not being true to our badge as conservationists and environmentalists when we plant crops that are more water intensive than others and have to use chemicals to control pests and disease, but we sometimes have to do what we have to for survival.

I remember when we used to take a pause in our farming in August and recommence in September. Now, we don't stop. We really can't afford to.

We have to make tremendous investments in plastic-lined rows, sprinklers, strip irrigation systems, to attain higher yields to offset the eternal crunch of spiraling input and handling costs.

Then, when our crops reach a delicate, critical state and are smitten, say, with a whitefly invasion, we need to have a chemical

to go with integrated pest management practices to protect the crop. We are trusting that the EPA's administration of the Food Quality Protection Act doesn't take away all the means of surviving a major pest assault and disease, unless there are affordable alternatives; and many of these appear to be along way from reality.

Little wonder the producers are interested in water transfer. When such transfer occurs, it will provide some very necessary funds to producers that can be used to modernize and equip themselves to deal with a turbulent business environment, so they can stay in business.

Even when we are able to retool and fully refuel agriculture's economic engine in Imperial Valley, we will continue to need state and Federal resource support to help us find better production practices, embracing both conservation and environmental needs, as well as a method to deal with pests and disease.

The Whitefly Management Committee of Imperial County is spearheading a unique and applaudable association of county, state, university, and Federal resources which might be able to get that dreaded pest under control. Continued research on such problems will be necessary.

Additional creative planning, both within our County and in the surrounding counties, together with the state and Federal resources, might help us attract a cattle processing facility to this region.

As a producer and general citizen, I applaud your united interest as legislators in seeking serious, meaningful funding for the restoration of the Salton Sea, as well as the New River. All my life I have been associated with the Salton Sea. It's like an old friend who you never want to see in a state of decline.

As a youngster, I enjoyed many recreational activities there. I got to know it extremely well one night when I took it for granted during an outing of fishing and waterskiing, becoming incapacitated and having to spend the night in the center of the Sea, and subject to many search parties. Two others that night weren't as fortunate, and they lost their lives. Needless to say, I have a lot of respect for the Sea. It has pained me to witness the decline of the Sea, and nothing would please me more than to be a part of its restoration.

This is why I am, at this moment, working with the U.S. Corps of Engineers in supporting Congressman Hunter's citizens' task force on the New River, headed by Leon Lesica, involving our residents and communities in a New River cleanup project that will contribute importantly to the restoration of the Salton Sea.

It's a simplified but exciting concept of building holding ponds which would allow the water to rest and purify and then be released into the Sea as it is needed to maintain the critical elevation posture.

Further, I am supporting the concept of diked impoundment as the preferred approach to the restoring of the Sea. Salinity is clearly the most paramount problem associated with the restoration.

Diking appears to me to offer the best buy for the dollar in dealing with the heavy salt load of the Sea and its critical water level. The diked impoundment concept, coupled with the management of cleaner inflows from the New River, Alamo River, Whitewater, and other sources seems to me to be wise, doable choices.

The concept also offers future opportunities to include other solutions which require longer timelines for implementation and effectiveness.

I'm glad that the Salton Sea Authority scores agriculture highest in its evaluation of criteria associated with the restoration project. In as much as Imperial County has the highest unemployment rate in California, the $1 billion industry of agriculture must be preserved and enhanced.

We accept this challenge to change our future by working with you to improve this major resource and allow Southern California to further diversify by benefiting from the resources we enjoy.

I have endeavored to outline for you some of my beliefs as a farmer why agriculture vitally needs the Salton Sea and why the Sea cannot do without agriculture. Thank you.

[The prepared statement of Mr. Veysey may be found at end of hearing.]

Mr. DOOLITTLE. Thank you very much. There will be now the opportunity for Members to pose questions to the panel.

Given the size of the panel and the number of Members we have, we should use these lights for ourselves, and try and stay within the 5 minutes, as well.

Let me just ask whichever one of you would care to answer, of the two problems, the rising salinity and the raw sewage coming in from the New River, which of the two is greater, and how much greater is it, in terms of greater threat to the fish and wildlife and the overall health of the Sea?

Mr. CODEKAS. I would like to speak to that.

Mr. DOOLITTLE. OK. Why don't you take the microphone?

Mr. CODEKAS. I think the salinity is a far greater problem than the New River, and you can cure the New River, but that's not going to solve the salinity problem, and that's the problem with the Salton Sea, as we see it on the Authority.

Mr. DOOLITTLE. OK. Do you agree with that, Mr. Spear?

Mr. SPEAR. Basically, I would agree. I would add something about the New River. We are torn about the New River from the point of view of, clearly, we want it to be cleaned up, but I think we want to make sure that water keeps flowing to the Sea, too.

I mean, we have this great water balance problem with quantity and quality, and so we want to see the New River cleaned up, but overall, I'd like to see—you know, the salinity problem is, I think, undoubtedly the greater problem. If it keeps going, it really doesn't matter.

Mr. DOOLITTLE. Is it primarily the salinity that's threatening the fish and wildlife?

Mr. SPEAR. It's a combination. You know, when you have the higher salinity, every year gets higher, it increases the stress, we're at the upper limits of the species' capabilities to survive. It takes less and less of a problem to cause some of the disease outbreaks.

But, obviously, some of the other contaminants are the things that may start the outbreak. So it's a combination of things. But every year, the salinity gets higher, they're closer to the edge, and these things are going to occur easier and easier.

Mr. DOOLITTLE. We don't have a representative of the State Department here, but perhaps one of you will share your knowledge with us on this.

I understand the United States has agreed to build a sewage treatment facility for Mexico to deal with the New River, and I'm wondering what we got out of the deal.

Can anyone comment on that?

Mr. HUNTER. Mr. Chairman, I could comment.

Mr. DOOLITTLE. All right. Mr. Hardie, do you want to shed any light on that?

Mr. HARDIE. Just a little. What we get out of it is cleaner water.

Mr. DOOLITTLE. OK, now, that's what I assumed. But then apparently, is it not clear that we continue to receive the flow of clean water?

Mr. HARDIE. I think that is a little misunderstood. The amount of water—I don't have the exact numbers in front of me. I've got them back in my office. But the amount of water that actually flows from Mexicali is not that large, in terms of the Salton Sea. The New River is large. But that gets reinforced by all the drainage.

And so the actual, if Mexicali decided to redirect the water, I think is like 5 percent of the total.

Mr. DOOLITTLE. Five percent of the annual flow into the Salton Sea comes from the New River, then?

Mr. HARDIE. Roughly. I don't know offhand. It comes from Mexicali.

Mr. DOOLITTLE. Oh, comes from Mexicali.

Mr. HARDIE. From Mexicali, right.

Mr. DOOLITTLE. But is it clear in our treaty with Mexico, the negotiations that produced this plan, that they cannot then take that cleaned-up water and divert it?

Mr. HUNTER. John, I can do this real quick, here.

Mr. DOOLITTLE. All right.

Mr. HUNTER. We're going to pay about half the money for the cleanup, the big joint project—it's a joint project—in Mexicali. The reason for that, the justification for that is that we are asking Mexico to clean up their sewage, that is, to wean their sewage system from the New River.

The New River is mostly made up of flow from the drainage, from the big irrigation developments in the Mexicali Valley. It's all the farm waters.

But the toxic wastes coming in from the chemical plants and the raw sewage coming in from their sewage system, which is constantly broken, adds that dimension of toxic and sewage waste that ultimately gets to the sea.

So what we're doing is, we're spending about half the money, they're going to spend about half the money, and we're going to hopefully wean their sewage system from the Sea—from the New River.

They still have the right—and they've said that they want to do this at some point—to cutoff their flow of New River, that is, the sewage effluent, at some point, to recycle it in the same say that people are talking about recycling New River and Alamo River on this side.

So we can't guarantee that we're going to have the largest part of the flow of New River coming across that border from where the sun now stands. It could cutoff at some point.

Mr. DOOLITTLE. Thank you. We saw in the chart the comparison between the Salton Sea and the ocean and the lake.

Where does the Great Salt Lake fall on that chart, anyway? I'm just curious.

Mr. HARDIE. It's about, I believe, 280 parts per thousand.

Mr. DOOLITTLE. OK. Dramatically higher than anything you've shown on the chart.

Mr. HARDIE. And the Dead Sea is about the same at its surface, and it varies a lot. But it's as high as 325 parts per thousand, roughly, at the bottom of the Dead Sea.

Mr. DOOLITTLE. Thank you. Mr. Brown, you're recognized for your questions.

Mr. BROWN. Mr. Codekas, the Salton Sea Authority has been referenced as having some responsibility for relationships with Mexico. It's not clear exactly what. But that's true, isn't it?

Mr. CODEKAS. No.

Mr. BROWN. No?

Mr. CODEKAS. It is not true. We have no connection, tieup with Mexico at all.

Mr. BROWN. So any assertion that that's included as part of your responsibilities, which I saw in one of these papers, is not correct?

Mr. CODEKAS. That's correct. We are completely divorced from that.

Mr. BROWN. Now, the reason I raised the question is because it's been mentioned by several people that we need consultations with Mexico if we're going to dump water into Laguna Salada; and you haven't had any such discussions?

Mr. CODEKAS. No, but we figure that has to be done.

Mr. BROWN. Yes. And has the Bureau of Reclamation has any such discussions?

Mr. CODEKAS. No, we haven't.

Mr. BROWN. Did you have such discussions when you ran the Brine Line from Yuma down to the Sea of Cortez?

Mr. CODEKAS. Yes, absolutely, yes.

Mr. BROWN. And you got Mexican permission to do that?

Mr. CODEKAS. Yes, we did.

Mr. BROWN. Do you see it as insurmountable that you would get it to run another Bring Line down to a dry lake?

Mr. CODEKAS. I don't know that I would say insurmountable. I think there would be some issues probably that Mexico might have. The quality of water from the Salton Sea would certainly be a lot higher than the quality of water that we were running down because of the salinity issues.

The drainage water that we take down to Mexico now is about 3,000 parts per million.

Mr. BROWN. Same as the drainage water in Imperial Valley?

Mr. CODEKAS. Right, about the same.

Mr. BROWN. And it's like it, because it's created a very beneficial salt marsh down there?

Mr. CODEKAS. That's true, right. But Salton Sea water is 44,000 parts per million.

Mr. BROWN. I understand, but it would not be draining into the sea, it would go into what is already a dry lakebed?

Mr. CODEKAS. That's correct, yes. I don't know what Mexico—I certainly wouldn't say it's insurmountable.

Mr. BROWN. Would your agency be the proper agency to consult with Mexico about the feasibility of doing that?

Mr. CODEKAS. I would think that the International Boundary and Water Commission, which is an arm of the State Department——

Mr. BROWN. This isn't part of this problem, as I think one of the Fish and Wildlife people indicated, of complex jurisdictional situations which preclude any action, is it?

Mr. CODEKAS. I wouldn't say that it precludes action, no. I would think that you would have to involve the State Department, through the International Boundary and Water Commission, to have discussions with Mexico on that subject, though.

Mr. BROWN. Did you involve them when you negotiated the Brine Line from Yuma?

Mr. CODEKAS. Yes.

Mr. BROWN. OK. That sounds like a reasonable solution, then.

Mr. Chairman, do you want to entertain a comment from Mr. Pena?

Mr. DOOLITTLE. If you will come forward and take the oath, we will have you testify, with your answer. Please be brief, though.

[Witness sworn.]

Mr. DOOLITTLE. Thank you. Will you identify yourself and your position, please?

STATEMENT OF CARLOS PENA, PROJECT MANAGER, MEXICALI WASTEWATER PROJECT, U.S. SECTION, INTERNATIONAL BOUNDARY AND WATER COMMISSION

Mr. PENA. Thank you. I'm Carlos Pena, with the U.S. Section of the International Boundary and Water Commission, and I'm currently the project manager on the Mexicali Wastewater Project, so I can maybe answer some questions on that.

Mr. DOOLITTLE. OK. Mr. Brown, do you want to direct your question to him?

Mr. BROWN. The question that arose here has to do with whether there have been any discussions between the U.S. and the Mexican side about the possibility of pumping out Salton Sea water into the Laguna Salada. Can you answer that?

Mr. PENA. As far as I know, there haven't been any discussions yet.

Mr. BROWN. Would the Mexican side entertain discussions about that?

Mr. PENA. I'm sure they would be interested in hearing our proposals. I couldn't really say what Mexico would respond to.

Mr. BROWN. No. And you wouldn't care to comment which of these multiple agencies on the U.S. side should entertain these negotiations, would you?

Mr. PENA. Well, any discussions, we would probably be involved in. Is that what your question is, which agency——

Mr. BROWN. I understand that the Bureau of Reclamation negotiated the previous Brine Line. Would that be the appropriate agency, from your standpoint?

Mr. PENA. That would probably be one of them.

Mr. BROWN. Now, with regard to the Mexicali sewage plant, can you give us a very, very quick, in light of the time, update as to the progress and anticipated date in which it will become operational, and if you have any plans to keep the clean water on the Mexican side?

Mr. PENA. Right now, in fact, there's going to be a public meeting this afternoon in El Centro regarding that. The project has been forwarded to the Border Environmental Cooperation Commission for certification, and that is scheduled for December.

And once the December certification occurs, the money could be released through international agencies for——

Mr. BROWN. The NAD Bank?

Mr. PENA. The NAD Bank. So the construction is anywhere from 18 to 24 months, like you mentioned earlier, so that is still on schedule.

Mr. BROWN. Assuming approval early next year, you could have it done by the middle of 1999?

Mr. PENA. Eighteen to 24 months is the construction time period.

Mr. BROWN. Thank you very much.

Mr. PENA. Thank you.

Mr. DOOLITTLE. Mr. Lewis, you are recognized.

Mr. LEWIS. Thank you very much, Mr. Chairman. Mr. Chairman, it occurs to me that, when you look at the history of the Salton Sea, and those discussions involving concern about the Sea, we have, in the past, appropriated a good deal of money and spent some of the money relative to studying, and there's been study and restudy of this problem.

I'm very interested in beginning to try to get a handle on where we go from here. The Congress is about to appropriate almost as much as $7.5 million themselves. There are monies that Dave Kelley mentioned to me earlier that involve state dollars and approval, $2.5 million, that involve some matching provides. That provides sort of a platform for a new beginning here.

We tend to be—I tend to be—a local government guy. I'd like to get your impression, or give us your input regarding who the stakeholders would be in moving forward with a new solution, who would they look to as the appropriate body to coordinate all this, what kinds of requirements would such a body have, in relatively short order.

Mr. CODEKAS. If this were given, in some manner, through the Authority, the Authority represents all the local level that are stakeholders in this proposition.

I think what we would like to do is begin, if we're going to go on the impoundment, is to start engineering cost studies to see where we're going and what this will all cost and the size of the dikes and the number of years to clean up the Salton Sea, and keep it at the continuing level it is today.

Mr. LEWIS. Mr. Codekas, you suggested that—early on, you cautioned us that we should look to solutions that are practicable, that can be accomplished.

Yet it strikes me that the Salton Sea Authority has kind of come to a conclusion that diking is that practical line but, on the other hand, there are some who feel—we heard testimony that suggested that perhaps pumping in and pumping out might very well provide a broader and maybe a more ideal solution.

Mr. CODEKAS. I just feel, when you're pumping water that's 10 percent or 20 percent lower than what's in the Sea, you're going to pump out the whole sea to change the status of the salinity. There's not enough differential in that water.

Mr. LEWIS. Unless you brought water in from the Sea of Cortez, for example, or some other source.

Mr. CODEKAS. I believe you're going to be in the same position.

Mr. LEWIS. Others? Any other comment regarding that? Mr. Spear?

Mr. JOHNSON. I think the question you started with was more of the institutional arrangement, and we got into the diking question.

I'd make a comment on something else I'm involved in, which I think is an effective institutional arrangement, and maybe it ought to be looked at here.

Some of you are undoubtedly familiar with the Bay Delta process, what's going on up north.

Mr. LEWIS. I'm very interested in it.

Mr. JOHNSON. It's a Federal-state process with a very large stakeholder involvement type activity.

I believe to the extent that what we're looking at is a solution that is much larger than local, people talking about bringing in Federal dollars and state dollars, as well as local contribution, I think we ought to consider some sort of structure which brings all of the sort of local policy members from those institutions—Federal, state, local—sitting down at a body with some charge from the Congress and the administration about timing, about funding, a set of rules, so to speak, and then, you know, take our state of knowledge, decide whether, how much more research needs to be done, if any, how much, and then also begin to propose the kind of solution.

And, frankly, I expect, the way these things go, in the end, Congress, if they are going to come up with a lot of money, is going to ask a lot of tough questions.

Mr. LEWIS. It strikes me, Mr. Chairman, that this is a line that the Committee could very well pursue.

That is, there are farmers' interests that are local stakeholders; there is water district interest, water users; that the asset itself is every bit as interesting and perhaps as important as Bay Delta, and that's a model that, indeed, has given us a good deal of experience here, and might very well broaden the base of financial support, and look to the state for major resources, as well as water users as resource, and the Federal Government, as well.

Any other comment.

Mr. CODEKAS. I would just like to say, in my oral testimony, I stated we work in cooperation and in conjunction with state, county, and feds, in any operation.

Mr. LEWIS. Mr. Veysey?

Mr. VEYSEY. Yes. I can just give you a little local spin on this.

As you know, this has been studied for many years, and studies have been studied. And, when this came up with this pump-in, pump-out system and it was brought up $1 billion might be the cost of it, that scared a lot of the local residents around the Sea, saying that this will be studied and then, all of a sudden, come up to say, "Well, we can't afford $1 billion to finish this project."

This is why I think diking is very important. It's maybe a little more feasible, and it's proven it does work.

Mr. LEWIS. Thank you, Mr. Chairman.

Mr. DOOLITTLE. Thank you. Mr. Bono, you are recognized.

Mr. BONO. Thank you. Mr. Spear and Mr. Johnson, there's talk again about studies. And being as active as this Committee has been in getting reports on studies, is there much more that we can study?

It seems like we have covered this thing to the Nth degree, and I personally can't see where we could study much more.

My concern is that we're on a clock now, as you mentioned, and probably, if we started yesterday, it wouldn't be soon enough. So I'm concerned about duplication in studies, or bureaucracy in studies, and the length of time it takes for a bureaucracy to study.

If you would respond?

Mr. JOHNSON. I think that there are still some issues that haven't been answered. I think Mr. Spear referred to the fact that we still don't know what's causing all the die-offs; and I don't know that you can ever get an answer to that question or that we should necessarily wait until we have that answer.

But I think that plays in, to some extent, as to where you go with an option. For instance, the diking alternative will leave a significant portion of water that's going to continue to be highly saline.

Mr. BONO. Right.

Mr. JOHNSON. And if that's one of the causes of the die-offs, there's no way to keep birds from landing in an area that's good water versus bad water.

So I think that there are some issue there around the diking alternative that need to be addressed, in some way.

Mr. BONO. Yeah, that's the solution portion of the studies, and I think that's very valid. The question is, do you think there's any more studying we can do to find out about the problem?

I know we specifically haven't got an answer on what is exactly wrong, but it's very logical that all that pollution, all the salt, and all of those things accumulated would cause the results that we have right now, and that the cleanup of that would certainly be a big contributor to getting rid of those things.

Mr. Spear?

Mr. SPEAR. Yes, Mr. Bono. I think this is the dilemma, even in my own mind, that I bring to you here, a question of timing, that as time clicks off, the salinity gets higher and our problem gets worse.

But I also bring to you some suggestion of scientists about studies. And we even pressed them to say, "Anything you recommend has got to be done in 3 years." That was an artificial time which seemed short to them and now seems long in talking about this problem.

I guess I'd make a general comment. That is, I feel pretty confident in saying that there's been a lot more understanding of the physical aspects of what will happen if you produce this much water at this salinity, and what will change over time, and a real understanding of the biological, ecological systems, and I would say a related human health issue of what may happen if we don't look at some things further.

Mr. BONO. Let me ask you a practical question. If a study has to be done in 3 years, that could be 5 years. That gets you at about 10 years of life left, and does that leave you the time to do something constructive to turn that around, and a solution? Couldn't we run out of time by then, by not moving sooner? I question whether we have 5 years to study.

Mr. SPEAR. I question it, too. And I wonder whether we shouldn't say maybe 3 years is even too long.

Somebody says to me and the scientists and the other folks, saying, "We'll give you a year-and-a-half," and then get some folks very quickly, from the National Academy, or whatever body you want, Los Alamos or other others, and say "Judge these," and say "All right, what are the key things you have to do in a year-and-a-half?"

I think we would be making some mistakes if we didn't look at a couple of the key points here. I am not the person to judge exactly which ones are the best, but I think there's some time we should take, but not very long.

Mr. JOHNSON. I would echo that. I don't think that we ought to take a whole lot more time to study this, either. I think a lot of the stuff can go on on a parallel track, addressing some engineering issue with other.

Mr. BONO. That would be great. Thank you. Let me just ask Mr. Hardie one question.

With the treatment plant in Mexico, it's going to cause some clean water to come in from Mexico, but we're going to pick up more polluted water from the runoff here, going into the New River, and then into the Salton Sea; is that correct?

Mr. HARDIE. I don't understand which polluted water you're talking about.

Mr. BONO. The cleanup from Mexico is 5 percent of the—5 or 10—coming in from the New River.

Mr. HARDIE. Right.

Mr. BONO. So there's an additional amount that has to be cleaned up. I guess my point is, wouldn't part of the solution be to clean the water before it runs off into the Salton Sea?

Mr. HARDIE. Desalinization?

Mr. BONO. Not necessarily, not necessarily desal, but to treat the water——

Mr. HARDIE. Of industrial and municipal wastes?

Mr. BONO. Yes.

Mr. HARDIE. Well, I agree, but most of that will be treated. The source of most of that is Mexicali.

Mr. BONO. Don't we pick up a lot of that from our own runoff here, the pollution, from agriculture runoff?

Mr. HARDIE. Agriculture wastes, yes.

Mr. BONO. Yes. So you're treating the water, and then the agriculture runoff comes in, that's a big contribution to the New River; is that correct?

Mr. HARDIE. We did not look at that because we didn't have time. So I can't answer that question.

Mr. BONO. OK. It seems logical that if we clean it at that point, and then it gets polluted and dirty again, that to spend all that money cleaning it, maybe we should look at done something closer to the Salton Sea, rather than——

Mr. HARDIE. I agree. It's always easier to clean something up before it gets into——

Mr. VEYSEY. That's what we were talking about in ponds and purifying water before it goes into the Sea. I can also add that the New River and the Alamo River have been tested where they've gone into the Sea, and they test approximately the same.

So, in the process of coming to the Sea, it's dropping out into our community, the raw sewage and the other industrial wastes.

Mr. BONO. Thank you. Thank you, Mr. Chairman.

Mr. DOOLITTLE. Thank you. Mr. Calvert is recognized.

Mr. CALVERT. Thank you, Mr. Chairman. The discussion has been about several potential solutions, and I would like to ask a couple of questions in that regard.

Mr. Hardie, you mentioned just a pump-out theory, rather than pumping in, and that there's obvious problems in cost in that, pumping water back into the Salton Sea.

It is possible to pump water out without diking the Salton Sea, which may cause other problems, unintended consequences, and have evaporation pools separate from the Salton Sea within the United States, without having to pump long distances?

Mr. HARDIE. Yes, you certainly could do that. The impact on the Salton Sea would be the same as if you pumped it to Laguna Salada in terms of the reduction in size, which would be a reduction in surface area of about 35 percent.

Mr. CALVERT. Then the problem would be the amount of water that comes into the sea, whether or not there's any flushing action.

The question I have, under the treaty obligations we have with Mexico—and I'll ask this of anyone—the number of acre feet of water that we must deliver across the border into Mexico for their beneficial use, in good years, when that's in excess, is it possible to divert that water through the All American Canal and put that water into the Salton Sea for a period of time in order to help offset some of that?

Mr. HARDIE. Well, I sure wouldn't count on it. We would have to talk to the Salton Sea people.

Mr. CALVERT. We have years, obviously we have years, where we have water that we can't use and it goes out to the sea. Is it possible, in those years, to divert that water and put it into the Salton Sea?

Mr. CODEKAS. We're in a flood condition at all times in the Salton Sea. We have bad rains. We have these hurricanes, and we flood property, and the water just——

Mr. CALVERT. The question was, though, in concert with a pump-out theory, if we pump water out of the Salton Sea, nearby, if we put it into evaporation pools which, by definition, would shrink the

size of the Salton Sea, then we would need to get water to come in in order to maintain some type of elevation stability.

Is it possible to take water from the Colorado River in years of excess and allow that water to go into the sea to allow for that differential?

Mr. CODEKAS. Yes, I guess you could do that, but what years do you know you're going to be in surplus on the Colorado River?

Mr. CALVERT. I just bring that up as a potential solution. Yes, Mr. Johnson.

Mr. JOHNSON. That could occur intermittently. There would be years when you have lots of flow on the Colorado River, more than we can possibly store, and you can divert it and move it into the sea.

Over time, it's expected that that will decline and there will become less and less available, but there could be some available, yes.

Mr. CALVERT. Any other comment on that?

[No response.]

Mr. CALVERT. Another question, different subject. On the fish kill and the bird kill in the Sea, I suspect you chart that somewhat to the degree and numbers of the fish and birds that are dying off from year to year.

Do you see a potential for something that could happen dramatic within the next several years, if nothing is done relatively soon?

Mr BLOOM. Yes, Mr. Chairman. I think that if nothing is done, you will see an increase, especially in fish mortalities. Fish kills, over the past 5 years that I have been present there as the manager, have increased probably tenfold.

When I first came, a fish kill once a month was considered common. Now, a fish kill every three days is probably considered a common thing.

As far as the bird die-offs go, they generally follow fish kills. In other words, a fish kill is usually an indicator that you're going to have an increase in your bird deaths.

So it's logical to assume, then, if you have an increase in fish kills, you're going to also have an increase in bird die-offs.

Mr. CALVERT. Mr. Chairman, one question I would like to get answered, and it doesn't have to be answered at this hearing, but if there's any data that shows the amount of water that crosses into Mexico that exceeds our treaty obligation with Mexico, and what the constancy of that is, if any, is a potential way of diverting water into the Salton Sea.

Mr. DOOLITTLE. Why don't you ask Mr. Johnson here?

Mr. JOHNSON. It occurred in—from 1983 to 1988, we had some excess flows on the Colorado River system, and we're in full conditions on the Colorado River system, and it's occurring right now.

Mr. DOOLITTLE. How many acre feet a day is crossing the border in excess of our obligation to Mexico?

Mr. JOHNSON. I think our deliveries to Mexico this year are probably going to be, with the flood control releases, over 2 million acre feet. The annual obligation is 1.5 million acre feet. So we've probably released 500,000 acre feet over the treaty requirement this year.

Mr. CALVERT. So if we had 500,000 acre feet of Colorado River water, theoretically, going into the Salton Sea, if, in fact, we were able to have a pump-out, that's a significant amount of water?

Mr. JOHNSON. It is, if you can get it through—I mean, you've got capacity issues on the All American Canal, and those sorts of things. But, yes, periodically, there could be water like that that might be available, yes.

Mr. CALVERT. Thank you, Mr. Chairman.

Mr. DOOLITTLE. Thank you. Mr. Hunter is recognized.

Mr. HUNTER. Well, thank you, Mr. Chairman. All my colleagues, and all of our members of this team have, I think, in their questions, elicited a response that's painted an excellent picture of what we face here.

And Ken Calvert, I think, with his common sense questions, has sharpened it up.

Sonny Bono is our idea guy. He's got about 15 different ways we can develop a solution, and that's very valuable for us.

Jerry Lewis, as usual, wants to make sure we look at the big picture here. And, Jerry, we're going to do that.

And George Brown, with his scientific background, has really added a lot to this.

Let me just go to what I think is the big problem. The big problem is the physical problem. It's not a study problem, because if you hold up that salinity chart, you know that, at a certain salinity level, the fish die. You know that. You know that's going to happen.

That doesn't require more studies or more backgrounds in salinity. We know that's going to happen. And second, we know the pace at which it's presently happening.

So we can sit here and extrapolate that, at some point in the future, some date, we're going to have a dead sea.

Now, the only way to fix that sea from being dead is to effect some physical changes—that is, to either put in enough freshwater into the Sea, and maybe enlarge the size of the Sea, as to dilute the saline content, or to discharge the saline content and somehow—that's George's idea of discharge to Laguna Salada—discharge the salt and get rid of it, because we have a glass with too much salt that's becoming saltier all the time, and you either have to put in fresher stuff or you have to somehow discharge the stuff that's already salty, or isolate it. And isolation, of course, is the idea of the dikes.

Now, the idea was brought up, Mr. Spear and Mr. Johnson, that somehow, if you have a diked sea where you have part of the sea that's highly saline, basically a big salt basin, so that the remaining part of the body can stay alive and be relatively fresh, that that somehow would kill birds, or will have a deleterious effect on wildlife.

Well, obviously, you won't have any fish in it if it's the saline content of the Dead Sea or worse. We know that. We conceded that. So we're cutting off one arm so that the patient can live, if you will.

But there's no evidence that I've ever seen that birds would die because they landed in the salt. You've got highly salty areas in the Salt Lake in Utah, and birds don't die because they land in salt water. That's not what's killing the birds. I mean, a lot of things

are killing the birds with respect to stuff that's being shipped in from New River.

But I would like you to answer this question, one question, and I'll give you a couple of them.

First, do you have any evidence that simply having the saline impoundment, the salty impoundment would, in itself, result in a lot of bird deaths?

Secondly, it appears to me that we know, even though we haven't researched all these diseases that are coming there New River, we sure as heck know that they are a product, part and parcel of the massive sewage discharge in Mexicali.

So again, we have an issue that begs a physical solution—that is, weaning the city of Mexicali from that New River, keeping its sewage from pouring into New River. And that's the project that we're embarked upon with this big joint project with Mexico. So we need to do that.

Now, to help, there's a third dimension that hasn't been inserted here. And Mr. Tom Veysey, one of our great valley leaders, did bring this up. But that's an idea that a lot of our conservation groups, led by Desert Wildlife Unlimited, are moving on right now.

And that's to build a series of pounds, if you will, along the 50 miles of New River, between Mexico and the United States, with the idea that you flow—and we've had lots of research facilities that have validated this—as you flow water through this filtering marsh, if you will, you, to some degree, incrementally clean up that water.

That wouldn't be a bad thing, whether the Mexicali project is a 90 percent solution or turns out to be a flop or whatever, because in the least, it gives you more filtration and more cleanup than you had before.

One problem that our people have given us down there is that, looking over at first blush, the Imperial Irrigation District, looking at our EPA laws, have found that, if you touch the New River, once you take one drop of water out, you have to return that drop of water in literally drinking condition. So you can't incrementally clean up the river—another case of something that we've done to ourselves.

We may need to change that law. And I would like your comment on the validity of perhaps changing the law to accommodate an incremental cleanup as you go down through this ponding system.

And the Chairman is going to be meeting with some of those folks who are doing that citizens' task force later on today, and we would sure like to invite your presence.

But, if you could answer those questions, we would appreciate it.

Mr. SPEAR. On the latter one, which I remember the best, we've certainly shown that various places around the country—Arcadia, California is one of the great examples—where use of marshes as wastewater cleanup facilities—in that case, you go from your contaminated, polluted water, to a Stage 2 type—I think it's a Level 2 type treatment within the marsh.

I personally—and again, just from my—I don't understand the problem of moving it through and incrementally continuing to clean it up. I mean, I think we're seeking overall cleaning. To sort of stop

at maybe one point, and then not continue further, may be a problem.

But if it's a matter of incremental cleaning, running it through a series of marshes, it seems to make sense to me.

Mr. HUNTER. We may have to have a law change to do that, so we may need your assistance.

Mr. SPEAR. I hadn't heard that we had that problem before.

You mentioned earlier the comment about the dike. I wish I could say more, and I would like to get back to the Committee on that point. Just so that I don't give you an impression that it's all OK or it's all bad, I'd rather go back and talk to my——

Mr. HUNTER. OK.

Mr. SPEAR. [continuing] on the subject of what happens when the birds land in a very high salinity environment and what issues there might be as they related to this circumstance here.

Mr. HUNTER. OK. But, as of now, do you have any information that salt ponds, if you will, in themselves, are dangerous to wildlife? Does anybody have any information on that?

Mr. SPEAR. I would rather get back to you.

Mr. VEYSEY. Duncan, on the Salton Sea, there's many areas that are inlet areas, where it's very shallow, and the water is back in there, and it looks almost stagnant. And the birds relish that area. They like it better than more out into the Sea. I don't think that salt is a big problem there.

There's also some dead fish in those areas, and I've never seen any dead birds.

Mr. HUNTER. Thank you, Mr. Chairman, and thank you for your brilliant conduct of this hearing, while we're at it.

Mr. DOOLITTLE. Thank you for your brilliant insight, Mr. Hunter.

Let me ask as Chairman, I don't think we'll need a second round of questions, but I would ask unanimous consent for five additional minutes for me to pose one or two more questions, and if anyone else wishes to share the balance of that time, I'll be happy to make it available. Is there any objection to that?

Mr. LEWIS. Reserving the right to object.

[Laughter.]

Mr. DOOLITTLE. All right. Mr. Veysey, you testified that the bacterial count at the point where the Alamo River enters the Salton Sea is roughly equivalent to what it is where the New River enters the Salton Sea; is that correct?

Mr. VEYSEY. Yes, that's correct.

Mr. DOOLITTLE. Now, either that means it's pretty good in the New River or the Alamo River has problems. I'm not that acquainted with the Alamo River. So which is it?

Mr. VEYSEY. Well, the Alamo River doesn't take sewage from Mexico, and the New River does. So the New River starts out bad.

Mr. DOOLITTLE. All right. So really, then, this issue of the New River polluting the Salton Sea is perhaps overstated?

Mr. VEYSEY. Absolutely.

Mr. DOOLITTLE. OK. Mr. Johnson, the Colorado River, as I recall, is one of the most widely fluctuating rivers in the United States. Maybe it is the most.

What about the idea—I see elements of a solution here. Occasionally, it has enormous flows which cannot be predicted very well in

advance, I guess, but you would have some idea perhaps a few months ahead of time that you will have those flows.

Is there a solution out there that would allow for—of course, I realize we will have to deal with getting rid of the water that's in the Salton Sea if you did that. But is there a solution that would allow, in times of high flows in the Colorado River, to send in a couple of hundred thousand extra feet into the Salton Sea?

Mr. JOHNSON. Periodically, there would be times, as I said before, and I don't have numbers off the top of my head to give you an idea of how often that would occur.

But there could be times when we literally have so much water coming in that we're making releases and, in fact, we would be encouraging people to divert water. In fact, we've been doing that this year and, in fact, you know, additional water could be put in.

I think over time the availability of that water is going to go down.

Mr. DOOLITTLE. Yes. When do you expect the full capacity of the Colorado River——

Mr. JOHNSON. The Colorado River is an over-allocated, as everybody knows, the lifelong debate of the Colorado River is it's an over-allocated resource. Average annual flow is about 15 million acre feet, and the amount allocated in the United States and Mexico is about 16½ million acre feet.

Now, our saving grace is that we're not currently utilizing all of the water that's been allocated, but in time, potentially, as upper basin development occurs, the frequency of additional water would decline. We'll have more storage capacity and we'll capture and store all of those flows for consumptive use under the compact in the decree.

Mr. DOOLITTLE. So, long-term, an additional source of high quality fresh water would be highly desirable for this area?

Mr. JOHNSON. It would be desirable, but I don't think you can count on the Colorado River providing a long-term source for that purpose.

Mr. DOOLITTLE. I have an idea that I'll discuss later with Members of a way maybe we could get that.

I have a few more minutes left. Does anyone wish to——

Mr. BONO. I do, Mr. Chairman.

Mr. DOOLITTLE. OK, I'll yield to Mr. Bono.

Mr. BONO. Mr. Hardie, is it possible that a solution may not be one solution, but some of the above, or a few of the above? It seems like maybe that's something we should be looking at, as well.

Mr. HARDIE. That's right. If you go with diked impoundment, for example, there will have to be pump-out eventually. So diked impoundment will require pumping out the brine water someplace.

I want to say one thing about this concern about if the birds put their little behinds in salty water, then that's bad.

If that's bad, then almost no solution will work, because if we send this water to Laguna Salada, I don't think we have Mexican birds and American birds. So those birds are going to be sitting their little behinds down in Mexico, too.

So I think we need to be concerned about that water, whether it's in a diked impoundment in the U.S. or whether it's in Laguna Salada in Mexico.

Mr. BONO. Mr. Spear, I think I can safely say that part of the vision of the community, of the entire district, I think is, if we are going to find a solution, to also look to maximize the recreational use of the Sea, if we get to that point, to try to do everything, which could create, I think, an economic boom in the industry.

I was just wondering if that vision is in communication with your vision of fixing up the Salton Sea.

Mr. SPEAR. A clean Salton Sea, people would be encouraged to go to and recreate on, which be absolutely spectacular for fish and wildlife and ecological purposes.

Mr. BONO. That's great. Thank you very much, Mr. Chairman.

Mr. CALVERT. Mr. Bono is right when he says that there may be more than one solution potentially. And the reason I brought up the Colorado River earlier—and I understand that it's been over-allocated probably, depending on how many lawsuits you look at—is that that would be a short-term solution, maybe only a 20-year solution.

But finding water is the real problem here, in the long term, as Mr. Doolittle pointed out, and there may be other sources of water we can look to in the long term.

But in the short term, the potential diversion of the Colorado River in times of excess may at least bring the salinity level down where we could buy some time and bring the Salton Sea into a more livable condition.

Mr. DOOLITTLE. Mr. Brown.

Mr. BROWN. Mr. Chairman, I want to respect your decision as to when to terminate this panel, so don't let me run too long.

I'd like to ask two questions, one to Mr. Johnson. And, Mr. Johnson, I have the greatest respect for you, but sometimes I can be very critical of people that I respect.

[Laughter.]

Mr. BROWN. You made the statement that the Bureau of Reclamation doesn't have enough information to make a recommendation on the solution to the Salton Sea problem.

The Bureau has more experience with this problem than any other agency, been working on it for at least 25 years that I know about, yet you didn't even calculate the cost, the capital cost, of a pump-out solution.

I know the answer, but would you tell us why you didn't do that?

Mr. JOHNSON. Well, I think we made some rough estimates of capital costs, but I think we were also, in conjunction with the Authority, concerned about O&M costs, and we thought the O&M costs looked pretty high on that alternative.

Mr. BROWN. The O&M costs would exceed the $10 million.

Mr. JOHNSON. Right.

Mr. BROWN. That's the statement that is made in your report.

Mr. JOHNSON. Yes. Yes.

Mr. BROWN. Now, one of your pump-out solutions only cost $12 million, so you were getting pretty close to the limit to making it.

Los Alamos made the estimate that the pump-out solution would cost $300 million and $5 million in O&M. Isn't that close enough to justify looking in more detail at the——

Mr. JOHNSON. We have not eliminated any alternatives, and I would not imply that we have eliminated a pump-out from any-

thing that we're considering. I certainly didn't mean to imply that Reclamation has concluded that a pump-out solution was——

Mr. BROWN. I really think your problem here is that diffuse jurisdictional responsibility, which I have talked to the Secretary and the under secretary about, and suggested that they might solve that problem, and we could get more action here, and that would open your opportunity to do a little more effective or directed job on this, would it not?

Now, let me ask Mr. Spear a question. Mr. Spear, you indicated what you're doing is a bandaid approach to this whole problem of the Salton Sea. You're not solving the problem, you're just kind of disposing of the carcasses in a sanitary way, and that's not really the long-term solution, is it?

Mr. SPEAR. No, and maybe I should clarify that. The problem we have is, if we don't dispose of carcasses, is that you leave the dead carcasses, there's continued feeding, those things are getting into the food chains. And so we spread it throughout the flyway.

So it is not part of a long-term solution. It is trying to keep from getting——

Mr. BROWN. I'm not arguing the importance of it. I agree with the importance of it.

I made an effort, in discussion with friends on the Appropriations Committee, to get $2 million to allow you to do a more effective job on that and to also do some planning for a restoration plan for the Sea, and I was informed from a number of sources that representatives of the department and the Fish and Wildlife were very unenthusiastic about taking that money. Do you have any information about that?

[Laughter.]

Mr. BROWN. Well, as a taxpayer, I think this is noble, but as a person trying to save the Salton Sea Authority, I have serious qualms here.

Mr. SPEAR. I believe you talked to Mr. Garamendi about that Monday. I heard about it, about 30 minutes later.

Mr. BROWN. Yes.

[Laughter.]

Mr. SPEAR. I was on a field trip in San Diego, and he found me on top of San Miguel Mountain, and——

Mr. BROWN. I'm delighted to know he's as responsive as I always knew he could be.

Mr. SPEAR. Well, I indicated to him that we were aware of the proposal you were making and that we had given our support for that.

I sense what has happened here—and I do not know for sure—is that what's happened is that we're at the end of the appropriations process, the beginning of conference, and the budget folks, in essence, get very concerned about whether that will be new money or taken out of somewhere else, and it's the end of the process.

And I think that's the major—so it probably was not about the substance of the issue, it was more about where it was in the process.

Mr. BROWN. We're all students of the governmental process here, and we're interested in learning how it works, so this answer is very illuminating. Thank you.

Mr. LEWIS. But the problem is that, overnight, the $2 million dropped to $1 million in the actual bill that was written, and that's a little disconcerting to me.

Mr. SPEAR. Me, too.

Mr. DOOLITTLE. I'd like to thank the members of this panel for your testimony and the members of the Subcommittee. You've kept us on schedule, and that's good.

There will be further questions that we would wish to direct to you, and the record will be held open for your responses. We would encourage you to make your responses in a very timely fashion. Did you want to—yes, sir.

Mr. CODEKAS. Mr. Chairman, I would just like to say one thing before we close the session. The Authority has no crabs if Fish and Wildlife wants to do more studies, but we think you should start now reducing the salinity of the Sea. That's our position.

Mr. DOOLITTLE. OK. Thank you. Please respond quickly. With that, we will excuse the members of this panel. We are going to keep right on going, and I would invite the next panel, and final panel of witnesses, to come forward.

In the interim, while they are coming forward, I would like to acknowledge that Senator Feinstein has submitted a written statement for the record, expressing her views in this important matter of the Salton Sea, and those views will be incorporated into the record.

[The prepared statement of Hon. Dianne Feinstein may be found at end of hearing.]

Mr. DOOLITTLE. Gentlemen, will you please remain standing. Let me encourage our Subcommittee members, if they need, to take their conversations outside, so we can proceed and keep on schedule.

Ladies and gentlemen, let me ask the audience, please, we're trying to conduct a hearing. It's going to be difficult if we have this level of background noise.

I'd like to welcome Mr. Jim Stubchaer, Mr. Norm Niver, Dr. Philip Roberts, and Dr. John Zirschky.

Mr. LEWIS. Ladies and gentlemen, if you could, kindly keep quiet. If you must talk, please leave the room.

Mr. DOOLITTLE. Thank you. All right, gentlemen, will you raise your right hands? Let's see. Do we have Mr. Gruenberg up here, too? Yes, we've got him. All right. Good.

[Witnesses sworn.]

Mr. DOOLITTLE. Thank you. Let the record reflect that each answered in the affirmative. Please have a seat. I think you all heard me explain how the lights work.

Let us begin by recognizing Mr. Jim Stubchaer, who is the vice chair of CAL–EPA within the State Water Resources Control Board.

He will be accompanied by Mr. Phil Gruenberg, the executive officer of the State Regional Water Quality Board. Mr. Gruenberg will be available for questions. Mr. Stubchaer will be offering the testimony.

You are recognized, sir.

STATEMENT OF JIM STUBCHAER, VICE CHAIR, STATE WATER RESOURCES CONTROL BOARD, CAL–EPA

Mr. STUBCHAER. Thank you, Mr. Chairman. On behalf of CAL–EPA, I would like to thank the Committee for holding this hearing on this important subject. I am the vice chair of the Water Resources Control Board, which is a member agency of CAL–EPA, and I am representing them today.

I also represent CAL–EPA on the Mexican border affairs, so I have some familiarity with some of the issues you were discussing with the previous panel.

As Mr. Lewis mentioned, Proposition 204, which was passed by the voters last year, does include $2.5 million of the Federal research moneys for the Salton Sea.

Mr. Doolittle, I'm sorry. It was a little confusing. Mr. Gruenberg is going to make the presentation for us, and we will both be able to answer questions.

Mr. DOOLITTLE. Oh, that will be fine. Then, Mr. Gruenberg, you are recognized.

STATEMENT OF PHIL GRUENBERG, EXECUTIVE OFFICER, CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, COLORADO RIVER BASIN REGION

Mr. GRUENBERG. Mr. Chairman, members of the Subcommittee, I've lived in the Imperial and Coachella Valley most of my life, so I've got a special interest in the Salton Sea. In fact, as executive officer of the Regional Board, I've set two goals, personal goals, for myself.

Mr. LEWIS. Mr. Chairman, folks in the back indicate they can't hear.

Mr. DOOLITTLE. You're going to just about have to pick that up like I'm doing it in order for people to hear you. Yes, there you go.

Mr. GRUENBERG. As executive officer of the Regional Board, I've set two personal goals for myself. One is clean up of the New River and the other one is the restoration of the Salton Sea.

However, this cannot be done via regulation alone. I'm going to need help, and I come here humbly today asking for your help in achieving the goal of restoring the Salton Sea.

I think one of the problems in the past, why not much has been done, is there has been too much finger-pointing and blame-placing on the issue of the Sea. You hear too many comments along the lines of "They don't care," "They need to clean it up," "They're not doing anything." I think we need to think about who "they" really are—maybe me, maybe you.

I think the bottom line on this is that we all share responsibility toward the problems of the Sea, and we're all going to have to work together to effectively realize a solution.

As far as what that solution is, there's been a lot of studies done on the Sea. In 1965, the Regional Board contracted with Pomeroy Engineers to review the Sea's problems. What they concluded was that, as salinity increases, the fishery was going to decline and, ultimately, die out.

Now, with that warning, not much happened. My feeling is not much happened because not that many cared about the loss of the sport fishery.

In the last 5 years, it's been a lot more than that. There's been catastrophic die-offs of birds and what appears to be a total ecological collapse. It's something that we simply can't walk away from. It's more than just a sport fishery.

What Pomeroy recommended was that an in-sea evaporation basin be constructed to control the Sea's salinity problem, to address this situation. Back at that time, I thought, "There's got to be something better than this," and a lot of people thought the same way. But now, 32 years later, I'm back at that point exactly again, and I think they were right on target. I don't think there are many options, and I believe that's really it.

There have been some other ideas that sound attractive—a two-way exchange with the Gulf of California. But with the high salinity of ocean water and the high evaporation of the Salton Sea, it simply isn't going to work.

There are some flaws with diking. One of them is going to be the challenge of keeping waterfowl out of the diked area. The other one is, people have said dikes are ugly.

Well, consider San Diego and Mission Bays. Those are largely diked, and they're actually quite attractive, so diking doesn't need to be ugly. It could be landscaped and have access for fishing and so on.

It is also going to be important with diking to have the proper size of a dike and location. Pomeroy Engineers had recommended a 40 to 50 square mile dike. That's going to be too small. The salinity is too high now. I think 125 square miles is more on target.

As far as where it's located, it needs to be away from the portion of the sea which is of greatest importance, and I kind of hate to suggest where this is, but the south end is important for fish spawning. There's a wildlife refuge, and it was a good area for corvina fishing. So I believe that the deep water area at the north would be the best, something along these lines.

To conclude, I believe that salinity needs to be addressed as a priority, and we need to do it expeditiously.

[The prepared statement of Mr. Gruenberg may be found at end of hearing.]

Mr. DOOLITTLE. Thank you. Our next witness is Mr. Norm Niver, who is with the Salton Sea Citizens Advisory Board. Mr. Niver, you are recognized.

STATEMENT OF NORMAN E. NIVER, SALTON SEA CITIZENS ADVISORY COMMITTEE

Mr. NIVER. Thank you all, this whole panel, for being here. We've waited a long time for you guys to come, and I really appreciate your interest. I'll get on with my testimony.

I live on the water. I live in the Sea. I fish the Sea every day. So I come from there.

In 1956, scientists doing studies on the Salton Sea were predicting the Salton Sea's demise by high salt levels. A study at the time, the best of its kind to date, found massive fish die-offs along the seashores. Death of the fish due to algae blooms were creating oxygen insults to fish caught up in them.

At the time, scientists were aware of the wind-driven currents that would gather floating dead fish and assemble them into large

bodies of death, floating from here to there, meandering from the direction of the wind.

Fish were observed swimming upside down, spiraling like airplanes at air shows, up and down, all near death, brain dead with enough nerve movement left in their bodies to fulfill their waning wiggles in their final moments. The fittest of the fish always survived.

The question to these scientists was where would this die-off accumulation of fish end up? They thought out the areas well, to get a more accurate dead fish count than they do today.

Fish populations grew, from 1950 to 1955, millions of healthy sport fish. Many fish died. Some fish died from starvation. Most died from algae blooms created by the rich nutrients flowing into the sea from local farmlands.

The point of this is, fish have been dying here at the Sea from 1955 until now. I personally actually see less fish dying at this time than I have ever witnessed since being involved with the Sea 30 years ago.

Throughout the 1960's and 1970's, we could always find fresh dead corvina and croaker in some given place, as we fished the Sea. These kills always occurred during the summer months—big corvina, floating belly up, areas as big as football fields heading toward shore. It looked like a white floating freeway.

The fish would back up against shore, out at least 200 feet, only to drift away with the help of a Borego wind from the southwest, the next day.

What we are seeing today is tilapia that died perhaps a week to 3 weeks ago, very few fresh dead fish found along the west shores. It's unlike it used to be.

Over the years, the public's feelings have changed from acceptance of the Salton Sea to rejection of the Sea because of the fear of people to use it for recreational purposes. The public, since the selenium scare, have progressively turned their back on the Salton Sea as an option.

There has been, and continues, an unnecessary assault on this maligned sea. The thousands of people surrounding the Sea, people that know the Sea well, are amused at the ongoing redundant press releases about fish in the Sea, at the same time being very sympathetic to the U.S. Fish and Wildlife Service for their hard and depressing work, last year and today, to some degree, cleaning up the bird die-offs.

Press releases still pour from them, even though the bird deaths are much lower than last year. I say the world already knows about what happened at the Salton Sea. I think it is about time to tell the people that avian botulism kills 500,000 birds in the United States each year. Forty thousand perfectly healthy birds left the United States and died in Mexico of the same problem.

Why do they keep blasting the Salton Sea with "I think so's," "It's a hypothesis," or "It's a theory," or the assumption that it is the "sewage from Mexico"? This current opinion of the Salton Sea has grown rapidly over the last 10 years. Our people have never read so much negative hits on this sea.

If it is the "squeaky wheel gets the grease" bit, it has never worked until now. However, why would taxpayers invest in a cesspool that is sick and dying?

Some teachers even teach the filth, the ilk, and the cesspool concept of the Salton Sea with their data based on press releases, assumptions, and theories brought forth by their reading of the local news media.

Unfortunately, these false impressions have been placed in the public's mind all over the earth, repeatedly. The public and the schools are provided with misleading information that add to their already preconceived ideas of the Salton Sea.

New workers coming to agencies involved with the Sea arrive knowing everything about the Sea, they think when, in fact, they only know what they read or watched on the electronic media.

The support groups, everywhere, the local economy, businesses, property values, along with people's lives, have been destroyed by this action. They laugh and yet cry over the loss of this valuable resource to all.

Dead fish, windblown, gather in certain areas. The press will photograph them and call them massive fish kills—killed on this very spot, they think. This adds to preconceived opinions of the Salton Sea and drives the public away while devaluing the very Salton Sea that we would hope that taxpayers would be willing to pay to have it saved.

All dead fish were fresh dead at one time, but where did they come from? Where did they die? Where did they originate?

Today, is it a natural cycle working on this wall to wall population of this perch-like fish, the tilapia? Die-offs are different today. Dead fish counts are far from accurate—and that's emphasis added.

The water quality issue is salts. Nine million tons each year flow down the Colorado River. This river water comes to the Coachella and Imperial Valley's farmlands—comes from.

Each year, 4 million tons of salts arrive at the Salton Sea in agriculture runoff water to add to the 460 million tons that are currently in suspension in the water of the Sea today.

This is for sure: evaporation of Salton Sea water is the only means of water leaving the sea so far. These salts, left behind, accumulate into the amounts that are currently stressing the fish and birds at the Salton Sea.

Salt removing can be corrected quickly by building a dike option, as proposed by the 1974 and 1975 and the 1986 and 1992 efforts to find a salt-removing project for the Salton Sea. The great Salton Sea Authority and its talented Technical Advisory Committee has also come up with these options, once again.

A dike, for the first time, will give the Salton Sea an outlet. Salt removal is faster on some options. More study will have to be done on the final option.

Mr. DOOLITTLE. Mr. Niver, can I just interrupt? You're making an excellent statement, but can you summarize the remainder of it, rather than read the remainder?

Mr. NIVER. Sure. Gentlemen, I could go on for hours and hours. [Laughter.]

Mr. NIVER. The beautiful birds and the great fishing is outstanding at this time. It is about time to bring a billion dollars income to both Riverside and Imperial Counties in the future. It is about time to recognize that only 16 percent of the people in California even play golf; 17 percent play tennis.

If you look into the problems of California, you will find that one-half the population live from Los Angeles to the border. Fifty-nine percent of those want and need water-oriented recreation areas. It is a positive for the fish and wildlife. It is another positive for the counties and the State of California.

Thank you.

[The prepared statement of Mr. Niver may be found at end of hearing.]

Mr. DOOLITTLE. Thank you very much, sir. Our next witness is Dr. Philip Roberts, Associate Dean of the College of Natural and Agricultural Science, the University of California at Riverside. Dr. Roberts.

STATEMENT OF PHILIP A. ROBERTS, ASSOCIATE DEAN, COLLEGE OF NATURAL AND AGRICULTURAL SCIENCES, UNIVERSITY OF CALIFORNIA, RIVERSIDE

Mr. ROBERTS. Thank you, Mr. Chairman, and I thank the Committee for their time.

My testimony will present the proposed role of the University of California in the coordination and conduct of research and implementation addressing the solution options to the stabilization and water quality improvement of the Salton Sea.

The University of California at Riverside has been asked to coordinate research efforts for the UC system because of its concentration of relevant programs and expertise and its proximity to the Sea. We propose to provide a research coordination for not only the UC system but also with other institutions and state and Federal agencies.

Why is such coordination needed?

We recognize that there have been a number of helpful, numerous previous research activities and assessments, many referred to today, over the last several years. However, in general, they've been limited by the complexity of the scientific issues involved.

These issues include hydrology, engineering, biological-ecological systems, soil and toxics, chemistry and bioremediation, salinity and wastewater management, economics, agricultural interests, and human social and cultural considerations.

Although good evaluations and some data are available for some components, a holistic approach that integrates the component issues across disciplines we feel is lacking still, at this time. We do not have the cause-effect-solution relationships for all component parts and their solution options when we try to target a decision on a solution.

The university proposes to provide the objective forum and a core of expertise to pursue a comprehensive research-based analysis of primary proposals for solutions. We are now in the process of pulling together an action team of UC and other scientists, to this end.

Now, what can we contribute?

Within the system, we have research expertise, programs, and facilities. At UC Riverside alone, we have about 25 faculty who have expertise bearing on the many complex issues which face the Sea.

Coordination of scientists from several UC campuses will be necessary, and we recognize that about 12 percent of the water expertise scientifically in this country is found at the University of California.

We have made contacts with scientists at Berkeley, Davis, Irvine, UCLA, San Diego, Santa Barbara, and preliminary contact with Los Alamos.

Coordination of scientists from other institutions and agencies will be necessary, obviously. Therefore, we will coordinate also with state and Federal agencies and other universities in this coordination role.

The University of California is the state's land-grant institution and we have, as our mission, to provide educational research and public service programs which can help you, as policymakers.

We are well positioned, therefore, to serve in a role of honest broker and provide coordination of the research, rather than the policy end of providing a solution.

I'd like to highlight a few programs that have direct relevance and facilities with relevance to the Salton Sea, within the UC system.

We have the Salinity and Drainage Program, headquartered at UCR. It's a consortium of scientists which have been studying similar problems in the Central Valley, most notably took a successful leadership role in addressing the Kesterson National Wildlife Refuge Problems.

We have the University's Water Resources Center, founded in 1957. It's a multi-campus research unit established to stimulate and aid research on water-related issues.

At the UC Riverside campus, we have the U.S. Salinity Laboratory located on the campus site, devoted specifically to the study and amelioration of salinity and pesticide-related agricultural and environmental problems. Many of the scientists there have UC-adjunct appointments.

We have also headquartered at the university the University of California Institute for Mexico and the United States, commonly referred to as UC–MEXUS.

This program has undertaken a long-term research focus on binational issues of water and the environment in the California-Mexico border region, which we feel would be critical to assessing and implementing any solution that would involve a binational component to the solution. Here, we could draw policy and science together in terms of the binational issues.

We also have a newly formed Center for Conservation Biology at UC Riverside that focuses on issues related to habitat restoration, constructed wetlands, et cetera.

Finally, in terms of facilities, we have a 540-acre agricultural research station four miles from the north shore of the Salton Sea.

We believe that this would be most suitable for a research base for efforts involving scientists from other UC campuses than our own, and also from other universities and state and Federal agencies.

In terms of an action plan, we envisage a four-phased approach to this phase, in terms of the coordination of an action of research.

Phase I is an evaluation phase, a short timeframe of two to three months in which a further review of existing data would determine information gaps and research needs.The purpose here is to integrate priorities across disciplines.

Mr. DOOLITTLE. Dr. Roberts, can you summarize the rest of your excellent testimony, just in the interest of time?

Mr. ROBERTS. OK. The other phases would follow a testing phase of from one to three years, to do a feasibility study. This would work in parallel, then, with Phase III, an implementation phase, in which we would monitor the actual implementation of a solution from a research standpoint.

My final point is that the university would look at a long-term partnership and monitoring relationship in this process and take ownership of the health of the sea long after the actual solution to be adopted has been put in place.

I thank you for your time.

[The prepared statement of Mr. Roberts may be found at end of hearing.]

Mr. DOOLITTLE. Thank you, sir. Our final witness is Dr. John Zirschky, who is the Acting Assistant Secretary of the Army for Civil Works. Dr. Zirschky.

STATEMENT OF JOHN H. ZIRSCHKY, ACTING ASSISTANT SECRETARY OF THE ARMY FOR CIVIL WORKS

Mr. ZIRSCHKY. Thank you, sir. I'll be very brief—three minutes or less.

I would like to spend the first minutes telling the people in the audience—you know us well—to tell those in the audience why the Army Corps of Engineers is here; two minutes saying what we've done in the one year that we've been involved in this project.

The United States Army's Corps of Engineers is about 222 years old. We've served our country as the nation's problem-solvers. We're one of the few Federal agencies the founding fathers would still recognize. In fact, we are the first environmental protection agency in this country.

Almost 100 years ago, in 1899, Congress directed the Army to keep people from throwing their garbage into the rivers. So you may want to, in 1999, take credit for your predecessors and celebrate the 100 years of Federal protection of our water quality.

We are the world's leader in ecosystem restoration. From Lake Tahoe to the Florida Everglades, from San Francisco Bay to coastal Louisiana, to the upper Mississippi, we support the Department of Defense, the Department of Energy, EPA, other Federal agencies, Russia, countries from Russia to Papua, New Guinea.

I would add that a lot of the work we do for foreign countries is paid for by those governments. They're not American tax dollars. For example, the Papua, New Guineans asked us to come clean up a river system that they had, that was contaminated.

These type of projects keep our military engineers in the Corps of Engineers trained and ready for other contingencies, such as natural disasters. It is how we get our training as the Army engineers.

When there's a North Ridge earthquake, for example, the same people that will be working on the project here will be crawling through the damaged buildings, making sure they're safe. So essentially, we think we provide two things for the price of one.

Enough of the commercial, I suppose, although I might also add—Congressman Bono, you're interested in water recreation—we're also the No. 1 provider in the world of water-based recreation, 400 million visits to our water projects, creating about 600,000 jobs.

We got involved in this ecosystem a little over a year ago, in the beginning of 1996. In the first year that we were involved, we worked with the Imperial County and the Imperial Irrigation District to pick and find eight sites on the New River and the Alamo River that we could do some ecosystem restoration.

Why these rivers? You noted in the first panel that 90 percent of the flow coming into the Salton Sea comes in through these rivers. Roughly about 10 percent of the flow in the New River comes out of Mexicali. The rest of it is added by return flow and drainage.

The health of these rivers we believe is very important to the health of the Sea. While salinity is a key issue, there are other contaminants going in there, and our ecosystem restoration projects, we believe, will help improve water quality.

We are hoping to continue our partnership with the county and the Imperial Irrigation District, and build at least two of these projects, one for each river.

What they will consist of are essentially wetlands and riparian habitat. Those projects will improve water quality, provide safe habitat for the birds. In other words, you will have an extra place for the birds to go to, that will be safe, there will be no question, to extend the amount of habitat for them. We'll stop sediment transport and we believe, also help the Pacific flyway route.

Our actions, we think, are 100 percent compatible with and complementary to the other efforts discussed here today. We have some pictures of what a project would look like. I can take you up to the Sonoma Bay, Northern California, and show you some of the types of projects on the ground that we are contemplating building and helping to build here.

We can support other efforts of the team that you've put together. Someone had mentioned removing sediments. We are well known for dredging. That's not always a plus with everybody. But if dredging needed to be done to deepen the Salton Sea in some areas, we obviously are the experts in that.

We think such actions would not only get out contaminated sediment, but deeper water columns, cooler water, less apt to help bacteria grow, and cooler water also has more dissolved oxygen that the fish need to breathe.

I think I've just about made my three minutes. I want to thank you, just mention we are the world's leader in ecosystem restoration. We think we're the A-team, and we're proud to be part of your team.

[The prepared statement of Mr. Zirschky may be found at end of hearing.]

Mr. DOOLITTLE. All right. Thank you.

We've heard the testimony, and I think just about everybody agrees that the increasing salinity of the Salton Sea is undesirable, but, after all, it's far less saline than the Great Salt Lake and, as Mr. Hunter brought out in the questioning, we're not having bird kills, as far as I know, in the Great Salt Lake. I guess, to one degree or another, these things just happen naturally from time to time on their own.

You were saying, Dr. Zirschky, that you provide safe habitat for birds. But they don't know it's safe, right?

Mr. ZIRSCHKY. True.

Mr. DOOLITTLE. As far as they're concerned, providing that habitat isn't necessarily going to solve this problem, because they're still going to go to the Salton Sea, I presume.

Mr. ZIRSCHKY. Some will. Some would also go to our habitat.

Mr. DOOLITTLE. We don't even really know, do we—I don't think anybody claimed to know—why exactly these birds are dying, anyway, or what the source is. Mr. Niver, I thought, brought that out in his testimony.

So I guess in that sense, you could study these things forever. But the fact of the matter is, if there is a common agreement that the increased salinity is negative, then we ought to at least be able to proceed along those lines to deal with that, as I think the gentleman representing the Salton Sea Authority was stating.

Any disagreement with that?

[No response.]

Mr. DOOLITTLE. Dr. Roberts, how can we ensure that all further research is going to be done on a coordinate basis?

Mr. ROBERTS. Well, we see it as being a missing link in what's being presented.

There's some 50-plus proposed solutions but, in almost every one you look at, there's a bias or an absence. Either that's a central engineering component, but how is that placed with the biological concerns? And you can go around in terms of the different components, and see that we don't have them pulled together.

I guess what I have proposed to you in the testimony here is our system, which has been historically in the business of taking a coordination role in research directed at problems—and I gave you the Kesterson National Wildlife Refuge problem and cleanup as an example.

We have a large system, but we have within it mechanisms that would allow targeted and rapid response,in a pooling of research to try to get at this integrated approach.

Mr. DOOLITTLE. So you would recommend using your system, then, as the clearinghouse, because you coordinate?

Mr. ROBERTS. Our system, we are offering that as a possibility, and we have historically had success in providing that objective forum.

I would like to restate that we see this as an inclusive, not an exclusive process, with our other university institutions outside the UC system, as well as the state and Federal agencies, the scientists and experts in those areas, too.

Mr. DOOLITTLE. OK. Thank you. A question to any of you who wishes to volunteer.

Which agency should be the lead agency to deal with this problem?

Mr. NIVER. Locally?

Mr. DOOLITTLE. Well, local, state, Federal.

Mr. NIVER. The Salton Sea Authority, in my estimation, has done an excellent job.

Mr. DOOLITTLE. OK. And which percentage of the cost should we bear for rehabilitating this?

[Laughter.]

Mr. DOOLITTLE. I think we have to know the answer to some of these questions. I don't want to hear that you think the Federal Government ought to be responsible for all of it.

Dr. Zirschky.

Dr. ZIRSCHKY. In our program, cost sharing is required for all of our projects, ranging from a 50/50 cost share to a 75 percent Federal/25 percent local cost share, depending on what types of projects are needed.

So the law specifies, for our activities, how much the locals must provide.

Mr. DOOLITTLE. OK. Mr. Stubchaer, would you care to volunteer the level of the state's participation in this project?

Mr. STUBCHAER. Well, I agree that some cost participation makes people more responsible. No, I can't volunteer how much the state participation would be.

I think it would take a bond issue by the voters of the state, probably part of a bigger bond issue, that provides benefits to other, more populous areas of the state, before substantial amounts of state money should be available.

Mr. DOOLITTLE. Would we get some sort of a commitment from the state to arrange for that bond issue, or to find the money somewhere else?

Mr. STUBCHAER. There may be legislation pending for the next bond issue that would include some funds for the Salton Sea. It would either be done by the initiative process or by legislation to foreclose the bond issue.

Mr. DOOLITTLE. Mr. Gruenberg, will you hold up that picture of one of those dikes? Is there an island or something you had there? Let's see that again.

Mr. GRUENBERG. This one here?

Mr. DOOLITTLE. No, the other one. All right. That would be the dike containing this pond of highly saline water which you said—it looks like what you're proposing, this thing in the upper part of the Salton Sea, that would be roughly about a third of the area of the entire Salton Sea that would be contained within that dike; is that right?

Mr. GRUENBERG. That is correct. Because the salinity is greater now than it was before, and because water conservation is coming, I think you have to design it bigger than what had originally been recommended back in 1965.

Mr. DOOLITTLE. Mr. Niver, would this offend your feelings about the Salton Sea, to have this constructed?

Mr. NIVER. Yes, it would, at that particular end. Riverside County is out, and my friends from the state park are out, and it looks to me like Desert Shores is out.

I prefer the dike in the center of the sea, just for beginning, now to get the salt out, turn it into an island later, and let the research go on to find a better and bigger way of doing the whole Sea.

Mr. DOOLITTLE. Mr. Gruenberg, do you want to respond to that?

Mr. GRUENBERG. This diagram doesn't show it real well, but the intent was to dike the Sea at the 20 to 30-foot contour. There would be no shoreline community cutoff in the beneficial uses or access using the Sea, including navigation.

Mr. DOOLITTLE. Well, with that stipulation, does that change your opinion, Mr. Niver?

Mr. NIVER. Looking closer, it would be like we would have a river leaving the north shore. We could go toward the Whitewater River and come around and arrive at Desert Shores. So it would be like a river, and coming down the river outlet would be right out in front of my house, which is OK with me.

But I don't know. I question why you want it at that particular end, when what's wrong with the contour at the south end?

Mr. DOOLITTLE. My time is up. Having flown over the San Francisco Bay a number of times, you can see the dikes and the impoundment. I believe Leslie Salt either owns or used to own those.

Is this similar to what we would be talking about, with these dikes where, through evaporation, they concentrate the salts? I don't think we'll be using it for table salt in this case.

Mr. GRUENBERG. Exactly. The salinity would buildup in there with time, and ultimately you would have to dispose of that, so that would take yet another project. But it would take quite a while for that to happen, because if the impoundment was this large, it would take a long time for that to buildup to the point where the salt would begin precipitating. So I would guess it would probably be 100 years or more before that problem would become an immediate need.

Mr. DOOLITTLE. Thank you. Mr. Brown, you are recognized for your questions.

Mr. BROWN. May I continue with Mr. Gruenberg for a couple of minutes or more.

You apparently have been a supporter of the dike solution for quite a number of years, according to your statement; am I correct in this?

Mr. GRUENBERG. I would say, in the last 3 years, I have become absolutely convinced that the evaporation basin in the Sea is the best way to go.

Mr. BROWN. Have you made a cost estimate of the diked solution?

Mr. GRUENBERG. No, but others have.

Mr. BROWN. Would you submit those for the record, the one that you seem to be most inclined to support, the diking off about a third of the northern end of the Sea?

Mr. GRUENBERG. That is going to be more costly and, frankly, I have not costed that out, but it will be more costly than some other diking proposals.

Mr. BROWN. Well, some of the diking proposals went up to half a billion dollars. Is this going to be more costly than that?

Mr. GRUENBERG. My guess—and this is just a guess—is that it would be in that ballpark, in that vicinity.

Mr. BROWN. If you were presented with a pump-out solution, pump-out only, with the figures that were indicated by the gentleman from Los Alamos, of $300 million plus $5 million O&M, would you be inclined to slightly shift your views toward that kind of a solution?

Mr. GRUENBERG. Not necessarily, because a pump-out solution would require cooperation from Mexico, and——

Mr. BROWN. If you were assured of cooperation from Mexico, would you be inclined to support it?

Mr. GRUENBERG. Yes, I would be inclined to support it, if that cooperation was guaranteed off into the future for a long period of time.

Mr. BROWN. Thank you for that informative response.

Have the board analyzed the long-term inflow to the Sea in light of the proposal to export irrigation water, the possibility of a cutoff of some part of the New River, and other circumstances, like the Metropolitan Water District buying up all the Alamo River and shifting it to Los Angeles?

Mr. GRUENBERG. The Regional Board is responsible for water quality control. The water rights associated with those other flows is a decision outside of our responsibility.

Mr. BROWN. Another matter of diffuse jurisdiction?

Mr. GRUENBERG. Yes.

Mr. BROWN. Do you wish to comment on that, sir?

Mr. STUBCHAER. Yes. I'm with the State Water Board, which hears appeals from Regional Board actions. We're part of the same agency.

Mr. BROWN. Yes.

Mr. STUBCHAER. So we do handle the water rights.

Mr. BROWN. Yes.

Mr. STUBCHAER. The application that you were talking about was just received and sent out for public notice, so that people can file protests.

Mr. BROWN. Which application is this?

Mr. STUBCHAER. The one for the Alamo and Whitewater Rivers——

Mr. BROWN. They actually had the gall to file that?

Mr. STUBCHAER. Yes.

[Laughter.]

Mr. STUBCHAER. Yes.

Mr. BROWN. All right. And when are you going to act on it?

Mr. STUBCHAER. It's gone out. As I said, it's circulated for public comment, to give people the opportunity to protest.

Mr. BROWN. Tell me where to send the public comment, and you'll get mine very quickly.

Mr. STUBCHAER. I'll give you my card. No, but seriously——

Mr. BROWN. You know, if that goes through, the Salton Sea immediately is reduced by 100,000 acres and the salinity goes up to the level of the Dead Sea.

Mr. STUBCHAER. Mr. Brown, I'm just the message bearer. Please don't shoot me.

[Laughter.]

Mr. BROWN. If I get excited, I'll shoot anybody.

[Laughter.]

Mr. STUBCHAER. But I also have to say that, if this matter comes before the board, when I'm on the board, I don't want to have any ex parte contacts on my record that will disable me to consider the evidence fairly, so I don't want to express any opinions of what I know or do not know.

Mr. BROWN. All right. Let me tell you where I'm coming from, you know. For 35 years, we've been looking at dike solutions, and only within the last two or three years have we recognized that it's inevitable that the Salton Sea is going to have less water flowing into it.

Most people don't realize that there is a one-to-one connection between the amount of water flowing in and the surface of the Sea. If a third of the water is cutoff, the Sea shrinks by at least a third.

Now, I'm asking you if you've made any projections as to what the situation will be, say, 10 years from now.

Mr. STUBCHAER. I have personally set up a computer model that analyzes the inflow, outflow, evaporation, concentration in the Sea.

However, this Metropolitan application just came in a week or so ago, so we haven't had a chance to analyze what that would be. We hadn't foreseen this eventuality.

Mr. BROWN. Another thing that that does, if the Sea shrinks by one third, is to leave an awful lot of dikes sitting up in the desert. Have you considered that?

Mr. STUBCHAER. Again, I will say we haven't considered the exporting of the Alamo or Whitewater River water away from the Salton Sea, because we just heard about it. We haven't had time to consider it.

Mr. BROWN. Have you heard about the possible sale of conserved irrigation water to San Diego?

Mr. STUBCHAER. I've heard about that.

Mr. BROWN. Now, how much would that reduce the Salton Sea?

Mr. STUBCHAER. We have not studied that.

Mr. BROWN. You have not studied that? Well, I'll tell you. If they go to 600,000 acre feet export, that will reduce the inflow by 200,000 acre feet and that ought to leave you with a beach about a mile wide, all around the Salton Sea. You haven't studied that yet?

Mr. STUBCHAER. No.

Mr. BROWN. Could I ask you to study it?

Mr. STUBCHAER. Well, you can ask.

Mr. BROWN. But the state wants to continue to be a player in this game, don't they, or do you just want to criticize what the Federal Government is doing?

Mr. STUBCHAER. The sale of the conserved irrigation water from the Imperial Irrigation District to other areas of the state is being studied by other folks right now, and the director of the Department of Water Resources, David Kennedy, is trying to broker a solution to that issue. And so it would be inappropriate for me to say anything more right now.

Mr. BROWN. All right. I'm not trying to bug you that much. We'll bug Mr. Kennedy next time.

Mr. Chairman, I have used my 5 minutes, and I will gladly terminate it at this point, but if there's a second round, I would use it.

Mr. DOOLITTLE. Thank you. Mr. Lewis is recognized.

Mr. LEWIS. Thank you, Mr. Chairman.

I'm not sure who to address this initial question to, but it is my understanding that the Colorado River is in somewhat excess, in terms of water flows at this point, at this moment, versus what we often find ourselves with, the past history. A lot of people are talking about El Nino. That could create all kinds of circumstance.

Is there, in the real world, a prospect of excess that might very well be diverted to the Salton Sea, providing a short-term freshwater input that would give us some time here to meet the challenge of these very difficult problems that we study and work on? Yes, sir.

Mr. NIVER. On the Salton Sea Task Force, which lasted for 7 years, we studied that, and all we did really was talk about that excess water.

And there are times, if I remember right, like every 10 years, at least, depending on how the snow pack on the Rockies was—what they can tell you is that the mouth of the—as the Colorado empties into the Gulf of California, it doesn't do that too often, it ends in rancid salt flats.

So, during our talks with the Salton Sea Task Force, it was discussed that we could actually, in high runoff years, run down water from the old Alamo Canal, right back into the sea, without too much problems.

When Mr. Calvert talked about that earlier, it was talked about very seriously, about high runoff years, running fresh water for flushing into the Sea, but only on the high runoff years, and I don't think they're that seldom particularly any more.

Mr. LEWIS. Other comments on that? Yes, sir.

Mr. GRUENBERG. Putting Colorado River surplus water in the Sea would be extremely beneficial to the Sea from the standpoint of its salinity and water quality problems, but there is another problem with doing that right now.

The Sea is at the elevation whereby if you put more water in there right now, it's going to cause more flooding. So that's something that could be done if the elevation drops down more effectively, to fill it back up, but right now would not be the time.

Mr. LEWIS. I appreciate that. That leads to my second question, and I would ask Mr. Zirschky specifically.

The Corps has had a lot of experience with dredging. Would dredging on the southern end of the Salton Sea have an impact that would be positive in terms of this solution, especially if there were excess waters that we might tap, and thereby give us all more time to work toward a long-term solution here?

Mr. Zirschky?

Mr. ZIRSCHKY. It could be very well worth looking at, sir. By taking out some of the sediments that have contamination in them, that would allow for a deeper water calm. The water would be cooler. The bacteria wouldn't have as good a climate to grow in, that are causing some of the disease.

The cooler water also has more oxygen in it than warmer water. That helps the fish breathe.

One of the reasons for the salinity is the evaporation coming out of the lake. If you have two lakes with the same amount of water,

one that's broad and shallow, one that has very little surface area but is deep, you will lose a lot more water out of the broad and shallow one.

So if you deepen the lake, put more water in, you'll have less evaporation, because the surface area will be smaller.

Mr. LEWIS. As we're going through, Mr. Chairman, with trying to coordinate these studies and attempting to find new sources of revenue, it sure seems to me that we ought to very quickly look to two possible elements.

One is deepening the lake, dredging being a piece of that, a very, very important part of that. The other is if, indeed, there's excess and the prospect for excess in the near term, we need to some way facilitate the diversion of that water.

I know that MWD has a good deal of interest here, and for all the right reasons. They're trying to serve water to a burgeoning population in Los Angeles. In the meantime, this asset is at risk if potential water sources that could help us with this, short term, end up being diverted too quickly, or other than they might otherwise, to maybe L.A.'s needs.

Mr. CALVERT. [presiding] An excellent idea, Mr. Lewis, and I'm sure the Committee will pursue that.

Mr. LEWIS. Thank you.

Mr. CALVERT. Mr. Bono.

Mr. BONO. Thank you, Mr. Chairman. Going along with Mr. Lewis's comments, the Army Corps of Engineers, we had a meeting last week, and brought up the dredging, and it was the first time that I had heard about it, but it seemed to make a lot of sense, from the standpoint that, if the water were deeper, the evaporation would be much slower and thus reduce the salinity from that point.

However, the other logical thing seems to be, going along with what you're talking about, if you get the water lower, you don't have the problem of additional flooding, you could just refill the basin.

With all the discussion that we've had here, and all the talk here, there seems to be in this a need for some action on an immediate basis. This certainly isn't a cure-all, but it seems like it would have to reduce the salinity, to add a great deal more clean water into that area and to deepen the water so that it would have all the plus qualities that you talked about.

Are there any comments on that from any of you? Because if we could, one shot, fill that basin again, fill the Sea again, with purely clean water, and reduce the level of the water, I think it would be a quick solution to a bad problem.

Mr. NIVER. I wanted to add to that what he talked about. Yes, you have to have pump-out to Laguna Salada, and then reflush from here.

One thing I remember from the task force, they suggested, if we were going to put that water into Laguna Salada, pump-out, they would like it down toward the south end if I remember right, because it would revive their brine shrimp industry, which showed an interest. And that came across the Salton Sea Task Force.

So the two together—bring in fresh water, pump out to Laguna Salada.

Mr. BONO. OK. I agree, George. As I told you, George knows everything about the Sea there is to know, and he displayed it today. I just wonder if there's any comments on doing something really fast and reducing the salinity, soon, just to relieve the crisis. Does anybody want to comment on that? Yes.

Mr. GRUENBERG. One comment on the dredgeout idea. We know that the Sea's bottom mud contains potentially toxic materials, so that would have to be done very cautiously, and I would have some great concerns with that.

Mr. BONO. OK. What do you have to say about that, Mr. Zirschky?

Mr. ZIRSCHKY. I don't know the actual chemical makeup of the sediments, but I have heard that there are some toxins in them, and that makes dredging oftentimes difficult. We would have to work very closely with the State of California to make sure that we did it in a manner that would not temporarily increase pollution in the water, and second, that we had a place to put the sediments that was safe, if they were highly contaminated.

Mr. BONO. Can that be done?

Mr. ZIRSCHKY. We've succeeded, but it sometimes takes time.

Mr. BONO. When you say time, are you talking another long time, or is it something that we could do on an immediate basis? Is this another study?

Mr. ZIRSCHKY. Interagency coordination would be required. We could not do any dredging, however, without specific—when they talk about a line-item veto and a line-item agency, that's the Corps of Engineers. Everything we do is line-item-funded.

We would need specific authorization and funding for that activity.

Mr. BONO. What do you think would be a ball park cost?

Mr. ZIRSCHKY. No idea, sir.

Mr. BONO. No idea?

Mr. HUNTER. Ask what their unit dredging costs are.

Mr. BONO. What's your unit dredging costs?

Mr. ZIRSCHKY. I do not know what they would be in the Salton Sea, but they range anywhere from 67 cents a cubic yard to over $4.00 a cubic yard, just for the dredging.

The disposal cost is often much more expensive. That can range from essentially free, where we're putting clean sand on a beach for shore protection to over $50 to $100 a cubic yard, if it has to go into a hazardous waste facility.

Mr. BONO. Piece of cake.

[Laughter.]

Mr. STUBCHAER. Mr. Bono?

Mr. BONO. Yes.

Mr. STUBCHAER. I would like to just add to that, if you were to create 100,000 acre feet of storage by dredging, that's roughly 200 million cubic yards, and if it's a dollar a cubic yard, that's $200 million.

So we think it would be much cheaper to get rid of the salty water, if you're going to replace it with fresh water, by exporting it, than by dredging, in this case. And then, as Mr. Gruenberg mentioned, you do have a potential selenium problem in the sediments, especially at the south end of the Sea.

Mr. BONO. What about the notion that the Sea is too shallow, and that we have this evaporation occurring on a rapid basis, and creating a bigger salinity problem in the process?

Mr. STUBCHAER. Dredging an area like that would be extremely costly—I mean, really costly. And I doubt if it would compete with the diking or pump-out alternative. As you know now we're under oath here. This is just my best engineer's guesstimate, you might say.

Mr. BONO. Thank you.

Mr. CALVERT. Thank you, Mr. Bono.

My first question to Mr. Gruenberg is on your chart here, on your conceptual dike layout. And we were discussing local participation when the Chairman was here earlier.

I'm sure Mr. Bono probably doesn't like this particular conceptual dike layout, because Riverside County would have the evaporation basin, where Imperial County would have basically the balance of the Sea.

Mr. BONO. That would be awful.

Mr. CALVERT. When we get into local participation, all of a sudden Riverside County may feel less, you know, enthusiastic about involving themselves in this project.

So, from a political perspective, I don't know if that's the solution, quite frankly.

I'm going to go back to the concept of a pump-out theory. We've been talking about pumping out to Laguna Salada, which is an interesting idea, and I think it should be pursued.

Going back to, say, evaporation ponds, somewhere nearby the Salton Sea, is it possible to create evaporation ponds that we can stack in a particular area, spreading water in those areas, allowing that water to evaporate, and then obviously, charging water back into the Sea through excess years from the Colorado River?

Mr. GRUENBERG. Yes, that would be very possible. That's been considered.

I would say the problems, though, with that, are the environmental impacts in that outlying area, wherever it is.

At least if the dike is located within the Sea's basin itself, you've eliminated a lot of those environmental issue because, if nothing is done about the Sea, we're just going to have a big problem, rather than this smaller dike problem.

So you get into groundwater issues, and quite a few different things, by moving this outside of the Sea's area, and that has been suggested before, but I would say it's run into too many snags to get something done expeditiously.

Mr. CALVERT. Just from a layman who is not looking at this from an engineering perspective, but from a concept where this could be done reasonably quickly, with your pumping costs considerably cut, because you're not talking about a long pump up to Laguna Salada, if you could do something within several miles of the Sea, and I suspect that evaporation, if it's done properly in shallow ponds, can take place very rapidly—you can continue to pump water into those ponds—especially on a day like today; I think it's 102 degrees—and then convert water from the Colorado River in good years.

Now, this obviously would be a short-term solution, and I think we'd have to look into things, as Mr. Bono pointed out, for a long-

term solution, because we would be dependent upon water from the Colorado River, which is probably not something we can depend on, but the Chairman has some ideas about some additional waters that I think we ought to pursue in the long run.

Do you think that that's something that we can do rapidly if we all work together?

Mr. GRUENBERG. Well, it's been discussed before, and the difficulty is locating a place, a site to store this water. If that can be done, and the process expedited, environmental review and such, sure, it would work, and it's a possibility.

But it's been suggested before, and we ran into a lot of snags in a hurry, so it just seemed to be much more difficult to proceed on than the dike inside of the Sea.

But it's a good idea.

Mr. CALVERT. I can tell you, Mr. Gruenberg, that Mr. Bono here is not going to be excited about a dike that cuts out Riverside County, and I don't think that that's going to be an acceptable solution.

I do think, though, evaporation ponds will get everyone here, maybe, I think, involved in a short-term solution, potentially, while we work on a long-term solution.

Mr. GRUENBERG. Let me make one thing clear. That dike is kind of my personal idea. The location of that, you could put that dike in many different locations within the——

Mr. CALVERT. Can we put it in Imperial County?

Mr. GRUENBERG. Yes, it could. It could definitely be put in Imperial County,

[Laughter.]

Mr. CALVERT. Never mind. I didn't ask that question.

Dr. Zirschky, I have one last question. We understand that salt concentrations, obviously, is the major problem we're talking here today, and the problems that we associate with the Salton Sea.

Outside of dredging, that you just mentioned, which may be too costly, how can the Corps use its expertise and resources to rapidly reduce salt concentrations in the Sea? The one I just mentioned, is that something you can come out and do?

Mr. ZIRSCHKY. On dredging, what we would be looking at would be hot spots. If there are areas of highly contaminated material, to get that out—not a dredging, probably, of the whole lake. That would take years, just to get the permission to do something like that. But if there are highly contaminated areas, to find those and get those out.

We have done some work in salt environments up at Sonoma Bay, Yellow Basin, a Salt Bayou project in Texas. Basically our studies to date, though, have stopped at the border of the Salton Sea. We focused on cleaning up the Alamo River and the New River.

I couldn't give you an answer on what we could do quickly, because we're not that familiar with what everyone has done on the Salton Sea.

Mr. CALVERT. Thank you.

Mr. DOOLITTLE. OK, Mr. Hunter, we're back to you.

Mr. HUNTER. Thank you, Mr. Chairman. While you were out, the task force had a little consultation on the cost-sharing that you

brought up. We thought it would be roughly approximate that that took place with the Auburn Dam, between Federal and state government.

Mr. DOOLITTLE. Yes. Well, I hope you can achieve a more effective solution than they have so far with that.

Mr. HUNTER. That's true. Fifty percent of nothing is not going to help us here.

Mr. Chairman, thank you. I think I've asked—I know I've got a lot of questions that I think have emanated from the outstanding questioning of my colleagues and the responses. There's just a lot of information we have to get here.

And, Dr. Zirschky, if I think there's a lot of questions that surround the idea of recharge, this idea of maybe using surge in the Colorado to recharge. I think Ken's question with respect to the evaporation ponds at least raises a possibility, because you've got 500,000 acres of bombing range immediately attendant to the east of the Sea, so we should at least look at that.

But we probably will have a lot of questions for you. Could you folks help us over the next three or four weeks, and respond to those?

Mr. ZIRSCHKY. We would be delighted to answer any question.

Mr. HUNTER. I'm sure our task force will get some written questions to you.

Mr. Chairman, I just want to thank you and my colleagues. We haven't solved everything here, but I think we've got a pretty good picture painted of the problem, and I think we know what areas we have to go into to gather more information before we can make a call.

I think it's pretty clear that we've got to take action quickly, and that that doesn't preclude continued investigation, extended scientific analysis, which must attend that. But nonetheless, I think we're kind of putting together at least the embryo of an action plan here.

Thank you, Mr. Chairman, and all my colleagues.

Mr. DOOLITTLE. Thank you very much. Gentlemen, I compliment you on your succinct testimony, and I compliment the members of the panel. We will have further questions, I am sure. I know Mr. Brown and I have further questions, and I think everyone in the panel up here does. So we will tender those in writing and ask you please to respond expeditiously.

I will just conclude by observing, as a Northern Californian, where two-thirds of this state's water originates, that——

[Laughter.]

Mr. DOOLITTLE. No, no. There's no bitterness.

[Laughter.]

Mr. HUNTER. That water comes from Colorado.

Mr. DOOLITTLE. Yes, it does, and Arizona, when they start taking their full share, and Utah and some of those other states, there's not going to be all this excess that we're presently using, let along finding a few hundred thousand extra acre feet like we've been talking about, and a temporary base to solve the Salton Sea's problems.

As an interim basis that, I think, is a very interesting idea that we ought to explore, but that will eventually be gone, for all intents and purposes.

I would just observe, though, that it's been now nearly 20 years since we have added any on-stream storage reservoirs to the water supply of this state. During that 20 years, our population has increased by more than 20 percent.

You have all heard the testimony here today, and you all know that reducing the salinity of the Salton Sea is critical. If you had extra water, you could do that.

We're going to have to, as citizens of this state and as citizens of the United States, recognize that additional water development is essential for maintaining and enhancing the quality of life that we have all been used to. We have just about run out of our ability, through conservation, to make do.

So I just share that observation with you. We will all work hard to work on a solution for the Salton Sea. It's going to be very expensive, as you've heard, and it will be a combination of state and local and Federal.

I think it's vital that we begin to recognize that there are other issues at play out there that we need to develop. These things take time. You don't have much time with the Salton Sea if you're going to stop it, as Mr. Hunter said, from becoming a dead sea.

That dam he referred to up in our area, which will provide vital flood control for the city of Sacramento and will also provide several hundred thousand acre feet of some of the finest water known, is a potential source for the solution to this problem way down at this end of the state.

So I'm going to propose to the Bureau that we take a look at that, and some of our officials, and see how we might—and the Salton Sea Authority—might incorporate possibly some aspect of that into the future for this area.

We will now conclude the hearing. Before I conclude, I want to recognize—someone mentioned his name, but I want to recognize—the former Representative in the House of Representatives for this area, Mr. Victor Veysey. Will you just stand up, Vic, and be acknowledged?

[Applause.]

Mr. DOOLITTLE. Mr. Veysey had a very distinguished career in both the state legislature and in the House of Representatives, and it's wonderful to see you here.

With that, ladies and gentlemen, the hearing of the subcommittee is now concluded.

[Whereupon, at 1:03 p.m, the Subcommittee was adjourned.]

[Additional material submitted for the record follows.]

STATEMENT OF TELLIS CODEKAS, CHAIRMAN, SALTON SEA AUTHORITY

Mr. Chairman, Members of the Committee and Members of the Salton Sea Authority Task Force:

I'm Tellis Codekas, Chairman of the Salton Sea Authority, and today I'm speaking on behalf of the Salton Sea Authority. My testimony begins with a short history of the Salton Sea and the Salton Sea Authority and why we have taken the lead in trying to save the Sea. Then, I'll tell you why we believe the problems of the Salton Sea need to be addressed and why we think it's a national issue and thus the need for Federal involvement. I'll close with an overview of the Authority's preferred alternative to solving some of the Sea's problems and the objectives we have targeted through implementation of the plan.

History

The Salton Sink, which is largely below sea level, was once the bottom of a prehistoric sea. The Gulf of California originally extended north into what is now the Imperial and Coachella valleys. Periodically the Colorado River overflowed its natural levees and filled the valley between mountain ranges to form a vast lake, which rose to about 30 feet above sea level.

The Sink was dry when construction of the Imperial Canal was completed in 1901. The Canal diverted irrigation water from the Colorado River just upstream of the Mexican Border. After about four years, silt deposits led to an attempt to relocate the diversion a short distance downstream from the border of Mexico. But unusual winter floods breached the diversion structure in 1905 and, for 18 months, the entire flow of the Colorado River poured through the Mexicali and Imperial valleys into the Salton Sink. The river break was finally closed in the spring of 1907 and the reestablished lake was named Salton Sea. So, the Sea is an accident created by both natural and man-made events. Since its creation, the Salton Sea has been sustained by flows consisting largely of agricultural drainage from the Imperial, Coachella and Mexicali valleys and from rainfall, storm runoff and groundwater inflow. Since the Sea exists in a closed basin, evaporation is its only outflow. Because of this fact, the high and increasing levels of salinity of the Sea's water is its greatest and best-known problem. Currently, the Sea is about 25 percent saltier than the ocean and approximately 11 thousand tons of salt are added every day. This chart illustrates the current trend.

Additionally, for the past several decades, concerns about elevation at the Salton Sea have been linked to increased agricultural runoff, above-average rainfall and increasing wastewater flows from Mexico. The rising water has damaged some agricultural, recreational and residential properties along the Sea's shores.

The Salton Sea Authority

Over the years groups of many kinds have organized seeking to solve the problems of the Salton Sea. They were never short on ideas, but always short on funding.

In 1986, 20 interested agencies joined to form the Salton Sea Task Force with a goal of finding a workable plan to stabilize the elevation and salinity of the Salton Sea. The Task Force was organized under the California Resources Agency at the direction of the Governor of California. The Task Force studied solar pond technology, pump-out facilities and diked impoundments, among other options, along with possible funding sources. A preliminary report was released by the Task Force in 1988 showing pump-out/solar pond technology to control elevation and salinity might be feasible, although certainly costly. While the work of the Task Force did not result in the start of a project, it did, in 1993, lead to the formation of the Salton Sea Authority—a joint powers agreement among the Counties of Imperial and Riverside, Imperial Irrigation District and the Coachella Valley Water District. The Authority was organized to work with the State of California, the Federal Government and the Republic of Mexico to develop programs to ensure continued beneficial uses of the Salton Sea. Over the last two years, the Authority has worked intensively with state and Federal agencies to develop practical, affordable and effective solutions to reducing the primary problem facing the Sea of high salinity.

Save The Sea

The Authority faced two key questions: (1) what do we need to save the Sea *from* and, (2) what do we need to save the Sea *for*. We believe that the Sea needs to be saved from increasing salinity and fluctuating elevation and it needs to be saved for economic and environmental reasons. The Authority recognizes the unique and valuable nature of the Sea as a national and regional resource, and recognizes the need to address its economic and environmental problems. As an agricultural drainage reservoir, the Sea is critical to the agricultural economics of the Imperial,

Coachella and Mexicali valleys. In addition, there are other extensive developments around the Sea, including geothermal, recreational and cultural, which need to be protected from the impacts of rising salinity and fluctuating elevation.

From an environmental perspective, the Sea provides important and diverse habitat for resident and migratory wildlife. The Salton Sea serves as a critical link in the Pacific Flyway for waterfowl, marsh and shore birds. We see the Flyway as being of great national interest and that by saving the Salton Sea we are in effect mitigating for the development that has taken place on the Coastal Plain of California, which is where the Flyway was previously located. It is our view that by reducing salinity, the environment in and around the Sea will be greatly improved and the problems of the Sea greatly reduced. This is a situation where, if we do not undertake a project very soon, the environmental resources of the Sea will be damaged in a significant and irreversible way. So, let's do first things first and reduce the level of salinity.

The fluctuating elevation has been a problem and remains a great concern. A stable and sustainable elevation at the sea is of particular local interest. The Imperial Irrigation District and Coachella Valley Water District have spent over $44 million to landowners along the seashore as flooding compensation.

Our Preferred Alternative

After extensive research and public input, last year the Salton Sea Authority adopted within-Sea diked impoundment as the preferred approach to cleaning up some areas to restore recreational uses. Although a specific project has not been identified, the designation of a diked impoundment as the recommended option allows the Authority to proceed with determining the best project alternative and eventually preparing the necessary environmental reports and other documents.

Managing salinity with diked impoundments is based on the concept of providing an artificial outlet for the Sea by creating an evaporation pond. Water would be admitted into the impoundment through an inlet structure in the dike and carry a heavy salt load, while the relatively fresh inflows to the Sea from the Alamo, New and Whitewater rivers and other sources would reduce the salinity of the Sea. Within the impoundment, water would evaporate leaving the salt behind. The capacity of an impoundment depends on size and average depth as well as other factors to be defined through the feasibility analysis, including possibly pumping the concentrate to an acceptable location.

This preferred alternative was selected after evaluating 55 plans based on their capability of (1) reducing the Sea's salinity to equal that of ocean water; (2) controlling Sea elevation at the minus 230- to 235-foot level; (3) holding operations and maintenance costs to no more than $10 million per year and (4) using only proven technology.

On the basis of our analysis and considerable public input, I would urge Congress to join the Authority and the Bureau of Reclamation in supporting diking as the most reasonable and cost effective solution to Salton Sea problems. Diking is a vital first step toward a permanent solution for the Salton Sea. By concentrating the salt in a brine pond the volume of material needed to be moved is reduced to a manageable level. Furthermore, the Salton Sea Authority would like to continue our effort to save the Sea as lead agency. The Authority, of course, will continue to work in a collaborative and coordinated way with local, state and Federal agencies into and through the implementation phase. We feel such an approach is the most practical, affordable and effective road to success and we are in the process of hiring staff for the Authority to do the foregoing.

Mr. Chairman, the demand for Colorado River water in Southern California and throughout the lower basin is very high and I expect water conservation and transfers to start within the next few years. Given the current circumstances and the likely future, the Authority believes a partnership must be formed among the Federal, state and local interests to address the problems. As shown in this chart, the Authority has a viable method for planning, building, operating and maintaining a diking system and we need your help to bring this plan to fruition.

The "fix" for the Salton Sea will be expensive and ongoing, but the Salton Sea Authority has limited resources, so we are asking for your help to save the Sea. If we do nothing, the Sea will continue as a drainage reservoir and the other economic and environmental values and uses will ultimately be lost. The Salton Sea never was and never will be a Lake Tahoe but it has been and can again be a great economic and environmental asset to our communities and nation. I ask you to join the Authority in moving forward now.

Finally, I would like to thank you for your interest in the Salton Sea and the support you have given us. We look forward to working with you.

STATEMENT OF BOB JOHNSON, REGIONAL DIRECTOR, LOWER COLORADO REGION, BUREAU OF RECLAMATION, DEPARTMENT OF THE INTERIOR

Mr. Chairman and Members of the Subcommittee, thank you for the invitation to appear today. I appreciate the opportunity to discuss the Bureau of Reclamation's involvement in efforts to address important issues affecting Salton Sea in southern California.

Background

The Salton Sea lies in a closed basin in the Salton Desert, and has existed intermittently throughout recent geologic time. Most recently, the Salton Sea was formed from 1906-1908 when a diversion of the Colorado River failed, and the Colorado River flowed into the Salton Desert to create the Salton Sea. The sea is presently about 40 miles long and 15 miles wide. Its greatest depth is about 45 feet. Over time, salinity levels at Salton Sea have increased. Presently the salinity is about 44,000 parts per million—about 1.25 times more saline than ocean water.

In this century, the Salton Sea has provided significant recreation, environmental and economic values to the local area. As the Sea's salinity has increased and overall water quality has decreased, these values have suffered. Recreation visits, for example, have dropped dramatically over the last 10 years. During the same period, significant numbers of grebes, pelicans and cormorants have died at Salton Sea, and the sport fishery appears to be in decline.

In an effort to address salinity and other issues at Salton Sea, the Congress throughout the years has established study programs. Reclamation's involvement dates back to the late 1960's and early 1970's when Reclamation and the State of California jointly prepared a feasibility study and environmental impact statement for a salinity management project.

In 1985, the Congress created the National Irrigation Water Quality Program to identify the nature and extent of irrigation-induced water quality problems that may exist in western states, including the Salton Sea. The National Irrigation Water Quality Program has provided a total of about $2.6 million to Interior Department agencies for fiscal years 1986-1997 to conduct studies and prepare reports concerning irrigation-related trace elements and pesticide contamination in the Salton Sea. Additionally, the U.S. Geological Survey has conducted water quality sudies at Salton Sea and the New River, one of the principal inputs to the Sea

In 1992, Congress enacted Title XI of Public Law 102-575 which authorized the Bureau of Reclamation to participate in a research project to develop methods to reduce and control salinity, provide endangered species habitat, enhance fisheries and protect recreational values at Salton Sea, and report to Congress. In fiscal year 1998, the President requested $400,000 in the Bureau of Reclamation's budget request for this purpose. Reclamation anticipates that the Congress will be provided the report later this year.

In a partnership effort with the Imperial Irrigation District, and with support from the National Irrigation Water Quality Program, Reclamation since fiscal year 1996 has been exploring opportunities to use low technology biological processes to improve the quality of surface water in the Imperial Valley. Because waters from the Imperial Valley flow into the Salton Sea, this study has ramifications for the Salton Sea. The three-year study is well underway. Identification of the most contaminated drains was completed, and a membrane treatment process was tested in the field. Designs are being completed for in-drain biological treatment facilities.

In addition to the roughly $2.6 million provided through the National Irrigation Water Quality Program, Congress has provided about $8.5 million more since fiscal year 1986 for Salton Sea efforts conducted by the Bureau of Reclamation, U.S. Fish and Wildlife Service and U.S. Geological Survey.

In August 1997, the Department of the Interior sponsored the "Save the Salton Sea" workshop which brought together scientists to address Salton Sea problems. A report on the results of the workshop is expected later this year.

Alternative Solutions

The Bureau of Reclamation is participating with the State of California and local entities, including the Salton Sea Authority in an effort to address Salton Sea concerns. Presently, there are more than 50 separate solutions. Reclamation has not evaluated all of them and is not recommending Federal participation in any specific alternative. However, I would like to provide a brief description of some of the alternatives under consideration.

Diked Impoundments. A number of alternatives are variations on the concept of diking off portions of the Salton Sea to create evaporation ponds in the Salton Sea. These alternatives range from impounding different sizes of closed areas within the

Salton Sea that would act as an evaporation pond, to compartmentalizing larger portions of the sea into separate zones with dikes. Some alternatives would bring fresher water to portions of the sea, and allow other portions to become highly saline.

Pump-Out. Various proposals would create an outlet by pumping water out of the Salton Sea. Some alternatives would pump the sea water to on-shore evaporation ponds. Other alternatives would pump the sea water to Laguna Salada, a dry lake bed north of Mexico's Gulf of California. Still others would pump the water to a desalting plant or even to the Pacific Ocean .

Other Solutions. There are a range of other alternatives that have been suggested. As examples, there are proposals to dilute the Salton Sea with surplus imported water from the Colorado River, and proposals for deep well injection of Salton Sea water.

Evaluation of Alternatives

Reclamation, the Salton Sea Authority and the State of California are evaluating the proposed solutions. In public sessions held in California, the reviewing entities agreed on evaluation criteria in an effort to narrow the number of alternatives that could be studied in feasibility reports. Construction costs for various proposed solutions are estimated to range from $40 million to more than $2 billion. Additionally, there would be significant costs associated with conducting related scientific studies such as developing Sea circulation models and completing basic geologic hazard studies.

Conclusion

In summary, the Bureau of Reclamation has participated in a number of studies related to water quality and other issues at the Salton Sea. At the present time, Reclamation and other State, local and Federal agencies are evaluating various proposed solutions. Reclamation does not have enough information to recommend Federal participation in any of the proposals at this time.

Thank you for the opportunity to attend today's hearing. I would be pleased to answer any questions you may have.

STATEMENT OF TOM VEYSEY, FARMER, IMPERIAL COUNTY, CALIFORNIA

Honorable Congress Members:

My name is Tom Veysey and I am a resident of Brawley in Imperial County (also known as Imperial Valley), California, where I have farming interests and also engage in public service as a member of the Salton Sea Authority and serve the voters in District 4 on the County Board of Supervisors. District 4 encompasses all of Imperial County's portion of the Salton Sea.

I wish to visit with you as an agricultural producer. Agriculture is far and away the cornerstone of the Imperial Valley economy and its destiny is as dependent on the Salton Sea for drainage as it is on the Colorado River for water. But producers are anxious for the Salton Sea's restoration for reasons beyond the role of an irrigation drain water repository. We take pride in our participation as community-builders who are vitally interested in the quality of life available to our families and communities. We look on the Salton Sea as a tremendous asset with vast economic opportunity for all of the desert southwest and the so-called Inland Empire. Indeed the sea is sick, but given its restoration and renewed vitality, it will be a magnet for enterprise facilitating recreational activities and environmental gratification.

In its restored state the sea will be embraced by the Inland Empire and Southern California as a major recreational and environmental resource.

In its revitalized state, the Salton Sea will partner with agriculture to support the region's economy in ways that will not undermine its infrastructure of services. I envision a healthy sea as adding greatly to our tourism and visitor market and vastly enlarging the region's business opportunity base. This will provide new initiatives that should contribute to expanded, qualitative employment opportunities, contributing to better prosperity for rural and city life.

When it is restored the sea will be essentially reliant on agriculture for drain water inflow to help maintain its elevation. The development of the sea into a healthy, thriving recreational mecca will bring greater understanding of its relationship to our region's agricultural system.

The business of food production is fiercely competitive and increasingly fraught with high cost, risk and calamity. Farmers have to farm smarter and manage more effectively with each new crop year in this changing world. It will be challenging for agriculture to sustain a role in the new millenium as the principal job-producer

and wealth-maker of the County. Our cropping patterns are now in the throes of major change from the traditional ones as we seek newer crops and methods to sustain agriculture's economic engine. However, the necessity to force the salts through the soils and the resulting drainage will continue. Some of this change is due to pests and disease from such indomitable foes as the Silverleaf Whitefly that throttled our melon deal and afflicted numerous other crops. Some is due to market price decline in what used to be a bellwether of economic vitality—vegetables. Some is due to bad luck such as occurred in our tremendously promising durum wheat industry that was dealt a crushing blow with the unjustifiable imposition of a quarantine following the discovery of Karnal bunt in Arizona. Multi-faceted industries such as cotton that once was a hub-bub of activity with its production, harvesting, ginning, warehousing and shipping long has been in decline from natural pests. Cattle production, another major leg of the County's stool of economic vitality, has waned significantly in need of meat and slaughtering facilities.

Producers are struggling to find crops they can depend on that will yield a return. It might appear that we are not being true to our badge as conservationists and environmentalists when we plant crops that are more water-intensive than others and have to use chemicals to control pests and disease. But we sometimes have to do what we have to for survival. I remember when we used to take a pause in our farming in August and recommence in September. Now we don't stop. We really can't afford to. We have to make tremendous investments in plastic-lined rows, sprinklers and drip irrigation systems to attain higher yields to offset the eternal crunch of spriraling input and handling costs. Then when our crops reach a delicate, critical state and are smitten with, say, a whitefly invasion we need to have a chemical to go with integrated pest management practices to protect the crop. We are trusting that the EPA's administration of the Food Quality Protection Act doesn't take away all of the means to survive major pest assaults and disease unless there are affordable alternatives and many of these appear a long way from reality.

Little wonder that producers are interested in water transfer. When such transfer occurs it will provide some very necessary funds to producers that can be used to modernize and equip themselves to deal with a turbulent business environment so they can stay in business.

Even when we are able to retool and fully refuel agriculture's economic engine in Imperial Valley, we will continue to need state and Federal research support to help us find better production practices, embracing both conservation and environmental needs, as well as methods to deal with pests and disease. The Whitefly Management Committee of Imperial County is spearheading a unique, applaudable association of county, state, university, and Federal resources which might be able to get that dreaded pest under control. Continued research on such problems will be necessary. Additional creative planning both within our county and in surrounding counties, together with the state and Federal resources might help us attract a cattle processing facility to the region. Alternative agriculture enterprises providing value-added products from agricultural refuse could fortify our agricultural economic base. And many more opportunities are before us with some additional research and strategic planning.

As a producer and a general citizen, I applaud the united interest of our legislators in seeking serious, meaningful funding for the restoration of the Salton Sea as well as the New River. All of my life I have been associated with the Salton Sea. It's like an old friend whom you never want to see in a state of decline. As a youngster I enjoyed many recreational activies there. I got to know it extremely well one night after taking it for granted during an outing of fishing and water skiing, becoming incapacited and having to spend the night in the center of the sea and the subject of search parties. Two others that night weren't as fortunate as I, for they lost their lives. Needless to say I have a lot of respect for the sea. But it has pained me to witness the decline of the sea and nothing would please me more than to be a part of its restoration. That is why I am at this moment working with the U.S. Army Corps of Engineers and supporting Congressman Duncan Hunter's citizen's task force on the New River headed by Leon Lesica, involving our residents and communities in a New River cleanup project that will contribute importantly to the restoration of the Salton Sea. It's a simplified yet exciting concept of building holding ponds which would allow the water to rest and purify and then be released into the sea as it is needed to maintain the critical elevation posture.

And further, I am supporting the concept of a diked impoundment as the preferred approach to restoring the Salton Sea. Salinity is clearly the most paramount problem associated with the restoration. Diking appears to me to offer the best buy for the dollar in dealing with the heavy salt load of the sea and its critical water level. The diked impoundment concept coupled with the management of cleaner inflows from the New River, Alamo River, Whitewater and other sources seem to

me to be wise, doable choices. The concept also offers future opportunities to include other solutions which require longer timelines for implementation and effectiveness.

I am glad that the Salton Sea Authority scores agriculture highest in its evaluation of criteria associated with the restoration project. In as much as Imperial County has the highest unemployment rate in California and the lowest median income, the one billion dollar industry of agriculture must be preserved and enhanced. We accept this challenge to change our future by working with you to improve this major resource and allow Southern California to further diversify by benefiting from the resources we enjoy. I have endeavored to outline for you some of my beliefs as a farmer why agriculture vitally needs the Salton Sea and why the sea cannot do with agriculture.

STATEMENT OF PHIL GRUENBERG, EXECUTIVE OFFICER, COLORADO RIVER BASIN REGION

The Regional Water Quality Control Board, Colorado River Basin Region (Regional Board) is the primary responsible agency for water pollution control throughout California's Salton Sea watershed. The Regional Board regulates water pollution through issuance of discharge permits, enforcement orders, and implementation of best management practices for agriculture. Unfortunately, many of the Salton Sea's water quality problems fall outside of the realm of conventional regulatory control, and the primary problem—salinity—is not resolvable at all from the regulatory standpoint.

A discussion will follow of the primary water quality problems facing the Sea (in order of perceived severity), and an assessment of control options and correctability.

Salinity

Increasing salinity is the Sea's foremost problem. This problem was recognized over 30 years ago and as predicted back then appears to be directly and indirectly responsible for many of the Sea's adverse conditions now. The present salinity of the Sea is approaching 45 ppt. The salinity of ocean water is 35 ppt. It was forecast that when salinity reached 40 ppt that it would begin to adversely affect the Sea's food chain and ultimately lead to collapse of the sportfishery. Although in the past 10 years the sportfishery has had its ups and downs, the overall trend clearly appears to be down. The food chain has been disrupted, Tilapia are now the dominant fish in the Sea, have overpopulated, and apparently become more subject to disease because of overcrowding. What was not forecast was that due to disruption of the food chain that disease would be passed on to waterfowl causing catastrophic dieoffs. Last year over 14,000 birds died at the Salton Sea which included threatened/endangered species.

Although costly, correction of the Sea's salinity problem is relatively simple. The Sea is a closed basin and needs an outlet (or the equivalent thereof) to prevent salt buildup. Thus, the problem is naturally occurring with no identifiable responsible party. Potential resolution of the problem remains with the public via government.

Although the solution is simple, realistic corrective alternatives appear to be very limited. A 1965 report prepared by an engineering firm for the Regional Board concluded that "of various plans considered for salinity control, the one appearing best from the economic standpoint is to dike off a section of the Sea to serve as a final sink for collecting salt." Thirty two years later this recommendation still seems to make the most amount of sense. This solution avoids the environmental controversy associated with transferring brine to outlying disposal sites and the impacts thereof. Salt would thus accumulate in a smaller portion of the Sea than would otherwise occur under a no-action scenario.

As with any of the suggested solutions to address the Sea's salinity there are some negatives associated with diking. Foremost, is the challenge of keeping waterfowl out of the evaporation basin, where the existence of undesirable conditions due to salt buildup is likely. Another concern is that diking will create an unaesthetic, visually offensive sight. This need not be the case. Much of San Diego Bay and Mission Bay, for example, have been diked with attractive results. Dikes can be landscaped with greenbelts, access roads can be built, and the rock walls can be used for shoreline fishing. There is potential to make diking positive rather than negative, although of course costs will be increased somewhat to implement some of these improvements.

Siting and size of a diked evaporation basin is an important consideration. In 1965 it was suggested that a 40 or 50 square mile basin would suffice. However, at that time salinity was considerably lower, and the freshwater inflows to the Sea were considered stable. At present, with the Sea facing reduced freshwater inflows

in the future as a result of water conservation implementation, a 40 or 50 square mile dike would be much too small. Diking off about a third of the Sea, approximately 125 square miles is a much more practical and workable solution. Siting of the evaporation basin should be in an area which is of least importance for fish and wildlife, and recreational activity. The southern portion of the Sea near the New and Alamo River deltas is believed to be important for fish spawning and is also the site of the Federal wildlife refuge. The sportfishery has centered on this area as the premier fishing location since its inception. Tinkering with the hydrology of the Sea in this area could be very disruptive. To the contrary, the northern deep-water portion of the Sea is not considered a prime fishery area and with less fish present attracts less waterfowl. Diking this area off at the 20-30 foot depth contour would not cut off the shoreline communities' use of the Sea and would simply remove the least utilized and least important northerly mid-portion of the Sea from use.

A proposal to create a two-way exchange with the Gulf of California has some attractive facets to it, but should be disregarded for a number of reasons. Foremost, is that the inflow of ocean water (which is much more saline than the present inflows into the Sea) coupled with the high evaporation rate will exacerbate the Sea's salinity problem, rather than improving it. Other problems are political (securing and maintaining permission from Mexico), cost (upwards of $1 Billion), and biological (undesirable marine life from the ocean such as stingrays may find the Sea to their liking and become dominant).

In summary, salinity control is technically the simplest of the Sea's water quality problems to resolve, and also the problem whose correction will provide the most positive return. As time goes on, and salinity further increases, it will become more costly and difficult to correct. This needs to be addressed expeditiously as a number one priority.

Selenium

Although selenium has not created problems anywhere near the magnitude of those at the Kesterson Wildlife Refuge in Central California, this remains a concern because of a health advisory posted recommending limited consumption of Salton Sea fish and fears of wildlife biologists that increases could lead to bird mortality.

Selenium is present in Colorado River at about 2 ppb and concentrates to about 5-8 ppb in drainage water in Imperial Valley. Selenium apparently enters the food chain in the Sea in the New and Alamo River delta area with some of the element settling in the bottom muds. The actual selenium level of Salton Sea water in the middle of the Sea is relatively low at 1 ppb or even less.

Although regulatory control of selenium is possible, regulation must consider technical and economic practicalities. Presently the Regional Board has set a water quality objective of 5 ppb for selenium. Much of the inflow to the Salton Sea is in noncompliance with this objective. Imperial Irrigation District, as a primary responsible agency, is cooperating with the Regional Board in addressing reduction of pollutants in drainage water inflows to the Sea via implementation of best management practices. Unfortunately economically practical technologies for reducing selenium levels have presently not been developed. So realistically the present goal is to merely keep selenium from increasing. This is actually more difficult than it sounds, since most water conservation which is being implemented in Imperial Valley will focus on efforts which tend to decrease the volume of low selenium drainage water in the system and thus increase the proportion of high selenium tile drainage water.

Because selenium levels are relatively low in Salton Sea water, an in-Sea diked evaporation basin, located away from the high selenium inflows at the south end of the Sea, is not expected to accumulate problematic amounts of selenium.

Nutrients

The Sea has long been regarded as a highly eutrophic water body. Nutrients enter the Sea primarily via agriculture drainage conveying crop fertilizers, and sewage from Mexico. On the positive side the nutrients have helped make the Sea one of California's most productive inland sportfisheries. On the negative side eutrophic conditions can lead to unaesthetic algal blooms, oxygen depletion, fish kills, and foul odors. As with selenium, nutrients are amenable to regulatory controls, but at present stringent control on agricultural sources is considered technically and economically impractical. However, agricultural sources are required to investigate/implement best management practices to reduce pollutants including nutrients.

There has been some discussion of utilizing wetlands treatment to remove nutrients from agricultural drainage water. This could be beneficial with proper design, and should be pursued. Using wetlands to improve New River water is potentially

more problematic partially due to variable levels of pollutants beyond our control and should be pursued much more cautiously.

Pollution from Mexico

Mexicali, a City of about one million people, discharges raw and inadequately treated sewage, industrial waste, and solid waste into the New River some 60 miles upstream of the discharge point into Salton Sea. Although the gross pollution around the border City of Calexico presents a severe public health hazard, the impacts to Salton Sea appear to be much reduced due to a natural cleansing process before reaching Salton Sea.

With Mexico now accepting U.S. economic and technical assistance in addressing cleanup of the New River, real progress is now being made, and it is possible that the river will be substantially cleaned up in two to three years if present efforts continue.

STATEMENT OF PHILIP A. ROBERTS, PH.D., ASSOCIATE DEAN, COLLEGE OF NATURAL AND AGRICULTURAL SCIENCES, UNIVERSITY OF CALIFORNIA, RIVERSIDE, CALIFORNIA

Introduction: This testimony presents information on the proposed role of the University of California in the coordination and conduct of research addressing solution options to the stabilization and water quality improvement of the Salton Sea. It represents not only the relevant research resources in faculty expertise, programs, and facilities of the Riverside campus of the University of California, but in addition, the resources of the entire University of California system.

While there have been a number of independent research activities and assessments made on the Salton Sea over the last several years, a continual challenge to determining viable options to solve the problems has been the complexity of the issues involved. These issues include hydrology, engineering, biological/ecological systems, soil and toxics chemistry, bioremediation, salinity and wastewater management, economics, agricultural interests, and human social/cultural considerations. Although good scientific evaluations and baseline data are available to address some component aspects, the major gap in our ability to advise policy makers is a holistic analysis of potential solutions. A holistic approach that integrates the component issues to determine and implement the best solution must be followed in order to understand the "cause effect-solution" relationships for all component parts. For example, a solution to stabilizing salinization and elevation of the Salton Sea can be designed effectively from the engineering standpoint, but that design must be made while understanding the implications for the biological and ecological systems, and within a full economics context.

Until now, the proposed options, including their evaluations, have lacked an integrated and interdisciplinary understanding. The University of California proposes to provide the objective forum and a core of scientific expertise to pursue a comprehensive, research-based analysis of the primary proposals for solutions. We believe such an integrative and inter-disciplinary approach will allow the policy makers to make the most rational and informed decisions for a solution. This approach will serve the best long-term interests of the state and the nation, from environmental, cultural, and economic perspectives.

Faculty research expertise: About 25 faculty at UC Riverside have expertise bearing on the many complex issues which face the Salton Sea. We have prepared a directory of researchers at UCR, ranging from soil and water scientists who study such issues as salinity and drainage, to engineers who may deal with wastewater treatment or bioremediation, to biologists who are looking at the impact on fish and birds, to economists who evaluate issues related to resource management and the future development of the region. We are in the process of compiling a directory of programs and expertise for the entire UC system, within which is found 12 percent of the water-related expertise in the country. We have initiated contact with scientists at Berkeley, Davis, Irvine, UCLA, San Diego, Santa Barbara, and Los Alamos. These scientists represent the full range of specialized knowledge and research capability needed to provide the comprehensive, objective analyses to target the solution and to fully understand its environmental, economic, and cultural implications. To accomplish this, the coordination of scientists from several UC campuses as well as other institutions and agencies will be necessary. As described in the introductory remarks, the problems facing the Salton Sea are so complex that it will take more than one entity to solve them.

The University of California is the state's land grant institution. As such, it is our mission to provide the educational, research, and public service programs which can help policy makers such as this Congressional Subcommittee deal with problems

such as the Salton Sea. The University is well positioned to serve in the role of "honest broker," providing coordination of research efforts and offering sound, scientific based information. Therefore, we propose to coordinate both internally, among our campuses and national laboratories, and with state and Federal agencies and other universities

Program expertise and Facilities: In addition to our faculty expertise, the University of California has a number of programs and facilities relevant to the Salton Sea:

- The Salinity and Drainage Research Program, headquartered at UCR, was initiated in 1985 to mobilize a team of experts to address critical agricultural and environmental problems in the San Joaquin Valley. Working closely with state and Federal agencies, this consortium of scientists is developing, interpreting, and disseminating research-based information on salinity, drainage, selenium, and other toxic element problems similar to those found at the Salton Sea.
- The University's Water Resources Center, founded in 1957, is a multi-campus research unit established to stimulate and support research on water related issues. Its broad research focus includes conservation, development, management, distribution, and utilization of water resources with a view to their optimum present and future use. The Water Resources Center maintains close relationships with governmental agencies, quasi-public organizations, and other research institutions for the purpose of keeping both the University and outside organizations aware of one another's activities.
- The U.S. Salinity Laboratory, a USDA facility located on the Riverside campus, is the only research facility in the nation devoted specifically to the study and amelioration of salinity and pesticide related agricultural and environmental problems. We have discussed with the U.S. Salinity Lab the desirable collaborative involvement in the Salton Sea effort of their scientists, many of whom have adjunct appointments at UC Riverside.
- UC MEXUS, or the University of California Institute for Mexico and the United States, is another multi-campus research unit, headquartered at UCR. UC MEXUS has recently undertaken a long-term research focus on binational issues of water and the environment in the California-Mexico border region, including the lower Colorado River basin. The binational, policy oriented focus of UC MEXUS will be critical to assessing and implementing any solution that involves Mexico.
- A newly formed Center for Conservation Biology at UCR is intended to assist in the conservation of species and ecosystems for the benefit of society by facilitating the collection and dissemination of objective, scientific information. The Center seeks to provide information to guide the development of sound public policy for addressing conflicts such as the Salton Sea. Several dozen UCR faculty—ecologists, entomologists, botanists, population biologists, soil scientists, engineers, natural resource specialists and others—comprise a rich pool of academic talent and expertise aimed at assisting Southern California address these problems.
- UCR's 540-acre Coachella Valley Agricultural Research Station is just four miles from the north shore of the Salton Sea, offering nearby research facilities. These facilities could be used to serve collaborative research efforts involving scientists from other UC campuses and other universities and state and Federal agencies.

Coordination and Research plan: Because of this concentration of programs and expertise, and because of our proximity to the Salton Sea, UC Riverside has been asked to coordinate research efforts for the UC system. In addition, we will coordinate with state and Federal agencies and other universities. The University is now in the process of garnering internal and external resources to pull together an action team of UC and other scientists. Using this as seed money, we hope to attract state and Federal funding as well. Historically, it has been shown that state and Federal support for University programs is leveraged 4:1 by UC resources of scientists, staff, facilities, equipment, and funds.

Research: We see three broad areas in which research is imperative to the eventual solution of the Salton Sea. These are water, biology, and economics. As illustrated in Attachment 1, these issues are overlapping. You cannot look at engineering a solution to stabilize the Sea's elevation, for example, without considering the hydrology, economics, and the impact on fish and waterfowl. By providing a forum for scientific exchange, the University can help both to look at the overall picture, and to integrate the research that has been conducted in each of these broad areas. It is at the intersection of these three issues that the solution to the Salton Sea must lie. It is at this nexus where good public policy decisions can be made.

Although the Salton Sea has already been studied in some detail (fine studies have been done by the Bureau of Reclamation, various consultants, and most recently Los Alamos National Laboratory), the needed multidisciplinary, comprehensive approach that we propose has not been put into action. What we propose to do that is different from previous studies is to marshal the interdisciplinary scientific expertise into an action oriented approach along a defined timeline, as follows.

Action Plan: We envisage a four-phase, long-term process, as summarized in Attachment 2. We have identified timelines here, but it must be stressed that the phases—like the subject areas in Attachment 2—may be overlapping and flexible.

Phase I is the evaluation phase. We propose to look at existing data to determine what is known and where the gaps are. The purpose is to integrate priorities across disciplines, as described above. The timeframe is short: 2-3 months. Likewise, this phase is relatively inexpensive, costing $25,000-$50,000 to bring together a team of scientists to review existing research and make recommendations. While we recognize that some attempts at this have been made that added to the information base, most recently the summit in Palm Springs coordinated by the U.S. Fish and Wildlife Service, there were important gaps in represented expertise such as economics.

Phase II is the testing phase. The feasibility of proposed options will be tested by conducting solution-oriented and demonstration research. This may be done by modeling or, in some cases—such as constructed wetlands—by field testing. The purpose is to evaluate solutions to enable policy makers to decide on a course of action. The timeframe could be 1-3 years, and the research testing of various solution components could be conducted in a staged manner. For example, evaluation of some solution components such as wetlands and habitat restoration, could be done at the same time primary solution components such as pipeline or impoundment engineering were already being implemented. Effective coordination of the testing will be vital. The scientific summit recently held by the U.S. Fish and Wildlife Service estimated the cost of research to be as much as $40 million, but it could be considerably less, pending the outcome of Phase I.

Phase III is the implementation phase. It is not the University's role to implement the solution to the Salton Sea, but rather to conduct research to assess how well the solution is working as it is being implemented. The purpose of such research is to determine if the solution is performing as expected and what adjustments, if any, need to be made. The estimated timeframe is 2-5 years, but could be longer. The cost of the solution itself ranges widely, depending on the option(s) chosen. The cost of research during this phase would be only a small fraction of the cost of the selected solution.

Phase IV is the long-term management and monitoring phase. Once a solution is implemented, we cannot simply walk away. The University will be here for the long haul, evaluating the solution and its hydrological, biological, and economic impacts over the long term. The longer term commitment under this phase is compatible with the University's responsibility as the land grant institution for the state of California. It will provide a continuing objective scientific partner for the Salton Sea region as a whole, with the overall sustained health of the Salton Sea as a motivational force. The timeframe, of course, is indefinite, and the cost a small percentage of the operating costs of any solution which is implemented.

The four-phase approach is necessary whatever the chosen solution. The possible courses of action include not only the active salinity and elevation management approaches, but also the option to allow the Salton Sea to salinize (see Attachment 3, fact sheet). In the event that this becomes the option chosen by policy makers, it too would require important research-based inputs for its management. For example, lowering nutrients and pathogens entering from river inflow and improving waterfowl habitat along the rivers and delta would require testing.

Programmatic mechanism: Our proposed plan is action-based and solution-targeted recognizing the immediacy of the problem and the need for rapid policy decisions. We propose to coordinate the Salton Sea efforts through an existing University-wide program structure that will provide a flexible and responsive vehicle for scientific exchange as well as research coordination and funding. The UC Centers for Water and Wildland Resources is a multi-campus research unit that focuses activities on solving priority problems in agriculture, natural resources, and human development throughout California. It provides an umbrella mechanism for research and scientific exchange for four distinct programs dealing with water and wildland issues. One existing program under the Centers is the highly successful Salinity/Drainage Research Program, described earlier. After consultation with the leadership of the Centers and the UC Division of Agriculture and Natural Resources, we have determined that the Salton Sea action program outlined here should be a new branch of the Centers for Water and Wildland Resources. This branch will be

headquartered at UC Riverside. It will take advantage of the experienced programmatic structure in place, and it will have independence from existing programs to facilitate its responsiveness to the proposed timeline for action. Our ability to provide this much needed coordination and action program is dependent upon our ability utilize University seed money and expertise to attract new state and Federal resources.

Summary: This testimony has outlined a plan for how the University can best serve the state of California and, indeed, the nation, in dealing with the Salton Sea. The University of California is the only entity with the full breadth and depth of expertise required in the needed areas of biology, economics, soil and water/engineering. It can bring to bear expertise, facilities, and programs, including a coordinating program structure, as well as some seed money. The plan will overcome existing coordination problems, whereby UC and other scientists have been responding on an ad hoc basis. The University will provide objective, scientific-based research information to help policy makers form decisions, and coordinate across entities, with no agenda or bias of its own. Finally, the proposed research will be done in parallel with the chosen solution along the phased timeline.

STATEMENT OF DR. JOHN H. ZIRSCHKY, ACTING ASSISTANT SECRETARY OF THE ARMY (CIVIL WORKS)

Mr. Chairman and Members of the Subcommittee:

INTRODUCTION

I am John Zirschky, Acting Assistant Secretary of the Army for Civil Works. Thank you for inviting me to testify on the U.S. Army Corps of Engineers (Corps) involvement in the evaluation of the causes and proposed solutions for addressing the water quality and lake level stabilization issues facing the Salton Sea. My statement will consist of brief descriptions of the Corps environmental expertise in the civil works arena; our project evaluation and management strengths; and the past and current involvement of the Corps in Imperial County, particularly in the Salton Sea basin, California.

The Corps has a long history in water resources management, including environmental and ecosystem protection and restoration. The Corps role as this Nation's first environmental protection agency dates back to the "Refuse Act of 1899." The Act states that:

> "It shall not be lawful to throw ... any refuse matter of any kind or description whatever other than that flowing from the streets and sewers ... into any navigable water of the United States, or into any tributary of a any navigable water ..."

The Army was put in charge of enforcing this statute. We kept the garbage out of the rivers. Even earlier than that, in 1883, the Corps was entrusted with the sensitive ecosystem of Yellowstone National Park, which had been established 11 years earlier.

Today, the Corps has increased the priority of its environmental mission and gained widespread expertise and experience in all phases of environmental planning and ecosystem restoration.

CORPS ROLE IN ENVIRONMENTAL PROBLEM SOLVING

For more than two centuries, the Corps of Engineers has been committed to providing comprehensive engineering, management and technical support to the Nation. It is the Corps ecosystem restoration activities and problem-solving approach that I will highlight today.

The Corps interdisciplinary planning and engineering staff combines the resources necessary to identify problems and to develop, evaluate, and implement solutions to these problems. The well trained staff is accustomed to analyzing difficult problems and developing implementable solutions, and understands the importance of testing these solutions under the light of public scrutiny. In addition to the many planners, engineers, economists, biologists, and social scientists at Corps district offices, the Corps maintains very specialized technical expertise at several support facilities or laboratories located throughout the United States that can be mobilized to assist on an as needed basis. The Waterways Expenment Station in Vicksburg, Mississippi and the Hydrologic Engineering Center in Davis, California are world-renowned centers of expertise. It is the unique problem solving capability of the Corps that sets it apart and makes it a leader in the environmental restoration area.

The Corps is a leader in ecosystem restoration. We have broad experience on a range of related technical and legal issues, such as protection of private property rights and public involvement, as well as extraordinary experience in resolving mul-

tiple stakeholder issues. Our experience has increased through such projects as the following:

—Restoring the south Florida ecosystem including the Florida Everglades;
—Helping ensure the future health of Lake Tahoe;
—Planning and executing the highly successful Upper Mississippi River Environmental Management Program;
—Working sensitive hypoxia and other issues on the Gulf Coast;
—Louisiana Coastal Wetlands Conservation and Restoration Program;
—the "Project Modifications for the Improvement of the Environment" program, with such projects as Yolo Basin Wetlands in California, Sammamish River Restoration in Washington, Salt Bayou, Texas, and Anacostia River and Tributaries, Maryland;
—Papua New Guinea mine operation impact consultation; and
—the Land Management System research program.

Further infonnation on these projects and the Corps capabilities is available to the Subcommittee on request.

CORPS EXPERIENCE IN IMPERIAL COUNTY

I will turn now to a discussion of some of the Corps experience in Imperial County, California. The Corps earliest investigations in Imperial County focused on flood damage reduction. A 1943 investigation recommended construction of dikes and a dam to provide flood protection for the irrigation canals on the west side of the Imperial Valley. A 1976 flood plain report included approximate delineations of 100-year and 500-year flood events as well as water profiles for the 10-, 50-, and 100-year events. Following the Imperial County flood of 1976, which caused damages in the San Bernardino and Riverside areas, the Corps prepared a report describing the flood and summarizing its damages. Temporary emergency work was perfonned at Bombay Beach, consisting of strengthening a non-Federal dike threatened by the rise in the Salton Sea water level. A reconnaissance level study in 1977, conducted at the request of the Imperial County Board of Supervisors, investigated flood control in the town of Ocotillo.

In 1989, a broader study was performed to develop and evaluate potential solutions to flooding and related problems on Imperial County and San Diego County tributaries of the Salton Sea. Investigations included flooding threats from runoff from the Chocolate Mountains to the east, from several mountain ranges to the west, and from overflow from the New and Alamo Rivers. Flood damages were identified as destruction of canal embankments, clogging of canals with sediment, inundation of agricultural fields, and destruction of precise grading of agricultural fields by deposition of sediment.

Under the authorization of the Flood Control Act of 1941 (Public Law 77-228) and with funds appropriated in fiscal year's 1996 and 1997, a Reconnaissance Report on the Imperial County Watershed Study was completed by the Los Angeles District of the Corps in January 1997. Through evaluation of the baseline conditions and identification of key problems, the study approach was refined to focus on ecosystem restoration, with emphasis on the New River and Alamo River. In partnership with the Imperial County and Imperial litigation District (IID), the Los Angeles District is proceeding with a feasibility phase study called the Imperial County Ecosystem Restoration Study.

Imperial County and the IID have mainlined support for a cost-shared feasibility study for the development of an ecosystem restoration plan for the New River and Alamo River. Negotiations of the Feasibility Cost Sharing Agreement (FCSA) between the Corps and the potential sponsors for the Imperial County Ecosystem Restoration Study are in the final stage. Upon completion of the FCSA, which includes the Final Project Study Plan, by the Los Angeles District, it will be submitted through the Corps South Pacific Division to Corps Headquarters for review and approval.

The focus of the feasibility study will be to formulate and develop an ecosystem restoration plan for both the New River and Alamo River, which will concentrate on wetland and/or riparian habitat restoration. The Reconnaissance Report identified eight potential restoration sites (four on each river) for further consideration. The recommended plan for the Feasibility Study will include the design of at least one restoration area on each river. The development of this plan will require evaluation of the following water resource issues: (1) hydrology and hydraulics; (2) sediment transport; and (3) ecosystem restoration opportunities. As you are aware, water quality within the New River, Alamo River and Salton Sea Ecosystem continues to be of great concern to Federal and State agencies and environmental groups. Approximately 95 percent of the water supply needed to sustain the Salton Sea comes from the New River and Alamo River, which serve as collectors of agricul-

tural, industrial and domestic runoff water. Restoration of ecosystem values along these rivers which have been degraded by adverse water quality impacts may be accomplished by wetland and riparian habitat restoration measures. These restoration measures could contribute to the improvement of the water quality in the New and Alamo Rivers.

The Corps feasibility study will implement a coordinated stakeholders awareness program for the development of ecosystem restoration opportunities. Some of the key issues consist of (1) existing short-term and long-term impacts to water quality and the ecological resources; (2) increased surface elevations of the Salton Sea due to inadequate flood control facilities within Imperial County; and (3) the lack of data on sediment yield and transport for both the New River and Alamo River, which would promote understanding of the discharge of agricultural drainage runoff versus river degradation. A technical understanding of these issues and their roles in this sensitive ecosystem is required to better predict future environmental conditions. Improving the environmental and water resources of the New River and Alamo River will be a major step towards restoring the Imperial County ecosystem.

CONCLUSION

In summary, Mr. Chairman and other members of the Subcommittee, the Corps of Engineers is a leader in environmental problem solving. Each member of the Corps team is committed to integrity, quality, professionalism and caring. This concludes my statement. Thank you for this opportunity to discuss the Corps of Engineers experience and capabilities.

STATE OF CALIFORNIA—THE RESOURCES AGENCY PETE WILSON, Governor

DEPARTMENT OF FISH AND GAME
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SACRAMENTO, CA 94244-2090
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October 1, 1997

The Honorable John Doolittle
Chairman
Subcommittee on Water and Power
Committee on Resources
U.S. House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

The following is a written statement by the California Department of Fish and Game (Department) on the Salton Sea which is presented to the Subcommittee on Water and Power of the U.S. House of Representatives Committee on Resources for the hearing scheduled on Friday, October 3, 1997, in Palm Desert, California.

The Department appreciates the interest and support of the Subcommittee concerning the status and future of the Salton Sea. We thank all the members of the Subcommittee for the opportunity to provide written comments for your consideration during the hearing.

If you have any questions, or we may provide any additional information, please contact me at the above address or telephone number, or contact Ms. Patricia Wolf, Regional Manager for the Department's Southern California-Eastern Sierra Region at 330 Golden Shore, Suite 50, Long Beach, California 90802, telephone (562) 590-5113.

Sincerely,

Jacqueline E. Schafer
Director

cc: Ms. Patricia Wolf, Regional Manager
California Department of Fish and Game
Long Beach, California

Mr. Terry Mansfield, Chief
Wildlife Management Division
California Department of Fish and Game
Sacramento, California

TESTIMONY SUBMITTED FOR THE RECORD ON THE SALTON SEA BY THE CALIFORNIA DEPARTMENT OF FISH AND GAME

October 3, 1997 Hearing
U.S. House of Representatives
Committee on Resources
Subcommittee on Water and Power

The California Department of Fish and Game (Department) offers the following comments on the Salton Sea. We thank Chairman John Doolittle the Subcommittee, and other interested members of Congress from California, including Representatives Brown, Bono, Calvert, Hunter, and Lewis, for their interest in the Salton Sea and attention to these concerns.

Background

The Salton Sea, the largest inland body of water in California, lies in the Imperial Valley 227 feet below sea level and has a surface area of about 375 square miles and a maximum depth of about thirty feet. The lower two-thirds is in Imperial County, and the northern one-third is in Riverside County. Water for the Sea originally came from the Colorado River diversions and during flood stages when the river overflowed its banks. The basin occupied by the Sea is used to dispose of agricultural drain water and overflow irrigation water from agricultural operations in the area. The New and Alamo rivers also provide freshwater flows; water from the New River is mostly untreated or partially treated domestic wastewater from Mexico. Freshwater sources combined with agricultural drain water enter the Sea at the northern end through the Whitewater River, San Felipe Creek, and Salt Creek. The beneficial use of the Sea has been designated as an agricultural sump.

Much of the freshwater that enters the Sea originates from the Colorado River which has a relatively high salt content. As these waters are spread on agricultural fields, the salts are left in the soil. Salt deposits are then removed when fields are flooded with sufficient volumes to carry the salts to the subsurface tile drains and then to the surface drains. As a consequence, water that passes though the agricultural systems and is eventually deposited in the Sea has a high salt content. The Sea is a shallow terminal lake, with no outlet, and evaporation far exceeds the freshwater inflows. This results in a concentration of salts and all other dissolved and suspended constituents carried by agricultural drain water. Additional water conservation efforts already underway will continue to reduce the amount of freshwater entering the Sea, which will further increase salinity and degrade water quality.

The Sea is an integral part of the Pacific Flyway, providing food and a major rest stop for hundreds of thousands of waterfowl and shorebirds. Five bird species that use the Sea are federally- and State-listed as endangered or threatened. The area has become a premier birding spot in California and supports a popular annual bird festival that is sponsored by the community of Brawley and Imperial County.

The Department owns and operates the 5,883-acre Imperial Wildlife Area on the southeast shore of the Sea in Imperial County, plus 2,047 acres at Finney and Ramer lakes. The wildlife area provides habitat for migrating waterfowl and a variety of other wildlife, including a large population of the State-threatened and federally-endangered Yuma clapper rail. The wildlife area supports economically important opportunities to the public for waterfowl hunting and wildlife viewing.

Originally, fish were transported to the Salton Sea from the Colorado River, including carp, bonytail, humpback sucker, rainbow trout, and striped mullet. As salinity increased, these species declined. From 1929 through the 1950s, the Department stocked the Sea with several marine species of fish, including orange mouth corvina, bairdiella, and sargo from the Gulf of California. These species supported a thriving recreational fishery which has since declined. Through several routes of introduction, tilapia also became part of the recreational fishery. Desert pupfish, a federally- and State-listed species, now reside in drains and creeks as well as pools adjacent to the shoreline.

At one time, the Sea was a desert center of aquatic recreation with fishing, boating, and swimming supporting a significant recreational economy. Recreational opportunities attracted people from a wide area. The Sea enjoyed popularity for many years, and permanent and retirement communities sprang up on its shores. However, fluctuations in surface levels flooded homes built at the water's edge. The Imperial Irrigation District built seawalls to protect some communities and purchased others.

Issues and Concerns

The Salton Sea ecosystem is in serious trouble. Fish and wildlife emergencies, including extensive fish and bird die-offs, are increasing in frequency and scale and are requiring an escalating response and commitment of time and resources by public and private agencies. Recreational opportunities have declined precipitously. Salinity, selenium, nutrient load, and disease are specific areas of concern, but are interrelated.

As the State fish and wildlife agency with public trust responsibilities, the Department is concerned about the persistence and recovery of threatened and

endangered species; resident and migratory bird populations that rely on the Salton Sea for habitat and food; the maintenance of a healthy and successful recreational fishery; the maintenance of an ecosystem that will support the diverse biota of the Salton Sea and surrounding environs; and the continued economic viability of fish and wildlife programs for the area.

Salinity

The salinity of the Salton Sea has approached 44 parts per thousand. This has adversely affected the reproductive success of some recreational fishes. Studies by the Department indicate that salinity in excess of 40 parts per thousand has a detrimental effect on the reproductive success of corvina in the Salton Sea. Eggs and juvenile stages seem to be the life stages most susceptible to higher salinity. Because current salinity exceeds tolerance levels for some species, the diversity and number of fish species have been seriously reduced. Tilapia, however, seem to tolerate higher salinities when other species cannot. It is this species that appears to support the fish-eating birds.

Selenium

In addition to salts, other materials accumulate in the Sea that occur naturally in the Colorado River drainage or that result from agriculture. Colorado River water contains selenium derived from the geological formations of the basin. While selenium is not at detrimental concentrations in the water as it enters the Salton Sea, the same processes that concentrate salts concentrate selenium. The potential consequences of high selenium concentrations are well documented from areas such as Kesterson National Wildlife Refuge where bird birth deformities were experienced. High concentrations of selenium are known from the sediments of the Salton Sea, as are bird deformities from the Salton Sea National Wildlife Refuge. Elevated selenium concentrations in fish flesh caused the Department of Health Services to issue a health advisory to anglers who eat fish from the Salton Sea. This health advisory is contained in the California Sport Fishing Regulations.

Plant Nutrients

Plant nutrient levels in the Salton Sea have also been well documented. Nutrients from incoming waters concentrate in the Salton Sea, as salts and selenium do. Nutrient dynamics have not been as well documented; however, some information indicates that the highly eutrophic (high algal and low dissolved oxygen content) state of the Salton Sea is responsible for the development, and at times dominance, of

phytoplankton species that are poisonous to fish. In addition to potential deleterious affects on fish, the eutrophic nature of the Salton Sea greatly reduces the recreational esthetics of the area.

Disease

Fish die-offs have been documented in the Salton Sea for years. These events have traditionally been attributed to low dissolved oxygen levels. In the past two years, the involvement of fish-eating birds, and diseases associated with tilapia and birds, have been the subject of intense investigations by the State of California and several federal agencies. In 1996, a total of 14,150 birds (8,540 white pelicans and 1,130 brown pelicans, and 4,480 other bird species) died during a four-month botulism event. Many more undoubtedly perished but were not observed. Investigations provided the first evidence linking botulism poisoning in birds to the consumption of live fish. Tilapia were found to be infected with a salt water tolerant bacterium (*Vibrio algenolyticus*) which created an anaerobic condition that allowed the botulism to develop in the fish. Pelicans and other fish-eating birds were then infected with the botulism spores after eating the tilapia. There are now suspicions that at least some of tilapia die-offs may have been due to bacterial infections that were undocumented. Tilapia continue to die at the Salton Sea. In January, 1997, some 50,000 tilapia perished. Laboratory analyses confirmed the presence of *Vibrio alginolyticus* and botulism spores.

Eared grebes have been dying at the Sea in large numbers since 1992. Approximately 150,000 grebes died in 1992, 20,000 in 1994, and at least 1,000 sick or dead grebes were recovered in 1996. The cause of these deaths has yet to be identified.

An outbreak of Newcastle's disease among cormorants has been confirmed and fowl cholera has been known for some time from the Salton Sea. Newcastle's disease has serious implications for the poultry industry and has created some interest from the Department of Agriculture.

1996 Bird Mortalities

State, local, and Federal agencies collaborated to control the botulism outbreak at the Salton Sea last year from August through November. The Department of Fish and Game contributed significant resources in response to the botulism outbreak. In close cooperation with U.S. Fish and Wildlife Service National Refuge staff, the Department provided over 100 permanent and temporary personnel for field operations during the four-month event, and often contributed the majority of the people working at the Sea on a daily basis. The Department provided the expertise to develop the

Incident Command System that was used to manage this wildlife disaster. As of year-end accounting through June 30, personnel and operating expenses for the Salton Sea operation cost the Department $318,524. The total does not include administrative overhead costs at the rate of 23.09%, or $73,547. This is a conservative estimate because it did not include supervisory and management staff responsible for oversight of the event, including potentially serious health and safety issues which had to be addressed for the Site Safety Plan, or some resources we expended toward laboratory investigations and public information. Department personnel from all over the State were diverted to participate in a variety of ways in the botulism incident.

The Department has six shallow draft airboats strategically located throughout the State for quick response to botulism events. Five of those boats were committed to the activities on the Sea for the entire four-month period. The lengthy period of heavy use and the corrosive, saline environment resulted in repair costs that were included in the costs above.

The Department was not able to budget for the unanticipated costs we incurred for our involvement in the 1996 Salton Sea botulism event. These costs had to be absorbed within our existing budget authorization from funds generated primarily by California hunting and fishing revenues. We provided cost information to the U.S. Fish and Wildlife Service (Service) in anticipation of Federal reimbursement, but the Department received no Federal funding to defray any of our costs. As we have indicated to the Service in Sacramento, the Department is unable to financially sustain this level of participation at the Salton Sea without an appropriate new funding source for what appears to be a predictable annual event given the underlying environmental conditions. It is important to note that mortality at the Salton Sea involving large numbers of white and brown pelicans and other nongame species is unique and creates a significant problem for the Department in using revenues from hunting and fishing license sales which are reserved by statute to fund programs with a direct benefit to fishing and hunting activities.

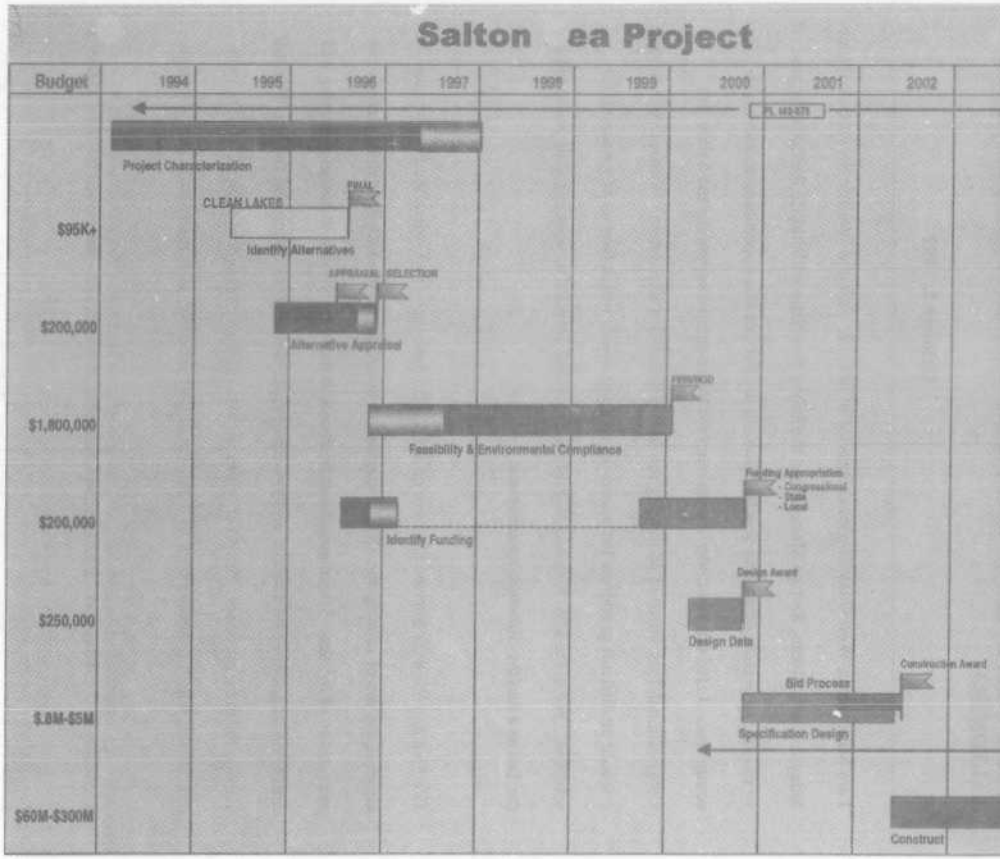
The Department is continuing its involvement in and support of Salton Sea issues and the current botulism event. We participated fully in conferences in Madison, Wisconsin last year and in Palm Springs, California this year to address technical issues and develop research proposals. We have made a commitment to continue to pick up any affected birds on our Imperial Wildlife Area and to make our facilities available as necessary, as was the case during the recent Newcastle's outbreak. The temporary staff we have hired to pick up birds on our area have also been available to assist National Refuge personnel. Our Wildlife Investigations Laboratory is continuing to be available for diagnostic analyses and technical support.

Recreational Attributes

During its peak recreational years, the Salton Sea attracted people from the southwest for water sports, camping, and fishing. The decline in the recreational fishery combined with the health advisory for fish consumption, concern for waterborne diseases, and the diminished esthetics of the Salton Sea have lead to an almost complete failure of the local recreational infrastructure. An economic study on the recreational significance of the Salton Sea published in 1989 cited surveys from 1969 that found that the Salton Sea provided 1.5 million recreation days (one-third of which were devoted to recreational fishing) and projected use rates of 4.3 million by the year 2010. Clearly, the Salton Sea does not approach this potential today. The same 1989 study found that the total economic contribution from a regional (nine southern California counties) perspective amounted to $296.3 million. The contribution to the local economy was $99.2 million. The Salton Sea and its recreational values have had a significant economic impact on the local economy specifically and on the southern California economy in general.

Long-Term Solutions

Understanding the status and complex interactions of the ecosystem as it exists today is essential to any long-term solutions to the Salton Sea's problems. The federally-sponsored workshop in Palm Springs in August, 1997 has provided working proposals for studies on the physical environment, biological environment, pathogens and disease, contaminants, and cultural resources. The Department believes it will be critical to identify and interrelate issues and problems in these areas and also take water supply and management as well as economic considerations into account. The recreational potential of the Sea should also be addressed. Effective long-term solutions to the Salton Sea's many problems must be based on sound scientific information. Finally, the Department firmly believes that the critical natural resource values of the Salton Sea, which benefit the State of California and the Pacific Flyway, must be acknowledged, restored, and preserved.


Salton ea Project
Budget
1994
1995
1996
1997
1998
1999
2000
2001
2002
Project Characterization
CLEAN LAKES
Identify Alternatives
$95K+
$200,000
Alternative Appraisal
$1,800,000
Feasibility & Environmental Compliance
$200,000
Identify Funding
$250,000
Design Data
$.8M-$5M
Bid Process
Specification Design
$60M-$300M
Construct

TESTIMONY OF MICHAEL J. SPEAR, REGIONAL DIRECTOR, U. S. FISH AND WILDLIFE SERVICE, DEPARTMENT OF THE INTERIOR, BEFORE THE SUBCOMMITTEE ON WATER AND POWER RESOURCES OF THE HOUSE COMMITTEE ON RESOURCES, REGARDING THE HEALTH OF THE SALTON SEA

October 3, 1997

I am Mike Spear, West Coast Regional Director of the U.S. Fish and Wildlife Service. With me today is Clark Bloom, Refuge Manager for the Salton Sea National Wildlife Refuge Complex. I would like to begin by thanking you for allowing the Service this opportunity to address the committee. I also want to underline the need for the continued support of the Salton Sea Congressional Task Force in addressing the failing Salton Sea Ecosystem. Without your support it would be difficult to address the numerous complex issues which face us as we search for solutions. We in the U.S. Fish and Wildlife Service look forward to working with you to restore the Sea as a healthy, functioning ecosystem

The Fish and Wildlife Service has been on the Salton Sea since 1939, when the first manager assumed the job of running the 35,000 acre Salton Sea National Wildlife Refuge located on the south shore of the Sea. The management emphasis in those early years included protecting and enhancing migratory bird habitat, and providing opportunities for hunting and fishing. We still manage for these purposes. However, today we also manage endangered species, and facilitate ecotourism, which generates over $3.1 million dollars annually, principally from bird watchers.

According to a 1988 report - Problems and Solutions at Salton Sea - developed for the California

Resources Agency, early studies conducted in 1969 and 1972 found that, although considerable efforts and discussion have occurred to address the Salton Sea's problems, no effective remedial strategy had yet been established and implemented with respect to salinity, flooding and pollution. As a result, recreational participation, land values and general levels of economic activity around the Sea have declined considerably over the past two decades. It is safe but sad to say that three decades have now passed since the problem was diagnosed, and the situation is much worse.

Since this report was prepared, the Sea's water level continues to rise. Its salinity still exceeds the salinity of the ocean. Raw sewage and industrial pollutants from Mexico continue to flow down the New River and into the Salton Sea along with nutrients, selenium, and other chemicals from agricultural drain water. The Sea is still officially considered as the ultimate sink for all drainage in the Coachella and Imperial Valleys. The effects of this constant poisoning have been dramatic.

In 1992, national attention was focused upon the troubled Sea when over 150,000 eared grebes and ruddy ducks died. The National Wildlife Health Center has since determined that some of the ducks died from avian cholera, but the cause of most of the duck deaths and all of the grebe deaths remain unknown today. Fish and bird kills have continued to occur. An estimated 20,000 water birds died in 1994. The cause has never been determined. Avian botulism killed over 14,000 birds in 1996, including more than 1,400 endangered brown pelicans.

Thousands of Tilapia, a species of fish, died of vibrio infections that allowed botulism to develop in their blocked intestines. Birds which consumed the sick fish were infected with the botulism and died. In 1997, Newcastle disease wiped out a breeding colony of cormorants, and the refuge staff witnessed a raft of dead fish 3 miles long. These losses hold great significance for the Pacific flyway--one of the main corridors over which migratory birds travel between their summer and winter homes. Since the Salton Sea serves as a substitute for flyway wetlands lost elsewhere in southern California, its health is essential for the long-term viability of the migratory bird population on the West Coast.

Several federal, state and private agencies and contractors have been working on numerous efforts to address isolated problems associated with the Salton Sea. Nonetheless, signs of ecosystem distress still appear through fish and bird die-offs. The Service itself has made a major effort to manage these incidents with partners by removing dead birds, destroying infected carcasses to prevent the spreading of disease and rehabilitating birds if possible.

However, largely due to complex jurisdiction questions, no one entity has been in a position to take the lead to develop a comprehensive program to resolve the numerous and interconnected problems here, such as potential water diversions from the Sea, wildlife diseases, human health risks, increasing salinity and rising water levels, along with related items such as loss of cultural resources. Without such a unified and reasoned approach, the many isolated efforts now underway cannot ultimately solve the ecological disaster we have before us.

This is all the more important since decisions are being made and implemented now which will affect the Sea. As one example, the United States Environmental Protection Agency is working with Mexico to construct a second sewage treatment plant in Mexicali which will discharge into the New River. This project will include the construction of a new channel for the New River and its enclosure in concrete through Mexicali all the way to the border. Another example is the on-going negotiation to transfer water eventually from the Imperial Valley Irrigation District to the city of San Diego. Decisions made now will effect the eventual plan to restore health to the Salton Sea.

Among the many complex issues related to the Salton Sea's problems is the fate of its endangered species. Given the last years' significant losses of migratory and endangered bird species, the Service is obliged to seek and implement an effective answer not only to these drastic losses of endangered and threatened species, but to restoring the ecosystem as a whole.

In August, we cosponsored a workshop in cooperation with the Bureau of Reclamation, the US Geological Survey Biological and Water Resources Division and the California Department of Fish and Game to identify what research voids exist and should be filled within a three year period to compliment the efforts of the Salton Sea Congressional Task Force initiative. The workshop brought together nearly 100 scientists, managers, agency and university representatives and other interested parties. In all, 21 different Federal, State and local agencies, universities and government offices participated.

The participants worked for four days to identify immediate research needs related to the natural and cultural resource problems, as well as information needed to evaluate proposed engineering solutions to repair the Salton Sea Ecosystem. The teams generated 31 research proposals that would require approximately $36 million to complete, or $12 million per year over a 3 year period, and 44 accompanying recommendations.

I offer for the hearing record the proceedings of the Saving the Salton Sea Needs Assessment Workshop. This document shows just how complex the Salton Sea Ecosystem is and demonstrates that caution and good science will be required to fully address the problems here.

This is for the long term. I would be remiss, however, if I did not point out that for right now and for the short-term future, the Fish and Wildlife Service can do no more than put a band-aid on the problem. We burn dead birds and fish in an effort to stop the spread of disease, and help in efforts to rehabilitate sick birds. This is all we can do. Needless to say, this leads to serious levels of frustration and stress at all levels of the agency, including myself; but particularly among the refuge staff. To fully appreciate their efforts, you must realize that people come to the Fish and Wildlife Service to protect and enhance fish and wildlife and their habitat, not to spend their days picking up and burning dead fish and birds. Clark Bloom and his staff are performing heroically under incredibly adverse conditions, and I want to publicly recognize this.

It is the ultimate goal of the Service to work with Congress and the Salton Sea stakeholders to

regain the health and productivity of the Salton Sea, for people and for wildlife. On behalf of the Service, I look forward to working with you and our partners in this great enterprise.

R. Wayne Hardie

EVALUATION OF OPTIONS FOR REMEDIATION OF THE SALTON SEA

INTRODUCTION

In May of this year Los Alamos National Laboratory was asked by the Congressional Salton Sea Task Force to provide technical support for the remediation of the ecological problems in the Salton Sea. Today I am going to report on some of our work in evaluating various concepts for remediating the Sea. Our results are preliminary and in some cases qualitative, but they can be used to help guide decision-makers such as yourselves in your deliberations. *Ultimately, selecting the "best" solution for saving the Salton Sea will have to integrate performance, economic, ecological, and institutional factors into the decision.*

Environmental issues related to the Salton Sea *are well known and* include

- industrial and municipal waste,
- selenium concentrations,
- high salinity, and
- variable water levels.

Today I am going to briefly discuss each of these issues.

INDUSTRIAL AND MUNICIPAL WASTE

The primary source of industrial and municipal waste to the Salton Sea is untreated sewage from Mexicali. However, although the amount of industrial and municipal waste discharged to the New River is large, *its impact on the Salton Sea is reduced during its 50-mile journey to the Sea. Furthermore,* plans are in the works for a Mexicali treatment facility which, when completed around the Year 2000, will help alleviate this problem.

Consequently, we feel that the issue of industrial and municipal waste pollution in the Salton Sea is already being addressed. *However, the impact of nutrients in agricultural return flows on the industrial and municipal waste needs further research.*

SELENIUM

Because the agricultural drain water entering the Salton Sea contains selenium there is concern that this may cause selenium poisoning problems in the Salton Sea and may be contributing to the bird and fish die-offs. *The health effects of human, fish, and waterfowl exposure to water and to sediments containing specific levels of selenium are not well known. The Environmental Protection Agency recommends that drinking water should not exceed more than 10 ppb and the Food and Drug Administration allows up to the same level in bottled drinking water.*

Information provided to us *by the Salton Sea Authority* on measurements of selenium concentrations in the drain water, Sea water, and sediments in the Salton Sea indicate levels that are below the existing EPA *and FDA* recommendations in the case of Salton Sea water and are typically a factor of ten or more below those experienced at the Kesterson National Wildlife Refuge.

Therefore, we do not view selenium in the Salton Sea as a pressing problem and think that additional research on selenium and its impact on the environment of the Salton Sea is needed before any actions are undertaken. Also, the selenium levels in the Salton Sea and

its sediments need to be carefully monitored so that any trends toward increasing selenium levels will be detected early.

HIGH SALINITY AND VARIABLE WATER LEVELS

The remaining two issues, high salinity and variable water levels, are complicated and most solutions will impact both these problems to varying degrees. Regarding salinity, the Salton Sea Authority has set a goal of 35 parts per thousand (ppt), which is equal to the salt content of ocean water, and a decrease of about 9 ppt from the current level. The Authority would like to stabilize the water level at between -230 and -235 feet, which is a slight decrease from today's elevation of about -227 feet.

Los Alamos has examined the cost, salinity, and Sea level changes of three remediation concepts:

- desalination;
- pump-in; pump-out; and
- diked impoundment

and compared these results with "doing nothing." We have concentrated on performance and economic issues and have not evaluated ecological or institutional factors in this analysis.

The purpose of this work is to determine the primary advantages and disadvantages of each concept. For each concept, there are numerous variations, so detailed engineering designs must be completed once a concept is selected.

The assumptions for our analysis are:

- *due to anticipated water conservation, the inflow into the Salton Sea will linearly decrease from the present flow of 1.3 million acre-feet per year (MAF/year) to 1.0 MAF/year over a twenty year period.*
- *the salinity level of the inflow to the Sea will increase from the present 2.3 ppt to 3.0 ppt over the same time period.*

The "water and salt balance" model that we used is a fairly simple computer simulation that calculates elevation, surface area, volume, and salinity. The model also takes into account changes in evaporation rate due to changes in salinity and surface area.

Do Nothing

First, if no action is taken the Salton Sea will, of course, continue to increase in salinity from today's level of 44 ppt. *Figure 1.* The Sea would reach a salinity level of about 60 ppt in about 15 years. This is important because some believe that most fish can no longer live in water around this salinity level. Therefore, there isn't much time if the Salton Sea is to be saved. *The salinity level would reach almost 100 ppt in 30 years, and after 50 years would approach 120 ppt.*

Regarding water level, the elevation of the Sea would be lowered from today's -227 feet to -242 feet after 30 years. This 15 foot drop in elevation would result in a reduction in the Sea's surface area by approximately 20%--from about 380 sq. miles to 304 sq. miles.

Desalination

If there were an inexpensive filtering or distillation method to remove salt from high-salinity water, desalination would be an obvious solution to the problems of the Salton Sea. The process could be used to reduce the salinity of the water already in the Salton Sea, or to desalinate ocean water being pumped from the Gulf of California as part of a "pump-in, pump-out" scheme.

45-367 - 98 - 4

If desalination is used to freshen the water in the New, Alamo, and Whitewater Rivers and the water allowed to flow into the Salton Sea, this reduces the quantity of salt going into the Sea but does not solve the salinity problem because salt is not being removed from the Sea. Furthermore, if the desalinated water is diverted instead of flowing into the Salton Sea, this will lower the Sea's elevation and increase its salinity thereby making the problem worse.

One desalination proposal was developed earlier this year by U.S. Filter. They propose treating New and Alamo River water prior to entering the Salton Sea and diverting about 160 TAF/year for recycle. *The saline water, 45 TAF/year, would be disposed of, in addition to 22 TAF/year of water which would be pumped out of the Salton Sea for a total water loss to the Sea of 227 TAF/year (160 + 45 + 22). U.S. Filter estimates that the total project capital cost would be between $750 million and $1.0 billion.*

The impact of the above proposal on the salinity of the Salton Sea is an increase to about 120 ppt at 30 years, which is 20 ppt higher than doing nothing. *Figure 2.* Furthermore, the surface area of the Sea would decrease by over 30%, *to about 260 square miles, and the elevation would decrease to -250 feet.*

Another proposal, by the Metropolitan Water District (MWD), would divert approximately 450 TAF/year of Alamo *(390)* and Whitewater *(60)* River water. *After desalination, the water would be delivered to the Colorado River Aqueduct. MWD estimates the capital cost would be $1.1 billion with operation costs of $58 million/year.* Once again, from the point of view of remediating the Salton Sea, this makes the Sea smaller and saltier.

In summary, desalination can be used to produce fresh water for urban use, but proposals that divert inflow water will make the Salton Sea salinity and elevation problems worse. *There are, of course, other desalination approaches which could improve the Salton Sea, but we feel these would be prohibitively expensive.*

Pump-In, Pump-Out

Another concept that has received attention consists of pumping water from an external source to the Salton Sea and pumping water from the Sea to an external location. The advantage of such a concept is that it has the potential to allow simultaneous control of salinity, elevation, and surface area.

The obvious source for pump-in water is the Gulf of California which, of course, is at ocean water salinity. However, for this concept to be practical, the salinity of the pump-in water needs to be considerably less than that of ocean water in order for the Salton Sea to eventually reach ocean water salinity. If the pump-in water is at ocean water salinity, very large quantities of water must be pumped, both in and out. For example, pumping in 400 TAF/year of ocean water and pumping out 500 TAF/year of Salton Sea water is required for the Salton Sea to approach ocean water salinity. *Figure 3. The elevation of the Sea would stabilize at about -250 feet for this scenario. Figure 4. Our estimate is that the capital cost for such a system would be about $1.7 billion, with another $30 million per year in operating costs (assuming electricity costs of 3.5 ¢/kWh).*

Since it is unlikely there will be a source of low-salinity pump-in water, a variation of this concept is "pump-out" only. Pumping out a relatively small 150 TAF/year of Salton Sea water will allow the Salton Sea to reach ocean salinity. *Figure 5.* This would create a smaller Salton Sea by about 35% *(to 245 square miles) with an elevation of about -253 feet. or just a few feet lower than pumping in 400 TAF/year and pumping out 500 TAF/year.* Our estimate of the capital cost for this system is about $300 million, with operating costs being approximately $5 million per year.

Therefore, "pump-out" achieves nearly the same results as "pump-in, pump-out," and at a much lower cost. Providing that a smaller Salton Sea is acceptable, "pump-out" should be considered as a viable option for the Salton Sea. One important issue that needs to be resolved with this concept is the destination of the pumped water. One frequently mentioned area is the Laguna Salada in Mexico. Technically this is feasible, but would entail reaching an agreement with Mexico.

Diked Impoundment

Another concept that has the potential for controlling salinity and elevation is the creation of in-Sea impoundment areas by diking. This could result in a Salton Sea with the same elevation as now and a salinity level comparable to that in the ocean. The primary disadvantage of "diked impoundment" is that part of the surface area in the Sea would be in an impoundment area which would contain very saline water. Fish would not be able to survive in the impoundment, and in time this brine would precipitate salt.

Eventually, this salt would have to be removed from the impoundment area--the cheapest way probably being to pump out the brine. When this has to be done is uncertain and will depend on the criteria for pumping out the brine. A lower bound would be when the brine first reaches saturation while the upper bound would be when the impoundment area fills up with solid salt.

Using our assumptions on inflow volumes, an impoundment area of approximately 65 square miles (about 17% of the area of the Salton Sea) would allow the Salton Sea to reach ocean salinity. *Figure 6.* Depending on the pumping criterion, the impoundment would be able to operate from 10 to 75 years before the brine needs to be pumped out. Our estimate of the capital cost of such a system is about $300 million for an earthen dike and about $700 million for a concrete dam. Operation costs would be $1-2 million/year.

If the impoundment area is increased to approximately 25% of the Salton Sea (about 95 square miles), the salinity decreases to about 25 ppt. In this case, pumping the brine could be delayed from 15 to 125 years.

If having part of the Salton Sea at a high salinity level is acceptable, we feel that "diked impoundment" is also a viable option for the Salton Sea.

Comparison of Pump-Out and Diked Impoundment

Therefore, based on the above analyses we feel that the best solutions for salinity and elevation control of the Salton Sea are "pump-out" and "diked impoundment." It is possible to do a rough comparison of the physical characteristics and costs of these two concepts. To make the comparison more meaningful, we will use scenarios where each concept results in ocean water salinity level for the Salton Sea.

In either case, the surface of the Sea will change. For the case of "pump-out," the elevation would be reduced by about 25 feet with a corresponding decrease in surface area of about 35%. With "diked impoundment" the elevation and the total surface area would be about the same as it is today. However, the impoundment area would be about 17% of the total surface area, or roughly half the decrease in the surface area under the "pump-out" option.

The capital cost for "pump-out" would be approximately $300 million, assuming the Laguna Salada as the recipient of the water, which is about the same as "diked impoundment" using an earthen dam. Operation costs would be about $5 and $1-2 million/year, respectively.

Compared to "pump-out," another advantage of "diked impoundment" is that it does not require an immediate repository for high-salinity Salton Sea water.

CONCLUSIONS

Based on our analysis, we conclude that:

- Industrial and municipal waste in the Salton Sea will be reduced considerably once the Mexicali treatment facility is operational around the Year 2000.
- There is time to address the selenium issue, allowing for further research and more information to be gathered.
- Desalination is not a viable concept for salinity and elevation control of the Salton Sea.
- "Pump-out" is a feasible method for salinity control, but the size of the Salton Sea would decrease.
- "Diked impoundment" will control salinity and elevation, but the impoundment area would have high salinity water.

Diked impoundment appears to be the solution which best meets the salinity and elevation requirements--and at a similar cost to "pump-out." More detailed and optimized designs need to be developed in order to better predict cost and performance. Finally, the ecological and institutional consequences of the various concepts need to be better analyzed before a final selection is made.

Thank you.

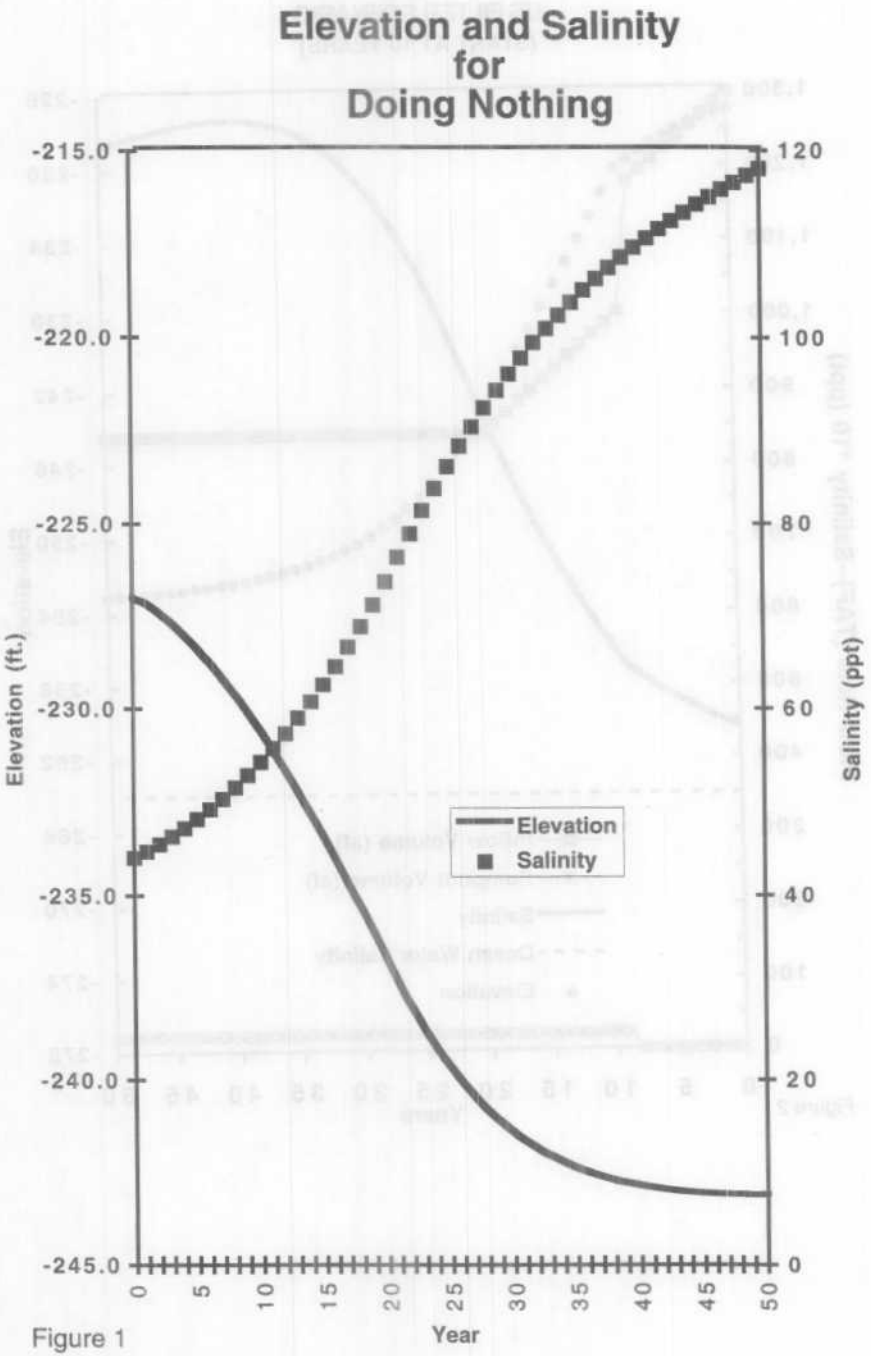

Elevation and Salinity
for
Doing Nothing
-215.0
-220.0
-225.0
-230.0
-235.0
-240.0
-245.0
Elevation (ft.)
120
100
80
60
40
20
0
Salinity (ppt)
Elevation
Salinity
0
5
10
15
20
25
30
35
40
45
50
Year

Figure 1

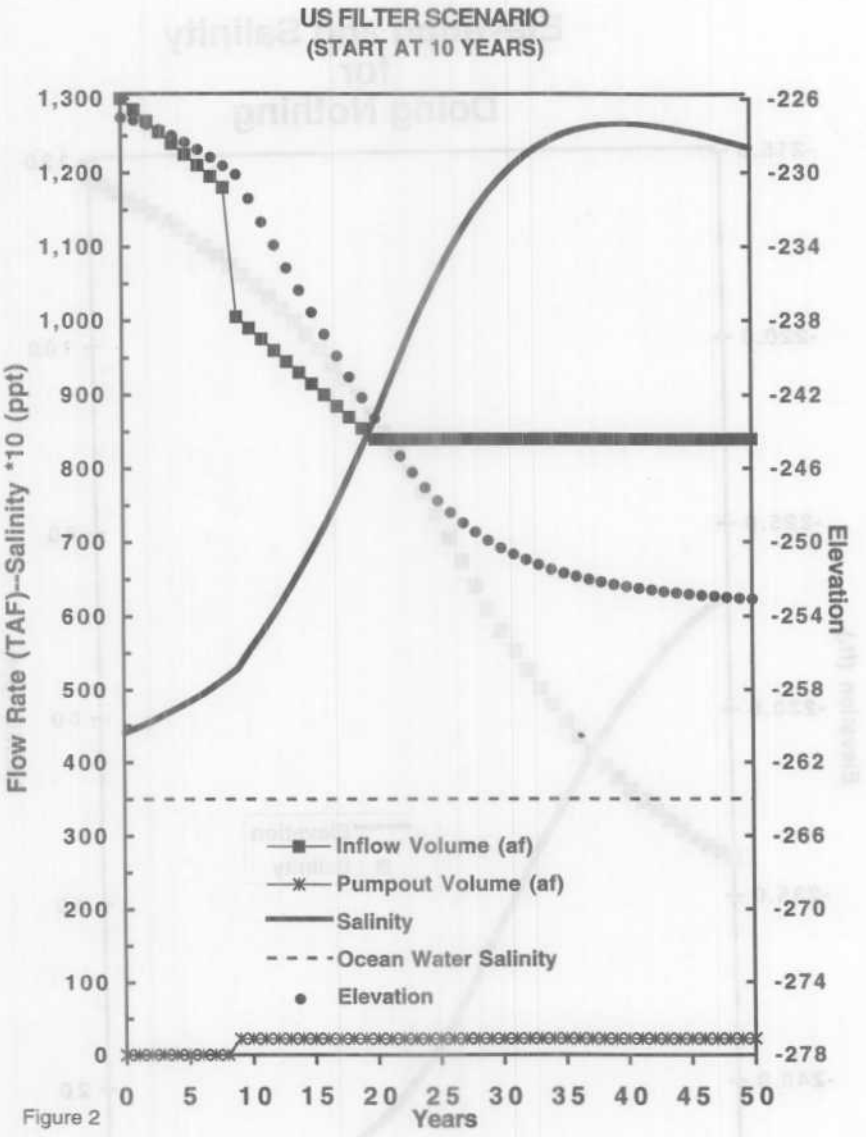

US FILTER SCENARIO
(START AT 10 YEARS)
Flow Rate (TAF)--Salinity *10 (ppt)
Elevation
Years
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
-226
-230
-234
-238
-242
-246
-250
-254
-258
-262
-266
-270
-274
-278
0
5
10
15
20
25
30
35
40
45
50
Inflow Volume (af)
Pumpout Volume (af)
Salinity
Ocean Water Salinity
Elevation

Figure 2

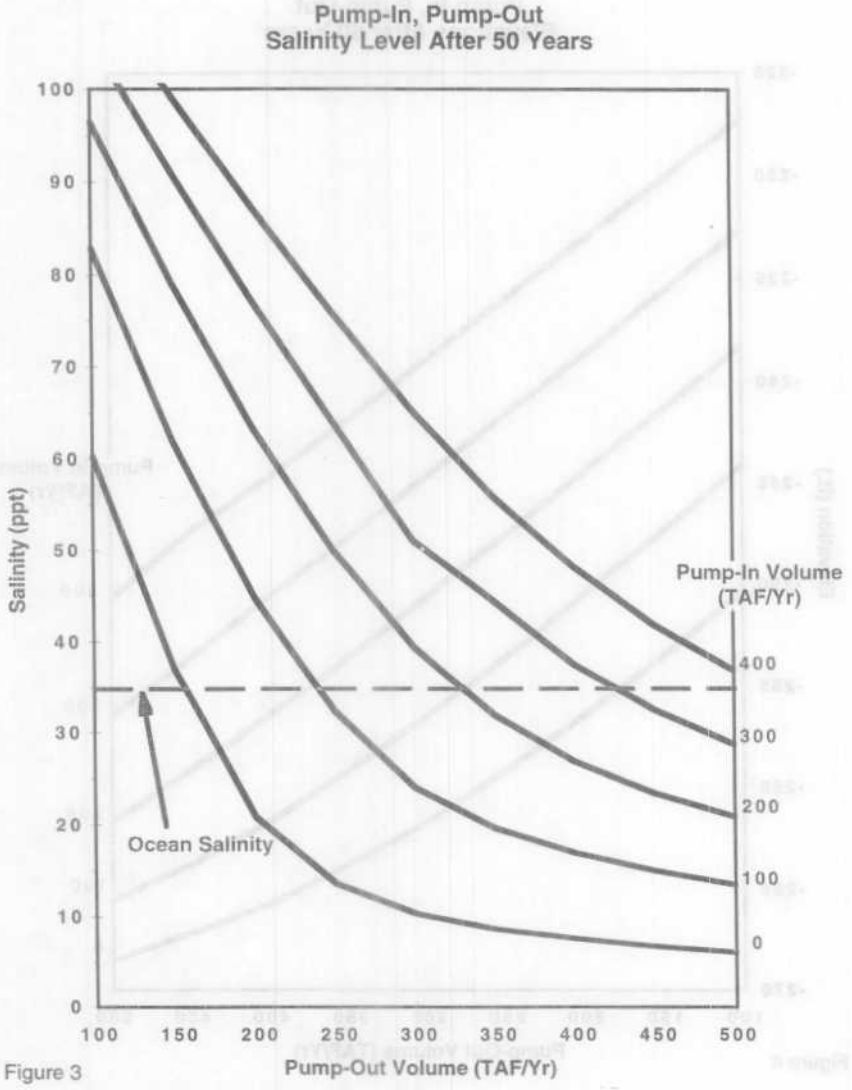

Pump-In, Pump-Out
Salinity Level After 50 Years
Salinity (ppt)
100
90
80
70
60
50
40
30
20
10
0
Ocean Salinity
Pump-In Volume
(TAF/Yr)
400
300
200
100
0
100
150
200
250
300
350
400
450
500
Pump-Out Volume (TAF/Yr)

Figure 3

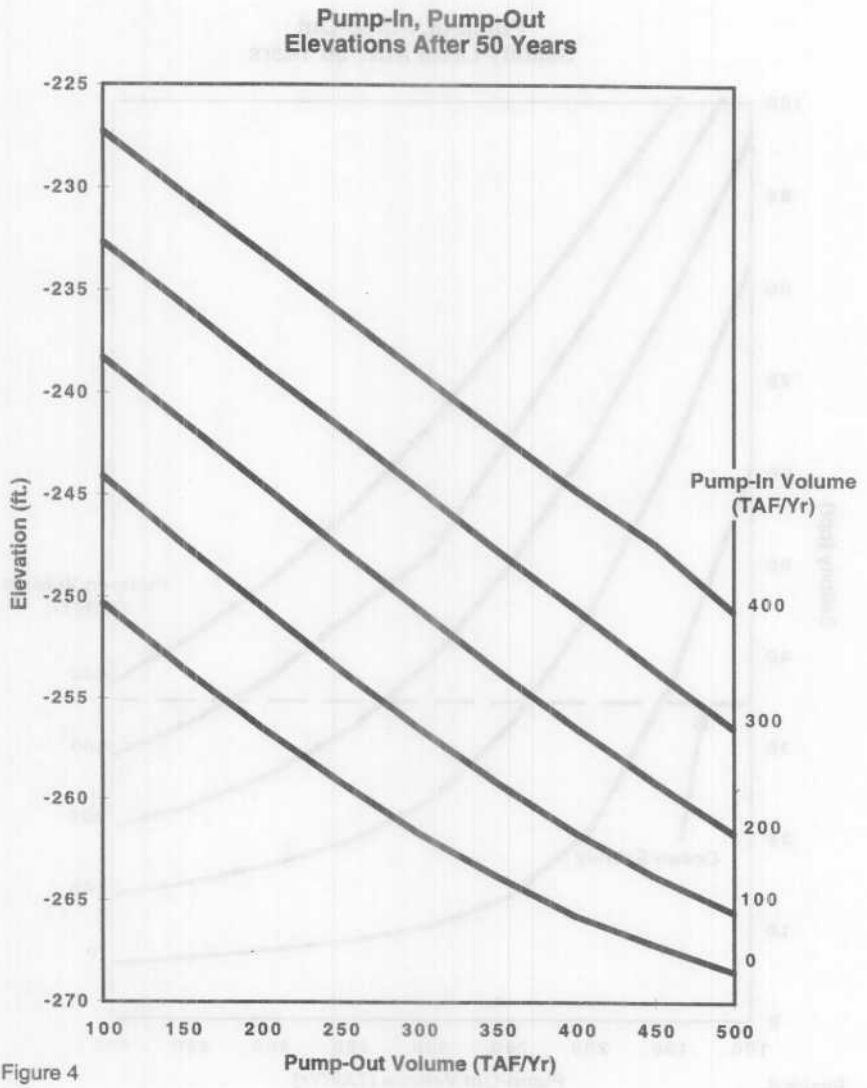

Pump-In, Pump-Out
Elevations After 50 Years
-225
-230
-235
-240
-245
-250
-255
-260
-265
-270
Elevation (ft.)
100
150
200
250
300
350
400
450
500
Pump-Out Volume (TAF/Yr)
Pump-In Volume
(TAF/Yr)
400
300
200
100
0

Figure 4

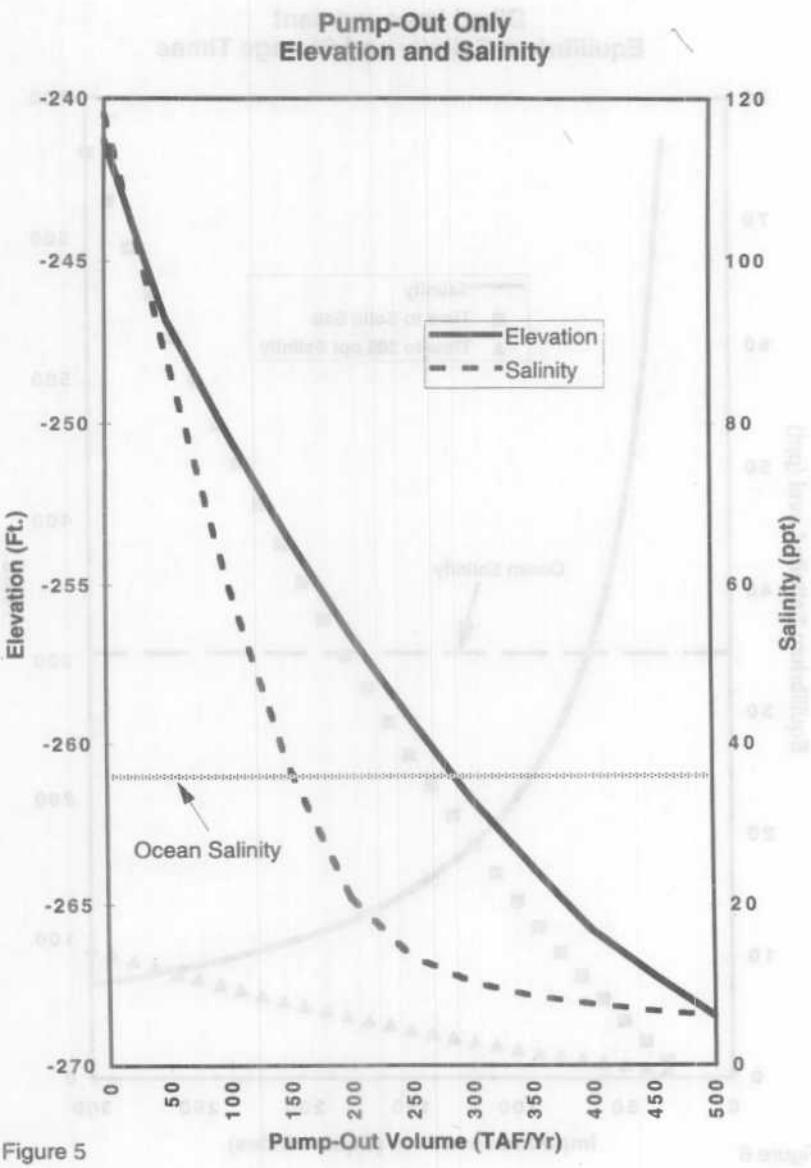

Pump-Out Only
Elevation and Salinity
-240
-245
-250
-255
-260
-265
-270
120
100
80
60
40
20
0
Elevation
Salinity
Ocean Salinity
Elevation (Ft.)
Salinity (ppt)
0
50
100
150
200
250
300
350
400
450
500
Pump-Out Volume (TAF/Yr)

Figure 5

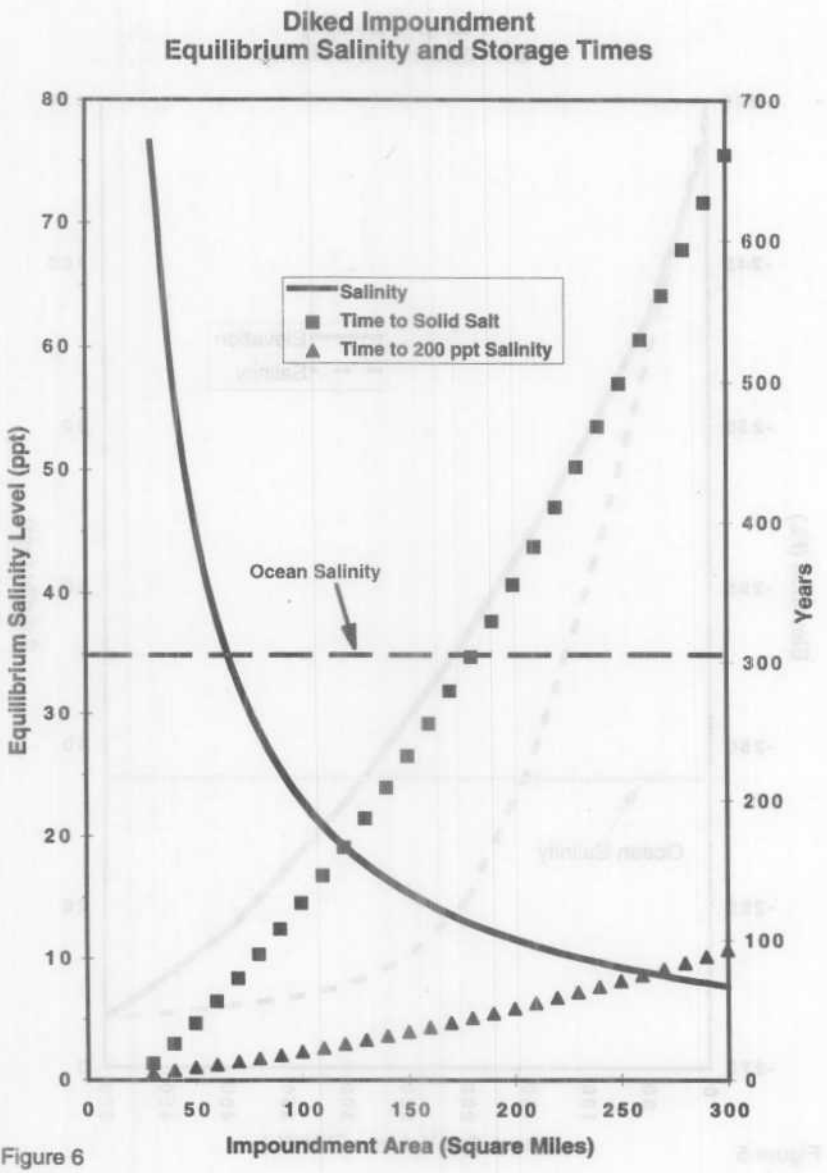

Diked Impoundment
Equilibrium Salinity and Storage Times
Salinity
Time to Solid Salt
Time to 200 ppt Salinity
Ocean Salinity
Equilibrium Salinity Level (ppt)
Years
Impoundment Area (Square Miles)
0
10
20
30
40
50
60
70
80
0
100
200
300
400
500
600
700
0
50
100
150
200
250
300

Figure 6

EVALUATION OF OPTIONS FOR REMEDIATION OF THE SALTON SEA

Testimony before the
Subcommittee on Water and Power
U.S. House of Representatives Committee on Resources

October 3, 1997

SUPPLEMENTAL SHEET

SUMMARY AND CONCLUSIONS

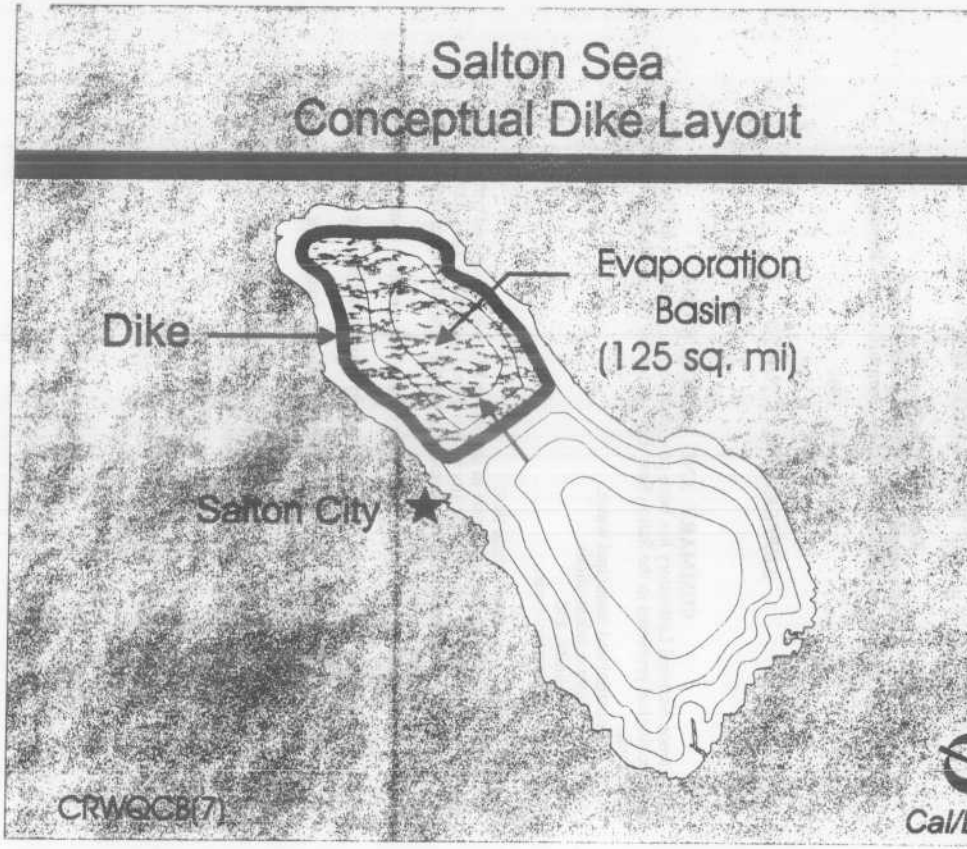
Los Alamos National Laboratory has been providing technical support for the remediation of the ecological problems in the Salton Sea. Environmental issues related to the Salton Sea include:

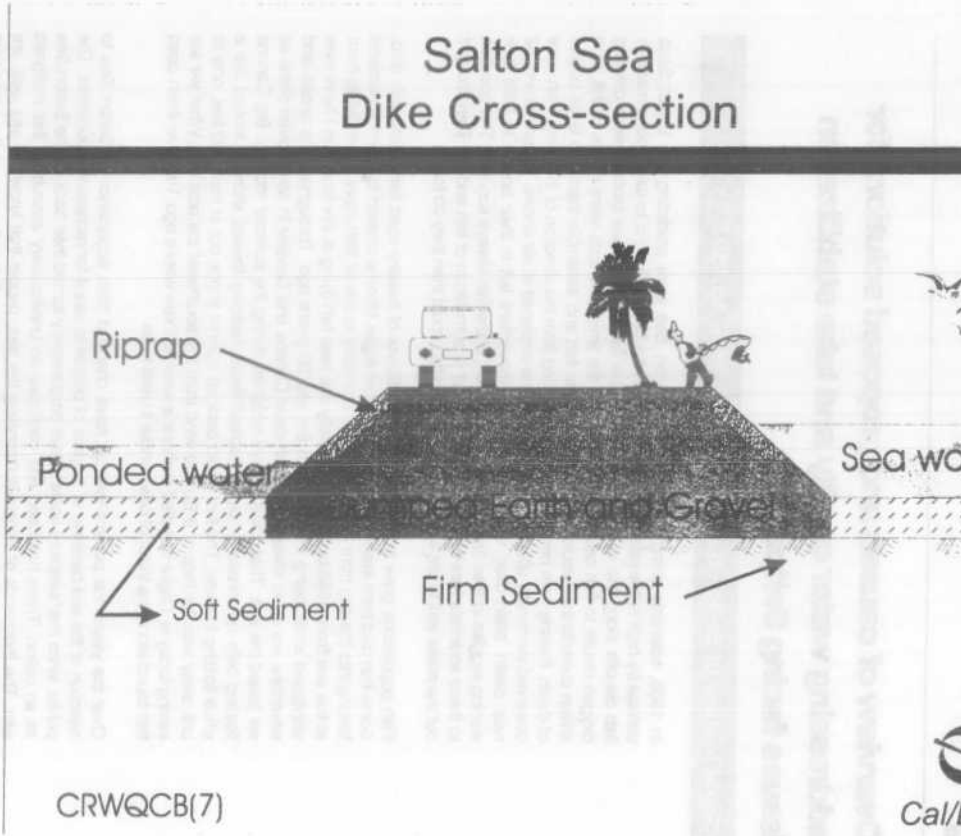
- industrial and municipal waste,
- selenium concentrations,
- high salinity, and
- variable water levels.

Based on our analysis, we conclude that:

- Industrial and municipal waste in the Salton Sea will be reduced considerably once the Mexicali treatment facility is operational around the Year 2000.
- There is time to address the selenium issue, allowing for further research and more information to be gathered.
- Desalination is not a viable concept for salinity and elevation control of the Salton Sea.
- "Pump-out" is a feasible method for salinity control, but the size of the Salton Sea would decrease.
- "Diked impoundment" will control salinity and elevation, but the impoundment area would have high salinity water.

Diked impoundment appears to be the solution which best meets the salinity and elevation requirements--and at a similar cost to "pump-out."


Salton Sea
Conceptual Dike Layout
Evaporation
Basin
(125 sq. mi)
Dike
Salton City
CRWQCB(7)


Salton Sea
Dike Cross-section
Riprap
Ponded water
Sea wa
Soft Sediment
Firm Sediment
CRWQCB(7)
Cal/

Testimony by Norm Niver.

Overview of causes and proposed solutions for addressing water quality and lake stabilization issues facing Salton Sea.

Some history of Salton Seas problems : 1956 to 1997

In 1956, scientists doing studies on the Salton Sea were predicting the Salton Seas demise by high salt levels. A study at the time, the best of its kind to date, found massive fish die-offs along the seashores. Death of the fish due to algae blooms were creating oxygen insults to fish caught up in them. At the time, scientists were aware of the wind driven currents that would gather floating dead fish and assemble them into large bodies of death, floating from here to there. Meandering from the direction of the wind. Fish were observed swimming upside down: spiraling like airplanes at air shows. Up and down. All near death: brain dead with enough nerve movement left in their bodies to fulfill their waning wiggles in their final moments. The fittest of the fish always survived. The question to these scientists was where would this die off accumulation of fish end up. They thought out the areas well to get a more accurate dead fish count than they do today.

Fish populations grew from 1950 to 1955. Millions of healthy sport fish. Many fish died. Some fish died from starvation. Most died from algae blooms created by the rich nutrients flowing into the sea from local farmlands. The point to this is: **fish have been dying here at the sea from 1955 until now**. I actually see **less** fish dying at this time than I have ever witnessed since being involved with the sea 30 years ago. Throughout the sixties and seventies, we could always find fresh dead Corvina and Croaker in some given place as we fished the sea. These kills always occurred during the summer months. Big Corvina floating belly up. Areas as big as football fields, heading toward shore. It looked like a white floating freeway. The fish would back up against shore, out at least 200 feet, only to drift away with the help of a Borego wind from the southwest the next day. What we are seeing today is Tilapia that died perhaps a week to three weeks ago. Very few fresh dead fish found along the West Shores, unlike it used to be.

Over the years, the public's feelings have changed from acceptance of Salton Sea to rejection of the sea because of the fear of people to use it for recreational purposes. The public, since the "selenium scare", have progressively turned their back on the Salton Sea as an option. There has been and continues an unnecessary assault on this maligned sea. The thousands of people surrounding the sea, people that know the sea well, are amused at the ongoing redundant press releases about fish in the sea, at the same time being sympathetic to U.S.F.&W.S. for their hard and depressing work last year and today, to some degree, cleaning up the bird die offs of last year. But press releases still pour from them even though the bird deaths are much lower than last year. I say, the world already knows about what happened at the Salton Sea. I think it is about time to tell the people that Avian Botulism kills 500,000 birds in the United States each year. Forty thousand

perfectly healthy birds left the US and died in Mexico of the same problem. Why do they keep blasting the Salton Sea with: "I think so,s" "it's a hypothesizes or theory" or the **assumption** that it is the "sewage from Mexico". This current opinion of Salton Sea has grown rapidly over the last 10 years. Our people have never read so mush negative hits on this sea. If it is the "squeaky wheel gets the grease bit", it has never worked until now. However, why would **taxpayers** invest in a cesspool that is sick and dying?

Some teachers even teach the filth, the ilk and the cesspool concept of the Salton Sea, with **their** data based on press releases, assumptions and theories brought forth by their reading of the local news media. Unfortunately, these false impressions have been placed in the public's mind all over the earth. Repeatedly. The public and the schools are provided with misleading information that add to their already preconceived ideas of the Salton Sea. New workers coming to agencies involved with the sea, arrive knowing everything about the sea, they think, when in fact they only know what they read or watched on the electronic media.

The support groups, everywhere, the local economy, businesses, property values along with peoples lives have been destroyed by this action. They laugh and yet cry over the loss of this valuable resource to all. Dead fish, wind blown, gather in certain areas. The press will photograph them and call them massive fish kills. Killed on this very spot, they think. This adds to preconceived opinions of the Salton Sea and drives the public away while devaluing the very Salton Sea that we would hope that taxpayers would be willing to pay to have it saved. All dead fish were fresh dead at one time, but from where did they die? Where did they originate? Today, **is it** a natural cycle working on this wall to wall population of this perch like fish, the Tilapia? Die offs are different today. Dead fish counts are far from accurate. Emphasis added.

The water quality issue is salts. Nine million tons each year flow down the Colorado River. This river water comes to the Coachella and Imperial Valley's farmlands. Each year 4 million tons of salts arrive at the Salton Sea in ag runoff water to add to the 460 million tons that are currently in suspension in the water of the sea today. This is for sure: **evaporation of Salton Sea water is the only means of water leaving the sea so far. These salts, left behind, accumulate into the amounts that are currently stressing the fish and birds at Salton Sea.**

Salt removing can be corrected quickly by building a dike option as proposed by the 1974-75 and the 1986-1992 efforts to find a salt removing project for the Salton Sea. The great Salton Sea Authority and its talented Technical Advisory Committee has also come up with these options again. A dike, for the first time will give the Salton Sea an outlet. Salt removal is faster on some options. More study will have to be done on the final option. Stabilization of the level of the sea is also assured. The issue of a dike creating new problems is **another assumption** or **hypothesis**. Some sort of transducers can be placed in and around dikes, solar powered, that would keep birds away. Some of the worst stagnate water in some of the shallow backwaters of the Salton Sea, without **any** water exchange, gives host to thousands of birds wallowing in the mud. The birds seem to love it. I have never observed a dead bird in these areas. Of course, birds do have a natural mortality and you could find them in these areas or anywhere else on the sea.

Many authors have shown that **many terrestrial bacteria can tolerate seawater, but not necessarily grow in it.** The high saline water, after a year in these dikes, would flat kill many bacteria. How could fish grow in a high salinity dike to attract fish eating birds? This statement above is why the Salton Sea has maintained a very low E.Coliform count for all of these years and is, as in the past, **recreation one-type water.** The Salton Sea has never been closed down. The biggest well-known hit on the sea is the warning about

eating a certain amount of fish from the sea because of selenium. This ill advised health warning dropped attendance at the State Park, Salton Sea Sector, from a record high in 1962 of 578,270 visitors to a record low of 87,000 after the Selenium scare of 1986. Again, visitors were afraid to use the sea. We found out that there is more selenium in a stalk of celery than in a twenty pound Corvina. Why not post the California side of the Colorado River with the same warning? Pregnant young women eat those fish too and those fish have the same amount, if not more, of selenium in their bodies. Selenium comes from the Colorado River and the **soils** of the southwest. So does Avian botulism pathogens.

The effort of the Salton Sea Authority and now this Congressional Committee offers the greatest effort to finally do something to save this sea. In all due respect, my advice to you is to follow the Authority's schedule and lets **maintain** the **resurgence** of our fighting fish, the **Corvina** and the **health** of our bird population. Over the last two years, thousands of these strong fighting game fish are pulling the tips of our poles down while they fly out of the water and back before we net them. We find nothing abnormal about the Corvina or Croaker we catch, and we also do not find anything wrong with the hard fighting Tilapia that strike lures and worms and fight desperately. Yes, for 30 years the residents and I around the sea have cleaned and eaten the fresh fish we catch. Still do. We still swim in it. Sick sea. Sick fish? I think not. Remove the salts and the faster the better. Farmers will be required to manage their chemicals and fertilizers back at the source.

Next year, Corvina will be bigger. Corvina and Croaker will be clearing out the wall to wall Tilapia, (forage fish), that has been a nemesis and subject of reported problems and bad press on the Salton Sea. The process is working now. We see them in the stomachs of the fish we catch.

The reports of a diseased sea are just talk. The near death fish, are indeed sick. They do not hit our lines with any vengeance at all. In fact, they don't hit at all, they only die.. One must look closely at the reports. Pay attention to where pesticides are found in the sea. Know that many pesticides today last 30 seconds to an average of a two-day life span. Prove to all of us that the New River from Mexico has turned the sea into a cesspool as the press reports and many believe. What tests do they quote? Listen closely to the "we think so's", "it is only a hypothesis", and "it's the "sewage from Mexico". Some of the comments from the press and local agencies are outright insults to those of us that live around the Salton Sea.

Gentlemen, I could go on for hours and hours about this recreational paradise: the beautiful birds and the great fishing is outstanding. It is about time to bring a billion dollars income to both Riverside and Imperial Counties in the future. It is about time to recognize that only 16 percent of the people in California even play golf. Seventeen percent play tennis. If you look into the population of California, you will find that one half-live from Los Angeles to the border. Fifty nine percent of those want and need water orientated recreation areas. It is a positive for the fish and wildlife. It is another positive for the Counties and the State of California.

Finally, I recommend to the Salton Sea Authority to stand up to the press. Hire a public relation group to put out good press, just as the Imperial County Supervisors have. The Salton Sea has been presented to the world over the years as sick and dying: a chemical brew- a cesspool- a conduit of sewage from Mexico etc etc. This is wrong.

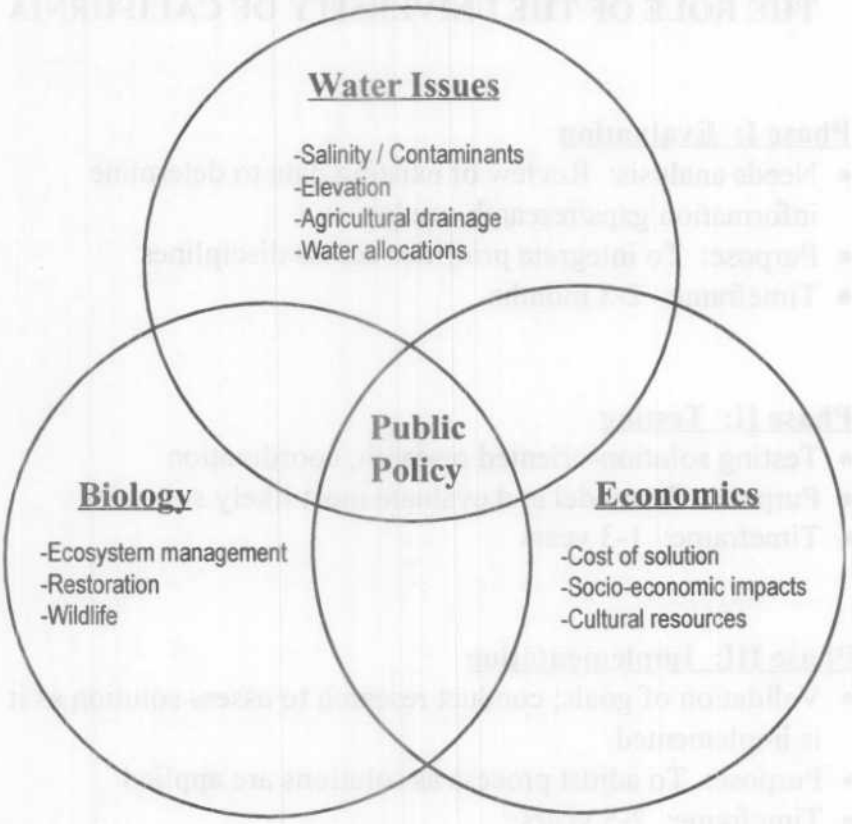
"Consciousness of a fact is not knowing it: if it were, the fish would know more of the sea than the geographers and the naturalists" George Bernard Shaw

This is my testimony. I would be glad to answer all questions. Thank you.

Norman E. Niewiadomski 10-3-97

Attachment 1

Issues Facing The Salton Sea



Attachment 2

THE SALTON SEA:
WORKING TOWARD SOLUTIONS
THE ROLE OF THE UNIVERSITY OF CALIFORNIA

Phase I: Evaluation

- Needs analysis: Review of existing data to determine information gaps/research needs
- Purpose: To integrate priorities across disciplines
- Timeframe: 2-3 months

Phase II: Testing

- Testing solution-oriented research; coordination
- Purpose: To model and evaluate most likely solutions
- Timeframe: 1-3 years

Phase III: Implementation

- Validation of goals; conduct research to assess solution as it is implemented
- Purpose: To adjust process as solutions are applied
- Timeframe: 2-5 years

Phase IV: Management/Monitoring

- Evaluation of solution over long-term
- Purpose: To provide a continuing resource/ownership
- Timeframe: Indefinite

Attachment 3

SALTON SEA FACT SHEET

UNIVERSITY OF CALIFORNIA, RIVERSIDE

HISTORY: The present-day Salton Sea was formed as the result of a levee break which allowed the full flow of the Colorado River to flood the Salton Sink for 18 months from 1905 to 1907.

The Sea's water level decreased continually due to evaporation until 1924 when massive irrigation began in the Imperial Valley. The Sea rose steadily until the mid-1980s when it stabilized at an elevation of about –227 feet below sea level.

The Salton Sea has no outlet other than evaporation. Salts carried in the inflows collect in the Sea. Salinity has risen steadily with minor fluctuations. In the 1950s salinity was about the same as ocean water. Today, the salinity is ~44,000 mg/L. For comparison, ocean water is ~35,000 mg/L, the Colorado River is ~700 mg/L, and the Great Salt Lake is ~254,000 mg/L.

SIZE: The Sea is about 35 miles long and 15 miles wide at its widest point. It covers about 380 square miles (245,000 acres). The average depth is 31 feet with a maximum depth of 51 feet and a volume of about 7.6 million acre-feet (MAF).

The evaporation rate at the Salton Sea is about 5.5 feet per. If all inflow were diverted, the Salton Sea would evaporate within ten years.

FLOWS: The total accumulative inflow to the Salton Sea is about 1.33 MAF per year. Most of this flow is generated from irrigation runoff. These inflows carry a little more than 4 million tons of salt per year into the Sea. The Salton Sea itself contains more than 450 million tons of salt. The primary inflows and their flow contributions are as follows:

Alamo River	600,000 ac-ft/yr
New River	475,000 ac-ft/yr (150,000 from Mexico)
Whitewater River	66,000 ac-ft/yr
Other (groundwater, precipitation runoff, misc. irrigation return flows)	191,500 ac-ft/yr

In the future inflow to the Salton Sea will decrease as a result of water conservation measures and/or mandated Colorado River allocation decreases. Total inflow to the Sea is expected to decrease to 0.8 to 1.0 MAF/yr, possibly lower.

ISSUES: Salinity – the salinity of the Sea is nearing the point where fish can no longer reproduce. The current fish population lives in a stressed environment.

Elevation – fluctuating water levels affect development and facilities near the shores. Because the Sea bottom is relatively flat, a small change in water elevation will increase/decrease the shore area significantly. Further, shoreline property is subject to flooding during storms when they do occur. If the total inflow to the Sea were to drop to 1.0 MAF/yr, the level would drop about 15 feet with a 20% decrease in area (mostly along the southeastern shore.)

Contaminants – selenium, DDT & metabolites, other pesticides, and nutrients enter the Sea. Untreated sewage from Mexico discharged into the New River also flows into the Sea.

Wildlife – The Salton Sea is a significant habitat for over one million migrating birds. At least 375 bird species, including 93 nesting species, winter in the area. Four of the species are listed as endangered species: brown pelican, peregrine falcon, bald eagle, and Yuma clapper rail. There is a 30,000 acre National Wildlife Refuge at the southern end of the Sea (most of which is inundated).

Recreation – The Sea supports a variety of recreational activities and is popular for sport fishing. This past year over 200,000 people visited the Salton Sea State Recreation Area along the northeastern shore. Over 1 million tourists visit the Sea annually.

POTENTIAL REMEDIAL ACTIONS:

LEVEL A: NO ACTION: Continue current practice.

Remedial measures: None. However, treatment of wastewater discharges from Mexico may be desirable to lower nutrient and pathogens within the New River.

Benefits: Low cost. Easy solution. Does not impact agriculture.

Disbenefits: Ecological – progressive loss of wildlife and habitat. Economic – progressive deterioration of recreation and tourism value. Social – aesthetic (odors) deterioration.

LEVEL B: SALINITY MANAGEMENT: Salinity is to be controlled at a level that protects the existing fish species against salt toxicity, namely between 35,000 and 40,000 mg/L.

Remedial measures: Different strategies can be employed for salinity control. One approach is the use of impoundments, internal or external to the Sea, to concentrate salts removed from the main body of the Salton Sea. Another approach is a pipeline system that would remove salts by pumping water from the Salton Sea (or highly saline water from a diked impoundment) to the ocean (Sea of Cortez). An extension of this second alternative would be a two-way system that would also import ocean water to replenish the exported water and dilute the saltier Salton Sea water.

Benefits: Will reduce salinity to levels that will support a healthy fish population, and the bird populations that feed on them. Lower capital and operating costs than Level C (see below) actions: Recreation and tourism can be prolonged. May help to stabilize water levels. Does not impact agriculture. *Pipeline approach*: a portion of the contaminants such as fertilizer nutrients, selenium, and pesticides will be removed from the Sea, helping to reduce associated toxicity and algal blooms. Pumping in both directions will dilute contaminants in the Salton Sea.

Disbenefits: Significantly higher costs than continuing current practice. *Impoundment* approach: A major portion of the Sea (at least 10%) or a large external area will need to be dedicated for salt concentration. Contaminants will continue to enter the Sea. Current aesthetic problems, algal blooms and odors, will continue. Toxic effects of contaminants may also not be addressed. *Pipeline approach*: Higher capital and much higher operating costs than the impoundment approach. Effect on ocean near the discharge point is unknown. With pump out only, the Sea will decrease in size even further. Two-way pumping adds more costs. An agreement with Mexico will be needed to implement this plan.

LEVEL C: SALINITY MANAGEMENT AND TREATMENT OF INFLOW STREAMS: In addition to salinity control of the Sea, the influent flows are treated to remove contaminants.

Remedial measures: There are a multitude of strategies to remove contaminants. Some involve the use of low energy, natural-type treatment systems such constructed wetlands, whereas others use high energy, highly engineered systems such as reverse osmosis treatment.

Benefits: Assuming that successful treatment can be achieved with salinity control, healthy fish and bird wildlife populations will be maintained. Water levels will be stabilized. Agriculture will not be impacted. Adverse toxicity and aesthetics effects of contaminants will be controlled. Significant opportunity for development around the Salton Sea.

Disbenefits: Very high capital and operating costs, in addition to those needed for salinity management, will be incurred. Low energy, natural-type treatment systems will require very large land areas. Contaminants removed by these systems, or treatment residuals, will require some type of disposal. Considerable study will be required to determine the most beneficial and cost effective treatment scheme.

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Opening Statement - Congressman Sonny Bono
Subcommittee on Water and Power, Salton Sea Field Hearing
October 3, 1997

Thank you Mr. Chairman. I would like to express my gratitude to Chairman Doolittle, not only for providing me with this opportunity to address this hearing, but also, for agreeing to hold this important field hearing in the 44th congressional district, home to the northern half of the Salton Sea.

I would be remiss if I did not also thank my colleagues who have taken the time to participate in this hearing. Particularly, I want to thank my fellow Members of the Salton Sea Task Force, who have worked especially hard to bring this matter to the attention of Congress. Representative Duncan Hunter, Representative George Brown, Representative Jerry Lewis and Representative Ken Calvert.

Congressmen Brown, Calvert and Hunter share with me a special bond with the Salton Sea. Each of us spent time during our youth fishing, waterskiing and enjoying the outdoors on the shores of the sea. We have worked with our colleague, Congressmen Lewis, to secure much needed funding for the study necessary to define the problems and evaluate proposed solutions. Already, Congress has provided funding - $100,000 each of the past two years and $6 million this year. Combined with the state funding secured by State Senator David Kelley and Assemblyman Jim Battin, these funds have allowed critical work to continue on the evaluation and analysis of this looming environmental disaster.

In addition, a special thank you to the members of the Salton Sea Authority, who have worked diligently to find a solution to the problems facing the sea. Finally, let me thank in advance all those witnesses who are appearing today. Their expert testimony will give us insight and provide Congress with the direction necessary to craft a lasting solution to this potentially devastating crisis.

As I mentioned previously, I have a special feeling for the need to solve the problems facing the Salton Sea. I believe that the potential for a healthy Salton Sea is almost limitless. Just imagine; America's largest inland sea with all the attendant amenities of a major watersport and recreation destination resort. But first, we must find an answer to the problem that is both scientifically sound and economically viable.

Today, we will hear from many experts on some of the solutions that are under consideration. We need to listen carefully and evaluate each on its individual merits. Due to the complexity of this situation, we cannot expect a decision today. But, we must reach a decision on how to proceed soon. While we cannot proceed without the necessary research, I believe the time has come for more action and less study. In addition, we must generate more interest in the plight of the sea, and create more national awareness of the need for action. This is not an issue that is limited to southern California. The agricultural resources of the Inland Empire provide a critical part of America's food supply. The fate of the sea will have an impact on the lives of Americans who live thousands of miles from this desert, and, perhaps, have never even heard of the Salton Sea.

- more -

There is another party that has an enormous stake in these proceedings. The Torres-Martinez Band of Cahuilla Indian's tribal reservation includes a large segment of inundated land beneath the Salton Sea. This land was originally intended to benefit the tribe, but has been largely useless to them since it was submerged. As the sea has grown, the Torres-Martinez have lost valuable property. For decades, the tribe has attempted to resolve this situation and any proposed solution to the Salton Sea situation must address the tribe's needs as well. I want to thank the tribe for all their patience and cooperation in working to reach an equitable solution to a long-standing inequity.

It is my hope that the private sector will join with government to craft a workable solution. Leaders in technology and development can play a significant role and reap enormous rewards from the revival of the sea. Environmentalists must also join the fight. The Salton Sea has been identified as one of the principal stop-overs for waterfowl and birds migrating on the Pacific flyway. In addition to other uses, eco-tourism presents a viable commercial opportunity if this resource is preserved. Nothing less than a combined effort by local, tribal, state and federal governments, in cooperation with the private sector, will be necessary to save the sea. If we fail to act, within sixteen years the sea will become a dead sea. The increase in salinity will be irreversible. We cannot afford further delay.

As a young man, I saw the future. A glamorous resort area, close to the population centers of southern California. Development could include everything from marinas to country clubs. Waterskiing, boating, fishing, boardsailing, bird watching, golf - the possibilities are tremendous. We can reclaim the sea for future generations if we begin the process today. It is my hope, and expectation, that this hearing marks the beginning of a new era for the Salton Sea.

Thank you Mr. Chairman.

Testimony Submitted by Senator Dianne Feinstein
On Degradation of the Salton Sea Ecosystem

Before the Subcommittee on Water and Power
U.S. House of Representatives Committee on Resources
October 3, 1997

Thank you for the opportunity to present my views about the environmental crisis that grips the Salton Sea and its diverse ecosystem.

I commend the subcommittee for its interest and commitment to seek solutions to the problems that plague this important national and regional resource.

Hearings such as this will, I believe, serve to fulfill an important role in helping to focus national and regional attention on the Salton Sea and assist further in leading us to decisions that will restore the Sea and preserve it for the enjoyment of future generations.

The value of the Salton Sea to the Riverside-Imperial counties from a recreational, economic and natural resource standpoint, has long been recognized. Unfortunately, those values have declined over the years because of the rising salinity and water levels, the pollution that enters the lake via the Alamo and the New Rivers, and disease-causing pathogens which have been found in the Salton

Sea ecosystem.

We are all aware of the devastating impact which these factors have had on the fish and wildlife of the Sea. The weekly mortality tolls of the waterfowl deaths issued by the Fish and Wildlife Service are self-evident. It is indeed a tragedy of enormous proportions.

I am aware that both the federal and state governments have designated the Salton Sea as a repository to receive and store agricultural drainage waters which are a product of the $1.1 billion agriculture industry in the Imperial and Coachella Valleys. Thus, it is fitting that agriculture has been, and continues to be an important partner with the various federal, state and local agencies in seeking ways to restore and protect the health of the Salton Sea, and I commend the industry for its efforts.

Amidst all of the death and destruction that is occurring in the Salton Sea, it is heartening to learn that progress is being made, and that several engineering projects have been identified as alterative solutions to the problems afflicting the Sea. The final draft of the Bureau of Reclamation's Salton Sea Alternative Evaluation report contains five such proposals which are recommended for further consideration. They all involve diking and impoundment works of various configurations on portions of the Salton Sea, however their focus is on reducing salinity levels and stabilizing the water elevation.

I agree with experts of the Fish and Wildlife Service and others who have

stated that the Sea's problems are complex and involve many unknowns with respect to the causes of disease outbreaks among the fish and wildlife and how the ecosystem might be affected by any restoration project. They have concluded that much more research and scientific data needs to be obtained before committing to any specific project to restore the health of the Salmon Sea.

For example, the report by the Fish and Wildlife Service on its Salton Sea Needs Assessment Workshop held last August, noted that "major knowledge gaps" exist as to the causes of many of the disease problems in fish and wildlife in the Salton Sea, and their magnitude and impact on fish and wildlife resources, the environmental factors contributing to these diseases, and the role of the ecosystem degradation in the recent increase in disease problems.

Other knowledge gaps include:

- Although studies have identified the presence of agents in the Salton Sea which could result in episodes of human disease, including polio, typhoid, cholera and tuberculosis, critical baseline scientific data to facilitate focused epidemiological studies do not exist. (Source: Fish and Wildlife Service's needs assessment report for the Salton Sea).

- The last comprehensive study of Salton Sea fishes was published in 1961. Since then a new fish species has become important in the Sea's ecosystem, and overall knowledge of the present fish

population dynamics, spawning requirements, food, and factors relative to salinity levels of the Sea and to potential project sites, as well as pathogen transfers to birds is lacking. (Source: Fish and Wildlife Service's needs assessment report for the Salton Sea).

- Very little is known about deposition of large volumes of sediment which enter the Salton Sea via the New and Alamo Rivers. Understanding the transport and effects of contaminated sediments is essential, especially if the tainted sediments are found to be linked to the environmental problems in the Sea. (Source: Fish and Wildlife Service's needs assessment report for the Salton Sea).

- According to the Fish and Wildlife Service, The Bureau of Reclamation's final Salton Sea Alternative Evaluation report contains very little analysis of the impact of the various alternatives on wildlife. Similarly, R. Wayne Hardie, group leader for the Los Alamos National Laboratory, has cited in his testimony the need for better analysis of the ecological, as well as institutional consequences of the various proposals before one is selected.

In conclusion, it is obvious the Salton Sea is in dire need of remedial action, but I firmly believe it would be a terrible mistake, with potential consequences not only for the Salton Sea ecosystem, but for public health, if we were to proceed hastily with a solution which, because of inadequate scientific research and evaluation, only makes conditions worse.

Therefore, I believe it is important that emphasis at this point be given to prioritizing the research and data needs which must be completed in order to adequately evaluate specific restoration projects to ensure that the most cost-effective and environmentally beneficial alternative is pursued. In that regard I have requested Secretary of Interior Bruce Babbitt to call on federal agencies with responsibility in the Salton Sea to review and re-prioritize their FY 98 work programs so that research tasks which are deemed most critical for implementation of restoration projects can begin as soon as possible.

I also am supporting the Fish and Wildlife's request for $2 million which it says is needed to deal with the immediate crisis at the Salmon Sea, including addition of more personnel and equipment to handle the rescue and treatment of sick birds and the cleanup and disposal of carcasses to prevent the spread of disease. I have also requested Franklin Raines. Director of the Office of Management and Budget to provide the $2 million for the Fish and Wildlife in the Fiscal year 1999 budget request. The support of this committee in providing these critically needed resources is also appreciated.

Finally, because the Salton Sea is an environmental and economic resource of regional and national significance. I strongly believe that the federal, state and local governments all must share in the responsibility for saving the Sea and in paying for its restoration.

I want to reiterate my commitment to do all that I can to help bring an end to the environmental devastation that is occurring at the Salton Sea. I firmly

believe that this will become a reality if the interest, cooperation and commitment which has been demonstrated at this hearing today prevails in the weeks and months ahead.

Thank you

ISBN 0-16-056198-1

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