Jeanine Townsend, Clerk of the Board,

Enclosed please find three enclosures:

This office's comments (with enclosures) on the Dry Year Report dated October 14, 2014 and February 12, 2015 in response to solicitation of public comments and suggestions.

A June 5, 2013 letter to Chair Marcus, with enclosures.

Those letters are public, albeit not written for (and two of them substantially predating) both the Salton Sea Workshop Notice as well as IID's petition mentioned in that notice. While all three letters address basic policy choices faced by the SWRCB as it struggles with the Drought, the letters included references to the Salton Sea as examples of certain dynamics. Like the other examples in those letters, the Salton Sea was chosen as an example because this office has substantial experience with it (over a decade), albeit is presently not representing any interest in connection with the Sea. This cover letter and its enclosures are being sent as early "comments" to the Salton Sea Workshop Notice so that any party or interest concerned with the long-term Sea trajectory may have access to them for their own uses once posted to the "comments" link of the Salton Sea program page.

Tom Virsik

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February 12, 2015

Via email to commentletters@waterboards.ca.gov
Felicia Marcus, Chair
State Water Resources Control Board
Sacramento, California

Re: **2/17-18/15 BOARD MEETING -- Recommended Improvements to the Implementation and Enforcement of Water Rights during Drought Conditions (Item 4)**

Dear Chair Marcus:

This office provided one of the 36 comment letters in response to the State Water Resources Control Board's (Board) September 10, 2014 public solicitation. Many of the suggestions and observations of that comment letter – many of which are in common with certain other comment letters – can be found in the current draft January 2015 Dry Year Program Report.[1] We are encouraged with the efforts and progress the Board has made towards a more comprehensive water management system for the State. We encourage it to continue on its path and offer the below as further signposts on that path.

POLICY ISSUES BEYOND THE DRY YEAR REPORT

The crux of the water management system in California to the contemporary era has been based on entitlements to water recognized by law, all of which are subject to the overriding Constitutional limitation on beneficial and reasonable use, including the priority system. As described in brief below, the Board should do everything in its power to encourage innovation rather than a reliance on the status quo that brought California to its present drought crisis.

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[1] The comment letter observations and suggestions tie in with the following parts in the January 2015 Dry Year Program Report: As to data collection -- 1.1 (all diverters to report details); 2 at "Demand Analysis"; 2.5 (enforcement of the collection of detailed data); 3.1 (detailed reporting on transfer data); 3.3 (annual—not triennial – reporting of water diversions); 3.5 (all reports should meet measurement standards of best practices and not rely on estimates); as to using modern technology -- 1.2 (satellite and telemetry); 3.0 (real-time basis as the standard); 3.3 ("best professional practices" and "best available technology" for all water reporting by all parties); 5.0 (modernize like other states have done); as to the statements of water diversion in particular -- Sections 3.1 – 3.4.

Classic legal distinctions are of lessened relevance. Over the last 165 years generations have spent inordinate time dealing with assorted legal niceties relating to different types of legal definitions of water entitlements and uses. Some of these very legal distinctions on which this traditional jurisprudence has relied are questioned in (1) From the Family Farm to Agribusiness: The Irrigation Crusade in California and the West *1850-1931* by Donald J. Pisani (1984) and (2) the current academic work at California State University, Monterey Bay on *THE DISEÑOS PROJECT: A Geospatial Visualization of the Environmental History of California, 1769-1892*.

The engineering basis for these different water entitlement are discussed in detail in the classic tome The California Law of Water Rights by Wells A. Hutchins (1956). A better understanding of water because of new technology has clouded these classic definitions. It's much harder to argue now that there is difference between underflow and groundwater than it was 75 years ago. But more importantly, the Legislature and Congress has confused the issues even more with their various clean water acts, making it much harder to harmonize the classic water entitlement system developed over the last 165 years with contemporary water management and the need to protect and optimize the water resources of the State.

Past successes at the Optimization of Water. In response to the need for optimization of water, there have been a number of successes and attempts by the SWRCB, DWR and water agencies across the State:

A. Groundwater Basin Programs,
B. Napa Frost Protection Program,
C. 1978 Dry Water Report,
D. Sax Report and Comments,
E. Mono Lake Preservation, and
F. LADWP settlement of the Inyo County Issues.

Not all of these attempts have been successful but the SWRCB is revisiting earlier attempts because of the Drought. Many of the issues the State is currently facing would be much easier to resolve if the earlier recommendations had been followed in 1978 and 2002. Hopefully the SWRCB will carefully consider the current policy recommendations and adopt them during this Drought.

Failures at attempts at Optimizing Water. There have been two major failures of which we have specific knowledge, to wit, Monterey County and the Salton Sea.

Monterey County has salt-water intrusion and water supply problems. The problems were diagnosed 75 years ago. Much government action and expense has been spent trying to solve the problems ever since, yet the problems still exist. Currently several Monterey County agencies and an investor-owned water company are waiting to find out from a Court who bears what proportion of the substantial fiscal downside of yet another failed project, caused by an admitted Government Code section 1090 violation. The People of Monterey County and the State have paid for the failure to deal with the seawater and supply problems for the past 75 years.

Much further south, the Salton Sea is an environmental problem. A close examination of the facts suggests that the Sea came into existence at its current level because in decades past the State of California wanted to increase its entitlement to Colorado River water. California and other western states need some portion of the one million acre feet water currently evaporating from the surface of the Sea each year. The State spent over 25 million dollars to develop a Salton Sea solution over the last ten years. Millions have been spent in Court by various public agencies arguing about responsibility for the Salton Sea and now the SWRCB is going to hold a workshop on March 18, 2015. The People of the region as well as the State of California have paid for all of this effort yet there is no solution in sight. See pages 6-9 of the October 14, 2014 comment letter submitted by this office.

Dynamics that foster failure. In a recent publication by the Hamilton Project under the auspices of the Stanford Woods Institute of the Environment (Discussion Paper 2014-06), there is an extensive discussion about the lack of innovation in the water industry. One key finding of the report is the following:

> Second, we call for regulatory reforms at the subnational level to create a more innovation-friendly environment. As part of this recommendation we suggest that some states could benefit from the creation of new water innovation offices to coordinate and support pro-innovation policies. We argue that many current regulations frequently hinder the adoption of cost-effective technologies.

Ajami, Newsha K., Barton H. Thompson, Jr., and David G. Victor, *The Path to Water Innovation* (October 2014), page 6.

This office has advocated for years that innovation has to be considered in order to deal with State and National water issues. At times this office on behalf of Clients have offered innovation for free to water agencies across the State. There has been a negative reaction to these offers:

1. *Restructuring America's Water Industry: Comparing Investor-owned and Government-owned Water Systems* (Reason Report), 1996, Reason Foundation—A Report in which this office participated in because the People of Color in Oakland and Richmond were not getting a fair shake from the San Ramon Valley development which depended on the expansion of Political Boundaries of East Bay MUD.

2. INSTADJUDICATOR — A computer program developed for solving the water entitlement issues in Salinas Valley.

3. Water Optimization Patents (Systems and Methods for Optimized Water Allocation, United States Patent Sep 28 2010 US7805380, United States Patent Dec 25 2012 US8341090) — the Imperial Irrigation District refused to consider the innovation, even when offered for free.

4. Salton Sea Patent (Method of Restoration of Highly Saline Lake, United States Patent November 16, 2010 US 7,832,959 B1)—the most capable engineering in the world was sought to bring an unbiased approach. See page 8, n3 of the October 14, 2014 comment letter from this office.

The Board may wish to consider why the water industry has such resistance to innovation and creative solutions. The likely answer can be found in an article by Professor Kagan about Dredging in the SF Bay:

> The argument can be briefly stated. The Oakland case is the product of an American political system that has become highly responsive to political demands, a system that quickly generates knowledge and public policies reflecting new insights and values, such as mankind's interest in protecting complex aquatic life cycles and ecosystems. But the American political system articulates and implements those policy ideas in a way that encourages adversarial, legalistic modes of decision-making. This adversarial legalism results in enormously costly, time-consuming, and erratic policy implementation and dispute resolution, conducted in courts or in the forbidding shadow of judicial review. Good policy ideas are thus transmuted into bad case-level outcomes.

Adversarial Legalism and American Government by Robert A. Kagan, Journal of Policy Analysis and Management, Vol. 10, No. 3 (1991), Page 370.

The status quo in water optimization is protected by the system Professor Kagan describes in his article. It is the Board's (and the State's) role to solve problems, not to honor the status quo.

A recent editorial in the Wall Street Journal discussed the impact of change on American Business.

> Former Florida Governor Jeb Bush made a useful point in his speech to the Detroit Economic Club last week: Of the companies on the first Fortune 500 list in 1955, 88% "don't even exist today or have fallen away." That reality of American capitalism was clear from the news that RadioShack has filed for bankruptcy.
>
> * * * *
>
> RadioShack joins the list of other famous American companies capsized by waves of creative destruction. The lesson is that in a capitalist economy no business triumph lasts forever, and the most dangerous moment can be when you are at the height of success. Andrew Grove, the former Intel CEO, summed it up when he wrote "Only the Paranoid Survive." The same cannot be said for government, where failure is typically rewarded with more money.

The RadioShack Lesson, Feb. 9, 2015, The Wall Street Journal. The people of California should not be required to continue subsidizing the failure of California's water agencies to optimize the State's water resources.

CONCLUSION

The People of California can reasonably expect all of its government agencies to follow the mandate of the Constitution and put the water resources of the State to reasonable and beneficial use, rather than allowing the parochial interest of different parts of the State to dominate the discussion, and thwart innovation at the expense of the greater good.

We encourage the Board to continue its pursuit of optimizing the State's water resources. If you, other Board members, or your staff wishes to discuss any of the points raised in this and our prior comment letter, let us know. We exercise caution in approaching the Board and its staff because in the past one of the larger California counties accused this office of exercising undue influence through such contacts.

Thank you for allowing us to comment on this matter of public importance.

Sincerely,

Patrick J. Maloney

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Via email to Clerk of the Board commentletters@waterboards.ca.gov
October 14, 2014

State Water Resources Control Board
1001 I Street
Sacramento, CA 95812
Attention: Clerk of the Board

Re: Dry Year Report Comments

Madame Chair:

The Law Office of Patrick J. Maloney (the Law Firm) is providing the within public comments pursuant to the Notice of Solicitation Regarding Improvements to the Implementation and Enforcement of Water Rights During Drought Conditions issued by the State Water Resources Control Board (SWRCB or the Board). These comments are informed to a significant extent by the 1978 Dry Year Report, referenced in the Notice of Solicitation, with which the Law Office largely agrees. Please note that the comments are not filed on behalf of any specific current, past, or potential client. The examples used below have been selected in part because the Law Firm is familiar with those matters.

The sections below are numbered for purposes of reference, rather than to designate priority. The specific queries from the Notice of Solicitation to which this letter offers comments and/or suggestions include 1, 5, 6, and 7, but is not limited to those questions as phrased. This comment letter relies on, inter alia, two prior letters by the Law Office of April 2, 2002 and June 28, 2014 including their listed attachments (including the April 2, 2002 letter), which are enclosed. Recommendations or strong concluding suggestions for the SWRCB are set forth in **bold** for ease of readability.

1. Background and Qualifications

The Law Firm has experience with water and agricultural issues across the State of California. The Law Firm is currently working with the Tanimura and Antle Library and Professor Ruben Mendoza at California State University at Monterey Bay on *The Diseños Project*. A soon to be published article explaining the *Diseños Project* is enclosed. Hopefully this project will give California a better understanding about how it developed and help it plan for the future.

The Law Firm spends a significant amount of time in any representation listening to and learning from well drillers, water purveyors and farmers including but not limited to their employees or the irrigators who makes the decision about how and when water is used on a crop or field. The women/men who make these decisions have more impact on the optimization of water than anybody else in the water system structure. The Law Firm is not alone in its opinion.

> The role human decisions play in irrigation system performance and water management should not be overlooked. In SV and TLB, growers and their irrigators decide when, where, and how much water to apply. The operator manages soil water and, by extension, deep percolation. While pressurized irrigation systems, sprinklers and microirrigation, can precisely control water flow and thus have a greater technical potential for field uniformity and delivery efficiency, using a high-efficiency technology (e.g., drip) will only increase irrigation performance if managed properly. It is the management of those systems that results in optimal or non-optimal performance. Likewise, performance of surface irrigation systems are significantly influenced by operators and can achieve reasonable efficiency levels, though their absolute technical potential is far less than pressurized systems. As a point of reference, Hanson (1995) reported that efficiencies among irrigation types were similar in practice across nearly 1000 irrigation systems monitored in California. Drip and microsprinkler systems did not show appreciably higher performance (*ibid*.). Observed irrigation efficiencies ranged between 70 and 85% for both microirrigation and furrow irrigation. It is worth noting that actual efficiencies may be below or above this range, and that changes in management practice may have improved to capture the technical advantage of pressurized systems in the 16 years since this study was published. At least one study suggests that variance in efficiency may not have increased despite the recent use of more sophisticated equipment. When irrigation performance was measured on nine drip irrigated celery fields in the Salinas Valley, performance was low. Water application rates ranged between 85% and 414% of ET, indicating under- and over-irrigation were common despite advanced capabilities (Breschini & Hartz 2002). Celery may not be representative of other cropping systems less sensitive to water stress; however, the results illustrate the potential for current irrigation system mismanagement even with advanced technology. Though the ability to apply the desired amount of water with each application is limited by the configuration of the irrigation system and hence uniformity and efficiency are somewhat predetermined, there are many practices growers can use to optimize water delivery systems (Dzurella et al. 2012).

Viers, J.H., Liptzin, D., Rosenstock, T.S., Jensen, V.B., Hollander, A.D., McNally, A., King, A.M., Kourakos, G., Lopez, E.M., De La Mora, N., Fryjoff-Hung, A., Dzurella, K.N., Canada, H.E., Laybourne, S., McKenney, C., Darby, J., Quinn, J.F. & Harter, T. (2012) Nitrogen Sources and Loading to Groundwater. Technical Report 2 in: *Addressing Nitrate in California's Drinking Water with a Focus on Tulare Lake Basin and Salinas Valley Groundwater. Report for the State*

Water Resources Control Board Report to the Legislature. Center for Watershed Sciences, University of California, Davis at 80 (emphases supplied).

The on the ground decision maker will put the water to reasonable and beneficial use if they are given the appropriate tools. The tools can be technically complex and but at the same time simple to use. The Law Firm over the years has worked with a number of engineers, economists and consultants and one of its first requirements is that these individuals understand what the decision maker at the lowest level on the water delivery process is doing and why. She/he usually has more knowledge than all of the Harvard, Stanford, UC Davis, CalPoly, UC Berkeley, Oxford, Fresno State, etc. graduates about how to optimize the water resources in any given area.

It may not be feasible, **but if each member of the Board were to spend a week in a different part of the State listening to the "on the ground" people and then the Board member could share this information with her/his fellow Board members, the Board's ability to deal with the drought would be materially improved.**

In 2002, the Law Firm in its comments (enclosed) on the Sax Report was one of a limited set of voices that advocated for a rational and comprehensive modification of the California water rights system based on reasonable use, erasing legal distinctions not based in verifiable science (such as treating ground and surface water separately), utilizing contemporary technology to strategically approach water management, greater emphasis on the Statements of Water Diversions, and market dynamics. The Sax Report raised important policy issues and the SWRCB choose to ignore them. The Law Firm was shocked with the responses from interests across the State to the Sax Report and the SWRCB's behavior. The Law Firm hopes the SWRCB does not ignore the issues raised by the drought if the rains come. **California water policy cannot be determined by the absence or presence of rain in a given year**.

2. State of eWRIMS

In the Law Firm's June 28, 2014 letter to the SWRCB (enclosed) it provided two notable examples of how the eWRIMS system has failed the public. It is not necessarily the system itself or staff that may be at fault, but prior polices and direction of the SWRCB that frustrated and prevented the timely, accurate, and comprehensive use of the system. The details of two such (unrelated) instances are detailed in our June 28, 2014 letter. For purposes of summary, the two instances reflected (1) apparent initial human error[1] that responded poorly to multiple attempts seeking correction and (2) SWRCB policy that allowed staff to reject Statements of Water Diversion (physically returned and/or threats to destroy the submitted documents) when staff believed such statements may impact existing filings, seemingly in complete disregard or ignorance of the priority system (i.e., statements based on a pre-1914 right "duplicated" reports submitted for permitted post-1914 rights of diversion).

[1] The statements were mislaid, misorganzied, or lost for a number of years, it appears.

The 1978 Dry Year Report strongly recommended that the SWRCB encourage and make it easier for pre-1914 filers so as to assist in better decision-making, not prevent the filing of Statements based on pre-1914 rights.

> The Division also believes that provisions should be included in law which accelerate the filing of statements of use by pre-1914 diverters and riparians. This data would have greatly assisted the work of the Dry Year Program.

Dry Year Report at 24 (emphasis added). **The Law Firm strongly agrees with the recommendation from 1978,** which goes to Queries 1, 5, and 7.

3. Use of Statements of Water Diversion

The Law Firm's 2002 letter at pages 5 and 6 recommended a general liberalization of the Statements of Water Diversion. The June 28, 2014 letter at page 4 followed up on those thoughts. The recent groundwater legislation appears to track part of what the Law Firm advocated in 2002 and again in 2014. SB 1168, SB 1319, and AB 1739. The SWRCB should continue to support law or regulation that requires all water users to file Statements or their equivalents. **All material use of water should ultimately be reported so that one can then compare uses, surpluses, and deficits, thereby encouraging conservation and the orderly transfer of water.** The days of using water in secret, hiding one's claim of right along with the actual use, must end. It remains important to have a definable water entitlement subject to drought impacts to support the stability of property ownership across California. That stability is undermined when the information about that right, its use, and comparison to others' rights and use remain hidden.

The 1978 Dry Year Report recommended public reports and analyses of the rights and water uses, which recommendations were washed away with the spring rains of 1978. Dry Year Report, at 26-29 (recommending a "water management section" be created that would, inter alia, collect and organize data and reports, use them to determine availability of water in critical areas, and then communicate it.) Queries 1, 5, 6, and 7. Recommendations of how to affect such goals using current tools are addressed below at part 5.

4. Confidentiality of Water Uses and Rights

The SWRCB, water agencies, and farming interests across the State have been advocates for confidentiality. See July 6, 2000 Order Quashing Subpoena, Application 30532. Dr. Reinelt's 2014 analysis retorts any theoretical or legal bases for maintaining confidentiality. February 26, 2014 Letter and submission by Dr. Peter Reinelt, Chair, Department of Economics, SUNY Fredonia. The Law Firm has discussed this issue extensively with farming interests across the state. Many of these interests have flatly stated that confidentiality is irrelevant and every farmer is always looking at what the other farmer is doing so he can improve his practices. One interest from the Napa Valley suggested that they are required to disclose all water use in the Napa and it has not hurt production or land values. **The practical reason for disclosing all of the water data is that farmers learn from each other.** Queries 1, 6 and 7.

5. Technology and Tools for Optimization

There are technical tools being developed and used across the world to help the individual farmer better manage water and its use. The Law Office 2002 letter explained some of the tools it had pursued at that time. See 2002 letter at 2 – 3. Since that time the Law Office has continued to pursue solutions to water management challenges, and is associated with two recent patents for water optimization (Patents: Systems and Methods for Optimized Water Allocation, United States Patent Sep 28 2010 US7805380, United States Patent Dec 25 2012 US8341090.

The SWRCB should require all water users who deliver water to third parties to do so without undermining or frustrating the use of current technology. For instance, if a water purveyor (such as an irrigation or water district) chooses to deliver water to the ultimate user (a farmer) in a way that can frustrate the use of new technology, the SWRCB should find that the purveyor (the district, not the farmer) is unreasonably using (or more specifically, unreasonably delivering) the water and take appropriate action. All tools to conserve and optimize water resources must be able to work together. Queries 1, 6 and 7.

6. Salinas Valley and Reasonable Use in Critical Area

The Dry Year Report mentioned the Salinas Valley (stretching from the mouth of the Salinas River in Monterey County to the interior of San Luis Obispo County), but did not perform any detailed analysis at that time. Dry Year Report at 12. It has been common knowledge for decades that a portion of the Salinas Valley in Monterey County near the ocean suffers from seawater intrusion. That pumping near the coast exacerbates the intrusion was well understood half a century (or more) ago. The seawater-intruded water has harmful effects on agriculture when used for irrigation, but more critically, it cannot be used as a drinking water source for the coastal communities such as the City of Salinas. Thus, several projects have been analyzed and built to address the over pumping and intrusion problems, including reservoirs, later modification of the reservoirs, and a water recycling plant to provide an alternate irrigation water source for the critical coastal area.

In addition to the physical projects studied and built, the local agency with the most responsibility for managing the seawater intruded area – formerly known as the Monterey County Flood Control District and presently the Monterey County Water Resources Agency – has implemented ordinances, regulations, and other management systems. Thus, under a local program, water extractors have been required to report their water use (i.e., pumping of water from a well) and certain farming practices for nearly two decades. The individual reports of water use are not public, but the aggregated water use is released in certain annual reports by the Monterey County Water Resources Agency. The 1995 (earliest) and 2012 (latest) ones are enclosed.

These summary reports reveal that water use for row crop in Monterey County has not gone down, even with all of the technological irrigation improvements over the last twenty years. See Ground Water Summary Report 2012. Water use for vineyards, in contrast, has gone down.

The overall flat trend of agricultural water use in the Salinas Valley suggests certain possibilities. It may be that as presently constructed, the "system" bulges or bottlenecks in a new place when regulatory pressure is applied to the targeted bulge or bottleneck. In other words, because regulatory pressure is so crisis-oriented rather than preventative, the symptoms respond to regulation, but the underlying problem does not improve. **To address that dynamic, universal and public reporting of water use is the necessary approach, so that regulatory actions can focus on trends rather than crises.** See Dry Year Report at 26 et seq (recommendations for predictive approaches).

Or it may be that the practical technological limit for efficiency improvements has already been achieved, and that the only option left to manage agricultural water use is to set hard limits on extraction amounts. (In others words, one gets a set amount one can use on many acres of a low water crop or on fewer acres of a high water crop.) The new groundwater legislation programs may reach that conclusion, at least for certain basins. Even if hard limits are the necessary long-term solution, technological advances remain a key component for optimizing water use under any regulatory system. **The SWRCB should require that the state of the art in technology be applied to water consumption and management issues in California.** Many water advisors (lawyers, engineers, consultants) suggest to water users that the best way to guarantee one's water source and right is to use as much water as one can. **Instead, the SWRCB should guarantee water and water rights to the water users who use the best water optimization practices based on the state of the art.** We recognize that this is a moving target but the failure to reasonably adopt current technology should be grounds for a finding by the SWRCB of unreasonable use. The Law Firm sees no difference between such an action by the SWRCB and Air Resources Agency findings that an emitter must install certain pollution preventing devices.

The above discussion goes to Queries 6 and 7.

7. Opportunity at Salton Sea for State's Drought Protection

The 1978 Dry Year Report and the Board's 2014 activities allocate substantial resources on managing the Sacramento and San Joaquin (Delta) situation, e.g., the curtailment proceedings earlier this year. These comments will not address the Delta per se, given the likelihood of constructive suggestions from many other interests and commentators with substantial Delta experience. These comments will instead address the other major water situation with critical public policy implications during this drought – the Salton Sea.

The Board addressed the Salton Sea to a degree in 2002 and 2003 when it approved the agricultural to urban transfer known as the Quantification Settlement Agreement or QSA. WRO 2012-13 (Revised) (SWRCB recognized it has a duty to reopen the Order if circumstances change)[2]. While the QSA and the Sea has been mired in litigation and other controversy these

[2] The relevant portion of the Order reads at pages 79-81:

> Because irrigation efficiency is not the only fact relevant to a determination of reasonableness, it would not be appropriate to find, as requested by IID, that the

past 12+ years, including whether the State shall, may, or must meet its restoration obligation and how, these comments will avoid all such "legal" controversies as much as possible.

While the 1978 Dry Year Report concentrated on the Sacramento and San Joaquin areas, it recognized in its recommendation section that the proposed data management and collection proposals were not limited to the Delta, but "to ensure full and equitable distribution of waters of the State so as to protect the public interest and the environment in accordance with water rights priorities." Dry Year Report at 26. The proposals included studying "specific trouble areas." Id. at 27. The Salton Sea is presently one such "trouble area" that has statewide impact on drought management. The Order approving the QSA recognized that the implementation of the transfer was a concern for the entire State, not just the specific parties to the QSA. "Implementation of the transfer as approved by this order will benefit not just the parties to the transfer, but the State as a whole." WRO 2002-13 (Revised) at 84. The QSA, including the Salton Sea, must therefore be analyzed from a statewide perspective, not parochially.

The water that presently flows to the Sea (1.0- to 1.2 MAF) could be substantially reduced if the Sea was managed (restored) to a smaller volume. Dr. Terry Fulp, Regional Director of the Bureau of Reclamation's Lower Colorado Region, informed the Imperial Irrigation District (IID) that the Bureau advocated a "smaller and sustainable [Salton] Sea" during his public presentation on September 16, 2014.

> 1:42:13 Dr. Terry Fulp – So all along here and in fact we spent a good hour with your environmental staff this morning to kick around some ideas about how we can really get on a positive again path, albeit first steps with regard to Salton Sea solution. And I'll use these terms, smaller and sustainable Sea is perhaps where we're headed. And energy development and all the other ideas that have been spearheaded by [IID] President Hanks and others are, I think, very viable and also valuable to now try to implement. That's the key. We've got to get some stuff implemented so we did kick around some ideas with your staff this morning. All that being said, of course, it's a complex problem again. As you know [IID Director] Matt [Dessert] and others, it's not an easy thing to fix. A recent report by the report by the Pacific Institute made it very clear about what the potential the costs are by not doing something – you know, not just the cost of doing something. And that's probably a valuable perspective as well. So I think

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circumstances under which we anticipate it may be necessary to reassess IID's water use are limited to changes in IID's irrigation practices or technological advances in irrigation efficiency.

It bears emphasis that by making this finding we do not intend to bind the SWRCB in any future proceeding, particularly if circumstances change. To do so would be an abdication of the SWRCB's ongoing responsibility to prevent the unreasonable use of water. (See Wat. Code, § 275; see also *Tulare Dist. v. Lindsay-Strathmore Dist.* (1935) 3 Cal.2d 489, 567 [45 P.2d 972, 1007] ["What is a beneficial use at one time may, because of changed conditions, become a waste of water at a later time."].)

> certainly more and more folks are beginning to understand the complexities around the Salton Sea and certainly it's value environmentally, ecosystem wise as well as, frankly, for what our intents were when we took those lands out of public domain—a runoff repository. It has to be there. I mean we need it. So the key now is to figure out what those first steps are to implement some of these ideas to get on a path towards that smaller and sustainable Sea. So I guess in summary, it's going to be another one of those very complex and difficult tough solutions and we're very hopeful, of course, that the State can find their way to meet their obligations as well.

September 16, 2014 Imperial Irrigation District Board of Directors meeting at approx. 1:42:13 http://imperialid.granicus.com/MediaPlayer.php?view_id=3&clip_id=67 (emphases supplied). From the Federal perspective, the key to managing the droughts affecting the Colorado River is to keep Lakes Mead and Powell above the critical levels. A "smaller and sustainable Sea" materially assists that goal by freeing up water that can be kept in the Lakes for the benefit of the many Colorado River (Upper and Lower Basin) states, including California. **In simplistic terms: a restored/managed Salton Sea that needs less water to remain viable allows more water to be kept in Lakes Mead and/or Powell.**

California is a major beneficiary of keeping the Lake levels up. As the Board understands, much of the Southern California water supply (be it through the Metropolitan Water District or the San Diego County Water Authority) (MWD and SDCWA) comes from the Colorado River, so any elevation building that aids the reliability of Southern California supplies from the Colorado River reduces the pressure on Northern California waters and makes the critical remaining supply more available for other uses. In this drought era, its a complex zero sum game. Unfortunately, much time, effort, and money have been spent in endless litigation, studies, and posturing by the many water entities associated with the QSA on local power and fiscal struggles, e.g., the QSA litigation and the several lawsuits among MWD, SDCWA, and their respective allies. Those lawsuits and use of political capital and financial resources by the squabbling water parties do not assist the State in optimizing its overall water resources – a key premise of the transfer. "If the proposed transfer is not implemented because the cost of mitigation is too high, the consequences to the State's water supply and to the San Francisco Bay/Sacramento San Joaquin River Delta (Bay-Delta) could be severe." WRO 2012-013 (Revised) at 44.

Proposals for a smaller and sustainable Sea[3] were offered multiple times over the past decade and more, but one or another local agency (i.e., not the State) chose to thwart such efforts for its own presumably parochial reasons. For example, the Metropolitan Water District was given an opportunity to use its considerable political and economic might to support discussions about a

[3] A group of farming interests, using the resoucres of world-class Dutch engineering, indepedently developed a flexible and low cost (according to the Salton Sea EIR prepared by the State) approach to restoration. The Dutch firm obtained a patent for the restoration plan. Method of Restoration of Highly Saline Lake, United States Patent November 16, 2010 US 7,832,959 B1, enclosed.

rational long-term Sea solution – the low-cost Dutch designed one -- that could make more water available to the State, but MWD chose otherwise. See enclosed February 8, 2005 letter (copy to Jeffrey Kightlinger, MWD's General Counsel at the time, now its General Manager). The local agencies – including MWD -- are now reaping the effects of their prior shortsighted decisions to treat the Salton Sea as a pawn, such as dwindling storage outlooks. The local government agencies have to date preferred to posture and squabble instead of immediately and constructively addressing the Sea and improving the State's (and their own) water picture. Had the Sea restoration been resolved ten years ago, there would today be hundred of thousands of additional acre-feet available for Lake elevation building and thereby a reduction of pressure on the Delta during the drought. "Local" water battles waged by intransigent government agencies and parochial interests can cause significant statewide harm, especially during a drought. In addition, the fights over water issues among government agencies of the State of California are costs that neither ratepayers nor the taxpayers should be forced to bear.

The failure of the State to timely solve the Salton Sea problem has allowed the various local governmental entities to ignore available solutions and instead pander to local political pressure, which does not solve the problem. With respect to the serious groundwater problems, the Legislature in its recently enacted groundwater laws now require the local governments to develop solutions to their groundwater problems within a fixed period of time or the SWRCB will impose a solution. The SWRCB can adopt a similar approach to problem areas of statewide impact such as the Salton Sea. **It should give the local governments a specific time frame to resolve the problem, or the SWRCB will step in and do it for them for the good of the State.** The opportunity to curb waste and put to reasonable use additional hundreds of thousands of acre feet of water in this time of drought is too important to California's wellbeing to allow local government agencies and parochial interests to frustrate it.

The Dry Year Report supports a State-led foray into a problem area that may have substantial (in this case, beneficial) impacts to the State. State-led coordination and including "other" areas of State interest in the Board's management were both recommended in the Dry Year Report. Dry Year Report at 27 (point 7) and 28 (point 6). **It is time to pursue the obvious opportunities in the Southeastern corner of the State for the overall benefit to the State and region.** Query 7.

Closing

The 1978 Dry Year Report's recommendations were practical, long-term, and fundamentally straightforward: acquire the data, analyze the data, and plan accordingly (and above all, publically). Over a century ago the then-State Engineer predicted that untimely data collection and analysis would lead to unwelcome results, politically and practically:

> When, as is sure to come, the State is forced to take control of her streams for irrigation, arterial drainage, and reclamation regulation, it will be found that the time has passed in which alone the data might have been acquired necessary for intelligent action, both in an engineering and political way.

William Hammond Hall, Report of the State Engineer to his Excellency R. W. Waterman, Governor of California, for the Year and a Half ending December 31, 1888, JCSA, 28th sess. (Sacramento, 1889), Assembly, 1:9-10, 8. The current drought is forcing the State to finally acquire the data and intelligently manage its water resources.

Thank you for allowing the Law Firm to provide comments on an important public matter with long-term strategic implications to the future of the State.

Sincerely,

Patrick J. Maloney

Patrick J. Maloney

Enclosures:

Mendoza, Ruben G, Ph.D, RPA, *THE DISEÑOS PROJECT, A Geospatial Visualization of the Environmental History of California, 1769-1862*, Boletin Vol. 30 November 1, 2014 (Journal of the California Mission Studies Association)

Water Conservation Practices – Monterey County Water Resources Agency:
1995 Ground Water Extraction Data and Agricultural Water Conservation Practices
Ground Water Summary Report 2012 – Monterey County Water Resources Agency

Method of Restoration of Highly Saline Lake, United States Patent November 16, 2010 US 7,832,959 B1

Linus Masouredis (MWD) February 8, 2005 letter to Patrick J. Maloney

Thomas Virsik June 28, 2014 letter to SWRCB with attachments:
April 2, 2002 Summary of Position on Sax Report
November 12, 2012 letter re Imperial Valley Statements
September 28, 2011 email re Maloney documents
July 6, 2000 Order Quashing Subpoena, Application 30532
February 26, 2014 Letter and submission by Dr. Peter Reinelt, Chair, Department of Economics, SUNY Fredonia

THE DISEÑOS PROJECT
A Geospatial Visualization of the Environmental History of California, 1769–1892

Rubén G. Mendoza, PhD, RPA, CSU Monterey Bay

The Diseños Project represents the culmination of some 40 years of research by noted California historical geographer and Professor Dr. David Hornbeck, Jr., Professor Emeritus of the California State University, Northridge. In an effort to facilitate the transfer of Dr. Hornbeck's vast collections to their new home in the Tanimura & Antle Family Memorial Library of the California State University, Monterey Bay, I was recruited by land and water rights attorney Patrick J. Maloney to see through the transfer and dissemination of these invaluable collections. To date, this effort has been underwritten in large part by the law firm of Maloney, and has produced thousands of scanned documents from the collections of Hornbeck and other archival collections throughout the country. Law clerk Miriam Infinger and Information Technologist Dennis Coady have in turn worked to identify, categorize, and digitize those documents collected as of this writing.

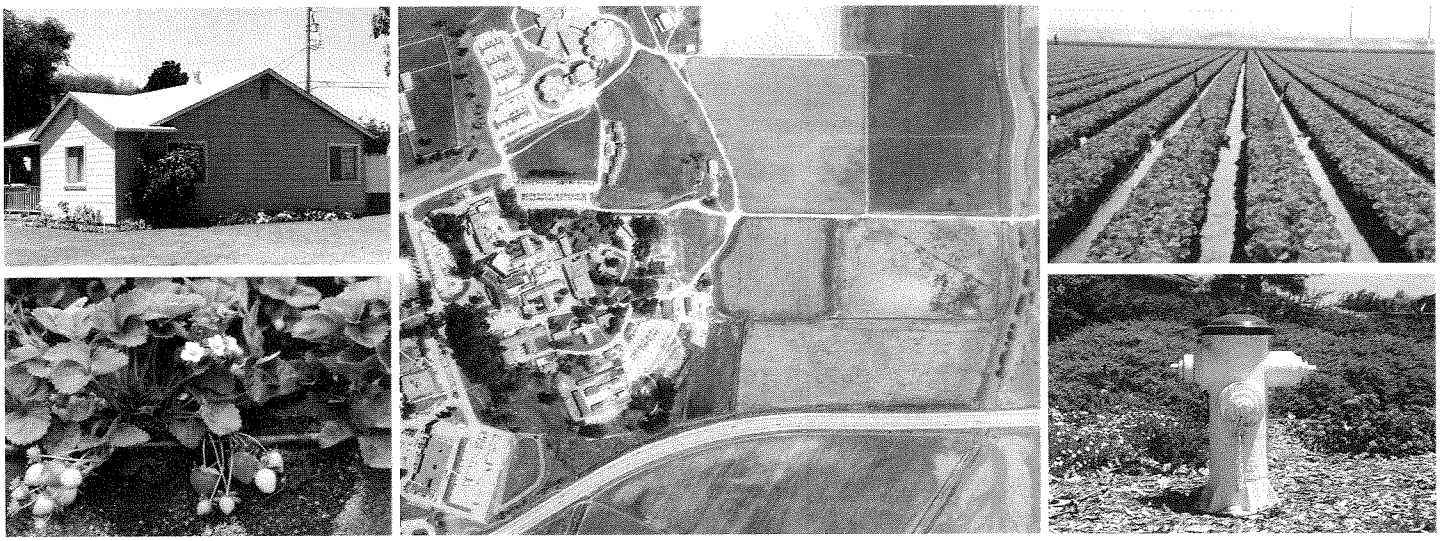
In an effort to raise awareness of the significance of the Hornbeck Collection, Ms. Jennifer Lucido and I recently submitted the first of a series of grant proposals intended to generate funding needed to facilitate the dissemination and public education dimensions of the project now underway. As a first step towards these initiatives, we applied for the 2014 National Endowment for the Humanities Digital Humanities Start-up Grants. Our initial foray constitutes an effort to address the growing water crisis in California by way of generating an Internet-based geospatial collection and *Google Earth* mapping of the Monterey Bay.

The proposed project seeks to deploy a digital humanities approach to sustainability. Historic maps, documents, and other resources of the Spanish, Mexican, and early American periods provide critical environmental data, and thereby, environmental histories of resource abundance and scarcity for the affected regions upon which millions of Americans depend. Hornbeck's pioneering historical geography and geospatial studies have produced a formidable archive of primary sources and Mexican land grant maps or *diseños* and constitute the centerpiece of this project. The proposed

Figure 1. Map of Public Surveys in California to Accompany Report of Surveyor General, 1859. Source: National Archives. Courtesy of Diseños Project, Patrick Maloney, esq., Miriam Infinger, and Rubén G. Mendoza, 2014.

grant seeks to assemble a team of geospatial technicians, anthropologists, social historians, historical geographers, and environmental scientists for the expressed purpose of formulating a digital humanities approach to addressing California's current environmental crisis and the broader question of sustainability.

By remapping the changing landscapes of early California, both legislators and environmental scientists will be able to make informed decisions for future planning and conservation. Given that folk cartographies and plat maps have been given short shrift in recent efforts to address climate change and its consequences, the proposed project will develop a *web GIS* and geospatial visualization of the Monterey Bay that introduces primary sources as a formidable resource for humanistic and scientific inquiry. Once the Monterey Bay portion of the online archive has been completed and deployed, the prototype will serve as a demonstration project for soliciting further public, private, and corporate funding needed to sustain and expand the online resource to encompass heritage resources from throughout the state of California.



Summary Report:

1995 Ground Water Extraction Data and Agricultural Water Conservation Practices

Published by the
Monterey County Water Resources Agency

August 1996

This report published by the Monterey County Water Resources Agency

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If you would like more information regarding the Monterey County Water Resources Agency Water Conservation Programs, or the Ground Water Extraction Reporting Program, please contact the Conservation staff at (408) 755-4860.

Funding for this work was provided from Zones 2 and 2A within the Salinas Valley, with additional support from Fund 201.

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Overview of the Extraction Reporting Program

In February, 1993, the Monterey County Board of Supervisors adopted Ordinance No. 3663 which required water suppliers within Zones 2, 2A and 2B to report water use information for ground water extraction facilities and service connections. Ordinance No. 3717, which replaced Ordinance No. 3663, was adopted in October, 1993; it modified certain other requirements in the old ordinance but kept the ground water extraction reporting requirements in place for ground water extraction facilities with a discharge pipe having an inside diameter of at least 3 inches.

The Monterey County Water Resources Agency (MCWRA) has collected ground water extraction data from well operators for water reporting years beginning November 1 and ending October 31, starting with the 1992-1993 water reporting year. The information received from the over 400 well operators in the above-referenced zones of the Salinas Valley is entered into the Ground water Extraction Management System (GEMS), a computer database maintained by the MCWRA. The intent of the ground water extraction reporting program is to provide for the accurate documentation and annual measurement of the ground water extracted from Zones 2, 2A and 2B of the Salinas Valley Ground Water Basin each year.

The MCWRA also requires the annual submittal of Agricultural Water Conservation Plans, which outline the water conservation practices that are adopted each year and planned for the next year by growers in the Salinas Valley.

The purpose of this report is to summarize the data obtained from the ground water extraction reporting program for the period of November 1, 1994, through October 31, 1995. The agricultural water conservation practices implemented by Salinas Valley farmers are summarized, and reference evapotranspiration data from the California Irrigation Management Information System (CIMIS) are presented. With this information, this report is intended to present a picture of current water pumping within the Salinas Valley, including agricultural water conservation improvements which are being implemented to reduce total water applied.

Explanation of Reporting Methods

The ground water extraction reporting program enables water users to report water pumpage by three different measuring methods, utilizing calculations based on flowmeter, electrical meter, or hour meter data. The MCWRA requires pump efficiency testing and calibration of meters in order to ensure the accuracy of the data reported. The summary of water pumpage presented in this report is compiled from data generated from all three reporting methods.

Disclaimer Regarding Quality of Data

While the MCWRA has made every effort to ensure the accuracy of the data presented in this report, it should be acknowledged that the data is submitted by the individual reporting parties and is not verified by the MCWRA. In addition, the accuracy of the reporting methods may not be 100 percent reliable at all times.

The MCWRA did not receive ground water extraction reports from approximately two percent of the wells in the Salinas Valley for the 1994-1995 water reporting year.

Notes Regarding Report Format

Ground water extraction data is presented in this report by measurement in acre-feet. One acre-foot is equal to 325,851 gallons.

Ground Water Extraction Data Summary

The MCWRA has designated subareas of the Salinas Valley Ground Water Basin whose boundaries are drawn where discernible changes occur in the hydrogeologic conditions. These boundaries are shown in Figure 1.

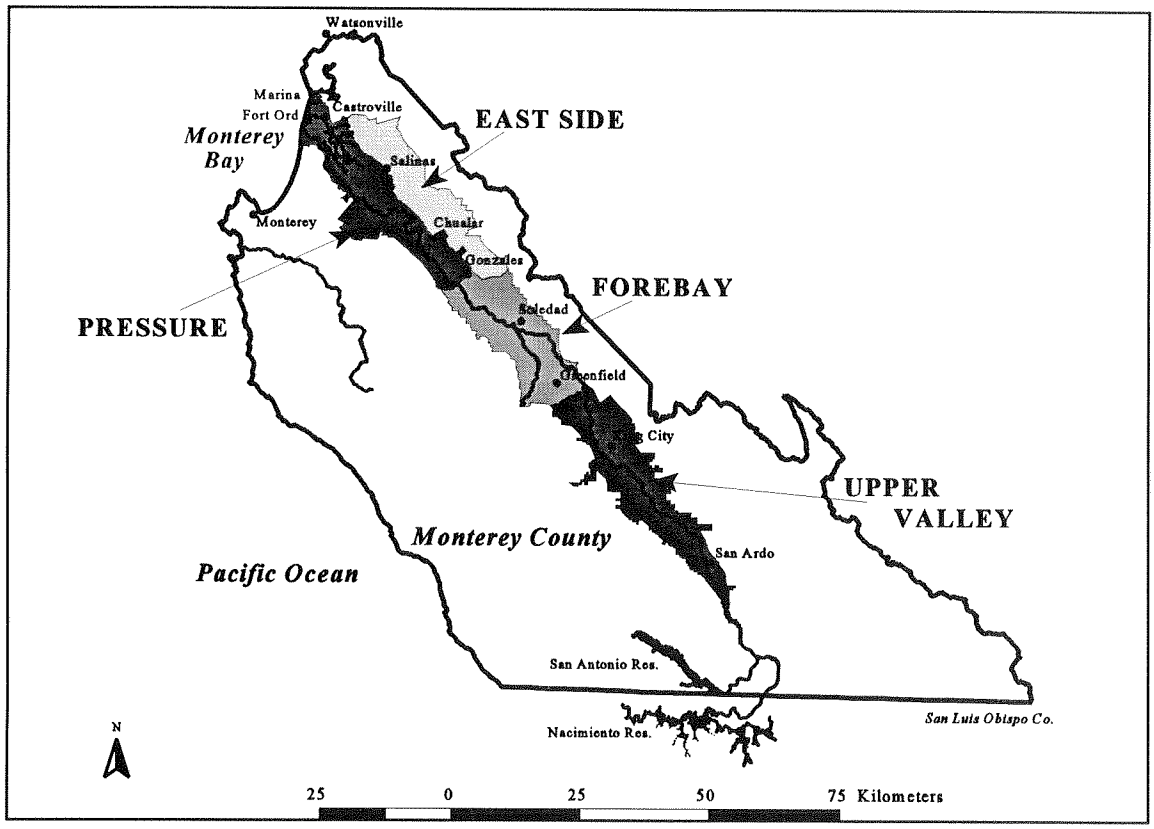

Figure 1. Salinas Valley Subareas

Summary of Methods Used for Extraction Reporting

The distribution of methods used for extraction reporting for the period of November 1, 1994, to October 31, 1995, is shown in Table 1; a percentage distribution by volume is shown in Figure 2.

Table 1. Total extraction data by reporting method

REPORTING METHOD	ACRE-FEET PER REPORTING METHOD	WELLS PER REPORTING METHOD
FLOWMETER	294,635	1,179
ELECTRICAL METER	208,868	661
HOUR METER	1,009	11
TOTAL	**504,512**	**1,851**

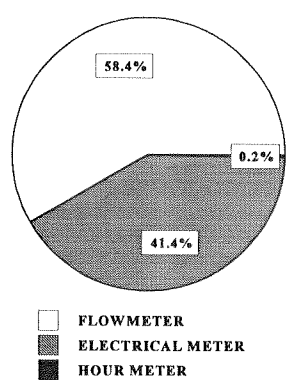

Figure 2. Percentage by volume of methods used for extraction reporting

Ground Water Extraction Data Summary

Total Extraction Data by Subarea and Type of Use

The total ground water extractions from Zones 2, 2A and 2B for the period of November 1, 1994, through October 31, 1995, are summarized by subarea and (1) type of use (agricultural and urban) in Table 2, and (2) percentage in Figure 3.

Table 2. Total extraction data by subarea and type of use

SUBAREA	AG PUMPING (ACRE-FEET)	URBAN PUMPING (ACRE-FEET)	TOTAL (ACRE-FEET)
PRESSURE	105,741	30,738	136,479
EAST SIDE	84,589	2,907	87,496
FOREBAY	133,226	3,994	137,220
UPPER VALLEY	139,072	4,245	143,317
TOTAL	**462,628**	**41,884**	**504,512**

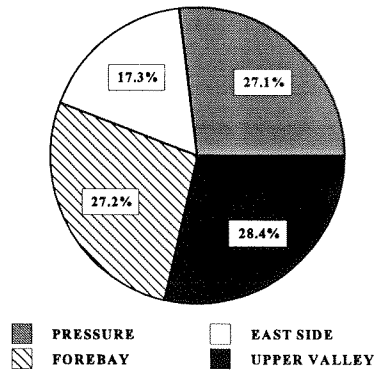

Figure 3. Percentage of total extractions by subarea

Urban Extraction Data by City or Area

The total ground water extractions attributed to urban (residential, commercial, industrial, and governmental) pumping for the period of November 1, 1994, through October 31, 1995, are summarized by city or area in Table 3.

Table 3. Urban extraction data by city or area

CITY OR AREA	URBAN PUMPING (ACRE-FEET)	PERCENTAGE OF TOTAL
CASTROVILLE	823	2.0%
CHUALAR	118	0.3%
FORT ORD[1]	2,802	6.7%
GONZALES	1,174	2.8%
GREENFIELD	1,349	3.2%
KING CITY	3,981	9.5%
MARINA COAST WATER DISTRICT	2,018	4.8%
SALINAS	20,667	49.3%
SAN ARDO	123	0.3%
SAN LUCAS	53	0.1%
SOLEDAD	2,562	6.1%
OTHER UNINCORPORATED AREAS	6,214	14.9%
TOTAL	**41,884**	**100.0%**

[1] The data reflect extractions that occurred subsequent to the closing of the military base and prior to the opening of California State University Monterey Bay.

Agricultural Ground Water Extraction Summary

Average Net Physical Acres Served per Extraction Facility

Table 4 presents the average number of net physical farming acres served per ground water well used for agricultural irrigation purposes in 1995.

Table 4. Average net physical acres served per extraction facility by subarea

SUBAREA	AVERAGE ACRES PER WELL
PRESSURE	92
EAST SIDE	102
FOREBAY	120
UPPER VALLEY	91
AVERAGE	**101**

Summary of Reported Unit Agricultural Water Pumped

Table 5 and Figure 4 present the average acre-feet / acre (unit water pumped) by subarea, calculated using the reported acreage and agricultural water pumped for the period of November 1, 1994, through October 31, 1995. The data used for Table 5 and Figure 4 represent a subset of the totals shown in Table 2, since not all agricultural extraction data were submitted with acreage information.

Table 5. Reported unit agricultural water pumped by subarea

SUBAREA	UNIT WATER PUMPED (ACRE-FEET / ACRE)
PRESSURE	2.25
EAST SIDE	2.20
FOREBAY	2.66
UPPER VALLEY	3.44
OVERALL AVE.	**2.63**

Please note that during the 1994-1995 water reporting year, the 1995 floods affected the number of acres in production and the amount of water needed for irrigation. Even during a normal rain year, pumping rates will vary by crop type and location.

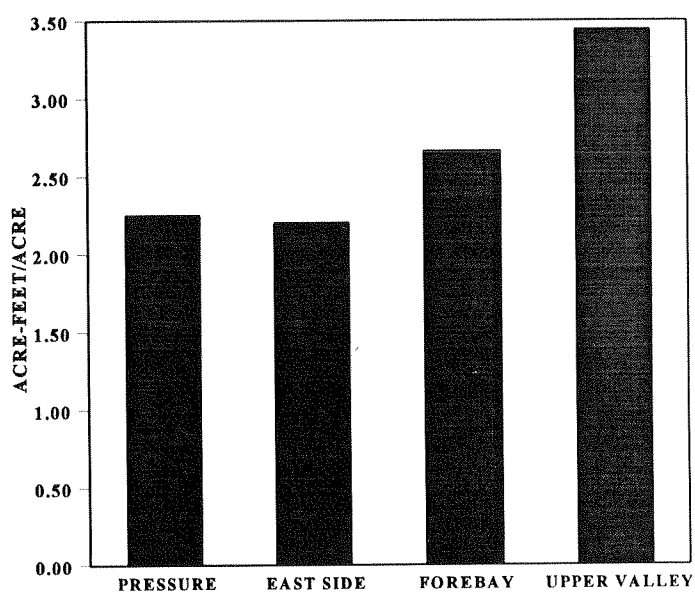

Figure 4. Reported unit agricultural water pumped by subarea.

Summary of Irrigation Methods

The Agricultural Water Conservation Plans include information about how many acres are irrigated with each type of irrigation method, by crop category. This information shows the changing trends in irrigation methods in the Salinas Valley. Tables 6 and 7 show the distribution of irrigation methods by crop type for 1993 and 1996, respectively.

This information shows a trend of decreased acreage in combined sprinkler & furrow and solid set sprinkler irrigation and increased acreage in drip irrigation, in both vegetable crops and vineyards, from 1993 to 1996.

Table 6. 1993 distribution of irrigation methods by crop type

1993	FURROW (ACRES)	SPRINKLER & FURROW (ACRES)	HAND MOVE SPRINKLERS (ACRES)	SOLID SET SPRINKLERS (ACRES)	LINEAR MOVE (ACRES)	DRIP (ACRES)	OTHER[2] (ACRES)	TOTAL (ACRES)
VEGETABLES	2,349	84,060	30,764	6,607	3,827	3,682	0	131,289
FIELD CROPS	575	2,173	2,236	90	50	48	0	5,172
BERRIES	1	0	0	0	0	4,158	0	4,159
GRAPES	261	0	0	13,347	0	15,976	0	29,584
TREE CROPS	0	0	122	251	0	1,216	10	1,599
FORAGE	41	202	1,327	0	48	0	189	1,807
TOTAL	**3,227**	**86,435**	**34,449**	**20,295**	**3,925**	**25,080**	**199**	**173,610**

Table 7. 1996 distribution of irrigation methods by crop type

1996	FURROW (ACRES)	SPRINKLER & FURROW (ACRES)	HAND MOVE SPRINKLERS (ACRES)	SOLID SET SPRINKLERS (ACRES)	LINEAR MOVE (ACRES)	DRIP (ACRES)	OTHER[2] (ACRES)	TOTAL (ACRES)
VEGETABLES	4,209	77,925	33,160	6,434	4,093	6,546	0	132,367
FIELD CROPS	529	740	1,358	310	39	422	0	3,398
BERRIES	0	0	0	0	0	4,374	0	4,374
GRAPES	0	0	0	8,155	0	21,240	0	29,395
TREE CROPS	0	0	12	131	0	1,195	0	1,338
FORAGE	186	690	249	20	0	0	1,141	2,286
TOTAL	**4,924**	**79,355**	**34,779**	**15,050**	**4,132**	**33,777**	**1,141**	**173,158**

[2] "Other" may include different combinations of irrigation systems or areas that were not irrigated.

Agricultural Water Conservation Practices

For the past six years, Salinas Valley growers have submitted water conservation plans to the MCWRA. Table 8 shows the number of acres, by year, on which selected practices have been implemented.

Table 8. Agricultural water conservation practices implemented from 1991 through 1996

WATER CONSERVATION PRACTICES	1991 ACRES	1992 ACRES	1993 ACRES	1994 ACRES	1995 ACRES	1996 ACRES
12 MONTHS SET ASIDE	4,705	4,810	6,586	6,096	5,064	3,123
SUMMER FALLOW/OTHER FALLOW	1,480	6,546	5,953	4,081	6,486	6,208
FLOWMETERS	31,702	26,404	39,206	127,971	122,054	126,031
TIME CLOCK/PRESSURE SWITCH	131,237	131,237	142,162	134,985	121,645	137,297
SOIL MOISTURE SENSORS	39,549	39,549	51,348	43,883	43,188	51,428
PRE-IRRIGATION REDUCTION	92,865	112,290	117,899	108,454	104,937	99,429
REDUCED SPRINKLER SPACING	64,613	72,226	81,736	74,409	75,451	78,925
SPRINKLER IMPROVEMENTS	70,035	97,233	104,160	107,626	102,053	116,809
OFF-WIND IRRIGATION	100,274	109,050	115,984	101,765	94,810	113,381
LEAKAGE REDUCTION	96,672	109,589	117,455	112,135	110,973	119,727
MICRO IRRIGATION SYSTEM	18,120	22,952	24,408	25,506	29,307	37,991
SURGE FLOW IRRIGATION	9,334	18,230	22,588	37,866	15,202	19,772
TAILWATER RETURN SYSTEM	20,357	25,034	21,020	20,994	15,101	22,707
LAND LEVELING/GRADING	55,186	60,563	59,413	58,963	57,749	64,164
TOTAL NET FARMING ACRES[3]	**174,892**	**178,251**	**173,610**	**179,313**	**161,574**	**173,158**

Evaluation of MCWRA Programs

The 1996 Agricultural Water Conservation Plans requested feedback regarding use and quality of the MCWRA's CIMIS and Mobile Lab Programs.

CIMIS Program

The California Irrigation Management Information System (CIMIS) is a network of weather stations which is used to estimate reference evapotranspiration. The MCWRA cooperates with the California Department of Water Resources in this effort, by expanding the program to cover the Salinas Valley. Additional information about the CIMIS program is provided on page 8. Of the 235 growers who submitted Agricultural Water Conservation Plans, 54 (23%) stated they had used the MCWRA's CIMIS Program, and 102 (43%) stated they would like more information.

Mobile Lab Program

The MCWRA operates a Mobile Lab program to provide on-farm technical assistance. Through this voluntary program, MCWRA staff evaluate irrigation systems and provide recommendations for improvements to distribution uniformity and overall efficiency of the system, as well as suggestions for irrigation planning. Of the 235 growers who submitted Agricultural Water Conservation Plans, 45 (19%) stated they had used the Mobile Lab Program, and 87 (37%) indicated they would like more information.

[3] Since different practices may be applied to the same acreage, the acreage cannot be totaled.

Capital Investment in Agricultural Water Conservation Practices

As presented in Table 8, the Agricultural Water Conservation Plans include information regarding how water conservation practices have been applied to farming operations in the Salinas Valley (by acre). These practices range from significant capital investments to recurring operational considerations. The implementation of these water conservation practices represents a significant financial investment by the agricultural community in long-term conservation measures. Table 9 estimates the investment in agricultural water conservation practices implemented since 1991.

Table 9. Capital investment in agricultural water conservation practices since 1991

CAPITAL IMPROVEMENTS	AVERAGE COST / ACRE ($/ACRE)[4]	CAPITAL INVESTMENT ($)
FLOWMETERS	40	3,773,160
SOIL MOISTURE SENSORS	10	118,790
TIME CLOCK/PRESSURE SWITCH	2	12,120
MICRO IRRIGATION SYSTEM	1,200	23,845,200
TAILWATER RETURN SYSTEM	200	470,000
SUBTOTAL	-	**28,219,270**
ON-GOING PRACTICES		
12 MONTHS SET ASIDE	700	21,268,800
SUMMER FALLOW/OTHER FALLOW	300	9,226,200
REDUCED SPRINKLER SPACING	75	33,552,000
OFF-WIND IRRIGATION	25	15,881,600
LEAKAGE REDUCTION	10	6,665,510
LAND LEVELING/GRADING	70	24,922,660
SUBTOTAL	-	**111,516,770**
CAPITAL IMPROVEMENTS / ON-GOING PRACTICES		
SPRINKLER IMPROVEMENTS	15	8,968,740
SURGE FLOW IRRIGATION	5	614,960
SUBTOTAL	-	**9,583,700**
TOTAL		**149,319,740**

The assumption of "1 well per 100 acres" was made for FLOWMETERS, SOIL MOISTURE SENSORS, and TIME CLOCK/PRESSURE SWITCH in the calculation of Average Cost / Acre.

Capital investment is calculated as follows:

Capital Improvements
Capital Investment = (1996 acres - 1991 acres) x Average Cost / Acre

On-Going Practices and Capital Improvements / On-Going Practices
Capital Investment = (sum of 1991 through 1996 acres) x Average Cost / Acre

[4] These estimates were developed with the consensus of the Monterey County Water Resources Agency Agricultural Water Conservation Committee (July 1996).

CIMIS Data Summary

The California Irrigation Management Information System (CIMIS) is a network of automated weather stations located throughout California. In the Salinas Valley, CIMIS is a cooperative program of the California Department of Water Resources (DWR) and the MCWRA. The primary function of CIMIS is to provide information to improve water management through efficient irrigation management practices. Weather data including solar radiation, air temperature, relative humidity, wind speed, wind direction, soil temperature and rainfall are collected from each station in the network and transferred to a central computer in Sacramento. After being analyzed for accuracy, the data are used to estimate reference evapotranspiration (ET_o). ET_o is a standard measure of the evaporative power of the atmosphere. ET_o represents the theoretical water use of a four to seven inch tall cool season grass that is not water stressed. ET_o must be factored with a "crop coefficient" (K_c) to estimate crop water use.

Two original DWR CIMIS stations near Salinas and Castroville have been in operation since the 1980's. In 1993, in cooperation with DWR, the MCWRA expanded the coverage of the CIMIS system in the Salinas Valley to provide improved data coverage for the varied micro-climatic regions in the valley. There are presently six CIMIS stations located in the Salinas Valley. The data from these stations provides insight about the relative water demands throughout the valley. In addition to normal and unusual monthly variations, these three years of data reveal several distinct climatic regions and zones of transition between them that are closer to the coast than previously believed.

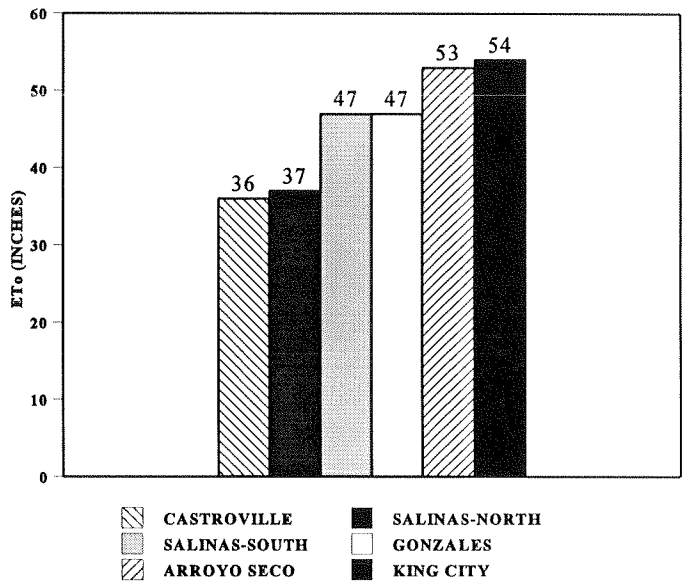

Figure 5. Average annual ET_o for rain years 1993 through 1996

Note: Rain year is from July 1 to June 30

Weather data throughout California are available to the public in hourly, daily, weekly and monthly formats via computer modem. Additionally, the MCWRA provides a toll-free telephone recording (1-800-4-U-CIMIS) of the ET_o and rainfall data for the six Salinas Valley stations. This "real time" data from CIMIS provides growers with the means to more precisely calculate irrigation needs.

The largest change in ET_o occurs just south of the city of Salinas, where the summer fog frequently clears early in the day, resulting in higher evaporative conditions than only a few miles further north.

Table 10. Description of Salinas Valley CIMIS stations

STATION NUMBER	STATION NAME	DISTANCE FROM COAST (MILES)
19	CASTROVILLE	1
116	SALINAS - NORTH	7
89	SALINAS - SOUTH	17
115	GONZALES	24
114	ARROYO SECO	40
113	KING CITY - OASIS RD	60

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Ground Water Summary Report 2012

Monterey County Water Resources Agency

October 2013

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Overview of the Ground Water Reporting Program

History of the Ground Water Reporting Program

In February 1993, the Monterey County Board of Supervisors adopted Ordinance No. 3663 that required water suppliers within Zones 2, 2A, and 2B to report water-use information for ground water extraction facilities (wells) and service connections to the Monterey County Water Resources Agency (Agency). Monterey County Ordinance No. 3717, which replaced Ordinance No. 3663 and was adopted in October 1993, modified certain other requirements in the previous ordinance while keeping the ground water extraction reporting requirements in place for wells with a discharge pipe having an inside diameter of at least three inches.

The Agency has collected ground water extraction data from well operators, for the period beginning November 1 and ending October 31, starting with the 1992-1993 reporting year. Information received from the 300-plus well operators in the above-referenced zones of the Salinas Valley is compiled by the Ground Water Extraction Management System (GEMS) portion of the Water Resources Agency Information Management System (WRAIMS), a relational database maintained by the Agency. The intent of the ground water reporting program is to provide documentation of the reported amount of ground water that is extracted from Zones 2, 2A, and 2B of the Salinas Valley Ground Water Basin each year.

Since 1991, the Agency has required the annual submittal of Agricultural Water Conservation Plans (Ordinance 3851), which outline the best management practices that are adopted each year by growers in the Salinas Valley. In 1996, an ordinance was passed that requires the filing of Urban Water Conservation Plans (Ordinance 3886). Developed as the urban counterpart of the agricultural water conservation plans, this program provides an overview of the best management practices being implemented by urban water purveyors as conservation measures.

2012 Ground Water Summary Report

The purpose of this report is to summarize the data submitted to the Agency by well operators in February 2013 from the following annual reports:

- Ground Water Extraction Reports (agricultural and urban)
- Water Conservation Plans (agricultural and urban)
- Water and Land Use Forms (agricultural)

The agricultural data from the ground water extraction program covers the reporting year of November 1, 2011, through October 31, 2012; the urban data covers calendar year 2012. The agricultural and urban water conservation plans adopted for 2013 are also summarized. This report is intended to present a synopsis of current water extraction within the Salinas Valley, including agricultural and urban water conservation improvements that are being implemented to reduce the total amount of water pumped. It is not the purpose of this report to thoroughly analyze the factors that contribute to increases or decreases in pumping.

Reporting Methods

The Ground Water Conservation and Extraction Program provides well operators with a choice of three different reporting methods for each of their wells: Water Flowmeter, Electrical Meter, or Hour Meter (timer). The summary of ground water extractions presented in this report is compiled from data generated by all three reporting methods. Ordinance 3717 requires annual pump efficiency tests and/or meter calibration of each well to ensure the accuracy of the data reported.

Disclaimer

While the Agency has made every effort to ensure the accuracy of the data presented in this report, it should be noted that the data are submitted by individual reporting parties and are not verified by Agency staff. In addition, since so many factors can affect the extraction calculations, it is understood that no reporting method is 100 percent accurate. The Agency maintains strict quality assurance in the compilation, standardization, and entry of the data received. The Agency received Ground Water Extraction Reports from ninety-seven percent (97%) of the 1867 wells in the Salinas Valley for the 2012 reporting year. Agricultural and Urban Water Conservation Plan submittals for 2013 were ninety-four percent (94%) and one hundred percent (100%), respectively.

Reporting Format

Ground water extraction data are presented in this report by measurement in acre-feet. One acre-foot is equal to 325,851 gallons.

Ground Water Extraction Data Summary

The Salinas Valley Ground Water Basin is divided into four major hydrologic subareas whose boundaries are derived from discernible changes in the hydrogeologic conditions of the underground aquifers. Figure 1 (below) illustrates the Agency-designated Zones of the Salinas Valley in relation to the hydrologic subareas.

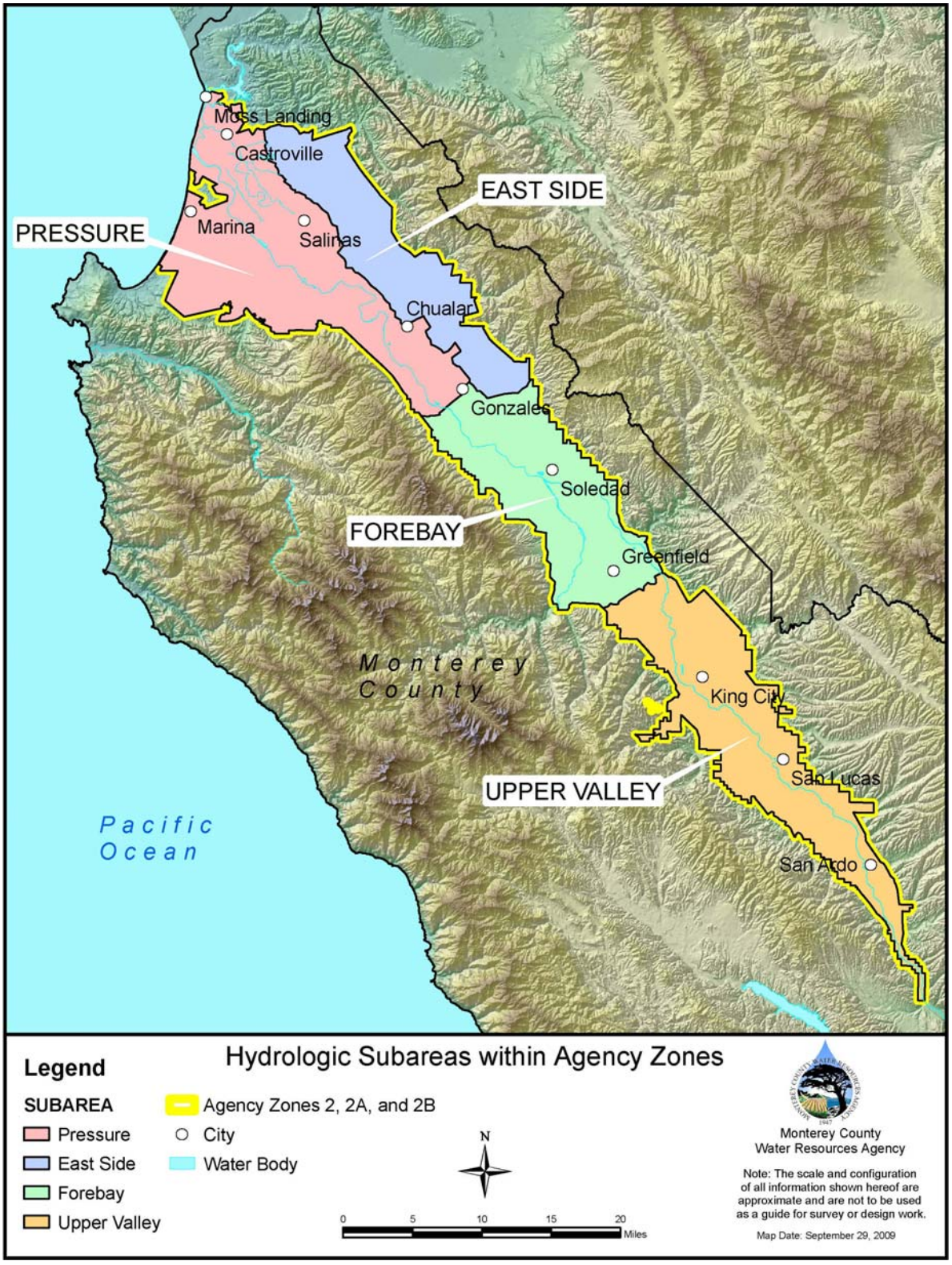


Figure 1. Agency Zones and hydrologic subareas of the Salinas Valley Ground Water Basin

Ground Water Extraction Data Summary (continued)

Summary of Methods Used for Extraction Reporting

The distribution of methods used for ground water extraction reporting (agricultural and urban) for the 2012 reporting year is shown in Table 1; a percentage distribution by volume is shown in Figure 2.

Table 1. Total extraction data by reporting method

Reporting Method	Acre-Feet per Reporting Method	Wells per Reporting Method
Water Flowmeter	343,597	1,380
Electrical Meter	136,543	407
Hour Meter	9,101	18
Total (2012)	489,241	1,806
Average ('03-'12)	**495,968**	**1,756**

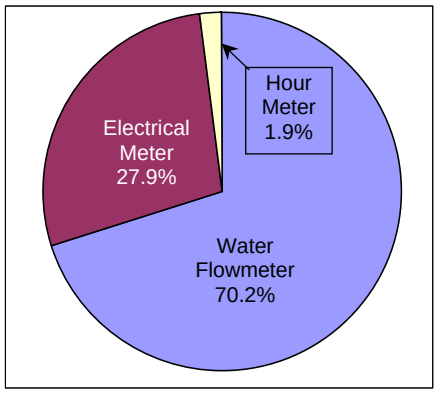


Figure 2. Percentage distribution by volume of methods used for extraction reporting

Total Extraction Data by Hydrologic Subarea and Type of Use

The total ground water extractions for the 2012 reporting year are summarized by hydrologic subarea, type of use (agricultural and urban in Table 2), and percentage (Figure 3).

Table 2. Total extraction data by hydrologic subarea and type of use

Subarea	Agricultural Pumping (acre-feet)	Urban Pumping (acre-feet)	Total Pumping (acre-feet)
Pressure	95,814	18,084	113,898
East Side	82,451	13,092	95,543
Forebay	135,971	7,488	143,459
Upper Valley	132,383	3,957	136341
Total	446,620	42,621	489,241
Percent of Total	**91.3%**	**8.7%**	**100%**

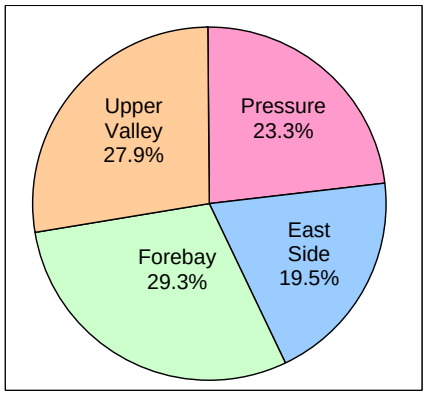


Figure 3. Percentage of total extractions by hydrologic subarea

Urban Extraction Data by City or Area

The total ground water extractions attributed to urban (residential, commercial/institutional, industrial, and governmental) pumping for the 2012 reporting year are summarized by city or area in Table 3. Figure 4 shows how the total urban pumping for 2012 is apportioned among each city or area.

Table 3. Urban extraction data by city or area

City or Area	Urban Pumping (AF)	Percentage of Total
Castroville	776	1.82%
Chualar	130	0.30%
Gonzales	1,454	3.41%
Greenfield	2,426	5.69%
King City	2,735	6.42%
Marina	4,129	9.69%
Other Areas (OA)		
OA-Pressure	3,893	9.13%
OA-East Side	3,434	8.06%
OA-Forebay	933	2.19%
OA-Upper Valley	1,081	2.54%
Salinas	17,360	40.73%
San Ardo	110	0.26%
San Lucas	31	0.07%
Soledad	2,519	5.91%
Soledad Prisons	1,610	3.78%
Total	42,621	100.00%

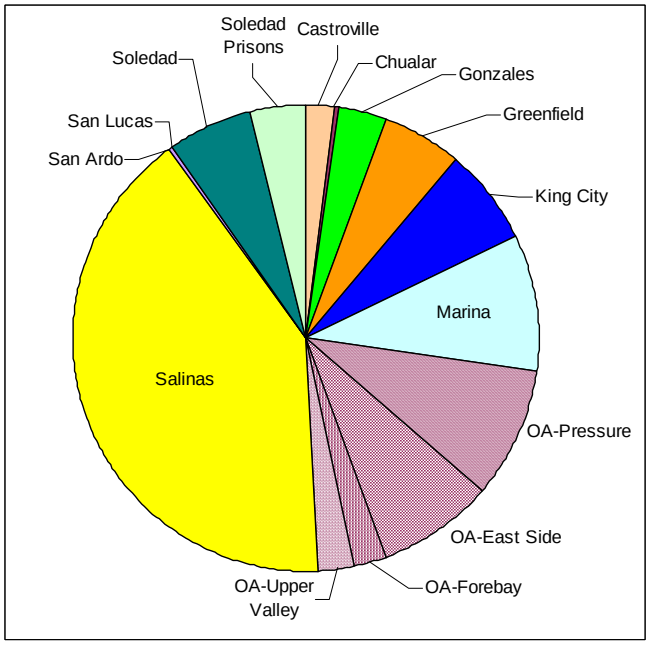


Figure 4. Distribution of urban extraction by city or area

Agricultural Water Conservation Plans

The Agricultural Water Conservation Plans include net irrigated acreage, irrigation method, and crop category. This information is forecasted and indicates what the grower plans to do in the upcoming year. It reflects the changing trends in irrigation methods in the Salinas Valley. Tables 4, 5, 6, and 7 show the distribution of irrigation methods by crop type for 1993, 2011, 2012 and 2013, respectively. Figure 5 (on the following page) illustrates the irrigation method trends from 1993 to 2013.

Table 4. 1993 - net acre distribution of irrigation methods by crop type (based on 94% companies reported)

1993	Furrow	Sprinkler & Furrow	Hand Move Sprinklers	Solid Set Sprinklers	Linear Move	Drip	Other[1]	Total
Vegetables	2,349	84,060	30,764	6,607	3,827	3,682	0	131,289
Field Crops	575	2,173	2,236	90	50	48	0	5,172
Berries	1	0	0	0	0	4,158	0	4,159
Grapes	261	0	0	13,347	0	15,976	0	29,584
Tree Crops	0	0	122	251	0	1,216	10	1,599
Forage	41	202	1,327	0	48	0	189	1,807
Unirrigated								N/A
Total	**3,227**	**86,435**	**34,449**	**20,295**	**3,925**	**25,080**	**199**	**173,610**

Table 5. 2011 - net acre distribution of irrigation methods by crop type (based on 94% companies reported)

2011	Furrow	Sprinkler & Furrow	Hand Move Sprinklers	Solid Set Sprinklers	Linear Move	Drip	Other[1]	Total
Vegetables	30	24,027	23,409	9,907	869	62,275	185	120,702
Field Crops	35	444	266	80	1,416	544	0	2,785
Berries	0	38	0	340	0	6,810	0	7,188
Grapes	0	0	0	620	0	33,008	0	33,628
Tree Crops	0	0	0	366	0	1,742	0	2,108
Forage	18	0	133	0	0	0	132	283
Other Type[2]	0	126	2,427	175	12	1,321	100	4,161
Unirrigated								6,137
Total	**83**	**24,635**	**26,235**	**11,488**	**2,297**	**105,700**	**417**	**176,992**

Table 6. 2012 - net acre distribution of irrigation methods by crop type (based on 92% companies reported)

2012	Furrow	Sprinkler & Furrow	Hand Move Sprinklers	Solid Set Sprinklers	Linear Move	Drip	Other[1]	Total
Vegetables	0	22,556	19,469	7,476	677	69,040	2,001	121,219
Field Crops	0	323	284	206	1,416	389	140	2,758
Berries	0	122	0	100	0	7,707	0	7,929
Grapes	0	0	0	363	0	34,381	0	34,744
Tree Crops	0	0	0	0	0	1,724	0	1,724
Forage	0	138	172	0	0	1	0	311
Other Type[2]	36	126	2,297	126	12	886	20	3,503
Unirrigated								6,317
Total	**36**	**23,265**	**22,222**	**8,271**	**2,105**	**114,128**	**2,161**	**178,505**

Table 7. 2013 - net acre distribution of irrigation methods by crop type (based on 94% companies reported)

2013	Furrow	Sprinkler & Furrow	Hand Move Sprinklers	Solid Set Sprinklers	Linear Move	Drip	Other[1]	Total
Vegetables	389	19,621	15,737	12,209	591	69,773	2,463	120,783
Field Crops	0	167	166	121	0	280	0	734
Berries	0	122	0	0	0	6,610	0	6,732
Grapes	0	0	0	363	0	34,358	0	34,721
Tree Crops	0	0	0	0	0	1,695	0	1,695
Forage	0	145	107	2	0	1	68	323
Other Type[2]	0	126	2,592	126	7	900	25	3,776
Unirrigated								1,280
Total	**389**	**20,181**	**18,602**	**12,821**	**598**	**113,617**	**2,556**	**170,044**

[1] "Other" may include an irrigation system not listed here or a different combination of systems
[2] "Other Type" are for other crop types not included, i.e. cactus, flower bulbs, etc.
NOTE: Percentage of companies reported varies from year to year

Agricultural Water Conservation Plans (continued)

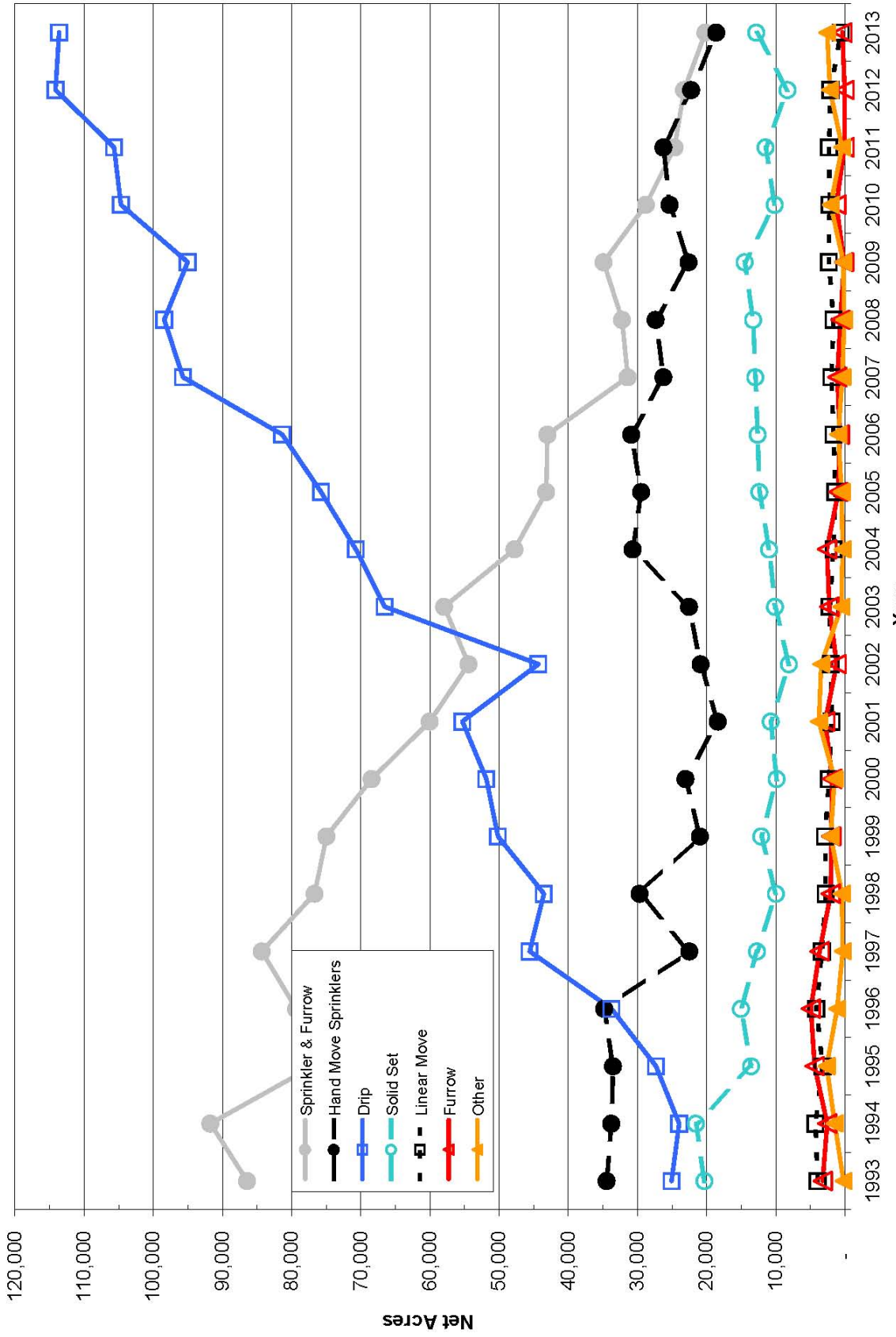


Figure 5. Types of irrigation methods used in the Salinas Valley based on companies reported

NOTE: Reported net acres vary from year to year

Agricultural Water Conservation Plans (continued)

Since 1991, Salinas Valley growers have submitted Agricultural Water Conservation Plans to the Agency. Table 8 shows the number of net acres, by year, for selected Best Management Practices (BMPs) or water conservation measures which were reported to be implemented over the past five years.

Table 8. Agricultural Best Management Practices reported to be adopted from 2009 through 2013

Best Management Practices	2009	2010	2011	2012	2013
12 Months Set Aside	9,043	7,447	3,285	8,172	1,314
Summer Fallow	509	692	1,944	688	1,462
Water Flowmeters	124,561	138,957	144,353	141,595	132,104
Time Clock/Pressure Switch	126,694	144,853	153,715	152,488	144,693
Soil Moisture Sensors	32,427	44,644	46,121	46,309	45,953
Pre-Irrigation Reduction	84,693	96,908	99,362	94,954	92,338
Reduced Sprinkler Spacing	83,046	90,065	97,926	90,503	89,289
Sprinkler Improvements	105,495	111,889	115,517	115,946	108,617
Off-Wind Irrigation	107,552	114,843	116,209	114,110	108,243
Leakage Reduction	105,702	113,820	115,255	113,372	110,565
Micro Irrigation System	71,710	67,383	87,464	93,146	84,031
Surge Flow Irrigation	7,182	8,785	11,473	12,275	10,154
Tailwater Return System	10,046	16,581	15,402	13,577	8,220
Land Leveling/Grading	56,482	73,361	76,436	79,534	65,306

Note: Due to unique crop rotations, it is difficult to account for each BMP used on total Crop Acres; therefore Net Acres were used.

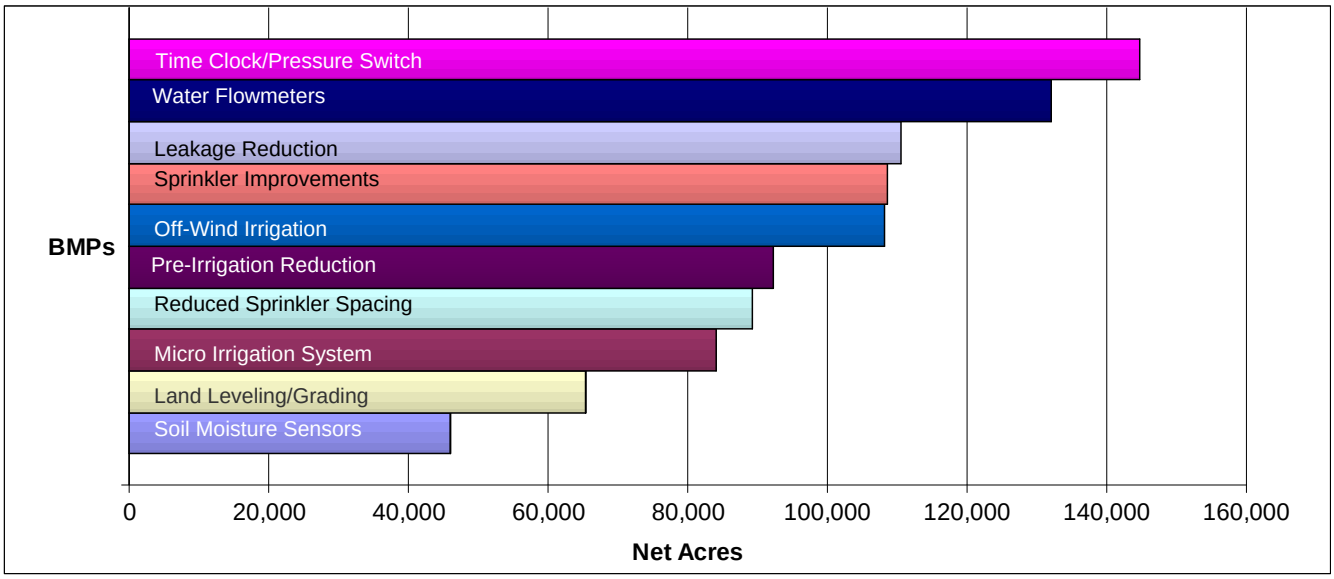


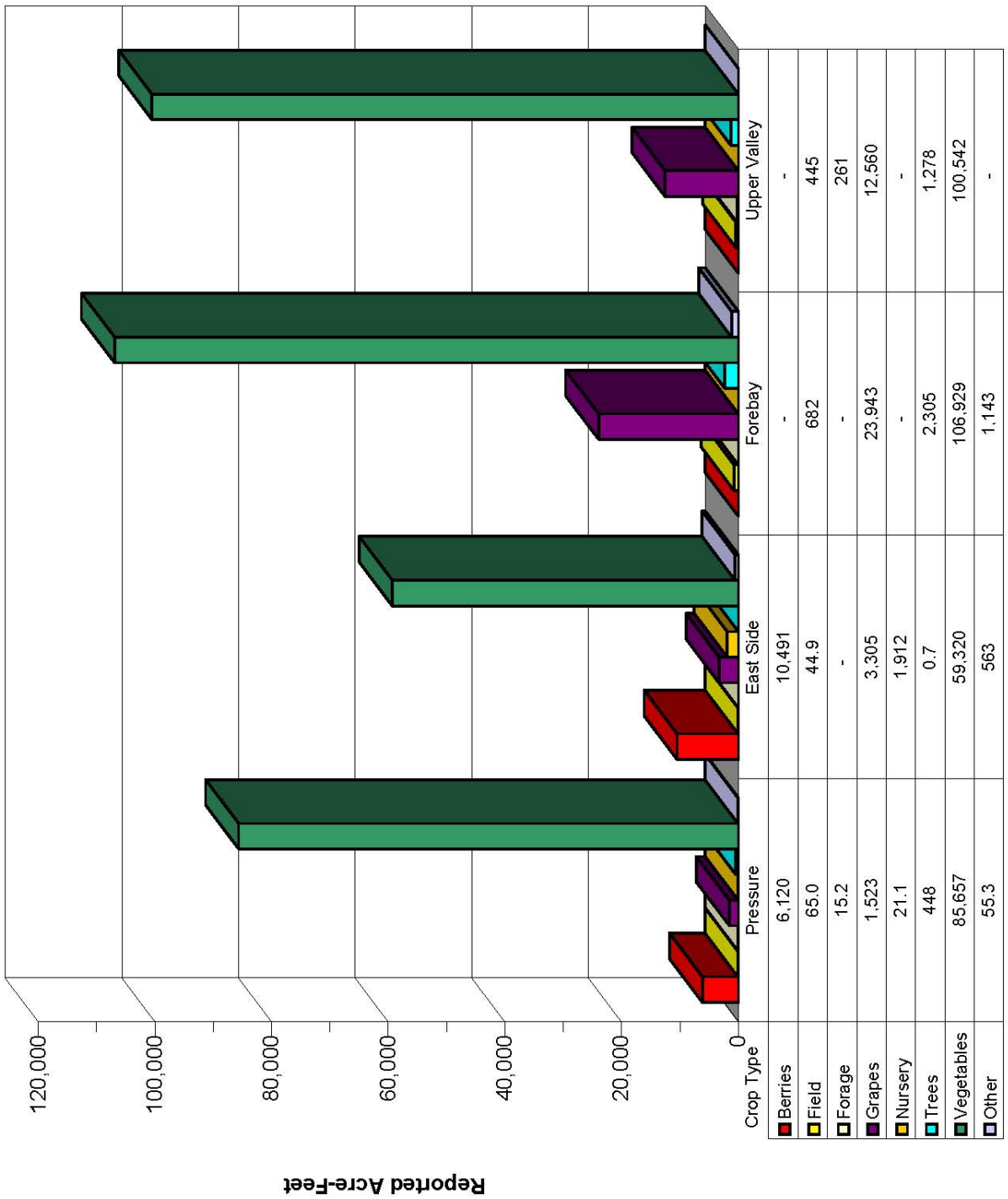
Figure 6. Top Ten Best Management Practices forecasted for 2013 based on reported net acres

Water and Land Use Forms

Agricultural Water Pumped

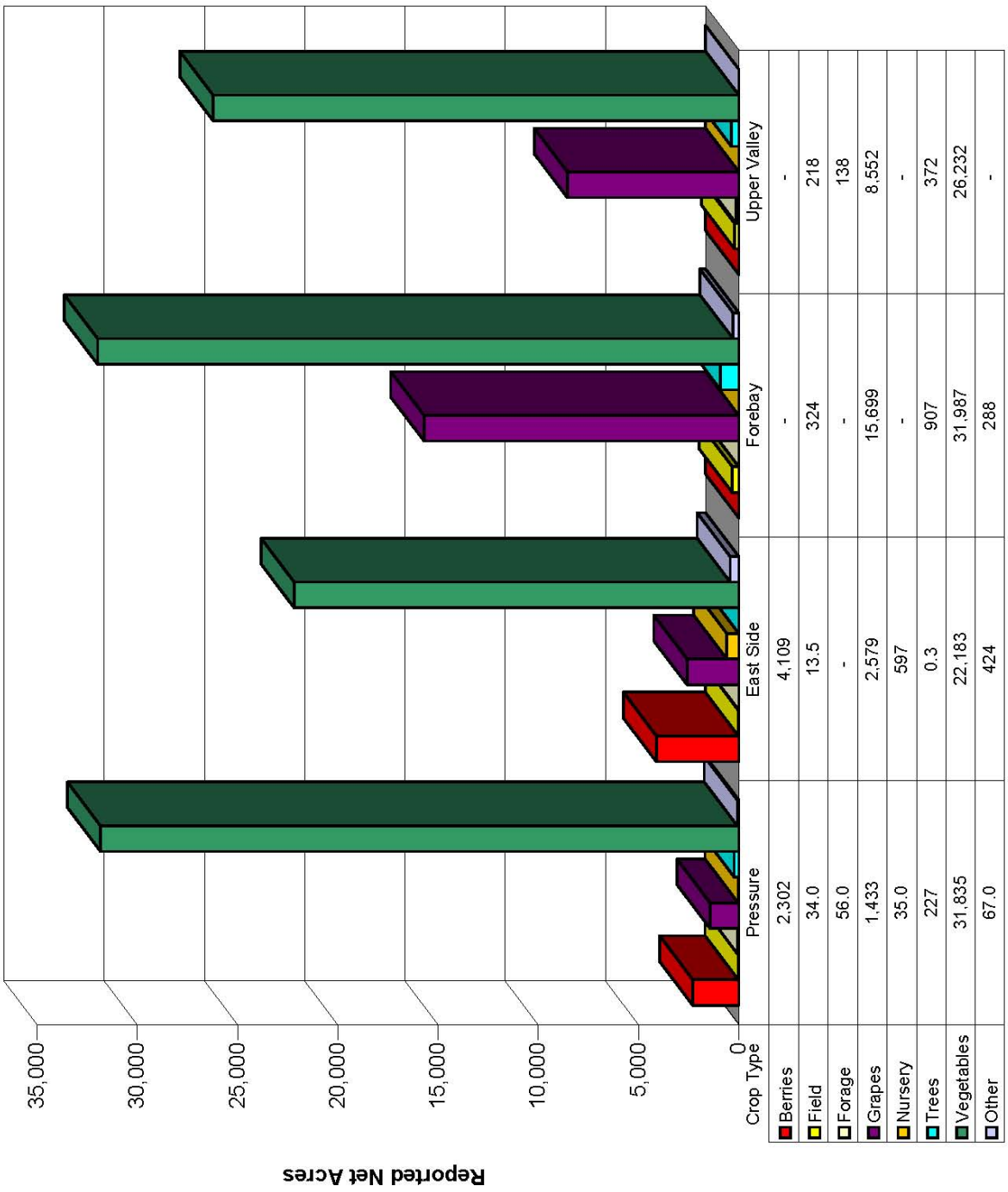
The following three figures present the agricultural water pumped (Fig. 7), irrigated net acres (Fig. 8), and amount of water used per acre (Fig. 9) by hydrologic subarea and crop type. The data was compiled using the reported acreage and water pumped from the 2012 Water and Land Use Forms. The data accounts for all crop types reported and all reporting methods: Water Flowmeter, Electrical Meter, and Hour Meter.

Changing weather patterns, variable soils, and crop types affect the amount of water needed for efficient irrigation. Even during a normal rain year, pumping rates will vary from one subarea to another and crop types will vary depending on economic demand.



Crop Type	Pressure	East Side	Forebay	Upper Valley
Berries	6,120	10,491	-	-
Field	65.0	44.9	682	445
Forage	15.2	-	-	261
Grapes	1,523	3,305	23,943	12,560
Nursery	21.1	1,912	-	-
Trees	448	0.7	2,305	1,278
Vegetables	85,657	59,320	106,929	100,542
Other	55.3	563	1,143	-

Figure 7. 2012 reported acre-feet by crop type & hydrologic subarea



Crop Type	Pressure	East Side	Forebay	Upper Valley
Berries	2,302	4,109	-	-
Field	34.0	13.5	324	218
Forage	56.0	-	-	138
Grapes	1,433	2,579	15,699	8,552
Nursery	35.0	597	-	-
Trees	227	0.3	907	372
Vegetables	31,835	22,183	31,987	26,232
Other	67.0	424	288	-

Figure 8. 2012 reported net acres by crop type & hydrologic subarea

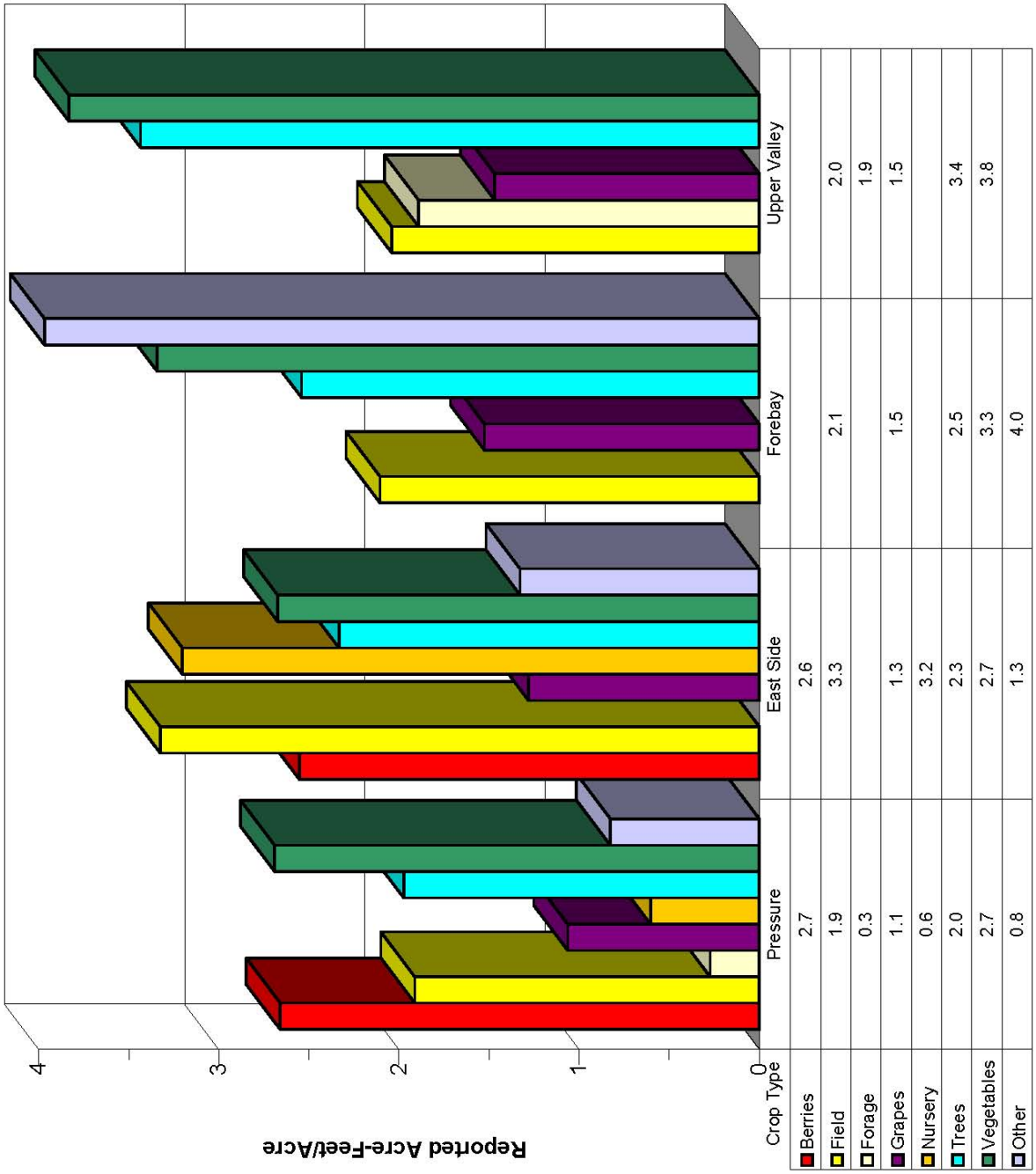


Figure 9. 2012 reported acre-feet/acre by crop type & hydrologic subarea

Urban Water Conservation Plans

Since 1996, the Agency has been collecting data for the Urban Water Conservation Plan program. Table 9 shows the forecasted adoption of "Best Management Practices" (water conservation measures) for the past three years, as a percentage of total acreage reported. It is important to note that, while all of the listed practices apply to "large" water systems (200 or more customer connections), not all apply to "small" water systems (between 15 and 199 customer connections). The practices that apply **only** to large systems are printed in **bold** below.

Table 9. Urban Best Management Practices reported to be adopted from 2011 through 2013

Best Management Practices	2011	2012	2013
Provide speakers to community groups and media	**85%**	**81%**	**85%**
Use paid and public service advertising	**74%**	**96%**	**89%**
Provide conservation information in bill inserts	94%	95%	94%
Provide individual historical water use information on water bills	92%	92%	96%
Coordinate with other entities in regional efforts to promote water conservation practices	94%	95%	94%
Work with school districts to provide educational materials and instructional assistance	**61%**	**92%**	**91%**
Implement requirements that all new connections be metered and billed by volume of use	99%	99%	98%
Establish a program to retrofit any existing unmetered connections and bill by volume of use	77%	78%	39%
Offer free interior and exterior water audits to identify water conservation opportunities	**98%**	**100%**	**98%**
Provide incentives to achieve water conservation by way of free conservation fixtures (showerheads, hose end timers) and/or conservation "adjustments" to water bills	**94%**	**90%**	**89%**
Enforcement and support of water conserving plumbing fixture standards, including requirement for ultra low flush toilets in all new construction	**78%**	**98%**	**94%**
Support of State/Federal legislation prohibiting sale of toilets using more than 1.6 gallons per flush	96%	97%	97%
Program to retrofit existing toilets to reduce flush volume (with displacement devices)	66%	34%	48%
Program to encourage replacement of existing toilets with ultra low flush (through rebates, incentives, etc.)	**89%**	**95%**	**89%**
Provide guidelines, information, and/or incentives for installation of more efficient landscapes and water-saving practices	94%	90%	94%
Encourage local nurseries to promote use of low water use plants	78%	78%	77%
Develop and implement landscape water conservation ordinances pursuant to the "Water Conservation in Landscaping Act"	**63%**	**63%**	**63%**
Identify and contact top industrial, commercial, and/or institutional customers directly; offer and encourage water audits to identify conservation opportunities	**89%**	**87%**	**89%**
Review proposed water uses for new commercial and industrial water service, and make recommendations for improving efficiency before completion of building permit process	**64%**	**84%**	**84%**
Complete an audit of water distribution system at least every three years as prescribed by American Water Works Association	74%	92%	93%
Perform distribution system leak detection and repair whenever the audit reveals that it would be cost effective	79%	97%	98%
Advise customers when it appears possible that leaks exist on customer's side of water meter	99%	99%	97%
Identify irrigators of large landscapes (3 acres or more) and offer landscape audits to determine conservation opportunities	**90%**	**89%**	**90%**
Provide conservation training, information, and incentives necessary to encourage use of conservation practices	**91%**	**92%**	**96%**
Encourage and promote the elimination of non-conserving pricing and adoption of conservation pricing policies	91%	86%	86%
Implementation of conservation pricing policies	96%	91%	91%
Enact and enforce measures prohibiting water waste as specified in Agency Ordinance No. 3932 or as subsequently amended, and encourage the efficient use of water	64%	71%	76%
Implement and/or support programs for the treatment and reuse of industrial waste water / storm water / waste water	**53%**	**67%**	**66%**

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Monterey County
Board of Supervisors

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Dave Potter	District #5

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Robert Johnson, Assistant General Manager, Chief – Water Resources Planning and Management
Brent Buche, Assistant General Manager, Chief – Operations and Maintenance
Cathy Paladini, Finance Manager – Administrative Services
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MONTEREY COUNTY WATER RESOURCES AGENCY
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US007832959B1

(12) **United States Patent**
Groen et al.

(10) **Patent No.: US 7,832,959 B1**
(45) **Date of Patent: Nov. 16, 2010**

(54) **METHOD OF RESTORATION OF A HIGHLY SALINE LAKE**

(75) Inventors: **Pieter van Groen**, De Bult (NL); **Jorrit K. de Groot**, Rotterdam (NL)

(73) Assignee: **Bean Stuyvesant, L.L.C.**, Belle Chasse, LA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 997 days.

(21) Appl. No.: **11/379,153**

(22) Filed: **Apr. 18, 2006**

Related U.S. Application Data

(60) Provisional application No. 60/672,310, filed on Apr. 18, 2005.

(51) **Int. Cl.**
E02B 13/00 (2006.01)

(52) **U.S. Cl.** **405/52**; 405/74; 405/80; 210/170.01; 210/170.11

(58) **Field of Classification Search** 405/52, 405/80, 60, 73, 74; 210/170.01, 170.09, 210/170.11
See application file for complete search history.

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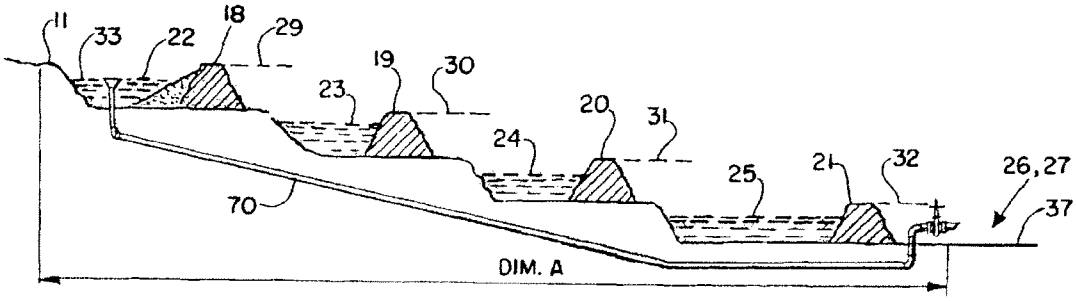
(57) **ABSTRACT**

A method of restoring a lake that has a high saline level is disclosed herein. In order to restore the lake, a series of concentric dikes or levees are provided that separate the lake into a plurality of smaller lake sections, each having a water surface. The smaller lake sections include an outer lake section which is next to the periphery of the lake and one or more inner lake sections. Each dike and each smaller lake section water surface have an elevation. Water is flowed from an influent source to the outer lake section and then to each of the inner lake sections. The outer lake section surface has a higher elevation. The inner lake section surfaces have cascading lower surface elevations. At a central area, a breathing brine area is provided that is surrounded by the smaller lake sections to provide an area that can be used to concentrate brine. The smaller lake sections can have differing salinity levels for sustaining diverse marine and plant life.

48 Claims, 5 Drawing Sheets



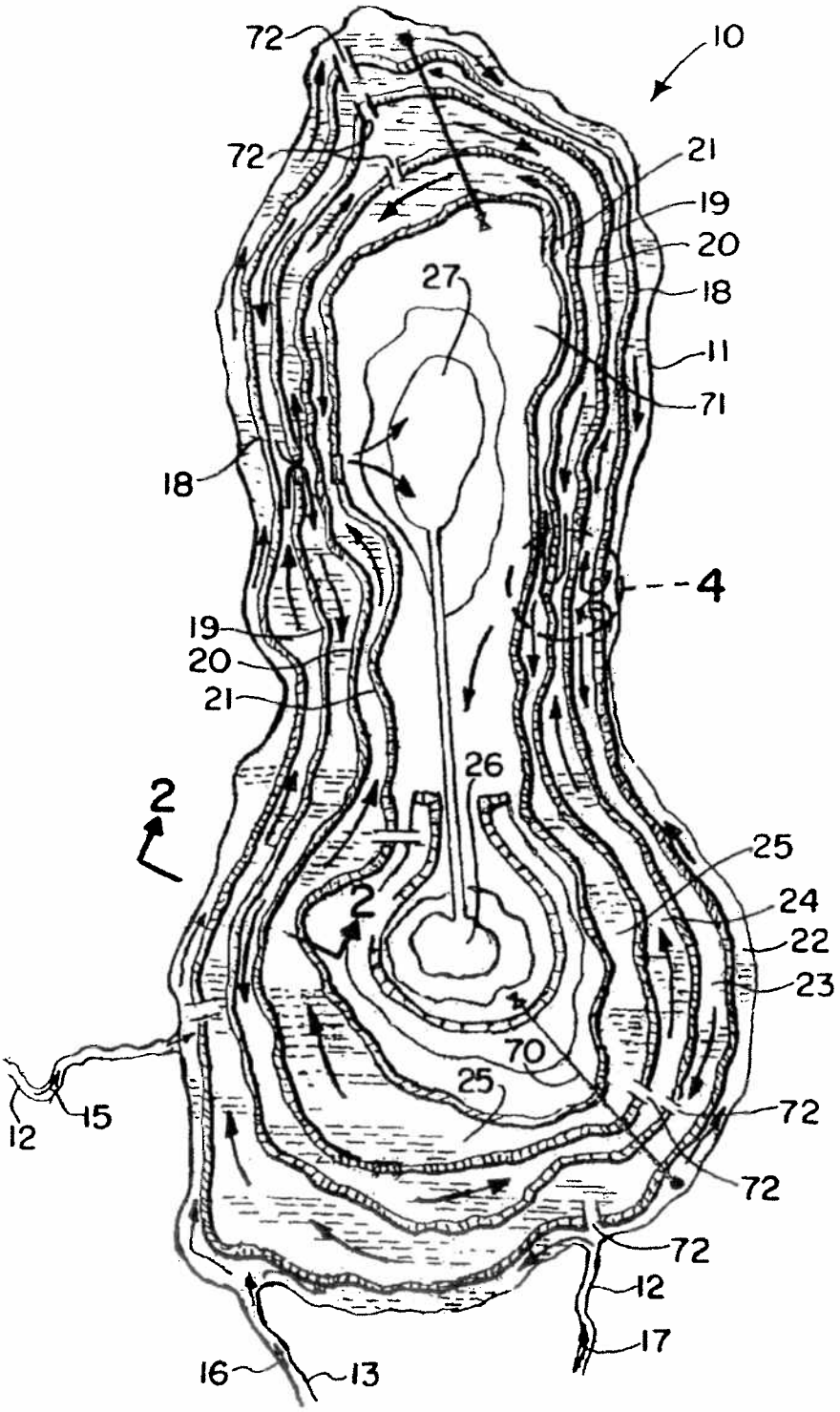

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FIG. 1.

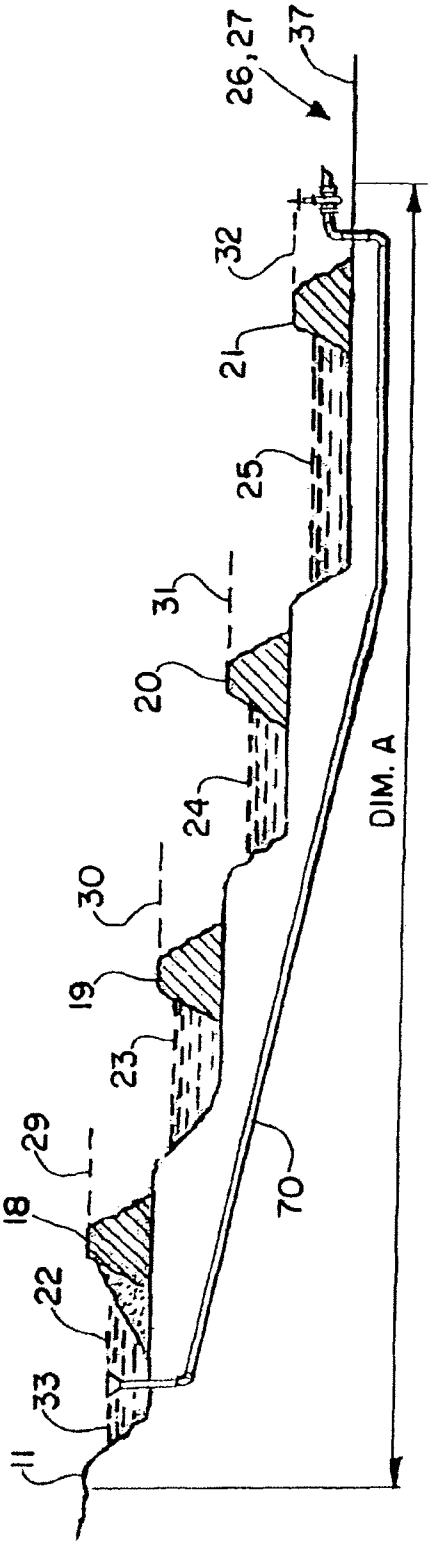

FIG. 2.

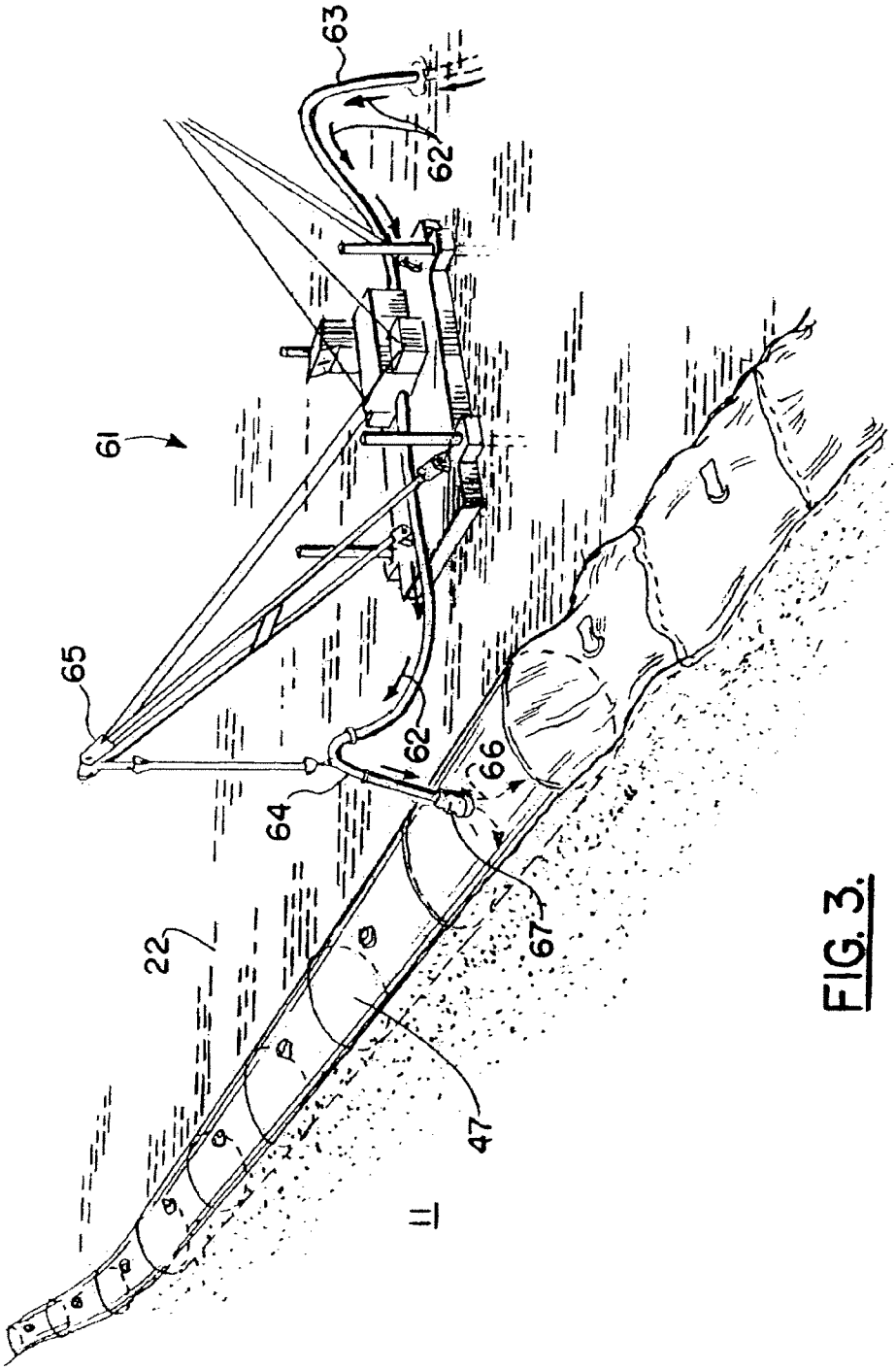

FIG. 3.

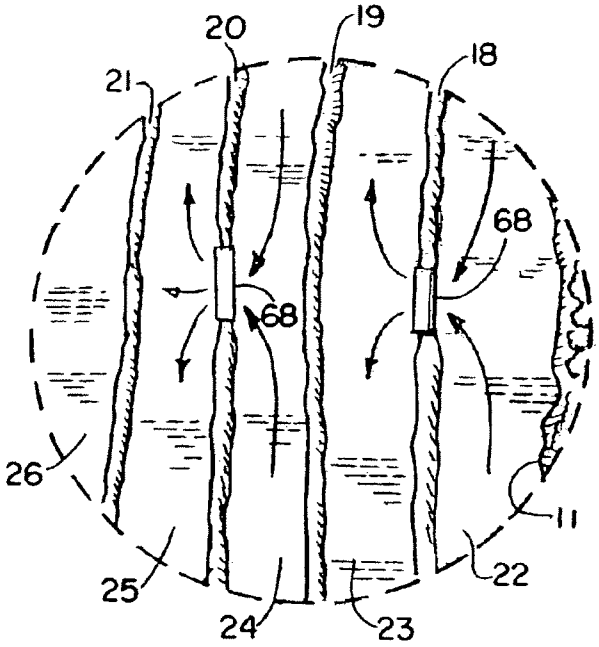

FIG. 4.

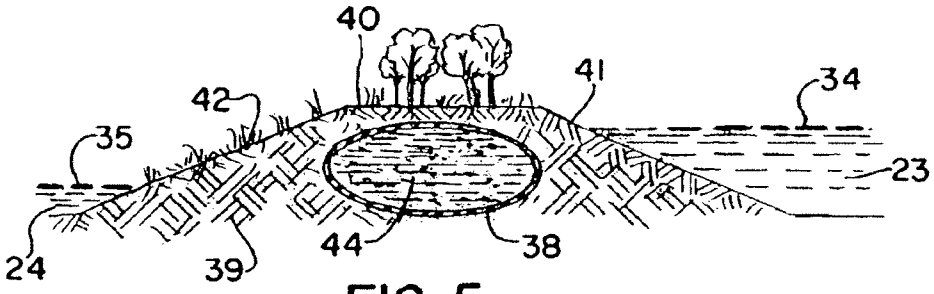

FIG. 5.

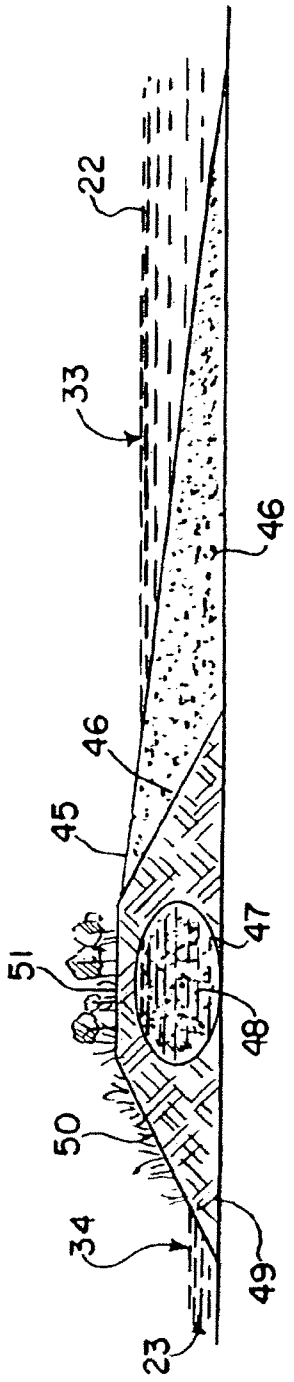
22
33
46
46
45
47
51
48
50
34
49
23

FIG. 6.

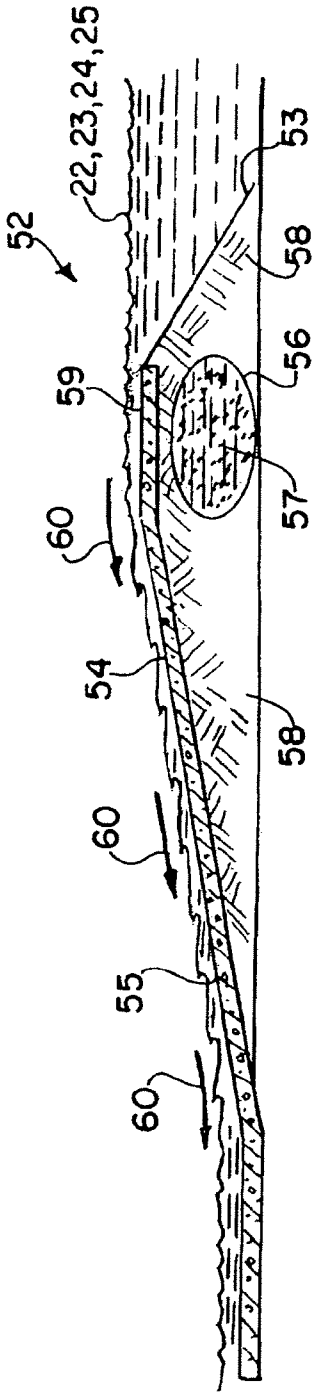
22,23,24,25
52
53
58
56
59
57
60
54
58
60
55
60

FIG. 7.

METHOD OF RESTORATION OF A HIGHLY SALINE LAKE

CROSS-REFERENCE TO RELATED APPLICATIONS

Priority of U.S. Provisional Patent Application Ser. No. 60/672,310, filed Apr. 18, 2005, incorporated herein by reference, is hereby claimed.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable

REFERENCE TO A "MICROFICHE APPENDIX"

Not applicable

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to restoration of a lake having a high saline content. More particularly, the present invention relates to an improved method of restoring a highly saline lake that utilizes inner and outer dikes or levees (preferably concentrically positioned), elongated smaller lakes formed between the dikes, a central area providing one or more breathing brine fields, wherein salinity of inflow gradually increases from outer lake to the inner lakes to the breathing brine field or fields. In the process, the overall lake water inflow needed to maintain several separate yet healthy lake ecosystems can be reduced.

2. General Background of the Invention

The Salton Sea is located in a closed basin in Riverside and Imperial Counties in southern California, south of Indio and north of El Centro. The Salton Sea is more than 220 feet below sea level and has no natural outlet. The Salton Sea Basin is part of the lower Colorado River delta system. Historically, lakes have existed in this basin as the course of the Colorado River has shifted. The current body of water (Salton Sea) was formed in 1905 when a levee break along the Colorado River caused flows from the Colorado River to enter the basin for about 18 months. Since 1905, the Salton Sea has fluctuated in size with varying inflow. It recently has had a surface area of 365 square miles.

Currently, the Salton Sea is filled by the agricultural runoff from the Colorado River Basin. In particular, approximately 80% of Salton Sea inflows come from the Imperial Valley. Since the Salton Sea has no outlet, evaporation produces the only export of water. Nearly all constituents in the inflow, such as salts, nutrients and fertilizers remain in the Salton Sea. Currently, the Sea is approximately 25% saltier than ocean water, with a continuing trend of increasing salinity. Eventually, a point will be reached where current biological activity in the Sea will cease, as is the case with other highly saline lakes such as Mono Lake. Under these highly saline conditions the benthic organisms that support the current ecology of the Salton Sea could no longer survive. The fisheries supported by those organisms would likewise disappear, and have practically vanished already. An ecology based on organisms adapted to highly saline conditions, such as brine shrimp, would result. Even under existing conditions, a project for the restoration of the Salton Sea (including improvement and stabilization of the water quality) is critically needed.

Accelerating these effects would be the reduced inflows to the Salton Sea anticipated under the 2003 Quantification Settlement Agreement (QSA). The QSA provides for the phased transfer of up to 560,000 acre-feet per year of water from agricultural to urban uses, resulting in a significant reduction of agricultural flows to the Sea, of at least 300,000 acre-feet per year. It is assumed that a water transfer of approximately the scale of that contemplated by the QSA will result in reduced inflows to the Salton Sea.

In future years, additional transfers may also occur as demand increases in the expanding urbanized areas of Southern California. For example, the Metropolitan Water District of Southern California (MWD) has pending a water rights application with the State Water Resources Control Board (SWRCB) seeking to divert all of the flows from the Alamo River and other agricultural sources that would otherwise reach the Salton Sea.

Filed in 1997, MWD's application contends that it has the right to take much of the inflow of the Salton Sea and divert it to its service area for various uses. MWD supplemented its application in June 2004 and reiterated that it continues to seek the inflows for diversion, although it recognizes that the amount of the inflows may be reduced due to various conservation measures described in the QSA.

If an appropriate Salton Sea restoration plan is not implemented, a substantial portion of the inflow may be diverted permanently from the Salton Sea area such that no restoration would be possible. The resulting reduction in inflows would be severe, ranging from approximately 400,000 to 450,000 acre feet per year, with net inflows to the Salton Sea being reduced to as low as 468,000 acre feet per year (assuming diversions comparable to that contemplated under the QSA).

Over time, those smaller inflows will result in a reduction in the surface area of the Sea. This reduction could expose previously inundated sediments. The reduced water volume in the Salton Sea will also result in a corresponding increase in salinity. Without affirmative restoration activities, a number of adverse environmental consequences would result, such as a reduction of the Sea's important habitat values for the Pacific Flyway, increased air pollution, and decreased aesthetics values.

Any restoration plan must solve both of the key problems faced by the Salton Sea, water quality and water quantity. Over the years, a number of options have been explored for addressing these concerns. In 1998, the Salton Sea Authority, in a joint lead with the federal Bureau of Reclamation, initiated an environmental review of a number of alternatives to address the problems that existed at the time. These alternatives primarily focused on "whole-sea" restoration approaches such as the conveyance of water to and/or from the ocean to address the elevation and salinity problems, various evaporation options to facilitate the removal of salt, and desalination options using vertical tube evaporation technology. This effort, however, was not completed, primarily due to critical problems identified with all of the alternatives being evaluated, such as excessive costs or environmental impacts.

In April 2004, the Salton Sea Authority (SSA) evaluated four "reasonable" restoration alternatives: (1) no marine lake; (2) south marine lake without elevation control; (3) south marine lake with elevation control, and (4) north marine lake with elevation control. The SSA ultimately concluded that the North Lake concept, combined with other features, was its preferred project.

After much discussion between DWR and the interested parties, four alternatives, two of which draw upon the work completed by the Salton Sea Authority in 2004, gained promi-

nence as a reasonable range for the alternatives evaluation: (1) the "Low Sea" alternative, which allows the sea level to drop and involves the construction of a relatively small brine pond, (2) the "Shore Lake" alternative, which involves the creation of a relatively deep short lake along the entire perimeter of the current sea, separated from a dry area and brine pond in the interior by a dike (similar to the SSA's In-Sea Solar Evaporation Pond alternative, but with a different configuration), (3) the "North Lake" alternative (the SSA's "North Lake with elevation control" alternative) which separates the sea with a relatively high dam and allows the southern portion of the lake to largely dry out, except for a brine pond, and (4) the "South Lake" alternative (the SSA's "South Lake with elevation control" alternative) which is similar to the North Lake alternative with the dry areas and brine pond to the north.

The Salton Sea Reclamation Act of 1998 formulates the goals of the restoration as follows: continue to use the Sea as a reservoir for irrigation drainage; reduce and stabilize the overall salinity of the Sea; stabilize surface elevation of the Sea; reclaim, in the long-term, healthy fish and wildlife resources and their habitats; and enhance the potential for recreational uses and economic development of the Sea.

The 2000 Draft EIS/EIR on restoration of the Salton Sea prepared by USER and the Salton Sea Authority revised the fourth of these objectives as follows: provide a safe, productive environment at the Sea for resident and migratory birds and endangered species.

The state QSA implementing legislation requires that the preferred alternative provide, to the maximum extent feasible, for attainment of three key objectives, which further refine the habitat objective and add an objective relating to the air quality impacts: restoration of long-term stable aquatic and shoreline habitat for the historic levels and diversity of fish and wildlife that depend on the Salton Sea; elimination of air quality impacts from the restoration projects; and protection of water quality.

Additionally, in order to be successful, the project will need to be economically viable, implying the following objective: plan, construct, develop and operate the restoration project within the practical economic constraints of available funding sources and maximizing economic benefits.

As with these economic factors, in order to be successful the project must be one that can receive all required permits and other entitlements, satisfying the following objectives: qualify the project as the Least Environmentally Damaging Alternative under the Clean Water Act 404(b) (1) guidelines; ensure that the project avoids jeopardy to endangered or threatened species, or the adverse modification of designated critical habitat, and otherwise meets USFWS permitting requirements; comply with Clean Air Act general conformity requirements; and fully comply with all other regulatory programs.

A number of other practical factors also need to be addressed in the selection and implementation of an alternative: 1) ensure timely achievement of project benefits; 2) maximize collateral benefits of the project, particularly the provision of effective water storage capacity that can assist in the management of fluctuating Colorado River flows, and conveyance of water from the IID inflows to other potential users; 3) allow for flexibility of design and construction, in particular to adjust to the actual pattern of water transfers over the coming decades; 5) minimize seismic risks; 6) maximize public acceptance; and 7) maximize the active participation of the local residents in the construction of the project.

The following U.S. Patents are possibly related to lake restoration and are each incorporated herein by reference.

TABLE

PAT. NO.	TITLE	ISSUE DATE
5,807,030	Stabilizing Elements for Mechanically Stabilized Earthen Structure	Sep. 15, 1998
5,902,070	Geotextile Container and Method of Producing Same	May 11, 1999
6,623,214	Modification of Geotextile Tubes	Sep. 23, 2003
6,626,611	Beach Restoration and Regeneration Systems, Methods and Compositions	Sep. 30, 2003
6,726,406	In Situ Formation of Reactive Barriers for Pollution Control	Apr. 27, 2004
6,773,595	Compartmentalized Facultative Lagoon and Method of Creating and Maintaining Such a Lagoon	Aug. 10, 2004

BRIEF SUMMARY OF THE INVENTION

The method of the present invention provides a series of concentric dikes that can be formed through the installation of geotubes, which are used to create "cascade" levels or terraces of wetlands, ponds and marine lakes.

The method of the present invention optionally provides a wide variation of wetlands, ponds and marine lakes, from deep to shallow and from nearly fresh to ocean salinity. The range of habitats meet the needs of eco-tourism, water recreation and fishing while decreasing salinity, protecting the environment and protecting farmland which depends on conditions created by the sea.

The flexible design of the present invention allows to adjust the remaining total wet surface to the actual remaining inflows, hence to the actual transfers. In view of all uncertainties around the transfers, the flexibility of the design is essential.

The main construction consists of many hundreds of miles of small low head dikes which is attractive in view of safety (compare to high head dams in seismic areas). Also the type of dike construction (e.g. geotube) will enhance safety. Repetition of elements facilitates optimization and efficiency during the phased implementation.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

For a further understanding of the nature, objects, and advantages of the present invention, reference should be had to the following detailed description, read in conjunction with the following drawings, wherein like reference numerals denote like elements and wherein:

FIG. **1** is a plan view illustrating the preferred embodiment of the restoration method of the present invention;

FIG. **2** is a sectional view illustrating the restoration method of the present invention;

FIG. **3** is a perspective view illustrating the restoration method of the present invention;

FIG. **4** is a fragmentary schematic plan view showing the use of flow controls in the dikes;

FIG. **5** is a sectional view illustrating the restoration method of the present invention;

FIG. **6** is a sectional view illustrating the restoration method of the present invention; and

FIG. **7** is a sectional view illustrating the restoration method of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

In FIGS. **1-2**, a saline lake **10** is shown that has a shoreline **11**. However, it should be understood that FIG. **1** is illustrative and not to scale. The saline lake **10** can be a lake that receives inflow from one or more influent streams **12**, **13**, **14**. The method and apparatus of the present invention can be used to restore an existing saline lake such as the Salton Sea located in Southern California. In FIG. **1**, each influent steams **12**, **13**, **14** is provided with an arrow **15**, **16**, **17** respectively that indicates the direction of flow.

The influent streams **12**, **13**, **14** can be existing rivers. A lake that is receiving an influent stream, influent streams, or an influent flow containing salt can increase in salinity. This problem is compounded if the lake does not have an outflow as is the case with the Salton Sea. If there is no outflow, as water flows from the influent streams **12**, **13**, **14** into the lake **10**, the only way for the water to escape from the lake **10** is by evaporation. Evaporation results in a concentration of salt within the sea **10** raising levels of salinity. Increased salinity can threaten the ecosystem if those levels become too high for the animals and plants of the lake ecosystem. In the case of the Salton Sea, there are other (human) demands for water that flows in the influent streams **12**, **13**, **14**, possibly diverting all or part of that water. Water districts want the influent water or streams **12**, **13**, **14** for city use near the Salton Sea.

The method of the present invention solves the problem of restoring the lake **10** by creating a number of smaller lakes or smaller lake sections **22**, **23**, **24**, **25**. Each lake section **22**, **23**, **24**, **25** is capable of having a different level of salinity. Each is capable of functioning as a separate ecosystem for sustaining plant and animal life based on the salinity of the particular smaller lake section **22**, **23**, **24** or **25**.

In accordance with the method of the present invention, the saline lake **10** is divided into a number of smaller lake sections **22**, **23**, **24**, **25** using a plurality of levees or dikes. These dikes **18**, **19**, **20**, **21** are preferably concentrically placed. These levees or dikes include preferably an outer dike **18**, first inner dike **19**, second inner dike **20** and third inner dike **21**. It is possible to perform the method and apparatus of the present invention using more or fewer levees/dikes. At the central portion of the saline lake **10** (inside levee or dike **21**), there is provided one or more breathing brine areas **26**, **27**.

In FIGS. **2-4**, schematic illustrations show more particularly the construction detail for the plurality of dikes or levees **18**, **19**, **20**, **21** and the relative elevations of the dikes **18**, **19**, **20**, **21** and the smaller lake sections **22**, **23**, **24**, **25**. In FIGS. **1-2**, the saline lake **10** has a shoreline **11** that basically defines the periphery of the lake **10**. As part of the method of the present invention and as illustrated in FIGS. **2-3**, a first, smaller outer lake section **22** is formed in between shoreline **11** and a first dike or levee **18**. In FIG. **3**, this method is illustrated using a suction dredge **61**. The dredge **61** initially places geotextile tube **47** and fills it with available fill or sediment or other material that is available to the dredge **61**.

In FIG. **2**, the first smaller lake section **22** that is formed provides an outermost smaller lake section **22** that surrounds the remaining smaller lake sections **23-25** and a central breathing brine pond area or areas **26**, **27**. An interconnecting canal **69** can be used to enhance transmission of highly saline water between the ponds **26**, **27**. A siphon or siphons **70** can be used to transfer fluid between any river **12**, **13**, **14** and any selected lake **22**, **23**, **24**, **25** or pond **26**, **27**. As an example, siphon **70** enables water flow between lake **22** and the area **71** inside levee **21**. A siphon **70** can be used to connect areas preferably near the inflow (**12**, **13** or **14**) with relatively fresh water to the dry areas **71** around the brine areas **26**, **27** to facilitate irrigation (e.g. in view of dust control). Navigation locks **72** enable navigation between the lakes **22**, **23**, **24**, **25**. In between two lakes (e.g. **22**, **23**) with different water levels there should be at least one lock **72** to facilitate navigation. Thus, there would be provided at least three locks **72** needed to connect the four lakes **22**, **23**, **24**, **25**.

In FIG. **2** dimension "A" designated by the numeral **28** illustrates the distance that is spanned by the plurality of smaller lake sections **22**, **23**, **24**, **25**. In viewing FIG. **1**, it can be seen that this dimension "A" **28** will vary and can be determined by contour lines. The crest elevation of each dike or levee **18**, **19**, **20**, **21** will preferably be at a constant elevation for each particular dike or levee **18**, **19**, **20**, **21**.

In FIG. **2**, the outer dike **18** has a crest elevation **29** that can, for example, be −228 feet. This would be an elevation that would maintain a water surface elevation **33** of the outer, smaller lake section **22** of preferably about −230 feet, as an example.

Dike or levee **19** has a crest elevation **30** (e.g. −240) for maintaining a second smaller lake section **23** with a water surface elevation **34** of, for example, −242 feet. Dike or levee **20** provides a crest elevation **31** (e.g. −250 feet) for maintaining a third smaller lake section **24** having a water surface elevation **35** of, for example, −252 feet. Finally, dike or levee **32** has a crest elevation **30** of, for example, −260 feet for maintaining a fourth smaller lake section **25** with a water surface elevation **36** that can be about −262 feet, for example.

The breathing brine areas **26**, **27** have a brine area elevation **37** that is below the elevation of crest **30** of levee **32** such as, for example, about −270 feet. These elevations are merely exemplary, and are not deemed to limit the scope of the present invention.

FIGS. **5**, **6** and **7** show details of construction that can be used for the dikes or levees **18**, **19**, **20**, **21**. In FIG. **6**, a geotextile tube **38** can be filled with fill material **44** that is made available for suction dredge **61**. Fill material **44** can be pumped into geotextile tube **38**. After being filled with material **44**, the tube **38** can then be surrounded with additional fill material **39** to provide the dike or levee shape that is shown in FIG. **5**. For example, in FIG. **5**, the dike or levee **19** provides a crest **40**, upstream face **41**, and downstream face **42**. The main construction consists of many hundreds of miles of small low head dikes which is attractive in view of safety (compare to high head dams in seismic areas). Also the type of dike construction (e.g. geotube **47**) will enhance safety. Repetition of elements facilitates optimization and efficiency during the phased implementation.

In FIG. **6**, the dike or levee **18** represents the outermost dike or levee that would face homes, parks or the like that are located near the shoreline **11**. A beach fill material **46** can be applied at the upstream face **45** as shown in FIG. **6**. In FIG. **6**, a geotextile tube **47** is filled with pumped fill material **48** that can be pumped into the tube **47** using suction dredge **61**. The geotextile tube **47** can be surrounded with fill material **49** to provide a desired shape for the dike or levee **18**, providing a crest **51**, downstream face **50** and upstream face **45**. The levee **18** separates smaller lake section **22** from smaller lake section **23**.

FIG. **7** shows a spillway section **52** that could be provided to any one of or all of the dikes or levees **18**, **19**, **20**, **21**. The spillway section **52** has an upstream face **53**, downstream face **54**, and a concrete layer **55** that can be applied to the downstream face **54**. Geotextile tube **56** is filled with pumped fill material **57** using suction dredge **61**. Additional fill material

58 is placed around the filled geotextile tube 56 to provide a dike or levee shape having upstream face 53, crest 59, and downstream face 54. Arrows 60 in FIG. 8 indicates schematically the flow of water over spillway section 52 as an emergency flow controller in the event of heavy rain or like weather that increases dramatically the influent flow from influent sources such as streams 12, 13, 14 to lake 10.

Flow controllers 68 can be used to control the flow from one smaller lake section 22 to the following, downstream lake sections 23 or 24 or 25. A siphon 70 can be used to control the flow between the innermost smaller lake section 25 and the breathing brine areas 26, 27. Flow controllers 68 are schematically shown in FIG. 5 and can include any number of known flow controllers such as weirs, siphons, valves, pumping stations, lift stations, or the like.

The present invention thus provides a method of restoring a saline lake 10 by dividing the lake 10 into smaller lake sections 22, 23, 24, 25. Because the influent streams 12, 13, 14 flow first into an outer smaller lake section 22, flow control devices 68 allow water to flow to the next lake section 23 when the influent streams 12, 13, 14 have elevated the surface 33 of lake section 22 to a selected first elevation.

Water flows from the lake section 22 to the lake section 23. Similarly, the elevation 34 of lake section 23 is set using a weir or other flow controller 68. In this fashion, levees 18, 19, 20, 21 and flow controllers 68 such as weirs, or the like can be used to create a cascade effect wherein the elevations of the lake sections 22, 23, 24, 25 gradually decrease from the outermost lake section 22 to the innermost lake section 25. The flow controllers 68 are positioned to prevent short circuiting of flow (see arrows 43 in FIGS. 1 and 4). The breathing brine areas 26, 27 would have an elevation 37 that is lower than the elevation 36 or the innermost lake section 25. The dikes or levees 18, 19, 20, 21 as shown and described form the smaller lake sections 22, 23, 24, 25.

By maintaining selected water surface elevations 33, 34, 35, 36 for the lake sections 22, 23, 24, 25 the salinity gradually increases as water flows from the influent streams 12, 13, 14 to the outer smaller lake section 22, to the next lake section 23, then to the other lake sections 24, 25 in sequence and finally to the breathing brine areas 26, 27. The relatively fresh inflowing waters (12, 13, 14) will flow through the chain of lakes 22, 23, 24, 25. In each lake 22, 23, 24, 25 some water disappears by evaporation so for each lake it holds that the salinity of the outflow is higher than the salinity of the inflow. (This has nothing to do with evaporation time). At the end of this chain the salt waters will enter the brine ponds 26, 27. With the high laying inflow and low laying brine the flow through the lakes is under gravity (each downstream lake lies a little bit lower than the upstream one).

This system of a plurality of dikes 18, 19, 20, 21 and smaller lake sections 22, 23, 24, 25 ensures that each lake section 22, 23, 24, 25 can have a distinct ecosystem that is defined by the salinity of water contained. Similarly, the crest of each dike or levee 18, 19, 20, 21 can provide a land mass area that can grow vegetation that is compatible with the salinity level of the adjacent lake sections.

Each of the lake sections 22, 23, 24, 25 can be sized to support selected fisheries and marine life, or for certain water sport use (e.g. boating, sailing).

The following is a list of parts and materials suitable for use in the present invention.

PARTS LIST

Part Number	Description
10	saline lake
11	shoreline
12	influent stream
13	influent stream
14	influent stream
15	arrow
16	arrow
17	arrow
18	outer dike
19	first inner dike
20	second inner dike
21	third inner dike
22	smaller lake section
23	smaller lake section
24	smaller lake section
25	smaller lake section
26	breathing brine area
27	breathing brine area
28	dimension A
29	crest elevation
30	crest elevation
31	crest elevation
32	crest elevation
33	water surface elevation
34	water surface elevation
35	water surface elevation
36	water surface elevation
37	brine area elevation
38	geotextile tube
39	fill material
40	crest
41	upstream face
42	downstream face
43	arrow
44	pumped fill material
45	upstream face
46	beach fill material
47	geotextile tube
48	pumped fill material
49	fill material
50	downstream face
51	crest
52	spillway section
53	upstream face
54	downstream face
55	concrete layer
56	geotextile tube
57	pumped fill material
58	fill material
59	crest
60	arrow
61	suction dredge
62	arrow
63	suction line
64	discharge line
65	boom
66	arrow
67	fitting
68	flow controller
69	canal
70	siphon
71	area
72	navigation lock

All measurements disclosed herein are at standard temperature and pressure, at sea level on Earth, unless indicated otherwise. All materials used or intended to be used in a human being are biocompatible, unless indicated otherwise.

The foregoing embodiments are presented by way of example only; the scope of the present invention is to be limited only by the following claims.

The invention claimed is:

1. A method of restoration of a highly saline lake having a periphery, a water bottom, and an influent water source that enables water to be added to the lake, comprising the steps of:

a) forming a series of dikes that separate the highly saline lake into a plurality of smaller lakes, each having a water surface, the lakes including an outer lake that is next to the periphery and one or more inner lakes, each dike and each lake water surface having an elevation;

b) flowing water from the influent source to the outer lake;

c) flowing water from the outer lake to the inner lakes;

d) providing a breathing brine area that is surrounded by the smaller lakes;

e) flowing water from the inner lakes to the breathing brine area;

f) cascading water in steps "c" through "e" from one lake to another lake with simultaneous drops in elevation beginning at the outer lake, then to the inner lakes and then to the brathing brine area; and

g) gradually increasing the salinity of the water that flows in steps "c" through "f".

2. The method of claim 1 wherein the outer lake has a lower salinity level than the salinity of any of the inner lakes.

3. The method of claim 1 wherein there are at least two inner lakes.

4. The method of claim 1 wherein there are at least three inner lakes.

5. The method of claim 1 further comprising providing the breathing brine area at a position that is surrounded by all of the inner lakes.

6. The method of claim 5 further comprising maintaining in the breathing brine area some dry land.

7. The method of claim 5 further comprising maintaining in the breathing brine area a brine reservoir having some water with a high salinity that is higher than the salinity of at least one of the smaller lakes.

8. The method of claim 5 further comprising maintaining in the breathing brine area a brine reservoir having some water with a high salinity that is higher than the salinity of water in multiple of the smaller lakes.

9. The method of claim 1 wherein each dike has an upper average elevation, and the dikes have differing respective upper elevations.

10. The method of claim 9 wherein each dike that surrounds another dike has a greater upper average elevation than the dike it surrounds.

11. The method of claim 1 wherein the dikes are concentric.

12. The method of claim 11 wherein the smaller lakes have a total water volume that is about half the volume of the saline lake.

13. The method of claim 1 wherein the smaller lakes are concentric lakes.

14. A method of restoration of a saline lake having a periphery, a water bottom, and an influent water source that enables water to be added to the lake, comprising the steps of:

a) forming a series of dikes that separate the saline lake into a plurality of smaller lakes, each with a water surface, the lakes including an outer lake that is next to the periphery and one or more inner lakes, each dike and each lake water surface having an elevation;

b) enabling a water flow path that sequentially transmits water from the influent water source to the outer lake, to the inner lakes and then to a breathing brine area;

c) allowing salt to concentrate at the breathing brine area as water evaporates from the breathing brine area;

d) enabling water to at times accumulate in the breathing brine area, said water flowing to the breathing brine area at least in part from an inner lake;

e) concentrating the saline content of the water in steps "b" through "d" in greater concentrations as the water flows from the outer lake to the inner lake; and

f) cascading water in steps "c" through "e" from one lake to another lake with simultaneous drops in elevation from the outer lake to the inner lake to the breathing brine area.

15. The method of claim 14 wherein there are at least two inner lakes.

16. The method of claim 14 wherein there are at least three inner lakes.

17. The method of claim 14 further comprising providing the breathing brine area at a position that is surrounded by all of the inner lakes.

18. The method of claim 14 further comprising maintaining in the breathing brine area some dry land.

19. The method of claim 14 further comprising maintaining in the breathing brine area a brine reservoir having some water with a high salinity that is higher than the salinity of one of the smaller lakes.

20. The method of claim 14 further comprising maintaining in the breathing brine area a brine reservoir having some water with a high salinity that is higher than the salinity of water in multiple of the smaller lakes.

21. The method of claim 14 wherein each dike has an upper average elevation, and the dikes have differing respective upper elevations.

22. The method of claim 14 wherein each dike that surrounds another dike has a greater upper average elevations.

23. The method of claim 14 wherein the dikes are concentric.

24. The method of claim 14 wherein the smaller lakes are concentric lakes.

25. The method of claim 14 wherein the smaller lakes have a total water volume that is about half the volume of the saline lake.

26. A method of restoring a lake that has an influent flow stream of a first volume and an effluent flow stream that is smaller than the first volume so that the salinity of the lake is increasing over time, comprising the steps of:

a) dividing the lake into a plurality of lake sections using dikes as dividers;

b) providing a water flow course from a first lake section to a second lake section;

c) wherein in step "b", the water cascades from higher to lower elevations;

d) after step "b", transmitting water from the second lake section to a breathing brine section wherein water evaporates, leaving brine in the brine section; and

e) wherein the salinity of water flowing in steps "b" through "d" gradually increases in salinity.

27. The method of claim 26 wherein there are at least two inner lakes.

28. The method of claim 26 wherein there are at least three inner lakes.

29. The method of claim 26 further comprising providing the breathing brine area at a position that is surrounded by all of the inner lakes.

30. The method of claim 26 further comprising maintaining in the breathing brine area some dry land.

31. The method of claim 26 further comprising maintaining in the breathing brine area a brine reservoir having some water with a high salinity that is higher than the salinity of at least one of the smaller lakes.

32. The method of claim 26 wherein each dike has an upper average elevation, and the dikes have differing respective upper elevations.

33. The method of claim 26 wherein each dike that surrounds another dike has a greater upper average elevation than the dike it surrounds.

34. The method of claim 26 wherein the dikes are concentric.

35. The method of claim 26 wherein the smaller lakes have a total water volume that is about half the volume of the saline lake.

36. A method of restoration of a highly saline lake having a periphery, a water bottom, and an influent water source that enables water to be added to the lake, comprising the steps of:

a) forming a series of dikes that separate the highly saline lake into a plurality of smaller lakes, each having a water surface, the lakes including an outer lake that is next to the periphery and one or more inner lakes, each dike and each lake water surface having an elevation;

b) flowing water from the influent source to the outer lake;

c) flowing water from the outer lake to the inner lakes;

d) providing a breathing brine area that is surrounded by the smaller lakes;

e) flowing water from the inner lakes to the breathing brine area;

f) cascading water in steps "c" through "e" from one lake to another lake of higher elevation with drops in elevation beginning at the outer lake, then to the inner lakes having a median elevation lower than the outer lake higher elevation and then to the brathing brine area having a lower elevation that is lower than the median elevation; and

g) gradually increasing the salinity of the water that flows in steps "c" through "f".

37. The method of claim 36 wherein the outer lake has a lower salinity level than the salinity of any of the inner lakes.

38. The method of claim 36 wherein there are at least two inner lakes.

39. The method of claim 36 wherein there are at least three inner lakes.

40. The method of claim 36 further comprising providing the breathing brine area at a position that is surrounded by all of the inner lakes.

41. The method of claim 36 further comprising maintaining in the breathing brine area some dry land.

42. The method of claim 36 further comprising maintaining in the breathing brine area a brine reservoir having some water with a high salinity that is higher than the salinity of at least one of the smaller lakes.

43. The method of claim 36 further comprising maintaining in the breathing brine area a brine reservoir having some water with a high salinity that is higher than the salinity of water in multiple of the smaller lakes.

44. The method of claim 36 wherein each dike has an upper average elevation, and the dikes have differing respective upper elevations.

45. The method of claim 44 wherein each dike that surrounds another dike has a greater upper average elevation than the dike it surrounds.

46. The method of claim 36 wherein the dikes are concentric.

47. The method of claim 46 wherein the smaller lakes have a total water volume that is about half the volume of the saline lake.

48. The method of claim 36 wherein the smaller lakes are concentric lakes.

* * * * *

MWD
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Office of the General Counsel

February 8, 2005

Patrick J. Maloney
Law Offices of Patrick J. Maloney
2425 Webb Ave., Suite 100
Alameda, CA 94501

Dear Mr. Maloney:

Thank you for your February 1, 2005 letter regarding a "Non-admissibility Agreement" for Salton Sea Restoration discussions between Metropolitan Water District of Southern California (Metropolitan) and your clients. I have passed on your suggestion to Jeff Kightlinger, as per your request.

Metropolitan is participating in, and supports, the Salton Sea Restoration process now underway. Metropolitan believes that the best way to proceed with that Salton Sea Restoration process is with public disclosure and transparency rather than through confidential discussions among a few parties. Consequently, Metropolitan does not believe it is appropriate to enter into a "Non-admissibility Agreement" with your clients at this time.

Sincerely,

Linus Masouredisser

Linus Masouredis
Deputy General Counsel

cc: Jeff Kightlinger, General Counsel

S:\ InMas\2-8-05 Letter to Patrick Maloney.doc

LAW OFFICES OF
PATRICK J. MALONEY

2425 WEBB AVENUE, SUITE 100
ALAMEDA ISLAND, CALIFORNIA 94501-2922

PATRICK J. "MIKE" MALONEY (510) 521-4575 THOMAS S. VIRSIK
FAX (510) 521-4623
e-mail: PJMLAW@pacbell.net

Via email to Clerk of the Board commentletters@waterboards.ca.gov
June 28, 2014

State Water Resources Control Board
1001 I Street
Sacramento, CA 95812
Attention: Clerk of the Board

Re: Agenda Item 5 – Emergency Regulations
SWRCB BOARD MEETING/HEARING
Tuesday, July 1, 2014 – 9:00 a.m.
Wednesday, July 2, 2014 – 9:00 a.m.

Dear Clerk:

The Law Office of Patrick J. Maloney (the Law Firm) is providing the within public comments on the proposed Emergency Regulations (Regulations or Regs) being considered by the State Water Resources Control Board (SWRCB or the Board). Please note that the comments are not filed on behalf of any specific current, past, or potential client nor is this letter intended to request relief with respect to any pending or past matter. While the below comments refer to actual proceedings, persons, policy, documents, and contents of public files, the references are used for illustration and policy discussion purposes only. The examples have been selected in part because (1) the Law Firm is intimately familiar with the matters and (2) they do not relate to the basins presently subject to curtailment.

Statement of Support

Broadly speaking, the Law Firm supports the policy behind the Regulations. The Law Firm was one of a set of voices over a decade ago that advocated for a rational and comprehensive modification of the California water rights system based on reasonable use, erasing legal distinctions not based in verifiable science (such as treating ground and surface water separately), utilizing contemporary technology to strategically approach water management, greater emphasis on the Statements of Water Diversions, and market dynamics. The Regulations – and general direction of this Board in the recent past -- are broadly consistent with the

approaches the Law Firm advocated in 2002. It remains important to have a definable water entitlement subject to drought impacts to support the stability of property ownership across California. The advocacy in 2002 was based on well-reasoned existing authority rather than any unique insights, which authority remains authoritative today. See Light v. State Water Resources Control Board, 2014 WL 2724856 (Cal.App. 1st, June 16, 2014), relying on In re Waters of Long Valley Creek Stream System (1979) 25 Cal.3d 339 and People ex rel. State Water Resources Control Bd. v. Forni (1976) 54 Cal.App.3d 743.

Cautionary Note on a Lack of a Clean Slate

The Regulations are based on certain implicit assumptions. First, the Regs assume that the eWRIMS system is accurate and reliable and thus can be used as a primary tool for calculation and notice purposes. Reg § 875(c)(1) and (2); (d). Another assumption is that prior Board policy was consistent with current Board policy, thus all filers and water rights participants are on a level playing field. Neither assumption is entirely accurate. The Board is not starting from a clean slate and should be aware that the present array of filings and information under its control arises from varying circumstances and at times was highly influenced by policies antithetical to the current policies underling the Regulations. Our suggestion is to craft a regulation that recognizes and provides a means to correct past Board anomalies instead of relying on the present unique means of seeking reconsideration at the Board level when a past application of (now contradictory) policy or some other error not the responsibility of the water user/diverter creates prejudice during a curtailment event. Reg. 875(f) (curtailment orders subject to reconsideration at Board level pursuant to petition process).

Regulations Explain Critical Role of Priority and Role of Statements of Water Diversion

The record in support of the Regulation contains an explanation of the current law of and Board policy about the Water Rights system, including an explanation of the role and processing of the Statements of Water Diversion. Digest, pages 5 et seq. These explanations include a discussion of how senior appropriative water rights may trump junior ones and thus more senior water rights holders are more likely to receive water in times of shortage. Page 6. Such statements are black letter law and presumably uncontroversial on their face. A key resource used to track such senior rights are the Statements of Water Diversion that are to be filed by the vast majority of users/diverters. Page 11. The Law Firm has assisted clients in filing 100's of such Statements. In the past there existed Board policy hurdles to some of the filings as well as unexplained delays that may prejudice filers in the absence of a method to formally work through such anomalies ahead of (or parallel to) any curtailment orders or processes.

Examples From Two Non-curtailed Areas

To concretely illustrate several of the potentially prejudicial past dynamics in the filing system and why the Regs need a method to address past practices, the Law Firm will point to two separate Statement filing anomalies, one relating to the Salinas Valley and the other to the Imperial Valley.

With respect to the Salinas Valley, the Law Firm submitted 100's of Statements for diverters starting in the late 1990's. The Law Firm has continued to update some, while in other instances (former) clients chose to take over that responsibility. But for reasons unknown to the Law Firm, a small but not inconsequential array of submitted Statements remained unfiled for years, with the most extreme for over a decade. Much correspondence (calls, etc.) was exchanged over the years to effect processing, with incomplete results. According to eWRIMS, the last of the early 2000's Statements were entered in the database and assigned numbers within the last year. Compare in eWRIMS, timely filing of S015562 with late filing of S022475 (both submitted March 2002, yet 10,000 Statement numbers apart). No explanation was provided or notice that the late filing had occurred, other than the annual supplemental filing demand (which triggered the eWRIMS inquiry and discovery of the recent filing). There is nothing suggesting that the very tardily processed Statements were unique, suspect, or anything other than routine (for the Salinas Valley). Given the peculiar timing, the burden is now on the filer of the timely filed but tardily processed Statement(s) to catch up on a decade of supplemental filings. Thankfully, there is no curtailment proceeding with respect to the Salinas Valley so a delay of even a decade need not prejudice the filers so long as adequate opportunity is allowed for supplemental filings to be added to the database and relate back to the original time periods. No prejudice appears at the moment for the subject Salinas Valley filings. But had the same situation occurred in one of the curtailed basins, the only remedy would be to petition for reconsideration of a curtailment order directed to the aggrieved filer and convince the Board of the inequity of imposing prejudice due to events out of the filer's hands. A simple administrative error or oversight can only be addressed by a formal petition to the Board, per the proposed Regs.

The second example comes from the Imperial Valley and is not on its face a function of error or unexplained delay, but Board policy. Statements of Water Diversion based principally on pre-1914 rights were submitted in 2006 and according to public documents, five years later they were all still sitting unprocessed in a staff office, awaiting an executive decision. See enclosed email. The final decision apparently was made in November 2012 to not process the Statements. See enclosed November 13, 2012 letter.[1] The policy on which the 2012 decision relies is contrary to the policy about water rights and the role of Statements of Water Diversion posted in support of the Regs. The policy of the Board has radically shifted between 2012 and now.

In 2012 the Board's policy with respect to Statements of Water Diversion included a comparison of the quantity of water being reported under various rights, rather than a comparison of the rights themselves. "The Division has received no information to document that the farmers divert water in excess of [the permit holder's] Permit 7643 at Imperial Dam." November 13, 2012 letter, first page. The current policy posted in support of the Regs, however, focuses on the priority of appropriative rights rather than the quantity of water, "As between appropriators,

[1] While there was litigation occurring on Imperial Valley water matters for over a decade and the permit holder asked the SWRCB to sanction the Law Firm for submitting the Statements, the written executive decision to reject all Imperial Valley Statements does not rely on or reference litigation or any litigation dynamic.

junior water rights holders may only divert when there is sufficient water to completely fulfill the needs of more senior appropriators." Digest, at page 6. The submitted Statements sought to protect the pre-1914 rights, rather than the permitted rights on which the permit holder already reports. Permit 7643. The Board has recognized that in the Imperial Valley, the permitted and pre-1914 rights exist side by side. WRO 2002-0013 (revised) at 3. By definition, the permit holder could only report on permit diversions, not pre-1914 ones. Nor did the permit holder choose to file Statements covering pre-1914 right diversions, which could have made the individual ones duplicative. Nevertheless, Board policy firmly rejected any and all Statements reporting on pre-1914 rights. The November 13, 2012 letter is based on prior policy that seemingly did not rely on the priority distinctions the present Reg background explains, where the priority of the right is key to how curtailment functions. Digest, at page 6.

Like the Salinas Valley example, had curtailment commenced in the Imperial Valley, the prior policy and rejection of the proffered Statements would have left the filers with nothing in eWRIMS showing their claim of use of pre-1914 rights so as to avoid curtailment of seemingly (and falsely) junior rights. Again, an aggrieved putative filer would have no option but to seek reconsideration based on the material shift in policy at the Board.

Other Policy Issues on Statements of Water Diversion

The Law Firm also supports the expansion of the use of Statements to report what is now known as groundwater, albeit such modifications may occur as part of the process presently in place on groundwater management. As part of any data collection process (via the Statements or otherwise), the State should no longer allow individual counties or water districts the right to determine the nature of the water right and especially what data is going to be made public. The Board has under prior policy deferred substantially to individual agencies about what water information that agency chooses to make public. For example, in 2000, the Board quashed subpoenas for certain water data in the hands of the Monterey County Water Resources Agency (MCWRA) because that local agency desired information be kept private. "The protestants have not demonstrated that their need for the personally identifiable information outweighs the need of the MCWRA to keep this information confidential." July 6, 2000 Order Quashing Subpoena, Application 30532, at fourth (unnumbered) page, a copy of which is enclosed. Public policy analysis, however, shows that reduced confidentially would result in net gains to the State. Letter and submission by Dr. Peter Reinelt, Chair, Department of Economics, SUNY Fredonia, February 26, 2014 (originally submitted for SWRCB Immediate Drought Response Options workshop), enclosed.

In addition, to the extent that the Board chooses to articulate current policy about Statements of Water Diversion in this era of curtailment, the Law Firm suggests that the Board articulate a liberal standard on the ground that more information is better than less or none at all. The Imperial Valley Statements rejected by the Board could have been available to provide greater and more detailed information about water use in that region, which could assist the Board if/when it is called to exercise its continuing jurisdiction over water dynamics in that region. WRO 2002-0013 (revised).

Thank you for allowing the Law Firm to provide comments on an important public matter with long-term strategic implications to the future of the State.

Sincerely,

Thomas S. Virsik

Thomas S. Virsik

Encl.
April 2, 2002 Summary of Position of Sax Report
November 12, 2012 letter re Imperial Valley Statements
September 28, 2011 email re Maloney documents
July 6, 2000 Order Quashing Subpoena, Application 30532
February 26, 2014 Letter and submission by Dr. Peter Reinelt, Chair, Department of Economics, SUNY Fredonia

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JOHN F. HANSON, JR.
OF COUNSEL

April 2, 2002

Paul Murphey
Division of Water Rights
SWRCB
Sacramento, California

Re: Workshop on Professor Sax's Report
SWRCB No. 0-076-300-0
April 10, 2002

Dear Mr. Murphey:

Professor Sax's Report is a significant document. The SWRCB should pay particular attention to Chapters V and VI. The solutions Professor Sax proposes in these two Chapters are important to water issues in the state and are particularly important to California's economy over the next fifty years. Our comments on the Report are divided into the following categories:

A. Background
B. Responses to the Questions Posed by the Board
C. People v. Forni
D. Indefinite Nature of California Water Rights
E. Existing Statutory structure

Background

Over the last thirty years lawyers in our Office have been involved in a number of different water issues in the State of California:

1>Developed the arguments and positions at the SWRCB on behalf of private clients which ultimately became People v. Forni.

2>Represented major landowners throughout California and Nevada.

3>Represented major financial institutions with concerns about their investments in California because of the water issue.

4>Co-Authored an article entitled "Restructuring America's Water Systems" published by the Reason Foundation. Neal, Kathy, Patrick J. Maloney, Jonas A. Marson and Tamer E. Francis, Restructuring America's Water Industry: Comparing Investor-Owned and Government-Owned Water Systems, Jan. 1996 (Reason Foundation, Policy Study No. 200). Many people see this article as an argument for privatization of the water delivery system in America. Morgan, Steven P. and Jeffrey I. Chapman, Issues Surrounding the Privatization of Public Water Service, Sept. 1996 (ACWA). The word "privatization" does not appear in the article. The article has received extensive criticism from organizations like ACWA, but the Reason Foundation article suggests public policy makers should rethink how water is distributed and managed in America and California in particular. The article has been purchased and studied by most significant water interests in the world including but not limited to financial institutions, water purveyors, engineering firms, and think tanks.

5>Developed the Instadjudicator. This is an interactive database that instantly determines a landowner's water rights or water entitlement in the Salinas Valley. The interactive database uses public source inputs such as chains of title, the APN system, assessor map overlays, County and State publicly available databases, defined engineering terms, the results of computer runs from the Salinas Valley Integrated Ground and Surface Water Model and other non-proprietary information. The utility of such a tool is to (1) quickly develop "what if" scenarios, and (2) to identify anomalous or skewed inputs or uses, e.g., identify by inferring from multiple sources that water use in a section of the analyzed area is substantially higher than the surrounding areas viz. unreasonable. We are not suggesting that the Instadjudicator is the only solution to the State's water issues but what is needed is a similar tool for all over-drafted (and ultimately all) basins so there can be a critical analysis of a Basin's water issues and "what if" scenarios can be quickly understood.

Engineers involved in the Mojave case have reviewed the operation of the Instajudicator and suggested its use would hasten the resolution of the Mojave case. The Instadjudicator was offered to the SWRCB with appropriate technical assistance for its use but the offer was rejected. At a contested hearing the

SWRCB refused to force the Monterey County Water Resources Agency to release data by which the instant adjudication of the Salinas Valley could be accomplished. Hearing on Motion to Quash Subpoenas, 6/28/00, Application 30532. A staff member of the SWRCB has suggested there are two problems with the Instadjudicator: A) The name and B) that this office developed it.

6>The office is currently working on an analysis of the leadership in the Water and Sewer industry with prominent People of Color. The purpose of this analysis is to compare the existing leadership of the water industry against the demographic make-up of the State now and forty years from now. The preliminary results of this research indicate that the California's water industry is not reflective of the ethnic demographic make-up of the State now or forty years from now.

Responses to the Questions Posed by the Board

Professor Sax proposes quantifiable criteria by which the water user could determine whether or not it is pumping percolating groundwater. The first problem with the proposed criteria is that they will involve more engineers arguing arcane hydrologic issues. These arcane hydrological issues are irrelevant if there is an unreasonable use of water. More importantly the percolating groundwater and underground surface water classification will change depending on what crop is used and how much water is being pumped in a given basin. What these criteria do is add further confusion rather than bring more definability to water usage in California. From time to time or place to place making the fine distinctions advanced by Professor Sax may be necessary, but only as a component of an overall solution-oriented water management system, not as the starting point. Making the management of California water more complex is not in the State's interest.

People v. Forni

Over thirty years ago adjudication was proposed for the Napa Valley and our vineyard clients decided adjudication would not solve the water problems caused by Frost Protection in the Napa Valley. The clients and their representatives instead worked closely with the staff of the SWRCB led by Ken Woodward, the former Chief of the Division of Water Rights, and the SWRCB to develop the principles which ultimately became People v. Forni. These principles and facts were presented in a highly contested hearing before the SWRCB. The arguments and the facts presented by our clients were the basis for the See decision and from

the See decision the SWRCB developed the regulation challenged in People v. Forni. People ex rel. SWRCB v. Forni (1976) 54 Cal.App.3rd 743; See Decision 1404. Our clients presented these positions because they felt the only way a system for Frost Protection could be developed was if all water sources in the water basin were considered and managed. Under the far-sighted leadership of Chairman Adams and Members Robie and Auer the SWRCB used its Sections 100 and 275 powers and brought stability to the region's water problems and allowed the Napa Valley to prosper. The lesson the SWRCB can learn from Forni is that once it develops a carefully reasoned engineering position it should take an active role in solving a region's water problem before the problem becomes a crisis.

For the last five years another set of clients have advocated a similar solution, the application of Sections 100 and 275 powers to the Salinas Valley's salt water intrusion and nitrate problems and the SWRCB has repeatedly rejected our clients' pleas. The current Chief of the Division of Water Rights has opposed the use of Sections 100 and 275 powers by the SWRCB because "initiating an unreasonable use proceeding would be viewed by the local agency as a 'blind-side' attack, and would probably be considered a back-door adjudication by the agricultural community. Nevertheless, if other efforts fail, this type of action would be preferred over an adjudication because the SWRCB could address administratively rather that in a judicial proceeding in superior court." (Confidential) Memorandum from Harry Schueller on Salinas Valley, June 16, 2000, page 8. The SWRCB's inaction has put in jeopardy the water supply of a major city in California and will likely cost the taxpayers (State and/or local) tens or hundreds of millions of dollars that could have been avoided by forcing a certain limited segment of the agricultural community to use water reasonably in the first place. The SWRCB has the power to solve water problems in this State and most of the issues raised in Professor Sax's Report. It must use the power and not worry about offending local water agencies or limited segments of the agricultural community.

Indefinite Nature of California Water Rights

No one really knows who has water rights in California. All water licenses are subject to vested rights. What those vested rights are is anybody's guess. Probably the most interesting statement made in Professor Sax's Report is found in footnote 122 wherein he cites In re Waters of Long Valley for the proposition that there is no such thing as unexercised riparian water rights in California. Long Valley probably does not say that, but the point is there is no water right in

California if the actual or contemplated water use is unreasonable. The Sax Report is full of references to cases by various California courts over the last century, which apply the reasonableness test to solve a water problem. There are no absolute water rights. A water right disappears in California when the needs of the community demand it.

The most disturbing problem we have in California water issues is that the SWRCB cannot figure out what its position is on most issues and the underflow issue is just a manifestation of the problem. We have staff letters of the SWRCB and Licenses telling the public that certain water rights exist yet frequently in public hearings of all types we have representatives of the SWRCB or other agencies of the State denying the validity of SWRCB's earlier positions. The SWRCB looks like a fool. To the outside world the State of California looks like a fool. In earlier times California could do whatever it pleased. Now, however, we have few major banks or financial institutions left in California and in order to maintain financing for our homes, agriculture and industries we must bring some order and discipline to the State's water system. We have to have more definability in our water system. We cannot reject definability merely because it upsets the sensitivities of certain water agencies or members of the agricultural community. The magic of People v. Forni and other things done in the Napa Valley to define water rights and optimize the region's water resources brought confidence to the investing and lending institutions and helped spur the development of California's wine industry.

Existing Statutory Structure and Actions of the SWRCB

Professor Sax's Report fails to recognize how much the Legislature and the SWRCB has actually done to solve the State's water problem. We direct the SWRCB's attention to Water Code Sections 5100 et seq. and 1010 et seq. and the forms prepared by the SWRCB. STATEMENT (1-00) and ST-SUPPL (2-01). No one knows exactly how to fill out the forms because of the SWRCB's inability to define underflow and consumptive use but at least there is a form. SWRCB has expanded the Section 5100 form dramatically in recent years without legislative approval. The forms should be expanded administratively to require water users to report all types of water sources and use. If the SWRCB does this administratively, there will be no need for the legislative action feared by Professor Sax. Once the forms are filed the data should be put into the existing publicly accessible SWRCB databases defined by USGS basin lines. Then Computer tools

should be developed for each water basin such as an "integrated groundwater and surface water model" throughout the State by which anyone could easily ascertain a reasonable use of water for a given basin.

Such a system would encourage conservation and the orderly transfer of water. Either the SWRCB or somebody else could then stop anybody who is unreasonably using water pursuant to Water Code Sections 100 and 275. Anybody who is using less than a reasonable amount water could transfer water to somebody who has a need for the conserved water. Then the State's water argument will be over reasonable use of water in any given basin not over the application of unclear laws to disputed hydrological facts.

Ultimately if the expanded Section 5100 form is not filled out and filed by a water user, the Legislature could develop legislation establishing a presumption the water user forfeits whatever water rights it has unless the water user can demonstrate good cause for not filing the form. Notwithstanding much of the uncertainty about the present filing system, this office has been active in filing reports for its various clients, relying on various public sources to explain and detail positions where the SWRCB has not provided clarity. This office understands the system to be akin to recording ownership of real property. In other words, if a water user declines to follow the statute and does not file, its claim will be entitled to less weight than any competing claim of a water user who followed procedures and filed reports – similar to that of a property owner who takes title but does not record it. Water users also file Statements with the expectation that this State database will be used by EIR preparers to catalogue and analyze water rights for a given project. Save Our Peninsula Committee v. Monterey County Board of Supervisors (2001) 87 Cal.App.4th 99, 122; Petition for Extension of Time for Permit 5882 (Application 10216) (1999).

California's computer industry deals with much more complex than the State's water issues. The SWRCB should rely on this industry for solutions. The SWRCB's existing data system on water rights should be modified to make all pumping data publicly available and a system of inquiry developed so the public can ascertain a reasonable water use standard for each basin.

Conclusion

The Sax Report offers important statutory history. The SWRCB should carefully consider the Report's generalized recommendations and develop an action plan to pursue the goal of a more defined system of water rights. This will ultimately lead to an overall solution-oriented water management system.

Very truly yours,

Patrick J. Maloney

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

State Water Resources Control Board

NOV 13 2012

In Reply Refer
To:KDM:A~~007482~~ incorrect
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Maloney/IID Statement

Mr. Thomas S. Virsik
Law Offices of Patrick J. Maloney
2425 Webb Avenue, Suite 100
Alameda Island, CA 94501-2922

Dear Mr. Virsik:

STATEMENTS OF WATER DIVERSION AND USE – COLORADO RIVER WATER USERS

This letter is regarding the Statements of Water Diversion and Use (statements) filed in 2006 on behalf of approximately 350 landowner/farmers in Imperial Valley who have a right to receive their water from the Imperial Irrigation District (IID).

The State Water Resources Control Board issued water right Permit No. 7643 to IID on January 6, 1950. Permit 7643 authorizes IID to divert a maximum of 10,000 cubic feet per second from the Colorado River from January 1st to December 31st of each year for irrigation and domestic use on 992,548 acres of land. IID diverts Colorado River water at Imperial Dam, thence into a canal system for distribution to its agricultural water users. IID also holds a pre-1914 appropriative water right and has a contract with the Secretary of Interior for the delivery of Colorado River water.

The statement filers are relying upon IID's pre-1914 right. California Water Code section 5101, subdivision (b) provides that a statement need not be filed if the diversion is covered by a permit. The statement filers receive water deliveries from IID, using IID facilities. The Division has received no information to document that the farmers divert water in excess of IID Permit 7643 at Imperial Dam. Thus, water diverted by IID at Imperial Dam under Permit 7643 to collectively serve its agricultural water customers need not be covered by statements filed by IID or others.

The statement filers filed the statements for water delivered from the IID canal system, stating that the turnouts are points of rediversion. Permit 7643 does not list any points of rediversion. Points of rediversion are not necessary in the permit because water diverted at Imperial Dam is

placed into a canal system and does not rejoin a stream system for subsequent rediversion from a surface stream.

Statements of water diversion and use are not required to be filed for the diversion of water from a water body other than a surface or subterranean stream. (See Wat. Code, §§ 5100, subd. (c), 5101.) The farm turnouts are not points of diversion within the meaning of the statute, nor are they points of rediversion. Also, as noted above, it appears that all of the water is accounted for in Permit 7643. Accordingly, the statements are not accepted. If you would like the statements returned to your firm, please advise the Division accordingly within 30 days of the date of this letter. After that date, the Division will destroy the statements in accordance with its records retention policy.

Katherine Mrowka is the senior staff person assigned to this matter. Ms. Mrowka can be contacted at (916) 341-5363 or by email at kmrowka@waterboards.ca.gov if you require further assistance. Written replies should be addressed as follows: State Water Resources, Division of Water Rights, Attn: Katherine Mrowka, P.O. Box 2000, Sacramento, CA 95812-2000.

Sincerely,

James W. Kassel

James W. Kassel, Assistant Deputy Director
Division of Water Rights

cc: Enclosed Mailing List

Petition for Modification List -- not Statement of Water Diversion Mailing List

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Barbara Evoy - Maloney Statements

From: Bob Rinker
To: Evoy, Barbara
Date: 9/28/2011 1:28 PM
Subject: Maloney Statements
CC: Sawyer, Andy
Attachments: Maloney Documents.PDF

Barbara,

I received the attached documentation from Patrick J Maloney. He is the gentleman that spoke at a recent Board session indicating to date we have not processed his statements. I still have all of the filings in a box in my cube [redacted]. The letter is addressed to you and cc's the Board members. Still need direction on what we are going to do with his statements and how to address him.

Thanks,

Bob Rinker
Division of Water Rights
Fee & Data Management Manager
(916) 322-3143
rrinker@waterboards.ca.gov

Winston H. Hickox
Secretary for Environmental Protection

State Water Resources Control Board

Executive Office
901 P Street • Sacramento, California 95814 • (916) 657-0941
Mailing Address: P.O. Box 100 • Sacramento, California 95812-0100
FAX (916) 657-0932 • Internet Address: http://www.swrcb.ca.gov

Gray Davis
Governor

July 6, 2000

TO: PERSONS TO EXCHANGE INFORMATION FOR HEARING ON APPLICATION 30532

ORDER QUASHING SUBPOENA OF CLIENTS OF MR. MALONEY

As part of an adjudicative proceeding on a water right application filed by the Monterey County Water Resources Agency (MCWRA), Application 30532, Mr. Patrick Maloney, attorney for a group of protestants which has been named "Salinas Valley Protestants," (protestants) issued a subpoena duces tecum (subpoena) to MCWRA. Two items that the protestants have requested that MCWRA produce pursuant to the subpoena are "all water extraction reports" (item 1) and "all water conservation reports" (item 2). MCWRA filed a Motion to Quash the Subpoena of Clients of Mr. Maloney (motion) as to items 1 and 2. MCWRA provided documents responsive to the other requests contained in the subpoena and they are not at issue in this motion.

A hearing was held on June 28, 2000, to provide an opportunity for the parties to present oral argument in accordance with Code of Civil Procedure section 1987.1. As hearing officer for the hearing on the motion and for the hearing on Application 30532 of MCWRA, I must resolve the motion. (Gov. Code, § 11450.30, subd. (b).) I read all briefs submitted prior to the hearing and I listened to the arguments given at the hearing.

Issues

MCWRA raises three issues in its motion:

1. The information requested in the subpoena is not relevant to the issues noticed for hearing on Application 30532.

2. The information requested in the subpoena is confidential by MCWRA ordinance 3717 and is protected by an outstanding order of the Monterey County Superior Court.

3. The subpoena is not valid because it was not served properly, not accompanied by a proof of service, and not accompanied by an affidavit.

Discussion

Relevance

MCWRA ordinance 3717 requires the annual reporting of groundwater extraction data and water conservation information on forms provided by MCWRA. The information reported is compiled in the MCWRA's Groundwater Extraction Management System (GEMS) database.

Pursuant to an order of the Monterey County Superior Court (Order on Motion to Compel Production of Well Extraction Data, *Orradre Ranch, et al. v. Monterey County Resources Agency*, No. 115777), Mr. Maloney has been given the water extraction data in the GEMS database aggregated by township and range without the personally identifiable portions. The court order does not address the conservation data.

The protestants contend that the groundwater extraction data and the water conservation data (items 1 and 2 in the subpoena) are relevant for four purposes:

1. To rebut MCWRA's water availability analysis;

2. To establish the protestants' conjunctive use of water in the Salinas Valley;

3. To "optimize" the water resources of the Salinas Valley; and

4. To determine how much water each person in the Salinas Valley should be allowed to pump.

The amount of water extracted from and conserved in the Salinas Valley groundwater basin may be relevant to the water availability issue noticed for the hearing on Application 30532. Water is not available for appropriation to the extent it deprives groundwater users of recharge on which they depend. The recharge serves groundwater extractors as a group, however, and it is the amount extracted in the aggregate – data that have already been made available to Mr. Maloney - not the amount extracted by any individual user, that is relevant to the inquiry. The personally identifiable portions of the reports in which extraction and conservation data are recorded are not relevant to any of the issues noticed for hearing.

The protestants contend that the subpoenaed data are needed as a matter of fundamental fairness to test the accuracy of the calculations, assumptions, and methodology used in MCWRA's water availability analysis. MCWRA developed and uses the Salinas Valley Integrated Groundwater and Surface water Model (SVIGSM) as a planning tool to analyze the hydrogeology of the Salinas Basin. MCWRA did not use the data in the GEMS database to develop or calibrate the SVIGSM. (Reply Brief, Exhibit A.) MCWRA did not use the GEMS database in developing its testimony, exhibits, or analysis for the hearing on Application 30532. (Reply Brief, Exhibit B.)

The protestants also contend that they need the subpoenaed information to establish their conjunctive use of water in the Salinas Valley. The protestants can use their own extraction and conservation data to show their use. The personally identifiable portions of the reports submitted by other groundwater users is not relevant to that issue.

The protestants contend that they need the subpoenaed information to enable the State Water Resources Control Board (SWRCB) to "optimize" the water resources of the Salinas Valley. The protestants contend that the SWRCB needs the subpoenaed information to develop a "rational solution" to the water problems in the the Salinas Valley. Neither optimizing the water resources of the Salinas Valley nor solving all of the water problems in the Salinas Valley is within the scope of the hearing on Application 30532. The purpose of the hearing on Application 30532 is to determine whether there is water available for the project described in the application. The subpoenaed information is not relevant to issues that are within the scope of the hearing.

The protestants contend that they need the subpoenaed information to determine how much water each person in the Salinas Valley should be allowed to pump. A determination of the amount of water each person should be allowed to pump would require an adjudication of the water rights of the Salinas Valley. An adjudication of water rights is outside the scope of the hearing and the subpoenaed information is not relevant to resolution of the issues noticed for the hearing on Application 30532.

The protestants have failed to establish the relevance of the subpoenaed information to the issues within the scope of the hearing.

Confidentiality

As described above, MCWRA ordinance 3717 requires the annual reporting of groundwater extraction data and water conservation information on forms provided by MCWRA. Section 1.01.13 of ordinance 3717 states that:

> "The Agency shall restrict access to and distribution of personally identifiable information consistent with privacy protections and requirements and trade secret protections."

Pumpers have relied on the confidentiality provision in complying with the ordinance. Without the confidentiality provision in the ordinance and promises of confidentiality made by MCWRA to the growers, it is doubtful that growers would submit the information. Many growers consider the information required to be submitted to be a trade secret. MCWRA needs the cooperation of the growers to get the information it needs to manage the water resources within its jurisdiction.

Section 1.01.02 of ordinance 3717 describes the purpose of the ordinance. The purpose includes:

1. Determine actual amounts of water extracted from the basin.

2. Provide information that can be used to develop demand management programs created by an inadequate water supply.

3. Facilitate and encourage water conservation by monitoring water use patterns and practices.

4. Facilitate the development of new water supplies by using the data collected to determine whether new water projects are necessary.

5. Allow MCWRA to allocate the costs of water management activities in the Salinas Basin and any new water projects for the basin, based on actual water use.

The success of MCWRA in managing the water resources within its jurisdiction depends on the cooperation of the pumpers in complying with ordinance 3717. Compliance with the ordinance depends on the promise to maintain the confidentiality of the information submitted. Without compliance, MCWRA is unable to use a valuable management tool. The protestants have not demonstrated that their need for the personally identifiable information outweighs the need of MCWRA to keep this information confidential.

The protestants contend that the SWRCB has waived the confidentiality of the subpoenaed data because it "ordered the Agency to craft a water availability analysis" and "[b]y ordering such an analysis to be placed into the public record, the Board has already determined that the confidentiality of water data is outweighed by the Board's statutory responsibility to determine whether water is available to the Agency." Neither statement is true. In fact, the SWRCB neither waived confidentiality nor made any determination as to whether other considerations outweighed the need to maintain confidentiality. SWRCB staff merely informed MCWRA, by letter dated March 26, 1999, that MCWRA must submit information that demonstrates a reasonable likelihood that unappropriated water is available for appropriation under Application 30532. There is no correspondence or any other documentation in the files to show that the SWRCB considered or made any determination regarding the confidentiality of data submitted pursuant to ordinance 3717.

Validity of Subpoena

MCWRA contends that the subpoena was not served properly, not accompanied by a proof of service, and not accompanied by an affidavit as required by law.

Government Code section 11450.20, subdivision (b), provides three ways to issue a subpoena: personal service, certified mail, and messenger. Messenger service was used to issue the subpoena. A copy of the written notation of acknowledgment of the subpoena, required by Government Code section 11450.20, subdivision (b), was not served on the parties or the SWRCB, but service of the acknowledgment is not required. MCWRA obviously received the subpoena. Failure to file proof of acknowledgment does not invalidate the subpoena. Proof of service of the subpoena was served on the SWRCB.

Code of Civil Procedure section 1985, subdivision (b), requires service of an affidavit with the subpoena. (See also Gov. Code, § 11450.20, subd. (a); 25 Cal.L.Rev.Comm. Reports 55 (1995).) The affidavit must include the following:

1. Show good cause for the production of the documents described in the subpoena.

2. Specify the exact documents requested to be produced.

3. Set forth in full detail the relevance of the desired documents to the issues noticed for hearing.

4. State that the MCWRA has the desired documents in its possession or under its control.

An affidavit was not served with the subpoena issued to MCWRA. Failure to serve the required affidavit at the time the subpoena is served invalidates the subpoena.

The protestants contend that an affidavit is not required and that the SWRCB's subpoena form allows a subpoena for documents without an affidavit. Contrary to the protestants' contention, the SWRCB's subpoena form provides notice of the necessity of an affidavit. (See SWRCB subpoena form at page 1, part 2 (a) and page 2, part 1.) The protestants cite Code of Civil Procedure sections 1985, subdividision (b), and 2020 as support for their contention that an affidavit is not required. The sections cited by the protestants do not support their contention.

Code of Civil Procedure section 1985, subdivision (b) requires an affidavit be served with a subpoena duces tecum. Subdivision (b) of section 1985 states: "A copy of an affidavit shall be served with a subpoena duces tecum issued before trial…" (emphasis added).

Code of Civil Procedure section 2020 does not apply to a subpoena duces tecum; it only applies to a deposition subpoena for the production of business records for copying. Section 2020 does not require service of an affidavit with the subpoena if the subpoena commands only the production of business records for copying. (Code Civ. Proc., § 2020, subd. (d)(1).) The subpoenaed information is not a business record because the water extraction reports and the water conservation reports were not prepared by MCWRA. (Evid. Code, § 1561, subd. (a)(3).) Accordingly, section 2020 does not apply.

The subpoena is not valid because Mr. Maloney failed to serve the required affidavit as required by Code of Civil Procedure section 1985, subdivision (b). Failure to provide the SWRCB and the parties with proof of service showing the manner of service does not invalidate the subpoena. Although failure to obtain the required written notation of acknowledgment may also call into question the validity of a subpoena, I do not believe the subpoena should be quashed on that basis, however, because there is no dispute regarding receipt of the subpoena and no indication that any party was prejudiced by the omission.

Conclusion

I find that:

1. The information requested in items 1 and 2 of the subpoena is not relevant to the issues noticed for the hearing on Application 30532.

2. The information requested in items 1 and 2 of the subpoena is confidential and should not be disclosed to the protestants.

3. The subpoena is not valid for failure to serve the affidavit required by Code of Civil Procedure section 1985, subdivision (b).

Accordingly, the motion to quash is granted. The subpoena is quashed as to items 1 and 2.

If you have any questions regarding my ruling, please contact Barbara Katz at (916) 657-2097.

Sincerely,

ORIGINAL SIGNED BY:

John W. Brown
Hearing Officer

cc: Barbara Katz, Esq.
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Mr. Kevin Long
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List of Persons to Exchange Information

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July 18 and 19, 2000, to be continued if necessary, on July 24, 25 and 26, 2000
(dated June 6, 2000)

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Felicia Marcus, Chair
State Water Resources Control Board

Submission for: Public Workshop Regarding Immediate Drought Response Options
February 26, 2014
Sacramento, CA

Attached is my submission "Proposal to Abolish or Limit Water Data Confidentiality to 1-5 Years: Improving Water Resource Management and Increasing Net Water Benefits in the State of California" to the SWRCB for the Public Workshop Regarding Immediate Drought Response Options.

I am presently chair of the Department of Economics at the State University of New York at Fredonia. I have a Ph. D. in Agricultural and Resource Economics and a B.A. in Physics and Applied Mathematics from the University of California at Berkeley. I have researched and published on California water issues for 20 years starting with a 1995 publication "Alternatives for Managing Drought: A Comparative Cost Analysis" examining potential EBMUD demand and supply side responses after the last major drought in California. I have also published hydrologic-economic models on seawater intrusion into groundwater aquifers originally applied to the Salinas Valley. In 2012, I was the lead guest editor for a special issue of Hydrogeology Journal, the official journal of the International Association of Hydrogeologists, on the Economics of Groundwater Management, as well as co-authoring an overview paper on "Factors Determining the Economic Value of Groundwater".

I have also consulted on many water issues for the Law Offices of Patrick J. Maloney over the last 17 years including historical benefits of district operations, seawater intrusion, and district and project cost allocation and environmental impacts in the Salinas Valley, nitrate loading of groundwater in the Central Coast Region and water rights, beneficial use, conservation methods, Part 417 determination, Quantification Settlement Agreement and Salton Sea restoration in the Imperial Valley. My consulting economic analysis has always been aimed at optimal management of water resources through maximizing the net economic benefits of the state's scarce water resources. A common barrier to the analysis of optimal management in all locations has been local water agencies' claims of data confidentiality that prevent the release of data necessary for comprehensive review and independent development of hydrologic-economic models. The proposal submitted herewith presents a conceptual economic framework for a comprehensive review of the economics of water data confidentiality with the goal, in furtherance of both public and private interests, of improving water resource management and increasing net water benefits in the State of California.

Dr. Peter Reinelt, Chair
Department of Economics
SUNY Fredonia

Proposal to Abolish or Limit Water Data Confidentiality to 1-5 Years: Improving Water Resource Management and Increasing Net Water Benefits in the State of California

With water supplies constrained by prolonged drought and future climate change and with continuing population growth raising water demands, California faces a future of increasing water scarcity and attendant impacts on water quality. As water becomes more economically scarce, improvements in resource management will require greater integration of surface and groundwater supply quantity and quality, more extensive and accurate measurement of relevant water parameters, and storage of this critical information in comprehensive databases available to state planners, affiliated and independent researchers, and the public.

A recent report for the State Water Resource Control Board "Addressing Nitrate in California's Drinking Water" recognizes many of these issues and proposes a statewide groundwater data task force to solve them. The report concludes that "It is now critical that the state has a coherent and more forward-looking policy and technical capability for the collection and management of groundwater data"[1] based on the following assessment:

> Inconsistency and inaccessibility of data from multiple sources prevent effective and continuous assessment. A statewide effort is needed to integrate diverse water-related data collection activities by various state and local agencies. Throughout this study, we often faced insurmountable difficulties in gaining access to data already collected on groundwater and groundwater contamination by numerous local, state, and federal agencies. Inconsistencies in record keeping, labeling, and naming of well records make it difficult to combine information on the same well that exist in different databases or that were collected by different agencies. A statewide effort is needed to integrate diverse water-related data collection activities of various state and local agencies with a wide range of jurisdictions. Comprehensive integration, facilitation of data entry, and creation of clear protocols for providing confidentiality as needed are key characteristics of such an integrated database structure. (p. 74)

Extreme scarcity demands that the unexamined assumption of "confidentiality as needed" (regularly cited to grant an indefinite time period for water data confidentiality for some water users but not others) be thoroughly analyzed in light of the pressure on current water institutions and how they are likely to evolve. The benefits to society from accessible data, granting the ability to review water resource modeling and policy decisions, has routinely been dismissed or ignored at the local resource agency level. The State, with the development of the Electronic Water Rights Information Management System (eWRIMS), has created a foundation for water data reporting and public access, but the scope of information is inconsistent. Monthly surface water diversions and use are publicly available on eWRIMS for individual diverters reporting under Section 5101 of the Water Code, but the same information is not publicly available for other individual users that receive their water from a water purveyor. While water purveyors also report diversions under Section 5101, they are only required to report monthly aggregated farm-

[1] Harter, Thomas and Jay R. Lund et al. of Center for Watershed Sciences, "Addressing Nitrate in California's Drinking Water, With a Focus on Tulare Lake Basin and Salinas Valley Groundwater: Report for the State Water Resources Control Board Report to the Legislature, California Nitrate Project, Implementation of Senate Bill X2 1", January 2012.

gate delivery data under Section 531.10, rather than delivery data for each farm gate. Groundwater extractors in Los Angeles, Riverside, San Bernardino and Ventura Counties must report their groundwater extraction either with local water agencies or with the State. State-filed groundwater recordation appears on eWRIMS. Furthermore, many individual well extractors who cannot physically or legally distinguish between "percolating groundwater" and "underflow" also report quantities pumped that are accessible on eWRIMS.[2] The time has come for a comprehensive state-level review of water data confidentiality policies for all water end-users and water sources that considers the interests of all citizens.

Are there any business gains to protecting 20-year-old data? Does society benefit at all by protecting 20-year-old data? What is the public benefit of making water data available? Are there business losses associated with releasing this claimed "proprietary information"? Is water data confidentiality socially beneficial or should it be abolished? If not abolished, should it be conferred for a limited time frame?

Before continued acceptance of indefinite water data confidentiality, the potential societal tradeoffs from limiting confidentiality must be examined based on the physical and societal relationships embodied in individual water rights and how readily accessible data may produce societal gains through better public analysis, monitoring and transparency of the water institutions charged with managing extractive and non-extractive uses, thus leading to better performance, accountability, credibility and confidence in the integrity of laws governing water use. This proposal examines these issues with reference to existing emissions reporting requirements and the economic theory of patents. Specific water data that serve the public interest is identified for disclosure either contemporaneously or after a fixed time delay. Recommended water data disclosure is limited to that which is necessary for the public purpose and structured to allow other data to remain proprietary to mitigate private costs. Finally, adjustments in the method of gaining accessibility for some data are considered in light of water system security concerns.

Existing Environmental Reporting and Public Access to Data

Requirements to disclose data on some aspects of business operations that impacts public health and commerce and grant public access are not new. EPA has long required reporting of emissions and public access to data that affects public health, commerce, and the environment. "Most U.S. environmental laws require that self-reported data be made available to the public."[3] The SO_x and NO_x allowance trading programs collect hourly data.

> The accurate measurement and reporting of emissions is essential, along with the rigorous and consistent enforcement of penalties for fraud and noncompliance. Also critical is transparency,

[2] See discussion on interlinkages between surface water and groundwater in **"**Physical and Legal Relationship between Water Diversion/Extraction and Public Interest" section below, and footnote 9 references from that section for the nonexistence of an absolute technical or legal line that divides surface water flows from groundwater flows.

[3] International Network for Environmental Compliance and Enforcement, "Principles of Environmental Compliance and Enforcement Handbook", April 2009.

> such as public access to source-level emissions and allowance data. The coupling of stringent monitoring and reporting requirements and the power of the Internet makes it possible for EPA to provide access to complete, unrestricted data on trading, emissions, and compliance. This promotes public confidence in the environmental integrity of the program and business confidence in the financial integrity of the allowance market. It also provides an additional level of scrutiny to verify enforcement and encourage compliance. Finally, accountability requires ongoing evaluation of the cap and trade program to ensure that it is making progress toward achievement of its environmental goal.[4]

EPA's 1995 policy "Incentives for Self-Policing: Discovery, Disclosure, Correction and Prevention of Violations" further creates incentives for regulated firms to self report violations of hazardous waste limits.

Patents

In the simplest form of the economic theory of patents, the government confers a exclusive property right on an inventor for a limited period of time to encourage investment in innovation in cases where the innovation could be easily appropriated/duplicated and the innovator could not recoup the investment costs that lead to the innovation. Patents require that the applicant publicly disclose the innovation for future public use and limits the time frame of the monopoly property right with the purpose of offsetting societal loss from monopoly with societal gains from innovation, thereby increasing *societal* benefits over the course of time. While the patent right assigns greater gains to the inventor, its purpose is to increase innovation for society and societal well-being more generally.

Patents can have other effects besides inducing innovation. For example, patents can also be used as litigative barriers-to-entry and for rent seeking. Patents can impede follow-on innovation until expiration, but increase future innovation after the patent expires through information disclosure. Furthermore, if the investment leading to an innovation is small or the discovery would likely soon be independently duplicated without the inducement of a monopoly property right, then patent research demonstrates that long-lived patents are detrimental to societal well being. In those cases, granting a monopoly right to an inventor for a long period of time produces excessive private gains at a cost to society. Some recent research on the gains from patents suggests the optimal time limit may be quite small in many circumstances.[5]

Proprietary Information, Water Data Confidentiality and the Public Interest

Protection of trade secrets is an alternative method of promoting investment in innovation. Government does not force disclosure of proprietary information to force diffusion of the innovation and reduction of economics rents for the benefit society. However, acceptance of the assumption of indefinite water data confidentiality ignores the potential societal tradeoffs beyond that between the value of innovation and economic rents.

[4] EPA, "Cap and Trade Essentials", http://www.epa.gov/captrade/documents/ctessentials.pdf.

[5] See for example, Boldrin, Michele and David K. Levine, "The Case Against Patents", Journal of Economic Perspectives, 2013, and a critique by Gilbert, Richard "A World without Intellectual Property? A Review of Michele Boldrin and David Levine's Against Intellectual Monopoly", Journal of Econmic Literature, 2011.

Since agriculture is the largest sectoral water user in California, we discuss the societal tradeoffs in a farming context; however, the conceptual framework can be applied to other sectors. To examine those tradeoffs, we first analyze the physical and legal relationship between water diversion/extraction and the public interest, and then discuss the public values of dispensing with or limiting water data confidentiality in favor of public access. From this discussion we identify two potential subsets of individual farming unit water data whose release would foster the identified public benefits and thus improve water resource management. Finally, we discuss the potential impact on farming profits of releasing this data and how security of water system concerns might alter the proposal.

Physical and Legal Relationship between Water Diversion/Extraction and Public Interest

Both the physical properties of water flows and legal conventions governing its use only exist in relationship between the extractive user and other extractive users, which constitute the public at large, as well as in relationship to societal benefits from non-extractive uses and the public trust.

Groundwater extraction impacts both groundwater levels and stocks available for other extractors. Percolation beyond the root zone of water containing unused fertilizer and pesticide residues eventually impacts water quality of other extractors. The right to extract groundwater is a correlative right between landowners overlying an aquifer, a right always in relation to other landowners. In situ groundwater values include buffering periodic shortages of surface water supplies, subsidence avoidance, water-quality protection and prevention of seawater intrusion.[6] Natural groundwater discharge can also support natural environments and recreation.

Surface water diversions and return flows physically and legally impact junior right holders and the environment. While usufructuary water rights establish the right to use, they also establish a relationship to public ownership of water. Beneficial use is the foundation of western appropriative water rights: "beneficial use shall be the basis, the measure, and the limit of the right" echo many western state constitutions and water statutes.[7] As operatively defined in United States v. Alpine Land & Reservoir[8] beneficial use is a relational concept:

> There are two qualifications to what might be termed the general rule that water is beneficially used (in an accepted type of use such as irrigation) when it is usefully employed by the appropriator. First, the use cannot include any element of 'waste' which, among other things, precludes unreasonable transmission loss and use of cost-ineffective methods. Second, and often overlapping, the use cannot be 'unreasonable' considering alternative uses of the water.

[6] Qureshi, M., Andrew Reeson, Peter Reinelt, Nicholas Brosovic, Stuart Whitten, "Factors determining the economic value of groundwater", Economics of Groundwater Management issue of *Hydrogeology Journal*, International Association of Hydrogeologists, 2012.
[7] Weil, Samuel C., *Water Rights in the Western States*, 1911.
[8] United States v. Alpine Land & Reservoir Co., 697 F.2d. 851, 854 (9th Cir. 1983) (discussing the beneficial use requirement of Section 8 of the Reclamation Act of 1902), cert. denied, 464 U.S. 863 (1983).

Waste and alternative uses are relative to other extractive users and with respect to non-extractive environmental, recreational and navigational in-situ uses.

Furthermore, understanding groundwater surface-water interactions is critical for evaluating interlinkages between alternative extractive and non-extractive uses, as groundwater extraction can reduce surface flow and surface water extraction can reduce groundwater flows.[9]

The Public Interest for Publicly Accessible Water Data

Publicly accessible water data creates the following public benefits that apply to the management and administration of water rights, conservation agreements, water trades, pollutant loading and water quality.

1) Allows independent public review of water resource models to better manage existing resources (data available only to restricted club creates opportunities for mismanagement).
2) Accountability for water right holders, local water agencies and consultants.
3) Reporting data and making it publicly accessible encourages compliance with existing laws and regulations.
4) Public verification of compliance with water rights, pollutant loading, and water conservation achievements tied to water exchanges/trades.
5) Public vigilance of public trust elements of water rights including environmental uses.
6) Public confidence in the integrity of laws governing water use.
7) Transparency (discourages political rent seeking, discourages protecting administrative turf/principal-agent problem, and discourages inequitable favorable treatment by local water agencies)
8) Reduction in delay time of regulatory solutions (and the water supply and public health consequences of those delays) caused by those who use water data confidentiality as a barrier to development and implementation of socially beneficial regulation.
9) Reinforces mutual credibility between agricultural sector and M & I sector water users, strengthening mutual acceptance of voluntary or mandatory drought reductions.
10) More civic and democratic participation.

Examples from recent years illustrate some of these issues.

The Salinas Valley Integrated Ground and Surface Water Model (SVIGSM) has been used to model historical benefits of reservoir operations, analyze proposals to halt seawater intrusion, and apportion cost for water projects and district operations. The

[9] Moreover, there is no absolute technical or legal line that divides surface water flows from groundwater flows. For example, see section on "Myth: Groundwater is Separate from Surface Water" in Hanak, Ellen, Jay Lund et al., "Myths of California Water – Implications and Reality", *West Northwest*, 2010; and Sax, Joseph L., "Review of the Laws Establishing the SWRCB's Permitting Authority over Appropriations of Groundwater Classified as Subterranean Streams and The SWRCB's Implementation of those Laws", 2002.

Monterey County Water Resource Agency collects monthly groundwater pumping data from well operators and maintains the data in the Groundwater Extraction Management System (GEMS) database. Detailed pumping data from the GEMS database was used to calibrate pumping simulated by the consumptive use methodology for truck crops and vineyards and also verify and adjust irrigation efficiencies, and could be used to model higher resolution of spatial variations in pumping. "The accuracy of the SVIGSM depends on the accuracy of calibration and host data and parameters used in the model. These include… Estimates of ground water pumping and distribution…" as well as eight other factors.[10] No analysis of the accuracy of the factor data was performed, and thus no propagation of error calculation to final results. However, by inspection of the model residuals, a "valley-wide level of accuracy of ±5 feet" is claimed for the SVIGSM. The National Resource Council recommends a full error analysis of ground water models as standard practice.[11] Independent confirmation of this extensively used model and its accuracy are impossible without the data used in its construction and calibration. As extended drought limits surface deliveries to the Castroville Seawater Intrusion Project for blending with lower quality reclaimed water, accurate prediction with the SVIGSM of the extent that replacement pumping in the deep aquifer will induce seawater intrusion into the last unintruded coastal aquifer is critical.

Measurement and data availability from Imperial Irrigation District including conservation and flows to the Salton Sea provides another relevant example. Investments of the magnitude considered for Salton Sea restoration require 1) a transparent process in which the public and decision makers can reliably analyze alternatives, 2) cost-effective reduction of inflow uncertainties since design success critically depends on future water flows, 3) a robust design that has flexibility to be adjustable over the remaining range of possible future inflows.

Careful reading of recent reports by IID, DWR, U.S. Bureau of Reclamation, and consultants hired by each agency highlight the gaps in understanding of current flows and the need for improvement in measurement and database management. Stated succinctly, the critical data is not publicly available for review and thus disputes arise between the consultants of various stakeholders. Pointedly, this renders the analysis of future flows of water to the Sea as tenuous at best, as evidenced by the commendable uncertainty analysis in DWR's January 2006 Draft Hydrology Report. Recent studies discussing private analysis of the data sources upon which restoration efforts are likely to be based indicate that the data is inconsistent and incomplete. The manner in which assumptions replace reliable data in the estimation of flows to the Sea is hidden from public scrutiny.

The opaque development and documentation of the data inputs used to calibrate the Imperial Irrigation Decision Support System (IIDSS), the model used to estimate changes in all flows through the Imperial Valley, do not satisfy the criteria for public transparency.[12] Stating that "Data gaps were identified and assumptions were made to

[10] MCWRA, Draft Technical Memorandum Update of the SVIGSM, p. 27, October 1999.
[11] National Research Council, *Ground Water Models, Scientific and Regulatory Applications*, National Academy Press, Washington, D.C., 1990.
[12] IID, Summary Report IIDSS, December 2001.

fill them (p. 2-7)" without further explanation is insufficient. Stating that "This partitioning of on-farm water into consumptive use and tailwater and tilewater return flow components is a complex process within the on-farm system (p. 2-3)" without further explanation is insufficient. Stating "Because only limited flow measurements in the drainage system were available, professional judgment was used to determine the fractions of water deliveries that returned to the drainage system (p. 2-8)" without further explanation is insufficient.

Numerous attempts to quantify the flows through the water delivery and drainage system using water balance methods have been published over the years and reviewed during the recent Part 417 process and in connection with Salton Sea restoration. The disparate estimates of component flows arise due to a lack of *direct measurement*. Planning investments of the magnitude contemplated for Salton Sea restoration based on this level of uncertainty when much could be resolved through systematic measurement is nearly unconscionable.

As water becomes more scarce during shortage situations necessitating an allocation program and substantial investments in conservation programs, accurate measurement of flows through the water delivery and drainage system become crucial for effective design, implementation, and management of these programs. Moreover, the fairness, economic efficiency, accuracy of water accounting, and transparency of a water allocation program are all enhanced when all significant deliveries are reliably measured and recorded. The August 2006 Draft Final Report of the Equitable Distribution Study sheds some light on the reliability and consistency of recorded data. Independent consultants hired by IID to analyze allocation methods during shortage situations conclude:

> Regarding an apportionment based on individual field history, after a careful analysis of the District's data, we came to the conclusion that the District does not have a sufficiently consistent and complete record of these individual field deliveries and, therefore, it would not be practical for the District to apportion water based on the average historical delivery to each individual field.
>
> The reason for this conclusion is as follows. There are almost 7,000 fields which have received at least one delivery of water between 1987 and 2005, and therefore have some sort of claim to receive water. About 5,000 of these fields received one delivery of water in every year over the period. The other 2,000 fields do not have a consistent long-run history of deliveries. Of the 5,000 fields with a long-run history of deliveries, we estimate that about 20-30% may have histories that are incomplete or questionable.3 In total, there are as many as 3,000 or more fields with histories that are problematic for apportionment based on individual field history (p. 3-4).

They further explain the "apparent" source of these inconsistencies:

> Having explored the data on field deliveries, we have come to the conclusion that a short-term apportionment based on the average historical use of each field is not a practical proposition because of gaps and incompleteness in the data. These arise in two ways: (1) There is not a complete history for every field in the District that received water. (2)

> There are sometimes errors in how the data were recorded which make the individual histories too unreliable for a statistical determination of history.

In October 2013, the IID board revised its shortage apportionment plan from 100% straight-line only to 50% historical use and 50% straight-line.

Proposed Measurement and Water Data Disclosure to Serve the Public Interest

The water data proposed for release to achieve the public benefits enumerated is limited to that which would allow for observation of water policy, rights and management outcomes on water sources and environmental flows. Water quantity and quality interactions of any water user with both other users and non-extractive uses, and thus the public beyond the unit, satisfies this criterion. Therefore, the proposed data requirement is the location, timing, quantity and quality of any diversion/extraction and location, timing, quantity and quality of return flows, whether surface runoff (tailwater) or deep percolation (also accounting for drain interception of percolation). Any other information about the practices on the farm would be unnecessary for the purposes of observing water quantity and quality resource management outcomes. Water diversion/extraction occurs at the farm gate or well making either the natural location for reporting. However, since multiple gates or wells could serve a field or farming unit, the water database would have to be structured to link appropriate diversion/extraction with return flow.

Since measurement of quantity and quality of return flows may incur substantial cost especially with respect to percolation, the farmer would have the option to report substitute information that could be used to estimate return flow location, timing, quantity and quality. Crop type, crop yield (to estimate ET), applied fertilizer and pesticides by type and quantity, irrigation technology, irrigation and fertilizer management processes, soil type, soil slope, and tailwater quantity measurement combined with available effective rainfall data would be a reasonable substitute for the minimal data requirements relating to return flows identified above. A further option could require reporting, but not disclosure, of this additional information if quantity and quality measurement data on return flows is reported.

These reporting and database requirements are robust for achieving the identified public benefits under the most likely potential future evolutions of water institutions to relieve reallocation pressures: 1) more extensive use of water markets for exchange of conserved water to improve allocative efficiency through shrinking the gap between the marginal value of water in different uses or 2) more extensive administrative or judicial evaluations of waste and alternative beneficial uses and subsequent “transfers” to achieve the same purpose.

Finally, the reason for the inclusion of return flow reporting requirements is two-fold. First, only actual return flow quantities can be diverted for subsequent use or left in-situ for environmental benefits. It is well-known by economists that increasing irrigation efficiency may not save any water, as consumptive use of water may increase even as water application decreases; more accurate timing and location of water in the root zone

increases consumptive use and crop yield and reduces return flow.[13] Therefore, conservation programs measured in terms of changes in applied water without accounting for changes in return flow can only overestimate the actual amount of conserved water. Return flow measurements are needed for the determination of actual "wet water" conservation in terms of changes in consumptive use. Second, return flow quantity and quality are needed to assess water quality management outcomes. Both the quantity of pollutant loading and the dilution effect from increasing water quantity are needed to model later pollutant concentrations from multiple return flows.

Value of Protection of Water Data Confidentiality

How will the disclosure of previously confidential water data affect business? Since agriculture is the largest sectoral water user in California, we discuss the issues in a farming context. However, the framework of the analysis can be applied to other sectors.

The value of proprietary information to the holder and the ability to control the information depends on 1) any profit differential between those with the information and those without, 2) how widely the information is known by competitors, employees and suppliers, 3) the cost or ease to acquire or develop the proprietary information, and 4) the value of the proprietary information to competitors.

The two possible proposed data disclosure methods allow for less disclosure if an owner is willing to pay for quantity and quality measurements of return flows. Thus, if the owner attributes a large profit differential to proprietary information, return flow measurements will be more affordable and more information can remain confidential. For lower perceived value proprietary information, more information would be disclosed as a substitute for return flow measurements, but some information would remain proprietary: labor and equipment costs for field preparation, planting, and harvest.

These options allow for choice in disclosure relative to the value of the propriety information, and only that data necessary to achieve the identified public benefits through observation of water quantity and quality resource management outcomes are ever publicly disclosed.

On the other hand, disclosure and public scrutiny may encourage better utilization of applied water and improved economic performance for some farms. From Technical Report 2, Nitrogen Sources and Loading to Groundwater of recent SWRCB Nitrate Study (see footnote 1):

> The role human decisions play in irrigation system performance and water management should not be overlooked. In SV and TLB, growers and their irrigators decide when, where, and how much water to apply. The operator manages soil water and, by extension, deep percolation. While

[13] Caswell, Margriet, and David Zilberman , "The effects of well depth and land quality on the choice of irrigation technology", *American Journal of Agricultural Economics*, 1986; Ward, Frank and Manuel Pulido-Velazquez, "Water conservation in irrigation can increase water use", Proceedings of the National Academy of Sciences, 2008; and Huffaker, Ray, "Conservation potential of agricultural water conservation subsidies," *Water Resources Research* , 2008.

> pressurized irrigation systems, sprinklers and microirrigation, can precisely control water flow and thus have a greater technical potential for field uniformity and delivery efficiency, using a high-efficiency technology (e.g., drip) will only increase irrigation performance if managed properly. It is the management of those systems that results in optimal or non-optimal performance. Likewise, performance of surface irrigation systems are significantly influenced by operators and can achieve reasonable efficiency levels, though their absolute technical potential is far less than pressurized systems. As a point of reference, Hanson (1995) reported that efficiencies among irrigation types were similar in practice across nearly 1000 irrigation systems monitored in California. Drip and microsprinkler systems did not show appreciably higher performance (*ibid*.). Observed irrigation efficiencies ranged between 70 and 85% for both microirrigation and furrow irrigation. It is worth noting that actual efficiencies may be below or above this range, and that changes in management practice may have improved to capture the technical advantage of pressurized systems in the 16 years since this study was published. At least one study suggests that variance in efficiency may not have increased despite the recent use of more sophisticated equipment. When irrigation performance was measured on nine drip irrigated celery fields in the Salinas Valley, performance was low. Water application rates ranged between 85% and 414% of ET, indicating under- and over-irrigation were common despite advanced capabilities (Breschini & Hartz 2002). Celery may not be representative of other cropping systems less sensitive to water stress; however, the results illustrate the potential for current irrigation system mismanagement even with advanced technology. Though the ability to apply the desired amount of water with each application is limited by the configuration of the irrigation system and hence uniformity and efficiency are somewhat predetermined, there are many practices growers can use to optimize water delivery systems (Dzurella et al. 2012).

Therefore, while recommended data disclosure is limited for the identified public purpose and structured to allow other data to remain proprietary to mitigate private costs, public scrutiny may also encourage better water management and economic gains for other currently water inefficient farmers who do not possess that proprietary information, independent of any valuable proprietary information disclosure.

Water System Security

Concerns about potential for sabotage of water infrastructure systems has long existed but has greatly heightened since the 9/11 terrorist attacks.

> Broadly speaking, water infrastructure systems include surface and ground water sources of untreated water for municipal, industrial, agricultural, and household needs; dams, reservoirs, aqueducts, and pipes that contain and transport raw water; treatment facilities that remove contaminants from raw water; finished water reservoirs; systems that distribute water to users; and wastewater collection and treatment facilities.[14]

For drinking water systems, most experts identified the distribution system as the single most important vulnerability and more experts identified it as among the top vulnerabilities than any other vulnerability.

> The explanations they offered most often related to the accessibility of distribution systems at numerous points. One expert, for example, cited the difficulty in preventing the introduction of a contaminant into the distribution system from inside a building "regardless of how much time, money, or effort we spend protecting public facilities." Experts also noted that since the water in the distribution system has already been treated and is in the final stages of being transferred to the

[14] Copeland, Claudia, "Terrorism and Security Issues Facing the Water Infrastructure Sector", Congressional Research Service, December 5, 2010.

> consumer, the distribution of a chemical, biological, or radiological agent in such a manner would be virtually undetectable until it has affected consumers.[15]

As compared to the distribution system, very few experts identify the source water supply as the single most important vulnerability but they do identify it as a top vulnerability but at a lower rate than the distribution system because:

> (1) that source water typically involves a large volume of water, which in many cases could dilute the potency of contaminants; (2) the length of time (days or even weeks) that it typically takes for source water to reach consumers; and (3) that source water will go through a treatment process in which many contaminants are removed.[16]

A state-level review on water data confidentiality must consider these real water security risks in the context of the public interest in conjunction with other risks to water quantity and quality. The discussion here is limited to potential modifications in data disclosure to reduce these risks, while still achieving the public interest gains of disclosure in water data.

Of the minimal data requirements for the public interest, disclosure of location of diversion/extraction is most often cited as the greatest security risk. Surface water diversion locations are public and known. Groundwater well location information is publicly disclosed in all western states except California. Therefore, precise well location disclosure should be reviewed in the context of these competing public interests.

Precise location is not needed for most of the public interest benefits enumerated above, except for "independent public review of water resource models to better manage existing resources." From the perspective of modeling groundwater, most often accomplished by finite element calculations, well location only needs to be known up to the resolution of the model (finite element size). Thus, extraction and diversion locations could be publicly accessible with less precision, perhaps in broad areas or zones, such as "...to the nearest 40-acre subdivision…" from Section 5103 of the Water Code. Then, an application review board could be established to consider limited use and no public disclosure of more precise location data for legitimate modeling in pursuit of reviewing existing models or in development of independent models for the public interest. This extra layer of the disclosure process would mitigate the terrorist risk from direct public access to a specific subset of reporting requirements without substantially reducing the gains in water management benefits from direct access.

Conclusion

Little or no attempt has been made to balance the public and private interest with respect to water data confidentiality for all water users. With water becoming more economically scarce, the need for greater coordinated management at the state level, coupled with the unresponsiveness of local water agencies to data requests to review existing models and develop independent models, indicates the time has come for a

[15] GAO, "Drinking Water: Experts' Views on How Future Federal Funding Can Best Be Spent to Improve Security", Report to the Committee on Environment and Public Works, U.S. Senate, p. 25, 2003.
[16] GAO report p. 8.

comprehensive state-level review of water data confidentiality policies for all water end-users and water sources that considers the interests of all citizens.

Permanent confidentiality is not in the public interest. Disclosure of water data can improve water resource modeling and management, increase accountability, compliance, transparency, and credibility and reduce delays to solving pressing water quality and quantity problems. The scope of water data disclosure can be limited to that which most serves the public interest, thus mitigating potential profit losses from disclosure of proprietary information. Similarly, online, publicly accessible locational data for groundwater wells could be available only at a coarse spatial resolution in consideration of water security threats, but more precise locational data would be available after demonstrating a legitimate public purpose.

After consideration of the public and private interests, such a state-level review could establish a limited water data confidentiality period of 1-5 years or perhaps abolish confidentiality altogether.

Then a publicly accessible and searchable water information database, based on systematic measurement and recordkeeping of individual unit water use and return flows, would be established in furtherance of the public and private interests in better water resource modeling and management in the State of California.

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June 5, 2013

Felicia Marcus, Board Chair
State Water Resources Control Board
1001 I Street
Sacramento, CA 95814

Dear Ms. Marcus:

I enjoyed our conversation yesterday. I am always concerned about describing my relationship with Tom Graf for fear people will think I am invoking his name to gain some advantage. Over the years Tom and I had a lot of conversations. In our last two or three conversations we discussed the many problems we had not solved. I learned a lot from Tom and he may have learned a little from me. We were convinced that it was our obligation because of our education, opportunities, and life experiences to try to make the world a little bit better. In our last conversation we wondered if we had given our children enough skills and values so they would be able to clean up some of the messes we had made. You seem to have understood our relationship. Frequently I say to my wife if I could only get together with Tom and discuss a certain issue. I guess it's a problem we all have as we get older.

I promised to send you the following documents:

- Prof. Kagan's Articles on Adversarial Environmentalism and Dredging

- Our letter to Anne Castle of the Department of the Interior. Attached to the letter are Patent Nos. US 7,805,380 B1, US 7,832,959 B1 and US 8,341,090 B1 for Water Optimization and Salton Sea Restoration. There is a lengthy story on why the Patents came into existence.

- Letter to Charles Keane, DWR, April 2004 without attachment. This letter was sent in response to the NOP of DWR on Salton Sea Restoration.

- Salton Sea Proposal 10-15-04 prepared on behalf of the Imperial Farmers with the Dutch, Dredging Contractors and other Experts and submitted to the DWR Committee created pursuant to three bills from the 2003 Legislative Session: Senate Bill 277 (Ducheny), Senate

Bill 317 (Kuehl), Senate Bill 654 (Machado) on the PEIR for Restoration of the Salton Sea Ecosystem and Preservation of its Fish and Wildlife Resources.

I have limited this letter to public documents. With your background on the Dredging issue in the SF Bay, it might be worthwhile for us to review with you the reasoning behind the plans the Dutch developed for the Salton Sea and related problems. It is fascinating how many similarities exist between the problems with the Salton Sea and the Dredging in the SF Bay and related Bay Delta issues. These similarities include but are not limited to the following: Social Impacts, Physical Solutions, Political Problems and the Environment. Probably the most interesting comment on the entire issue came from a University of Arizona Professor when he compared the SF Bay Delta to the Salton Sea and Mexican Delta and the different political reactions to the two. I told my story to him about the environmental community thinking Barbara Lee was the cleaning lady. Interestingly, Tom was involved in some of the discussions with the Dutch. However, I am not sure what we can discuss because at some point you might be involved in an adjudicatory capacity on some of these issues.

At the meeting yesterday we met Dr. Maria de la Paz Carpio-Obeso. She struck us as an extraordinary competent young lady and who had a deep understanding of the Imperial Valley//Mexicali Valley//Salton Sea issues. She was born in Mexicali. One of the issues Tom and I frequently discussed was the lack of "People of Color" participating in environmental issues and how to increase participation. The Board and the Country would be well served to have her involved in the Imperial/Mexicali issues.

If you think it is important to have further discussions on the issues covered in the Kagan articles, the Anne Castle letter, or the DWR submittals you may want to clarify with your own Board Counsel what type of discussions we can have.

I am

Sincerely,

Patrick J. Maloney

Enclosure(s)
Kagan Adversarial Environmentalism
Kagan Dredging
Maloney to A. Castle Dept of Interior 5-29-13
Maloney to Keane DWR 4-15-04
Salton Sea Proposal 10-15-04

Adversarial Legalism and American Government

Robert A. Kagan

Abstract

Compared to other economically advanced democracies, the United States is uniquely prone to adversarial, legalistic modes of policy formulation and implementation, shaped by the prospect of judicial review. While adversarial legalism facilitates the expression of justice-claims and challenges to official dogma, its costs are often neglected or minimized. A survey of existing research, together with a case study of environmental regulation in the Port of Oakland, indicates the extent to which adversarial legalism causes (or threatens) enormous dispute-resolving costs and procedural delays, which in turn distort policy outcomes. Adversarial legalism, moreover, has increased in recent decades, as Americans have attempted to implement the ambitious, socially transformative policies of activist government through political structures, forms of legislation, and legal procedures that reflect deep suspicion of governmental authority.

Three years ago, international shipping lines launched the latest generation of specialized trans-Pacific container ships—huge, fast, fuel-efficient, virtually automated $40 million vessels. These "super-Panamax" ships are too wide to pass through the Panama Canal; modern dockside unloading equipment and specialized container trains make it more economical to ship time-sensitive, high value goods across the country by rail. Technology has shrunk the North American continent, in effect, to an isthmus. Thus the new container ships are part of a transportation revolution, stimulated by deregulatory legislation, that dramatically increased the speed and reliability and reduced the cost of transoceanic, transcontinental cargo movements. Osaka residents nowadays eat Florida grapefruit, shipped in refrigerated containers. A moving inventory of Toyota parts, stowed in containers, flows from Japan by way of ship and port and train to an assembly plant in Kentucky. On both sides of the ocean, local monopolies and stodgy oligopolies are threatened by distant competitors, spurring productivity and innovation.

Now the bad news. The big new container ships draw 38 or 40 feet; the

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harbor at the Port of Oakland, a major West Coast seaport, is only 35 feet deep, on average. The ships, therefore, cannot carry full loads and even so must wait for high tide, disrupting the schedules of waiting container trains and consignees. The harbor's inadequacies are not due to lack of foresight. Port of Oakland officials first sought Congressional approval and funding of a harbor-deepening project in 1972. Not until early 1987, however, did Congress fund the project and the U.S. Army Corps of Engineers, in charge of dredging projects, pronounce the plan environmentally acceptable. Since then, for the last four years, a seemingly endless series of regulatory actions and lawsuits have blocked any authoritative decision about where the dredged harbor floor sediments, some of which may contain potentially toxic chemical wastes, can be deposited without risking harm to aquatic habitats, water quality, fisheries, or human health. While lawyers and judges and regulatory officials debate the adequacy of sediment samples and models of environmental impact, costs on the ground mount. The powerful hydraulic dredging equipment, which could deepen the harbor in a short time, stands idle. Shipping companies, facing higher costs and customer complaints, threaten to abandon the expensive port facilities in Oakland.

The Oakland dredging story is a casualty of what might be called *adversarial legalism*. Unfortunately, the same kind of costly, drawn-out legal conflict recurs in many spheres of public policy in the United States, frustrating the very aspirations for justice and economic well-being the legal system seeks to vindicate. By reflecting on the Port of Oakland dredging story, this paper seeks to illuminate certain pervasive features of the American system for making and implementating public policy.

The argument can be briefly stated. The Oakland case is the product of an American political system that has become highly responsive to political demands, a system that quickly generates knowledge and public policies reflecting new insights and values, such as mankind's interest in protecting complex aquatic life cycles and ecosystems. But the American political system articulates and implements those policy ideas in a way that encourages adversarial, legalistic modes of decisionmaking. This adversarial legalism results in enormously costly, time-consuming, and erratic policy implementation and dispute resolution, conducted in courts or in the forbidding shadow of judicial review. Good policy ideas are thus transmuted into bad case-level outcomes.

In the first two sections of the paper, I discuss the concept of adversarial legalism and sketch some of the costs of this mode of policymaking and implementation. To analyze the process more carefully, I then describe the controversy over dredging Oakland's harbor, the resulting legal deadlock, and how it distorted the policymaking process. In the final section, I explore the sources of adversarial legalism, arguing that it stems primarily from a political structure that has increasingly fragmented and restricted governmental authority. No governmental body has sufficient discretionary authority to create and enforce definitive compromises among contending political interests and values. Instead, policymaking power is parceled out to many agencies and confined by complex legal prescriptions whose proper observance is subject to judicial review, often at the behest of private citizens and organizations. In this legal structure, advocates of particular views have strong incentives to resort to adversarial legal weapons, if only to increase their bargaining power. At bottom, adversarial legalism has been stimulated

by the effort to formulate and implement the ambitious, transformative policies of activist government through political structures that reflect deep suspicion of concentrated authority. Greater awareness of the causes and consequences of adversarial legalism, however, might improve prospects for the evolution of less costly forms of policy implementation.

ADVERSARIAL LEGALISM

Derek Bok, president of Harvard University, complains that every year America's educational system turns thousands of bright students into lawyers, who work at redistributing pieces of the economic pie, while Japan's best and brightest become engineers, makers of a bigger pie [Bok, 1983; but see Kagan and Rosen, 1985; Gilson, 1984]. An administrator of the U.S. Environmental Protection Agency estimated that more than 80 percent of EPA's regulations have been challenged in court and that each year that kind of litigation consumed 150 person-years of EPA program staff and lawyers' time [Susskind and McMahon, 1985, p. 34; Bryner, 1987, p. 117]. Columnist Mike Royko [1985] writes of the Chicago men who, hearing a crash, poured out of a bar, climbed up onto the elevated track, sprawled on the floor of the derailed train car, and started to groan about their injured backs. A waiter in a *New Yorker* cartoon answers an inquiring diner, "You won't catch me recommending *anything*, sir. I have a lawsuit on my hands right now."

Social scientists who carefully study the legal system, on the other hand, tend to denigrate these stories as atypical, alarmist, or politically biased. Statistically, million-dollar judgments are rare. Surveys show that most people confronted with a problem (including victims of medical malpractice) don't sue or raise legal defenses [Metzloff, 1988; Miller and Sarat, 1981; Caplovitz, 1974]. In America today, the rate of civil lawsuits per capita, viewed cross-nationally and historically, does not appear to be remarkably high [Galanter, 1983; Selvin and Ebener, 1984; McIntosh, 1980–81; Kagan, 1984; Clark, 1990; Ietswaart, 1990]. Regulatory inspectors negotiate informal settlements more often than they "go by the book" [Kagan, 1989]. In view of these kinds of findings, law and social science scholars often characterize complaints about too much law and litigation as misguided, conservative laments, resentful of legal changes that empower the disadvantaged to demand attention to their interests. [Engel, 1984].

I'm not inclined to dismiss the "too much litigation" perspective so quickly. Yes, I would grant the scholars, law is a good thing, a barrier against official arbitrariness, a check on economic rapaciousness, a force for tolerance and healthy social change. But the scholars, interestingly, seem to have a parochial view of law. Focusing on only the current-day American version, they say, "This is modern law. Take it (with all its excesses) or leave it (and throw away its far more important social benefits)."

When one views the American legal system from a cross-national perspective, however, a different set of possibilities emerges. Other economically advanced democracies, too, have legal systems. Western European polities care about justice, environmental regulation, and preventing professional or governmental malpractice. In some areas, such as workers' rights and land use regulation, many Western European polities have "more law" than the United States. Japan has a more detailed and extensive set of legally man-

dated product standards and pre-marketing testing requirements [Edelman, 1988; Vogel, 1990]. But according to an accumulating body of studies, the U.S., when viewed from a comparative perspective, has a unique "legal style."[1] For one social problem after another—compensating injured people, regulating pollution and chemicals, ensuring equal educational opportunity, deterring malpractice by policemen, physicians, or presidential aides—the American policymaking system encompasses, on average:

1. more complex legal rules;
2. more formal, adversarial procedures for resolving political and scientific disputes;
3. slower, more costly forms of legal contestation;
4. stronger, more punitive legal sanctions;
5. more frequent judicial review of and intervention into administrative decisions; and
6. more political controversy about (and more frequent change of) legal rules and institutions.

Searching for a handy summary rubric for these legal propensities, I label them "adversarial legalism"—a method of policymaking and dispute-resolution characterized by comparatively high degrees of the following:

- *Formal legal contestation*—disputants and competing interests frequently invoke legal rights, duties, and procedural requirements, backed by the threat of recourse to judicial review or enforcement.
- *Litigant activism*—the gathering and submission of evidence and the articulation of claims is dominated or profoundly influenced by disputing parties or interests, acting primarily through lawyers.
- *Substantive legal uncertainty*—official decisions are variable, unpredictable, and reversible; hence adversarial advocacy can have a substantial impact.

This definition might be clarified by suggesting its opposites. Table 1 displays two dimensions along which legal or administrative decisionmaking processes vary. The horizontal dimension involves the degree of *legal formality*—that is, the extent to which disputing parties or interests invoke formal

[1] For some illustrative comparative studies, see Badaracco [1985] on occupational health regulation in Germany, France, England, Japan, and the U.S.; Bayley [1976] on regulation of police in Japan and the U.S.; Braithwaite [1985] on regulation of coal mine safety in several countries; Day and Klein [1987] on nursing home regulation in Great Britain and the U.S.; Brickman et al. [1985] and Jasanoff [1986] on regulation of carcinogens in several countries; Kelman [1981] on occupational safety regulation in Sweden and the U.S.; Kirp [1979] on racial desegregation in British and American schools; Kirp [1982] on regulation of education for handicapped children, U.K. and U.S.; Langbein [1985] on civil litigation methods in West Germany and the U.S.; Lundqvist [1980] on air pollution regulation in Sweden and the U.S.; Quam et al. [1987] on medical malpractice litigation in Great Britain and the U.S.; Vogel [1986] on environmental regulation in Great Britain and the U.S.; Bok [1971] and Flanagan [1987] on selection of labor union representatives; Glendon [1987] on abortion policymaking and dispute-resolution related to divorce and child support; Reich [1985b] on how different bank regulations and labor law affect governmental bailouts of large corporations faced with bankruptcy. Of course, national legal styles are not monolithic. They vary within nations and even within branches of the same legal institution. With respect to regulatory enforcement style, see Kagan [1989].

Table 1. Modes of policymaking and dispute resolution.

	INFORMAL to FORMAL	
HIERARCHICAL to PARTY-INFLUENCED	Expert or political judgment	Bureaucratic rationality
	Negotiation/ mediation	Adversarial legalism

legal procedures and pre-existing legal rights and duties. The vertical dimension concerns the extent to which the decisionmaking process is *hierarchical*—dominated by an authoritative official decisionmaker, applying authoritative norms or standards—as opposed to *participatory*, that is, influenced by disputing parties and their lawyers, their normative arguments, and the evidence they deem relevant. Taking each of these dimensions to their extreme form produces four ideal-types.

1. *Negotiation/Mediation.* A decision process in the lower left cell of Table 1 is adversarial in the sense that it would be dominated by the contending parties, not by an authoritative governmental decision maker. And it would be informal, nonlegalistic, in that neither procedures nor normative standards would be dictated by formal law. The purest cases would be dispute resolution through negotiation without lawyers and policymaking through bargaining among legislators representing contending interests. The cell would also include mediation, whereby an "official" third party attempts to induce contending parties to agree on a policy or settlement, but refrains from imposing a settlement in accordance with law or official policy.
2. *Expert/Political Judgment.* The more an official third party (as opposed to the contending interests) controls the process and the standards for decision, and the more authoritative and final the third party's decision is, the more "hierarchical" the decision process. Hierarchical processes can be legally informal, as suggested by the upper left cell in Table 1. Consider, for example, what Jerry Mashaw [1983] has called the "professional treatment model"—such as decisions concerning eligibility for disability benefits when made by a panel of government-appointed physicians (or perhaps physicians and social workers), without significant probability of intensive judicial review. (European disability and workers' compensation systems tend to follow this model). Another example of legally informal, hierarchical decisionmaking is provided by Badaracco's [1985] description of regulatory rulemaking concerning occupational safety and health in Great Britain, France, West Germany, and Japan. In these cases, a government ministry, with final authority to promulgate a rule, conducted a series of informal, closed-door, consensus-building discussions with a limited number of industry and labor representatives and scientists; in contrast with rulemaking on similar

issues in the U.S., participation and assessment of evidence was not organized in a "judicialized" manner, and the agency's decision was not subjected to judicial reversal, based on procedural or substantive legal criteria. Rather, faith is placed in the agency's political judgment and its ability to forge acceptable compromises from the expert advice of scientists, engineers, and economic analysts.

3. *Bureaucratic Rationality.* A decision process characterized by a high degree of hierarchical authority and legal formality (the upper right cell of Table 1) would resemble Weber's ideal-typical bureaucracy. The submission and assessment of evidence would be governed by written rules and procedures, as would substantive decisions, made by carefully trained, apolitical civil servants. The more hierarchical the system, the smaller the role for legal representation of and influence by affected citizens or contending interests. In contemporary democracies, this pure case rarely occurs, but it is an ideal systematically pursued, for example, by tax collection agencies, or the U.S. Social Security Administration. Tending toward this cell, too, would be German or French courts, where highly professionalized judges—not (as in the U.S.) the parties' lawyers, and not lay juries—dominate both the evidentiary and the decisionmaking processes [Langbein, 1985].
4. *Adversarial Legalism.* The lower right cell of Table 1 implies a decision process that is procedurally formalistic but in which hierarchy is weak and party influence on the process is strong. American civil and criminal adjudication provide vivid examples. Complex legal rules govern pleadings, jurisdiction, pre-trial discovery and testing of evidence, and so on, but the gathering of evidence and invocation of legal rules is dominated not by the judge but by contending parties' lawyers [see Thibaut and Walker, 1978]. At the same time, as comparisons of American and British "adversarial systems" make clear, hierarchical, authoritative imposition of the law is relatively weak in the United States [Atiyah and Summers, 1987]. From a comparative perspective, American judges are more political [see for example Levin, 1972; Rowland and Carp, 1983; Gottschall, 1986], their decisions less uniform. Law is treated as malleable, open to parties' novel legal arguments and pleas of extenuating circumstances. In civil cases, lay jurors still play a large and normatively important role in the U.S., magnifying the importance of skillful advocacy by the parties and reducing legal certainty.

Similarly, when compared to policymaking in European democracies, regulatory decisions in the U.S. entail more legal formality—more complex legal rules concerning public notice and comment, open hearings, *ex parte* contacts, evidentiary standards, formal response to interest-group arguments, and so on. But hierarchical authority is weak. Agencies cannot restrict participation by interest groups. Agency decisions are frequently challenged in court by dissatisfied parties and reversed by judges, who dictate further changes in administrative policymaking routines. Lawyers, scientists, and economists hired by contending industry and advocacy groups play a large role in presenting evidence and arguments. The clash of adversarially advanced argument, rather than top-down application of official norms, is the most important influence on decisions.

No legal system falls entirely into any single cell in Table 1. Different programs tend toward different policymaking and dispute-resolution meth-

ods, and variation also occurs within programs. Adversarial legalism can and does occur in reputedly cooperative nations such as the Netherlands [Niemeijer, 1989] and Japan [Upham, 1987]. Americans, conversely, often refrain from adversarial legalism, resorting to negotiation or submitting to bureaucratic or expert judgment. But viewed in the aggregate, adversarial legalism seems more common in the United States than in other democracies, and more common today than in the America of 30 years ago. Adversarial legalism—party-dominated legal contestation—seems to be a barely latent, easily triggered potentiality in virtually all contemporary American political and legal institutions.

THE COSTS OF ADVERSARIAL LEGALISM

Adversarial legalism, of course, is deeply embedded in American ideals and ways of governance. Americans value the idea of the rule of law and the right of ordinary citizens to pursue legal claims against anyone, including government officials, who unfairly harm them or ignore their interests. Adversarial legalism encourages and facilitates the articulation of new justice-claims and ideas. Ready recourse to a politically responsive judiciary enables dissenters to attack the official dogma of governmental officials, corporate toxicologists, medical experts, highway planners, and penologists. Repeatedly, adversarial legalism has enabled political underdogs to demand just rights from the government, first and foremost in the case of the civil rights movement, but also in the quest for more equitable electoral districts, more humane conditions in prisons and mental institutions, and more compassionate welfare administration. Focusing on these shining victories, legal scholars tend to celebrate the institutions that support adversarial legalism.

Without intending to dismiss these social benefits, I suggest it would be useful to attend to the other side of the ledger. The spirit of distrust of authority that underlies adversarial legalism can be used against the trustworthy, too. An equal opportunity weapon, it can be invoked by the misguided, the mendacious, and the malevolent as well as by the mistreated. Its processes enable contending parties to use the extraordinary costs and delays of adversarial litigation in a purely tactical way, to extort unjustified concessions from the other side.

No comprehensive account of the social and economic costs of adversarial legalism is readily available. This brief survey can provide only some scattered evidence. Most obvious and well-researched are the direct costs, such as lawyers' fees, which have been estimated to amount to some $80 billion a year.[2] The best-documented example concerns compensation of accident victims. In most Northern European democracies, a person injured in a hospital or in a motor vehicle accident turns first of all to a governmental health care bureaucracy for direct provision of medical services and, if unable to return to work, to another bureaucracy for disability benefits. Liability law restricts damages to losses uncompensated by such social welfare programs; protracted adversarial litigation is relatively infrequent; and the administra-

[2] In terms of value added (an industry's gross receipts minus its purchases from other economic sectors), in 1987 the American legal industry, with a value added of approximately $80 billion, was larger than the U.S. steel industry, textile industry, and even the domestic auto industry (Sander and Williams, 1989, pp. 434–35).

tive costs of running the compensation system are small. In the U.S., in contrast, tort law, implemented through negotiations with private insurance companies, backed by the threat of litigation in the court system, is a common method for delivering compensation, often taking precedence over private and public insurance systems.[3] For cases that result in litigation, lawyers absorb an astonishing 40 or 50 percent of the sums that liability insurers expend on claims by injured persons (Kakalik et al., 1983; Kakalik and Pace, 1986; Task Force on Medical Liability, 1987, p. 16; Institute for Civil Justice, 1990, p. 49–54). A more wasteful method of income replacement and compensation could hardly be imagined. Similarly, although dollar estimates are hard to come by, there is little doubt that American business managers engaged in negotiating sales franchises, acquiring other companies, floating stock issues, and launching new products are surrounded by larger phalanxes of expensive attorneys than their counterparts in France or Switzerland or Japan.

Then come the less visible costs. The enormous liability insurance premiums that American obstetricians, day-care centers, and waste disposal sites are obligated to pay are passed through to their customers. Huber [1988, pp. 3–4] reports that liability insurance adds $300 per birth to the cost of maternity and obstetrical care in New York City; it also accounts for 30 percent of the price of a stepladder, 95 percent of the price of certain childhood vaccines, 25 percent of the cost of a Long Island tour bus ride, and over one-third the price of a small airplane.[4] The hidden "liability tax" passed through by all American enterprises, Huber estimates, amounts to $80 billion annually.

Further uncounted sums—some socially desirable, some undoubtedly not—are expended simply to forfend legal attack. Most notorious are the unnecessary hospitalizations, lab tests, Caesarian sections, and other procedures designed to ward off possible malpractice suits (Task Force on Medical

[3] Some American compensation systems, of course, have tried to escape from the expensive adversarial legalism of the court-enforced tort law. State and federal workers' compensation laws have established administrative compensation systems for injuries arising from workplace accidents. State and federal bureaucracies administer disability benefits for those no longer able to work for medical reasons. Congress created a special administrative compensation scheme for coal miners suffering from crippling black lung disease. Although these programs entail lower lawyers' bills than the tort law system, they have been plagued by adversarial legalism. On the federal disability program, see Mashaw [1983]. In some state workers' compensation systems, lawyers' fees (for both sides) and other contestation costs have been estimated to equal some 30 percent of each dollar paid in claims [Task Force on Medical Liability, 1987, p. 16; Pease, 1988]. Moreover, as in the massive litigation involving asbestosis, injured workers increasingly have been able to circumvent the workers' compensation system through product liability suits against their employers' suppliers or tort suits against employers [Epstein, 1982].

[4] Those figures—as well as Huber's aggregate estimate of $80 billion per year—are not well-documented in his book. And unless one imagines a world with *no* liability insurance costs, it is hard to say how much of those figures might be deemed "excessive." Nonetheless, those figures surely are far larger than those incurred by comparable producers and consumers in Western Europe. An example is provided by clozypine, a promising anti-psychosis drug. It costs four times as much in the U.S. than in Europe, solely because liability fears have induced the supplier to insist on extremely costly patent-monitoring systems in the U.S. [Prager, 1990].

One provocative (but still very inconclusive) indicator of the "excess" liability tax is the variability in insurance rates from more litigious to less litigious regions. In 1985, obstetrician/gynecologists in urban Dade and Broward Counties, Florida, paid, on the average, $33,224 yearly in malpractice premiums. Their counterparts in other Florida counties, presumably not very different in skill and attentiveness, paid $16,700. And ob/gyn specialists in North Carolina paid $3000 [Task Force on Medical Liability, 1987, p. 14].

Liability, 1987). Analogous forms of costly "defensive medicine" occur in many other litigation-prone institutions and professions. To forestall litigation-caused delays, port authorities spend tens of thousands of dollars on environmental "mitigation projects" (such as man-made marshes and wetlands) that often fail to achieve their ecological objectives [Race, 1988]. Manufacturers of some ostensibly safe products—ranging from child-care equipment to contraceptive devices [Mastroianni et al., 1990]—have withdrawn those products from the market.

Simply because it costs so much and takes so long, adversarial legalism often undermines the law's most basic aspirations for effectiveness and justice. For some enterprises and organizations, avoiding the legal process becomes more salient than fighting for what they believe is the right or just result. As procedures for involuntary commitment of mentally ill individuals have become increasingly demanding and complex, many police and hospital personnel refrain from initiating the commitment process even when they feel it is fully warranted.[5] School administrators not infrequently accede to what they consider educationally unjustified parental demands concerning education of handicapped children, simply to avoid the costs of repetitive hearings and litigation [Melnick, 1990]. Liability insurers understandably concentrate costly legal defense efforts on the lawsuits with the most potential for huge damage awards.[6] The consequence is undercompensation, on average, for the most severely injured claimants—and overcompensation, it appears, for claimants in many smaller lawsuits, which the insurance companies find more costly to defend than to pay off [Sugarman, 1985, pp. 592–595; Munch, 1977, p. 14). Even more often, injured plaintiffs, especially those with small claims, are deterred from filing lawsuits. In debt collection and criminal adjudication, too, the high litigation costs and delays that flow from adversarial resistance commonly result in the abandonment or compromise of just claims and defenses.[7]

At the policymaking level, adversarial legalism provides citizen watchdog organizations access to the rule-making process in government agencies and, through the threat of judicial review, helps guard against administrative arbitrariness or "capture." But adversarial legalism also breeds legal deadlock and socially harmful inertia. The implementation of new regulations is often blocked by judicial appeals, sometimes at the behest of regulated entities complaining of unreasonable strictness or inadequate analysis, sometimes at the behest of pro-regulation advocacy groups complaining of regulatory inaction or laxity [Melnick, 1983; Rabkin, 1989]. When every decision must be bolstered by legally "bulletproof" scientific evidence and procedural methods, then vital protective measures concerning workplace health risks

[5] "Today, a person cannot be committed [to a mental hospital] involuntarily without a judicial finding—reached through protective procedures that include a right to counsel—that the person is dangerous to self or others. A physician, hospital, or police officer who violates those legal protections can be held liable for substantial damages to the wrongly confined patient" (Ellickson, 1990, p. 56).

[6] "In Cook County [Illinois] . . . there were only two verdicts of $1 million of more (in 1984 dollars) from 1960 to 1964, and these accounted for only 4 percent of personal injury awards. By 1980–84, sixty-seven verdicts of $1 million or more had been handed down, accounting for 85 percent of awards. In San Francisco from 1980 to 1984 only 3.8 percent of all personal injury cases produced verdicts of $1 million or more, but these accounted for almost half the total amounts awarded" [Litan et al., 1988, p. 9].

[Mendeloff, 1987], hazardous air pollutants [Dwyer, 1990], and motor vehicle safety features [Mashaw and Harfst, 1987] remain bogged down in the bureaucracy for years. Virtually every management plan for each of the many National Forests has been held up while waiting for appellate scrutiny.[8] In the last decade, virtually every Department of Interior decision about offshore petroleum exploration has been challenged in court [Lester, 1990]. Operating in the shadow of potential or actual legal appeals, the processing of license applications for nuclear plants increased from an average of 12 months for plants completed in 1960, to 33 months for those completed in 1973, to 56 months for 1981 plants [Chubb, 1989, p. 85]. While these legal pressures enhanced safety, overseas power plants, "equivalent to American reactors in quality and safety . . . have been built in much less time and at far lower cost" (ibid.).

One further, less tangible cost of adversarial legalism is its corrosive effect on personal and institutional relationships, as when physicians, in a corner of their minds, regard certain patients as potential medical malpractice claimants. Similarly, when a regulatory inspector and a regulated enterprise become locked into a legalistic, adversarial posture, the cooperation and exchange of information so essential to effective regulation is cut off [Bardach and Kagan, 1982; Scholz, 1984). When regulatory rulemaking is only a prelude to litigation, a National Academy study of the EPA found, contending interest groups are more prone to exaggerate or minimize risks and to suppress or distort information that weakens their position (National Academy of Science, 1977, pp. 79–81). Adversarial legalism and the distrust it symbolizes is demoralizing to teachers, nurses, architects, police officers, environmental engineers, and other occupants of what Eugene Bardach refers to as the "trustee stratum" of the nation, who are forced by the prospect of legal review to spend hours doing defensive paperwork rather than discharging their professional responsibilities [Bardach, 1982].

Yes, the reader might think, adversarial legalism does entail significant costs in some settings. But isn't it a necessary concomitant of the kind of legal controls needed to achieve justice in American society? Couldn't one argue that sharply defined legal rules, strong penalties, legal rights to challenge administrators, and formal adversary procedures are quite appropriate for

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[7] High litigation costs encourage collection companies to compromise unpaid debts when the debtor obtains an attorney and mounts a legal defense [Kagan, 1984, pp. 338, 348–49]. A law professor specializing in consumer protection law wrote, "I have heard many legal services lawyers allege that they can win nearly any consumer credit case, regardless of the merits, simply by initiating extensive discovery or by exploiting some other litigation device [Whitford, 1979, p. 1094]. Conversely, when defendants display signs of strong legal resistance, plaintiffs' lawyers, citing the high cost of litigation, often are unwilling to file suits arising from consumer complaints [Macaulay, 1979].

Expanded adversarial procedures for picking jurors and controlling evidentiary presentation have bloated felony trials until prosecutors can't even consider taking many cases to trial. Public defenders, too, cannot afford to try cases, and often pressure their clients to plead guilty in return for a reduced sentence. Defendants who insist on trial and are convicted obtain heavier sentences than similar defendants who plead guilty before trial [Brereton and Casper, 1981; Uhlman and Walker, 1979). When adversarial legalism is curtailed by judicial authority, trials are shorter and defendants get a day in court [Schulhofer, 1984; Langbein, 1979].

[8] In consequence, the U.S. Forest Service, according to some estimates, spends $200 million annually reformulating forest management plans, conducting new hearings on their terms, and otherwise trying to make them legally defensible [*The Economist*, 1990a].

a society like ours—where citizens are more mobile, individualistic, and culturally diverse than in Western European nations or Japan; where traditional informal social controls are weaker; where citizens are less deferential to government authority [see Bayley, 1976, p. 150]; and where entrepreneurs denigrate regulatory controls and perhaps need to be dealt with more legalistically [see Vogel, 1986, pp. 254, 259)]? From this perspective, isn't adversarial legalism just an unfortunate but relatively minor side effect of a generally desirable institutional system, like the pollution emitted by an electrical power plant?

It is difficult to answer such questions definitively, just as it is hard to know precisely when the emissions of scores of power plants start adding up to a serious environmental and health problem. What can be done is to look closely at the costs and the causes of adversarial legalism—as in the following case study—and to try to imagine changes in our political and legal institutions that may facilitate responsive public policy implementation and fair dispute resolution, but without so much costly, slow, and divisive litigation.

THE DREDGING DILEMMA: A CASE STUDY OF ADVERSARIAL LEGALISM

Increasing trade volumes and larger ships have generated powerful pressures for port expansion. Clogged roads between urban ports, railheads, and intercity highways evoke demands for new docks, linked more closely to highways and rail lines, large enough to store thousands of containers. Port authorities, backed up against crowded urban neighborhoods, have often sought to create new docks by dredging and landfill operations. Similarly, ports are pressured to dredge deeper harbor channels and dock areas to accommodate ever-larger ships. On the other hand, as this section will show, response to these demands is hindered by a complex, politically fragmented, and legalistic governmental process for funding and approving new port expansion projects and for minimizing their adverse impacts on the environment.

The Political Character of Funding Decisions

Historically the federal government, pursuant to its Constitutional jurisdiction over navigable waters, has been the primary funding source for major harbor-dredging projects. But Congress has never given the Army Corps of Engineers, the principal agency involved, an overall harbor-dredging budget and discretion to decide which projects are most essential. Rather, Congress has decided on projects one by one. This enables local members of Congress to take credit for visible benefits for their own districts [Ferejohn, 1974, pp. 46, 235]. But it is also a source of inordinate delay, because of the queue of project sponsors lined up at the Congressional trough, the numerous political decision points that must be hurdled in repeated House and Senate committee hearings, and the weakness of any priority-setting mechanism [ibid., p. 22].

Moreover, for almost a decade, between 1978 and 1986, dredging appropriations were put on hold while President Carter's and Reagan's budget offices battled Congress, seeking tighter controls and greater reliance on local funding and user fees. The Corps of Engineers was compelled by law to increase the analytic integrity of its justifications for new projects. Researching and weighing the diverse economic costs and benefits associated with each project now typically takes several years to complete.

Environmental Concerns and Regulatory Responses

Two decades ago, seas and harbors were used as free disposal sites for sewage sludge, garbage, and chemical wastes. Similarly, sediments dredged from harbor floors were simply barged into deep water or to a landfill site at the harbor's edge, there to be unceremoniously dumped. Regulatory officials and environmentalists had little input into port expansion decisions, even though dredging and disposal operations often destroyed the habitats of bottom-dwelling mollusks and crustaceans, depleted fisheries, and stirred up chemical wastes embedded in the sediment in rivers and urban bays. Landfill operations, moreover, destroyed marshlands and tidal areas rich in aquatic and bird life. [NRC, 1985]. Port expansion displaced other waterfront uses, recreational and residential, and generated heavy motor vehicle traffic, disturbing nearby residential neighborhoods.

During the late 1960s and early 1970s, however, a number of important environmental protection and land use laws were enacted. Together, their thrust has been to ensure that appropriate weight will be given to environmental values in planning dredging projects. To summarize them briefly:

1. *The EIS process.* Pursuant to the National Environmental Protection Act (1969), dredging projects cannot be initiated until a comprehensive analysis has been prepared by the Corps of Engineers and circulated for comments, assessing all potential environmental impacts and methods of mitigating unavoidable adverse consequences.[9]
2. *Focused environmental laws/specialized regulatory watchdogs.* The Corps, in turn, is regulated by other governmental bodies, which are expected to enforce legal standards in more specific statutes. For example:
   - Before issuing a dredging permit, the Corps must consult with the *U.S. Fish and Wildlife Service,* the legal advocate (under a number of federal statutes)[10] for migratory birds, marine mammals, threatened and endangered species, and wildlife preserves that may be adversely affected by dredging or sediment disposal. The Service must be satisfied that no harm will result or that appropriate mitigation measures (such as creation of new marshlands) have been planned. This requires, for each project, extensive research about imperfectly mapped underwater biota and imperfectly understood chemical and biological processes.
   - Any dredging permit application must by law be reviewed by the *National Marine Fisheries Service,* the statutory guardian for commercial and recreational fishing interests. The relevant state *Department of Fish and Game,* as well, must be accorded the right to review and comment on the proposed project, ensuring that it accords with state regulatory standards.

[9] In addition, the Water Resource and Development Act of 1986 obligates the Corps to make sure that an environmentally acceptable disposal site exists before issuing dredging permits for non-Corps projects.

[10] Among the relevant federal statutes are the Endangered Species Act of 1973, as amended, 16 U.S.C. sec. 1531 et seq.; the Bald Eagle Act, 16 U.S.C. sec. 666; the Marine Mammal Protection Act of 1972, 16 U.S.C. sec. 1361 et seq.; the Fish and Wildlife Coordination Act, 16 U.S.C. sec. 661 et seq.; the Marine Protection, Research and Sanctuaries Act of 1972, 33 U.S.C. sec. 1401 et seq.; the Migratory Bird Conservation Act, 16 U.S.C. sec. 715.

- The federal *Environmental Protection Agency (EPA)* has the legal responsibility to veto the deposit of dredged material in inland water, wetlands, or the open sea to prevent unacceptable adverse effects on municipal water supplies, shellfish beds, fishing areas, and wildlife or recreational areas [NRC, 1985].[11] This entails bioassays of many samples of the dredged material, modeling of water currents and aquatic life cycles in the proposed disposal site, and repetition of these analyses for a variety of alternative disposal sites.
- The Corps must obtain a certification from the *state agency charged with protecting water quality*, indicating that dredging and disposal will not violate state water quality regulations.
- A permit is generally required from the relevant state *Coastal Zone Management Agency*, which controls land use projects, including fill operations, at the water's edge, in most cases under a legal mandate to ensure that economic development does not overwhelm ecological, esthetic and recreational interests.

3. *Public Participation.* A variety of legal requirements provide that the relevant studies and plans be made available for public review, and that the Corps should conduct public hearings in which the voices of locally affected interests—including municipal officials, commercial fisheries, neighborhood groups, and environmental advocates—can be heard.
4. *Judicial Review.* In a further effort to ensure that the Corps and the relevant regulatory officials will conduct comprehensive, factually accurate, environmentally sensitive analyses, judges are given a powerful "fail-safe" role. Most of the environmental protection statutes mentioned above provide that citizens, local politicans, or environmental advocacy groups who feel the Corps or any of the other relevant agencies have not fulfilled their statutory responsibilities can seek judicial review before any additional steps are taken.

Negotiating the Legal Maze: The Oakland Harbor Case

In November 1984, after years of political deadlock over funding water and harbors projects, the Corps of Engineers completed its cost-benefit analysis and an environmental impact statement (EIS) concerning the Port of Oakland's harbor-deepening proposal, and in early 1987 Congress authorized funding. In 1986, however, California water quality and fish and game agencies raised concerns about adverse effects on San Francisco Bay fisheries and water quality if the 7 million cubic yards of dredged sediments were dumped at the originally planned site—near Alcatraz Island. Although the Corps of Engineers Supplementary EIS disputed their arguments,[12] the state agencies had legal power to block in-Bay disposal. This impelled the Corps to select an ocean disposal site (designated 1M) 15 miles from the Golden Gate, although the added distance would double dredging costs to $39 million. The EPA, however, refused to authorize use of the 1M ocean site. Furthermore, Citizens for a Better Environment (CBE) seemed poised to bring a lawsuit

[11] The EPA is obligated to restrict ocean dumping to sites it designates as acceptable. It is specifically required to prohibit dumping of heavy metals and other potentially toxic contaminants in sediment, unless they can be rapidly rendered harmless by a "capping" process, whereby the contaminated material is buried under uncontaminated sediment.

challenging the adequacy of the Corps' Supplementary EIS and demanding use of a disposal site beyond the edge of the Continental Shelf.

In January 1988, anxious Port of Oakland officials convened several meetings of representatives from the various regulatory agencies, environmental groups, and fishing organizations. Compromise was elusive. The Corps argued that in the absence of demonstrated environmental differences that would justify the greatly increased costs, it was legally precluded from endorsing disposal at more remote ocean sites. EPA and U.S. Fish and Wildlife officials said they were legally precluded from accepting 1M without further research showing it was environmentally acceptable compared to more distant, deeper ocean sites.

In March 1988, under pressure from Port of Oakland officials, EPA and the Corps of Engineers convened a "Technical Review Panel" in Washington, DC to review the scientific questions. Lacking sufficient data, the panel made a political decision: Since fishery interests were likely to sue and delay the project if 1M were used, a different ocean site (B1B) should be used for the first 500,000 cubic yards of dredged material (except for material from a clearly contaminated area), enabling the Port to make the channel just deep enough to accommodate the first larger ships. Meanwhile, further testing and study should precede a decision concerning disposal of the remaining 6.5 million cubic yards. CBE and the Pacific Coast Federation of Fishermen indicated that they endorsed this solution. The Corps hastily "beefed up" the section of its EIS concerning the effects of dredge disposal at B1B. Port of Oakland officials made arrangements for the actual dredging and transport of sediment to B1B, which was twice as deep as 1M but also twice as far—30 miles from the Golden Gate (but only 10 miles off the San Mateo County coast)—and hence 50 percent more costly.

Where access to court is easy, however, compromise is unstable. In mid-April 1988, the Half Moon Bay Fishermen's Marketing Association (HMBFMA), alleging that dumping dredged material at B1B would disrupt a valuable fishing ground,[13] filed suit against the Corps in federal court, arguing that the Supplementary EIS concerning B1B was inadequate under NEPA; that the selection of B1B violated the Marine Protection, Research and Sanctuaries Act; and that HMBFMA had not had adequate notice and opportunity

[12] Environmentalists and state agency officials observed that the Alcatraz site, which had been used for depositing sediments dredged pursuant to existing harbor maintenance programs, had developed a "mounding problem." This resulted, they claimed, in increased turbidity in the Bay, harming fishery resources. The Corps of Engineers had already begun to limit dumping of dredged material at Alcatraz. But Corps officials argued that fish catch levels, according to Fish and Game Department data, were unrelated to turbidity. They also argued that turbidity stemmed mostly from shifts in inflows to the Bay from rivers and from changes in wind and wave patterns.

Environmental agencies also were concerned about the likelihood that the dredged material, scooped from waters near an industrialized area, would contain heavy metals, petroleum compounds, PCBs, and other toxic chemicals which, once disturbed, would be absorbed by aquatic plants and animals and find their way into the food chain. The EPA and the California Water Quality Board argued that the Corps had not taken a sufficient array of samples and had not tested them adequately. The Corps did further testing near certain sites and, having found higher levels of contamination, revised its plan to require alternative "special care" disposal and "capping" methods for sediment dredged from those sites. The EPA protested the Corps' refusal to adopt a newer, more sophisticated testing method and questioned the Corps' conclusion that mortality rates for aquatic organisms tested with most Oakland sediments, while elevated, were not so high as to pose significant environmental dangers.

to request a public hearing on the use of B1B. On May 5, the federal trial judge denied HMBFMA's request for a temporary restraining order stopping the dredging, still poised to begin. HMBFMA immediately appealed. The Ninth Circuit Court of Appeals first issued a restraining order pending hearing, but on May 12, despite its expressed misgivings about the quality of the Corps' EIS, dissolved the stop order. Port officials ordered the dredging to commence; harassed by fishing boats, barges dumped the first loads of sediment at B1B.

On May 16, Half Moon Bay fishermen dumped a ton of fish heads at the Port of Oakland [Mackowski, 1988a]. Press reports indicated the dredging company had taken contaminated dredged material to B1B; dredgers claimed they had made a mistake, misreading their charts. Most significantly, on the same day, a San Mateo County Superior court judge, acting in a suit against the Port of Oakland filed by the County of San Mateo (later joined by the HMBFMA), issued a temporary restraining order stopping the dredging. The dredging permit had been issued, the court held, without a requisite certification from the California Coastal Commission that the project was consistent with its coastal development plan, which included enhancement of fisheries. (Actually, the Coastal Commission long before had been given notice of the project, but had not informed the Port or the Corps that it thought "consistency review" was legally required.) On July 15, 1988, a state appellate court rejected the Port's appeal of the lower court's restraining order.

Port of Oakland officials, under increasing pressure from shipping lines, had become desperate. They were still paying for the rental of expensive dredging equipment, in case the injunction should be lifted. They had expended huge sums enlarging train tunnels in the Sierra Nevada, on larger cranes, and on new intermodal transfer facilities, all in order to handle larger container ships as efficiently as competing ports. In August, they announced a new disposal plan for the first 440,000 cubic yards of dredged sediment, using a Sacramento River delta site where local reclamation officials were eager for diking material. Barging the material there would be 50 percent more expensive than taking it to B1B. It also would require an environmental impact report (EIR), as required by state law.

The 400-page EIR was completed in February 1989; it included test data indicating that the project would not significantly lower water quality or adversely affect the environment. Then the public hearing and comment process began. The Central Valley Regional Water Quality Control Board, from which a "waste discharge permit" was needed, demanded additional tests, but ultimately, on July 12, 1989, voted to accept the plan, subject to stipulated protective measures and post-disposal environmental monitoring. But the Contra Costa Water District, downstream from the disposal site, asserted that the EIR contained "incorrect dilution calculations," and expressed concern that heavy metals and salts in the sediment would run off

[13] An Army Corps of Engineers official argued that "The area affected by the disposal site is . . . just one to two of 1,500 square nautical miles of fishing territory. Any inconvenience is limited to a minute percentage" [Mackowski, 1988a, p. 26]. An HMBFMA representative, however, argued that currents would carry the dumped sediments more widely and that the sediment would disrupt rich breeding grounds for fish and shellfish. A representative for Citizens for a Better Environment, which earlier had accepted the B1B site, said that it would be better to take the spoils over the continental shelf because "You can't assume any place is safe" [ibid., p. 27].

into the delta waterways, violating water pollution discharge regulations. In early August 1989, the Contra Costa Water District and the Port of Oakland each filed a lawsuit against the other, seeking a judicial determination whether the Port's EIR was legally sufficient. Not until July 1990 did the court decide, upholding the legal sufficiency of Oakland's plan. But Port officials calculated that after all regulatory conditions and monitoring requirements, it would cost $21 a cubic yard to use the delta site, as compared to $2 at Alcatraz, $4 at B1B, and about $7 for an off-the-continental-shelf site. They decided to try once again to gain access to the Alcatraz and certain other delta sites for Phase I material.

As of April, 1991, no decision or resolution had emerged concerning the disposal of the Phase I 440,000 cubic yards of material, much less the additional 6.5 million cubic yards called for by the full-scale harbor-deepening project. American President Lines and Maersk Lines were still compelled to reduce loads and time their sailings to catch high tide, which boosted operating and stevedoring costs significantly. Oakland lost additional port business to Los Angeles and Seattle, slowing amortization rates for existing facilities, raising costs per ton of cargo handled, and imperiling some of the 40,000 jobs estimated to flow from port activities [*Pacific Shipper,* 1990a]. Yet the Corps of Engineers and EPA, only recently given appropriations for ocean studies, were only at the beginning of a two year research project that would provide the basis for designating a permanent ocean deposit site. Already confronted with vocal political challenges to its plans to designate an ocean disposal site in southern California, EPA insisted full-scale, legally defensible environmental analysis must precede approval of even a *temporary* ocean disposal site for the Oakland project. Meanwhile, the regional water quality board adopted regulations prohibiting deposit of new dredging project spoils anywhere in the Bay. Four years after Congress funded the Oakland harbor-deepening project, deadlock continues in the harbor, in the courts, in the agencies, and in the assessment of scientific evidence.

The Pathologies of Adversarial Legalism

The legal procedures that gave rise to the deadlock in the Oakland case reflect fundamental ideals of pluralistic democracy—the notions, for example, that public policy should be formulated and implemented only after full and fair deliberation; that meaningful attention should be given to the claims of the individuals and groups who are not politically powerful (such as the Half Moon Bay fishermen); that environmental protection should be given special weight in planning currently urgent development projects that might deprive future generations of irreplaceable ecological amenities; and that to vindicate those values, a variety of interest groups and agencies should be able to challenge official assumptions and judgments.

But the policymaking procedures designed to protect those pluralistic values seemed to fall into the hands of the Sorcerer's Apprentice, multiplying themselves beyond control. In consequence other important values were completely undermined, such as the public interest in a reasonable degree of procedural efficiency and in decisions that retain a sense of proportion and balance among competing substantive ends. Consider, for example, the operative characteristics of the process:

1. *Irresolution.* After four years of debate about disposal of dredged sedi-

ments, there has been no authoritative determination about where to put them and what impact they would have on the environment.

2. *Legal fragmentation.* Instead of combining their concerns in one comprehensive forum, a cascading jumble of regulatory agencies, private interest groups, and courts were legally enabled or compelled to take sequential whacks at the problem.
3. *Legal complexity.* The decision process was constrained by a segmented, detailed sequence of statutorily mandated reviews, certification points, substantive specifications, and scientific standards.
4. *Legal uncertainty and inconsistency.* For all its detail and complexity, the law afforded no certainty. Three compendious, expensive environmental impact reports, scrutinized through the lenses of adversarial legalism, were stripped of legitimacy; they resolved nothing. When one court upheld a regulatory decision, another could be found to overturn it on a different legal argument. While one water agency approved a Delta disposal plan, another blocked it in court for a year.
5. *Instability of compromises.* Negotiated agreements, when finally reached, were unstable. Any interest dissatisfied with the compromise could sue in court, relying on the uncompromising language of the law.
6. *Procedural extortion.* Simply by preventing definitive resolution of the issues, adversarial legal conflict shaped the outcome. No dredging has occurred. Repeatedly, the Port of Oakland felt compelled to accept more expensive disposal methods to avoid crippling procedural delays. The extortive pressures engendered by litigational and regulatory processes, not rational economic and environmental analysis, came to dominate the decisions on where the sediment would be dumped.
7. *Economic inefficiency.* In effect, and despite the law's intent, the social and economic benefits of more efficient transportation and trade were not weighed against but were totally subordinated to concerns about local environmental preservation. While uncertainties persisted about the ecological risks presented by disposal of the sediments in question, adversarial legalism seemed to enable virtually any claim of potential ecological harm, no matter how minimal or remote, to take precedence over development projects, no matter how beneficial to human beings.
8. *Demoralization.* Governmental authority and conviction collapsed, as officials retreated to a position of litigation avoidance. A Corps of Engineers official recently asserted that in harbor-dredging matters, the Corps does not want to "get caught in the middle," to battle environmental activists, or "to tell state agencies what to do." The Corps wants local entities—that is, port authorities—to "carry the ball," whether that entails doing the research, making concessions, or fighting for their position in court [Bowman, 1990]. As if hoping the problem will go away, EPA promises no decision on a permanent ocean disposal site before 1992.
9. *Diversion of attention.* Because of the institutionally fragmented, sequential way environmental issues were treated, with each agency myopically perusing expansion plans in terms of the particular environmental problems contemplated by its particular governing statute, environmental protection may actually have been reduced. In April 1990, the Exxon Long Beach, a sister supertanker to the infamous Exxon Valdez, laden with 50 million gallons of Alaskan crude oil, ran aground on a "high

spot" in Long Beach Harbor. Fortunately, no damage occurred; the ship was moving very slowly [*Pacific Shipper*, 1990b]. In other recent harbor accidents, the environment was not so lucky; tons of petroleum did foul the environment.[14] The message should be clear: Shallow harbors, by threatening damage to ships, may pose a far larger danger to water quality and marine habitats than properly "capped" dredging spoils. Yet these risks received little or no attention in the regulatory and judicial processes that have held up the deepening of Oakland's harbor. For adversarial legalism tends to focus attention on only those problems implicated in the claimants' legal briefs, not on those which have no advocate in court.[15]

THE ROOTS OF ADVERSARIAL LEGALISM

In the Oakland case, adversarial legalism arose from a legally structured decision system that a National Research Council panel understandably described as "complex, cumbersome, unpredictable, and fragmented" [NRC, 1985, pp. 3, 77]. Sometimes, as in the Oakland case, the system leads to repetitive, protracted regulatory and judicial proceedings; there have been 123 reported cases in the federal courts alone concerning dredging and disposal issues [McCreary, 1989, p. 43]. In other cases the port authority, fearful of litigation costs and delays, quickly accedes to any plausible (that is, not easily rebuttable) claim of environmental harm and invests in expensive mitigation measures [NRC, 1985, pp. 89–90; Wessel and Hershman, 1988; Mackowski, 1988c, p. 22]. Thus the litigation rate, here and in other policy spheres, is not the only indicator of adversarial legalism, and deadlock is not its only manifestation. What matters more is less observable—the "chilling effect" on responsible decisionmaking and the increase in the ultimate costs of development projects.

In a democratic society, "NIMBY" problems seem especially likely to raise the threat of adversarial legalism. The sediments in Oakland's harbor are akin to the New York City garbage that was barged from state to state in search of a dumping ground, encountering in every port the same chorus—"not in my back yard." Disposal of dredged material, like the creation of a chemical-waste storage site or a halfway house for narcotics addicts, may provide large benefits for the public at large, but also imposes risks or concentrated costs on residents of the neighborhood (or ecosystem) adjacent

[14] In the summer of 1989, a tanker attempting to avoid a sand bank in the inadequately dredged Houston ship channel collided with an oil barge, releasing 240,000 gallons of oil [Solomon and Machalaba, 1990]. In February 1990, a tanker spilled 400,000 gallons when it went aground near a Huntington Beach, California terminal, having misjudged the depth—at least partly because of siltation in the channel [*Pacific Shipper*, 1990c].

[15] Another example: The regulatory process neglected the environmental effects of forcing the Port to spend an estimated $2.5 million on environmental research and advocacy and the additional millions that more expensive disposal methods would require. Each million dollars spent on those matters left Port officials with less to spend on reducing congestion—and hence concentrated air pollution—on the crowded roads linking marine terminals with highways and railroads. Dedicated container roadways and on-dock railheads, which would reduce pollution and the risk of motor vehicle accidents, arguably provide a much greater environmental "value added" than expenditure on more remote ocean disposal of dredged material.

to the operation. Thus in the United States, proposed highways, electric power plants, offshore oil exploration, landfill areas, and housing developments are often tied up by lawsuits brought by neighborhood and environmental advocacy groups. Frequently, as in the case of the Seabrook (New Hampshire) nuclear power plant, the development project never really loses on the merits, but repeated, judicially mandated administrative rehearings and research projects drive up the project's costs enormously—and sometimes induce the financially exhausted sponsors to give up [O'Hare et al., 1983; Frieden, 1979].[16]

The question is whether the policymaking and dispute-resolution process in NIMBY cases must be as legalistic, adversarial, protracted, costly, and insensitive to economic values as in the Oakland dredging story. The answer, I would argue, is no. Adversarial legalism is a product of a particular way of articulating and implementing public policies—one that invites, exacerbates, and extends legal conflict.

Administrative Finality vs. Administrative Fragmentation

With respect to the dredging problem, for example, one can imagine a very different decision-system, characterized by what we might call *administratively final, multi-factor balancing*. Suppose the national legislature established a few regional port planning agencies with broad discretionary authority. Each agency's governing board could include representatives of recognized environmental groups. The agency would be expected to meet, in private, with local advocates of port expansion, environmental agencies, conservation groups, and representatives of the fishing industry. Based on those discussions, the agency would commission research it agrees is necessary, taking into account the apparent seriousness of the environmental risks and the social costs of delaying port expansion. It would attempt to build consensus around the plans and mitigation measures it deemed best, but if no consensus could be reached, the agency would be empowered to make a final decision.[17] The planning agency's decisions, if appealed to courts or to other political bodies, would command considerable deference, unless shown to have been substantively arbitrary or the product of unfair influence. That discretionary administrative authority to make final and binding decisions probably would encourage serious efforts by participating interests to reach a negotiated accommodation. Ideally, the agency would keep a series of port expansion issues on the table at the same time, so that concessions to intensely advanced economic or environmental concerns in one case might be traded off against reciprocal concessions in another.

Now contrast the existing system. The many Congressional statutes and state laws that structured the decisionmaking process in the Oakland dredg-

[16] A disturbing reaction by frustrated developers has been to file expensive damage suits, based on claims of defamation or other grounds, against citizens or local organizations who have used legal channels to block or delay the project. Researchers call these SLAPP suits—strategic litigation against public participation [Canan and Pring, 1988].

[17] Mitigation measures might include the creation of new marshes near those destroyed by fill, a new waterfront park, funding of mechanisms for more intensive monitoring of aquatic life and water quality, and so on. See Wessel and Hershman [1988]. Compensation measures might include creation of a trust fund that would pay money damages to commercial fisheries for lost revenues attributable to dredging operations. See generally O'Hare, et al. [1983].

ing case created a *legally-constrained, fragmented decisionmaking system*. The National Environmental Protection Act and the Marine Protection, Resources, and Sanctuaries Act seem to provide for multi-factor balancing.[18] But they fail to create a comprehensive, authoritative decision maker, capable of making binding decisions on the severity of environmental harm or whether it is worth the time and money to undertake additional research. The Corps of Engineers was the designated "lead agency," but the environmental conclusions in its EIS and its permit decisions were subject to multiple legal vetoes by other, more specialized environmental agencies, each bound to give primary consideration to the stringent environmental protection standards articulated in its own more narrowly focused statute.

In addition, each agency's authority was weakened and constrained by the prospect of *judicial review*. Legal rules that expanded "standing to sue" enabled private interests (such as the Half Moon Bay fishermen) and environmental advocacy groups to block any agency decision, at least temporarily, by hauling it into court. Because the governing laws tend to be both ambitious and complex,[19] they increase the probability of a *post hoc* judicial determination that the agency has not met its legal obligations.

These legal constraints discourage informal, binding compromises on difficult scientific, technical, and political issues surrounding major harbor projects. Each law demands formal legal and scientific findings for each project, viewed in isolation; hence a California regional water quality agency had no incentive or authority to trade a concession in the Oakland case for a more urgently needed environmental protection measure in another harbor. Be-

[18] After all the information, studies, comments, and regulatory agency opinions have been received, the Corps of Engineers, in making the crucial "public interest" determination for issuing a dredging permit, is legally obligated to carefully consider and weigh:

> All factors which may be relevant to the proposal . . . including the cumulative effects thereof: among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, land use, navigation, shore erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership and, in general, the needs and welfare of the people. [33 CFR sec. 320.4 (a) (1)]

[19] For example, to determine an appropriate ocean disposal site under section 102 of the Marine Protection, Research and Sanctuaries Act, the EPA must establish criteria which shall consider (but not be limited to) the following factors:

> (A) The need for the proposed dumping, (B) The effect of such dumping on human health and welfare, including economic, esthetic and recreational values, (C) The effect of such dumping on fisheries resources, plankton, fish, shellfish, wildlife, shore lines and beaches, (D) The effect of such dumping on marine ecosystems, particularly with respect to (i) the transfer, concentration and dispersion of such material and its byproducts through biological, physical and chemical processes, (ii) potential changes in marine ecosystem diversity, productivity, and stability, and (iii) species and community population dynamics, (E) The persistence and permanence of the effects of the dumping, (F) The effect of dumping particular volumes and concentrations of such materials, (G) Appropriate locations and methods of disposal or recycling, including land-based alternatives and the probable impact of requiring use of such alternative locations and methods upon considerations affecting the public interest, (H) The effect on alternate uses of oceans, such as scientific study, fishing, and other living resource exploitation, and nonliving resource exploitation, (I) In designating recommended sites, the [EPA] shall utilize wherever feasible locations beyond the edge of the Continental Shelf.

Note that the use of the term "feasible" in clause (I) invites litigation over the extent to which it allows or commands EPA to consider the far greater economic costs of disposal beyond the Continental Shelf.

cause decisions must be based on a judicially reviewable public record that carefully reports and responds to potential environmental objections, each agency must state and adhere to a formal position, bolstered by time-consuming and costly "defensive science."

Finally, because of the delays associated with lawsuits, rehearings, revisions of impact statements, and so on, the legal process empowered opponents of the project to block it simply by making legal claims, regardless of whether they were ultimately vindicated. Where the option to engage in adversary legalism is presented, advocates of the status quo—in this case, defenders of local environmental amenities—are encouraged to act opportunistically, to use legal claims to extort concessions for particularistic interests, rather than to establish by persuasion that their desires coincide with a broader public interest. Conversely, when an environmental agency is seeking to change the status quo—for example, by seeking to compel an existing factory or municipal sewage plant to make costly improvements in its emission control systems—then a structure that allows for and rewards adversarial legalism can operate to the detriment of legitimate environmental interests.

Some might object that my hypothetical alternative policymaking system—administratively final, multi-factor balancing, rather than fragmented authority, detailed legal rules, and high risks of judicial reversal—is not politically or legally feasible in the United States. Our tradition mistrusts governmental authority. American practice is to disperse governmental powers among separate, mutually checking agencies; to subject administrative bodies to legal regulation and review; and to guarantee citizens substantive and procedural rights with which to challenge the bureaucrats in court. That is precisely my point: The legal traditions and structural features of American government create the conditions under which adversarial legalism can flourish, not only in NIMBY situations, but in a wide array of policy domains.

Something Changed

If it's a matter of legal traditions and pluralistic political structures, why has the incidence of adversarial legalism in the United States increased in recent decades? We nod with familiarity when modern authors cite De Tocqueville's observation that in the United States of the 1830s, most major political issues became judicial issues. In the early decades of the twentieth century, business interests resorted to a kind of adversarial legalism to frustrate legislatively enacted regulatory controls, urging the courts (with mixed success) to rule them unconstitutional.

But for the most part, adversarial legalism of the type at issue in the Oakland case did not arise until late in the 1960s and the 1970s. Before then, standing to sue was restricted. Public interest groups rarely appeared in court. The regulatory statutes of the Progressive and New Deal eras typically granted administrative agencies broad discretion; immensely detailed "agency-forcing" statutes did not appear until the mid-1960s [Ackerman and Hassler, 1981]. Courts generally deferred to the decisions of federal administrative agencies and of local zoning boards, universities, school boards, and prison administrators. Massive class actions against business corporations and welfare departments were rare. So were malpractice claims against physicians and damage suits against police departments [Schuck, 1983]. Both civil and criminal trials were far shorter.

The period before 1965 was not a Golden Age. It was harder to challenge governmental and economic power, and power was not always benign. Many regulatory agencies, neither monitored nor pressured by public interest groups, were very soft on the industries they were supposed to control. Citizens, especially poorer citizens, often had little recourse when highways were thrust through their neighborhoods, when chemical waste sites were located near their homes, when schools discriminated against racial minorities and handicapped children, or when police or bureaucrats treated them arbitrarily. The point is only that before the 1965–70 period, adversarial legalism was far less common.[20]

Moreover, adversarial legalism persisted—and seems to have continued to grow—through the more conservative 1980s. It persisted even as a popular conservative president sought to dampen "excessive regulation" and liberal judicial activism. It persisted in the face of dissatisfaction among many segments of bench, bar, and public over judicial restructuring of school systems, extension of liability to parties who don't really seem primarily at fault, high insurance costs, and due process rules that seem to restrict crime control. It might be useful to consider why.

Legal Culture

Conceivably, increases in adversarial legalism reflect changes in Americans' legal attitudes and capacities. People have become richer, better educated, more adept at organizing. Perhaps people also have become feistier, more legally demanding; quicker to translate grievances into demands for new, harder-edged legal rights; readier to mistrust authority and to fight city hall and big business by any means, including the courts.

Lawrence M. Friedman [1985] argues that despite some rear-guard opposition [see Sanders, 1987, p. 609; Engel, 1984], American legal culture indeed has shifted its center of gravity, manifesting a widespread expectation of "total justice." Most Americans, Friedman suggests, no longer accept injury, ill-treatment, environmental degradation, or poverty as acts of God or as the inevitable by-products of capitalism and modern technology. To the contrary, they see that capitalism and modern technology create the means to prevent or remedy misfortune—insurance systems to spread the costs of alleviating suffering, sophisticated methods to test for carcinogens, double hulls for oil tankers, better education and nutrition for poor children. If those techniques

[20] Civil trial court litigation rates per capita will not quite do as a statistical indicator of adversarial legalism. As noted earlier, the extraordinary cost of litigation discourages many civil lawsuits and criminal trials. Moreover, legal claims increasingly have been diverted to specialized but often quite adversarial administrative forums.

One rough indicator is the growth in expenditures on lawyers. Using constant 1983 dollars, national payments for private legal services (that is, leaving out lawyers on the payrolls of governmental bureaucracies and corporate legal departments) grew slowly between 1929 and 1960, from $4 billion to almost $9 billion. Then expenditures on lawyers exploded, multiplying sixfold to $54 billion in 1987, almost tripling legal services' share of GNP (Sanders and Williams, 1989, pp. 434–35). Another indicator is the growth of constitutional litigation, disputes challenging the legitimacy of a government policy or decision. In the 1980s, some 20 percent of the approximately 10,000 state supreme court decisions per year involved constitutional issues, as compared to only 8.7 percent in the 1905–40 period [Kagan, 1987]. The federal courts of appeal in 1980 decided an estimated 2000 cases involving apparently serious constitutional issues, compared to perhaps 300 in 1960 [ibid.].

exist, it is unjust not to use them. The law, therefore, should require them, and establish individual rights to insist that the laws be properly implemented.

Such ideas, Friedman argues, have come to dominate the thinking of many, even if not all, members of the law-shaping governmental elite—law professors, legislative staffers, lobbyists, and journalists. Hence the expansion of strict liability and high damages in tort law, the growth of environmental and safety regulation, the spread of due process guarantees of fair treatment to the police station house and the welfare office, the extension of anti-discrimination laws to protect not only African Americans but other ethnic groups, women, the aged, and the handicapped.

Popular demands for "total justice" probably help explain the demand for more law. But a puzzle remains: Expectations of fair treatment, compensation for misfortune, and environmental protection do not necessarily lead to laws and legal institutions that encourage adversarial legalism. European governments have led the way in establishing social insurance schemes for the victims of misfortune [Kohler and Zacher, 1982; Kamerman and Kahn, 1988]. In many countries, European "Greens" have waged an increasingly effective political war for new laws regulating pollution and nuclear power generation. But the expansion of legal entitlements and regulation in Western Europe did not produce nearly as much American-style adversarial legalism.[21] Fierce controversies sometimes erupt in Western Europe, as in the case of siting decisions for such large-scale developments as nuclear power plants or the planned third London airport [see Vogel, 1986]. But they usually are resolved in political and administrative forums, not in courts, and outcomes rarely are shaped by the manipulative use of legal procedures and standards. Western European environmentalists and legal scholars often are attracted to American models. They call for tougher judicial review, citizen advocacy, and legal sanctions. Yet they generally have been far less successful in getting them.

Aaron Wildavsky [1990a] has argued that Americans (along with everyone else) tend to favor one of three political cultures that contend for influence over government and legal institutions. Believers in "*hierarchy*" value authority. They care deeply about order, traditional morality, effective governmental control of destabilizing economic forces and social tendencies, balanced budgets, and national defense. Economic *individualists* favor freedom from government control, low taxes, and policies that promote economic efficiency. *Egalitarians* mistrust authority, but also believe in economic and social equality, even if it takes governmental coercion to achieve it. Hence they favor redistributive tax, regulatory, and welfare programs, along with citizens' legal rights to challenge governmental authority and deep-pocketed corporations in order to compel them to ameliorate economic injustice.

Wildavsky presumably would see egalitarians as the truest believers in Friedman's "total justice," and even more crucially, as active proponents of adversarial legalism, which helps them enforce their views against mistrusted adherents of competing political cultures. From this perspective, if adversarial legalism has grown in the U.S., it is because American egalitarians, previously in a weaker position, have enjoyed a period of remarkable political success, penetrating the legislatures, judiciaries, law faculties, and news me-

[21] See comparative studies, footnote 1. Increasingly, European environmental regulation has taken the form of taxes on emissions and on polluting materials, rather than detailed legal specification of control technologies [*The Economist*, 1990b; Huppes and Kagan, 1989].

dia more fully than have their political antagonists [see Wildavsky, 1990b]. In Western Europe, in contrast, believers in hierarchy presumably remain politically stronger, influencing European egalitarians toward corporatist rather than toward litigational strategies.

Wildavsky's argument seems to identify an important wellspring of adversarial legalism. And it helps explain why the 1960s and the early 1970s represented a turning point. It was then that the populist, egalitarian spirit had one of its powerful periodic outbursts in American political life [Huntington, 1983]. The street demonstrations and the civil disobedience of the civil rights movement and the anti–Vietnam War movement overwhelmed the incremental processes of "normal politics." They spilled over into environmental, consumer protection, and feminist movements, spawning similar advocacy organizations, and inspiring ambitious politicians to seek their support through a moralistic, entrepreneurial brand of politics [see Wilson, 1980].

It was precisely in these years, between 1964 and 1975, that strictly worded, "technology-forcing" federal environmental, health, and safety regulatory laws first proliferated and that legalistic enforcement programs were mandated [Bardach and Kagan, 1982, ch. 2; Litan and Nordaus, 1983, p. 44]. It was then that administrative rulemaking was "judicialized" [Shapiro, 1988], that the Supreme Court most actively extended the "due process revolution" to local criminal justice systems, and that many states adopted tort law changes extending liability for malpractice, defective products, and government-caused injury [Priest, 1985; Ursin, 1981; Schuck, 1983]. It was then that judges began to issue injunctions requiring bussing of school children to achieve racial balance and de-institutionalization of mental patients [Curtis, 1986; Rothman and Rothman, 1984].

Still, it is not quite clear why the egalitarian impulse relied so heavily on adversarial, legalistic policymaking and implementation methods. Western Europe proponents of equality were active and often successful in the same time period; but they did not demand, or at least did not achieve, similar laws and court decisions. And why did legal measures that encouraged adversarial legalism in the U.S. persist, even in the face of conservative presidential opposition, even after national concerns shifted to oil shortages, inflation, declining productivity, trade imbalances, and international competitiveness?

Political Structure

Adversarial legalism in the United States, I would argue, has been stimulated by a fundamental mismatch between a changing legal culture and an inherited political structure. Americans have attempted to articulate and implement the socially transformative policies of an activist, regulatory welfare state through the legal structures of a reactive, decentralized, nonhierarchical governmental system. In the absence of a strong, respected national bureaucracy, proponents of regulatory change and social welfare measures have advocated methods of policy implementation that emphasize citizens' rights to challenge and prod official action through litigation.

This argument is inspired by Mirjan Damaska's *The Faces of Justice and State Authority* [1986]. Damaska formulates a typology of legal processes built on two dimensions. One dimension concerns the organizational structure through which administrative and legal processes flow; the other, varying cultural visions of the proper role of government. One mode of organizing

authority Damaska labels *hierarchical*, an ideal-type toward which Continental European legal systems incline. It features a limited number of strong, highly professional, national bureaucracies, topped by a central ministerial authority responsible to political leaders. Fidelity to official norms and policies, along with uniformity and predictability of case-by-case decisionmaking, are the reigning ideals.[22] Officials are relatively insulated from the potentially corrupting influence of local politicians and citizens.

American legal and administrative processes, on the other hand, lean toward a *coordinate* organization of authority. Designed to limit central authority's potential for tyranny or political bias, power is fragmented among many governmental bodies, often staffed by locally elected officials. Control is exercised horizontally, through one governmental body's capacity to check another and through citizens' rights to challenge governmental decisions in court. The best decisions will emerge, the coordinate model presupposes, not from uniform imposition of (potentially flawed) official rules, but from the clash of arguments proferred by a pluralistic welter of organizations and citizen-representatives. Outcomes in the coordinate ideal thus are to be closely attuned to the particular circumstances of each dispute, responsive to evolving local notions of justice. Adversarial claiming, negotiation, and compromise, rather than uniform hierarchical norm-imposition, will be common and will be favored.[23]

With respect to the political culture dimension, Damaska poses two further polar types: one that values an *activist state*, dedicated to the aggressive

[22] Damaska's favorite examples are Continental criminal justice systems, in which a national Ministry of Justice oversees sub-bureaucracies of police, prosecutors, judges, and correctional officials, whose members are appointed and promoted according to professional standards, akin to American "civil service" systems. They are often rotated around the country in the course of their careers, advancing the ideal of uniformity rather than responsiveness to local norms. Adherence to professional and legal norms is further ensured by frequent, searching hierarchical review of the files that set forth the grounds for lower-level decisions, and also by the powers of bureaucratic superiors to discipline, dismiss, or delay promotions of subordinate officers, judges, and so on. Participation in decisionmaking and the evidence-gathering processes by laymen, and even by private attorneys, is constrained and controlled by professional judges.

[23] In a criminal justice system organized according to the coordinate model, best exemplified by the United States, there is no overarching national ministry of justice with powers to hire and fire or direct front-line criminal justice personnel. Instead, thousands of separate municipal or county police forces are responsible to locally elected mayors. Prosecutors are elected or appointed at the county level, free from almost any hierarchical control. Judges are organized in state court systems, but typically owe their election or appointment to local political party organizations, and certainly not, as in European judiciaries, to high grades on a civil service exam and gradual progress through a closely supervised judicial bureaucracy. [On lateral, "political" entry even to high courts, see Kagan et al., 1984]. Control is exerted horizontally by each organization's ability to reject a case pushed forward by another. Prosecutors have virtually unreviewable discretion to decline to prosecute law violations forwarded to them by police organizations. Juries, nonprofessional citizen adjudicators, can reject the prosecutor's view of the facts or even the trial judge's statement of the governing legal standards, for they deliberate in private, free from the prospect of hierarchical appellate review. Whereas in hierarchical systems, the dominant role in adjudication is played by well-staffed offices of judges and apprentice judges, in understaffed coordinate systems, adversarially poised lawyers control the course of factual investigation, the evaluation, presentation, and testing of evidence. The trial itself emphasizes oral testimony and cross-examination, more evocative of a tribal moot than of the sequential, gradual accumulation of documentary evidence in the bureaucratic, hierarchical system. Throughout the process, negotiated settlements, sensitive to the character and circumstances of individual defendants, are common and legally acceptable [Feeley, 1979].

management or even transformation of economy and society; and at the other pole, a political culture that prefers a *reactive state*, expected only to provide an orderly framework for private economic and social interaction, to formulate and implement policy primarily by resolving conflict among competing interests.

There are obvious affinities between an activist state and a hierarchical organization of authority, with its respected bureaucracy and judiciary, willing and able to implement official policy faithfully. Similarly, a reactive state fits nicely with a coordinate organization of authority, with its wide openings for civilian influence, its skepticism about state-enforced norms, its reliance on adversarial argument, its openness to private negotiation. In the reactive, conflict-resolving state, when government is involved in a dispute with citizens, the governmental official stands on the same plane, in theory, as the individual, representing just another competing interest. A judge attentive to individual rights must have the last word, not (as in the activist state) the governmental official bent on policy implementation.

Through the nineteenth century, the United States blended the reactive state and coordinate authority. Its constitutional and political structures, organized along those lines, became deeply institutionalized. The central government never developed the large, high-status national bureaucracies created by European states before the advent of mass democracy. Courts shared power with legislatures, both through common law adjudication and constitutional decisions erecting individual and states' rights as barriers to governmental regulation.

In the twentieth century, however, American government, like government in other industrialized democracies, has experienced powerful political pressures to become more activist—to steer and stabilize the economy, to bring about the "total justice" Friedman describes. In the United States, those political demands had to be channeled through political structures designed for reactive government and decentralized conflict resolution, not for centralized, top-down social engineering. That meant trouble. As Damaska [1986] writes, "A state with many independent power centers and a powerful desire to transform society can be likened to a man with ardent appetites and poor instrument for their satisfaction" (p. 13).

Consider, for example, the 1960s "due process revolution" in criminal procedure. Advocates of this strain of "total justice," appalled by abusive police practices in segregated Southern states and crime-ridden Northern cities, could not readily exert reform pressure on the federal government. Congress and the Department of Justice lacked clear constitutional authority to impose reforms hierarchically on local police departments. The only viable strategy for change seemed to be a further elaboration of *coordinate* controls. Thus the Warren Court extended the terms of the Bill of Rights to state and local police forces, elaborating rules to regulate pretrial detention, interrogation of suspects, searches for evidence, station-house lineups, and jury selection. Simultaneously, the Court mandated adversarial mechanisms for enforcing those new rules. It required states to provide free defense counsel—before, during, and after trial. It required local judges to exclude evidence obtained through searches or interrogations that violated the Court's rules—freeing the criminal, if necessary, for lack of any hierarchical control over the blundering constable. The Court also expanded the federal courts' powers to review state court decisions. The result has been a surprisingly effective but an unusually

adversarial, politically controversial, and costly way of regulating local criminal justice officers.[24]

Similarly, in the 1960s, explosive political movements demanding socially transformative policies—in civil rights, in environmental and consumer protection, in reducing poverty—demanded enormous increases in the power and reach of the federal legislation, preempting weaker state and local laws. At the same time, movement leaders were intensely suspicious of centralized legislative and bureaucratic power, which they saw as conservative, potentially obstructionist, and susceptible to business pressures. They demanded, therefore, the *further fragmentation* of governmental authority. They insisted that the federal policymaking and implementing process conform to the adversarial principles of reactive, pluralistically organized government. They wanted far-reaching social change, but through what Michael McCann [1986] has called a "judicial model of the state."

The civil rights, environmental, anti-poverty, and other "public interest" movements, along with their growing cohort of legislative, academic, and journalistic allies, splintered the centers of authority in the legislature and in the Democratic Party. The seniority system in Congress was weakened. The power of standing committee chairs was distributed among a multiplicity of subcommittees, many of them chaired by more liberal politicians, each bolstered by larger staffs [Davidson, 1989]. Campaign finance reforms intensified each legislator's search for independent sources of funding and support. For all these reasons, political party leaders were stripped of a considerable measure of control over their members and over policy formulation [Huntington, 1983; Polsby, 1983; Ranney, 1983].

Advocates of governmental activism also sought to further restrict and fragment executive authority. After 1968, reformers confronted a politically divided federal government—another legacy of coordinate-model government. To implement socially transformative legislation, they had to rely on an executive bureaucracy headed by President Nixon's Republican appointees. And bureaucracy, in the coordinate tradition, was open to ongoing pressure from regulated businesses, lawyers, and tight-fisted budget office officials. Reformers, in response, demanded *more* coordinate-style controls—expanded rights for citizens and advocacy groups to participate in and seek judicial review of administrative decisions. Hence statutes began to include more detailed, judicially enforceable restrictions on administrative discretion. The policymaking process, it was asserted, should be more transparent: Decisions must be based on scientific findings and reasoned justifications available for scrutiny by advocacy groups and reviewing courts. To facilitate oversight, reformers demanded and Congress created new, special-

[24] Actually, motions to suppress illegally obtained evidence rarely enable the criminal suspect to walk out of the courtroom a free person [Davies, 1983]. But pretrial hearings on such motions occur, according to some studies, in almost one in every ten criminal prosecutions [Nardulli, 1983, p. 594], and in almost 40 percent of prosecutions that rely on evidence obtained by search warrant [Davies, 1983, p. 664]. Appellate courts battle over exceptions to confusing and ever-changing rules about criteria for searches, waiver of Miranda rights, and other aspects of criminal procedure. The adversarial method for implementing the "due process revolution," not surprisingly, has been severely criticized for producing legalistic results, inciting the accused to adversarial resistance rather than to repentance, vastly increasing the costs and delays associated with criminal proceedings and trials, and hence for promoting hurried plea bargaining rather than systematic adjudication.

ized agencies and appeal boards [Moe, 1989], further multiplying administrative fragmentation and opportunities for legal contestation.

Moreover, advocates of transformative federal legislation faced a decentralized political order that necessarily reserved a large implementation role for potentially recalcitrant state and local governments, school boards, and welfare departments. They could not be replaced with the "appropriate" instrumentality of the activist state—a far-reaching, hierarchically organized federal bureaucracy, whose top administrators could fire uncooperative local officials. Again, the reform strategy was to extend coordinate controls. The Supreme Court required state and local governments to provide court-like due process hearings before cutting off welfare benefits or suspending unruly students. Congress gave citizens and advocacy groups rights to sue state and local government for half-hearted enforcement of federal laws, to sue the feds for inadequate oversight of the states, and to sue regulatory violators who had not been adequately punished by governmental officials. To sustain such "private attorney generals," government was ordered to pay the lawyers' fees for advocacy groups that won in court [Greve, 1989].[25]

Liberal or egalitarian reformers did not have the field to themselves. Conservatives lacked the political power to block or alter the basic goals of regulatory, civil rights, and welfare legislation, but they too could seek further checks on administration. Permitting authority for wetland fills and ocean dredge disposal was given to the development-minded Corps of Engineers as well as to the EPA. Agency heads were ordered to report to Congressional subcommittees responsive to conservative interests as well as to liberal ones.[26] Presidential orders and Congressional statutes required administrators to conduct cost-benefit analyses of new regulations and projects. Those analyses, and the agency's response to criticisms of them, were subjected to coordinate review by economists in the White House and by Republican appointees on the federal courts of appeals [Landy, Roberts, and Thomas, 1990; Reich, 1985a, p. 1622). Conservative state and federal executives promulgated legal regulations restricting the discretion of local officials who administered expanding welfare programs [Simon, 1983]. Conservative public interest law firms popped up, paralleling liberal ones in their eagerness to haul beleaguered administrators into court.

The resulting institutional and legal structure helps explain the persistence of adversarial legalism in the last 15 years, when the transformative impulses of the 1960s ran up against stubborn economic realities, budget deficits, and conservative political successes. The legislation of the newly activist state demanded strict top-down enforcement of centrally formulated standards—EPA-determined "best available technology" pollution control devices for all new pollution sources, bureaucratically prescribed handicapped access provisions in all public transportation systems, and so on. But without

[25] Similarly, the False Claims Act (31 U.S.C. sec. 3729) authorizes any private citizen who believes a contractor is defrauding the federal government to bring a treble damage action on behalf of the government and, if successful, keep 15 percent of the treble damages plus lawyers' fees and costs.

[26] According to John Chubb, "By 1981 Congress had divided up authority over energy policy among forty-three subcommittees, more than double the number of a decade before" [1989, p. 92]. EPA officials must report to 11 House and 9 Senate committees and at least 50 subcommittees. During several years in the 1980s, EPA officials were called to Capitol Hill to testify more than 100 times—about every other working day.

a tradition of hierarchical implementation, administration is repeatedly subjected to coordinate model challenges. Regulated enterprises and municipalities complain to local legislators and hire lawyers to take their case to court. Local administrators and judges often respond to local pressures for more accommodative regulatory decisions [Melnick, 1983; Sholtz and Feng, 1986] or for more restrictive social benefit program decisions. But then yawning gaps appear between the ambitious law on the books and the law in action. Advocacy organizations [Rabkin, 1989] and disappointed entitlement-seekers [Mashaw, 1983] file lawsuits and appeals (a coordinate model strategy) alleging administrative infidelity to law (a hierarchical model principle). Legislative oversight committees respond by demanding tougher sanctions against regulatory violators and more legal constraints on administrators.[27] Hence adversarial legalism grows rather than diminishes.

Similarly, because authority in Congress remains fragmented and government remains politically divided, legislation becomes more, not less, prolix and procedurally complex. Individual Senators and House Subcommittee chairs more often add hastily drafted last-minute amendments [Smith, 1989], further reducing statutory coherence. Fearful that statutory standards will be eroded by Republican administrators or judges, liberal legislators add amendments articulating more exalted rights and heavier regulatory penalties, while conservatives add amendments enabling regulated entities to raise technical defenses. Laws end up resembling elaborately constructed arms control treaties between mutually suspicious nations, laden with convoluted but substantively unclear provisions that one side or another can invoke in court to challenge administrative decisions it dislikes [Shapiro, 1988, p. 172]. Like multisubject omnibus appropriations acts, impenetrable tax law provisions, and the 400-page Clean Air Act of 1990, statutes become longer but more opaque [Blake, 1990; Stout, 1990], and hence more likely to generate uncertainty and litigation.

Interpreting poorly drafted statutes, judges unavoidably shape and reshape the law according to their own political judgment [Atiyah and Summers, 1987, pp. 37–40, 305–08]. Thus decisions vary from court to court, precedents are viewed as malleable, and litigation is encouraged. As laws and special-purpose agencies proliferate, so do elaborate interagency review processes (as in the offshore oil and harbor-dredging policy areas), giving rise to more legal disputes. Hence again, adversarial legalism grows rather than diminishes.

CONCLUSION

Adversarial legalism arises from a vicious circle. Americans want government to do more, but governmental power is fragmented and mistrusted. So Americans seek to achieve their goals by simultaneously demanding more of government and by fragmenting and regulating it still further. Legislatures and

[27] For example, despite badgering by Congressional oversight committees and advocacy group lawsuits, EPA has managed to meet only about 14 percent of the scores of statutory deadlines for regulatory action that Congress has built into pollution control statutes [Environmental Law Institute, 1985, p. 12]. Rather than increase agency capacity to meet them, however, Congress responded during the 1980s by enacting new and more specific deadlines, thereby inviting new lawsuits each time a financially crimped and demoralized EPA misses a statutory deadline again.

courts mandate new goals, new benefits, and new regulatory protections. Yet implementing agencies are constrained by formal legal requirements, buffeted by threats of litigation and judicial review. In this harried condition government seems doomed to fail—incapable of living up to the demanding legal duties imposed on it, bogged down in costly legal disputes or in legal defensiveness. Perceiving governmental failure, public cynicism grows and governmental authority is diminished further. Those seeking to achieve their ends or influence government feel compelled to arm themselves with lawyers, insist on strict observation of legal rules, and threaten to go to court, simply because their opponents are likely to do the same.

Increasingly, scholars are calling for alternative, less litigious ways of solving social problems, making public policy, and resolving disputes. Their solutions call for a reversal of the anti-authority spiral—to get less adversarial legalism, we must somehow reconstitute governmental authority.

Legal scholars, for example, call for an administrative process based more on informal discussion and debate, a search for shared values, a spirit of compromise and cooperation. They criticize a body of administrative law that squeezes policymaking through a court-like litigational mold. Instead, they call for decisionmaking methods that foster "public deliberation" [Reich, 1985a; Shapiro, 1988]. They call for informal negotiation of regulatory rules among contending interests [Schuck, 1979; Susskind and McMahon, 1985]. In social benefit programs, some scholars suggest, the adversarial assertion of due process rights should give way to mechanisms designed to support a "dialogic community" between administrators and beneficiaries [Handler, 1988]. Administrative law, Mashaw [1983] argues, should focus less on judicial review and more on building and supporting administrative competence.

Cross-national studies of administrative rulemaking and implementation point in the same direction. Western European regulatory agencies, Badaracco [1985] demonstrates, avoid adversarial legalism because they have the final say. The laws give them broad discretion. Their decisions, absent major misfeasance, generally are not reversible by courts. They meet informally, privately, and repeatedly with a relatively small network of interest-group representatives who, to retain influence, must develop a reputation for integrity and reasonableness. The participants, lacking any escape route to the courts or to individual legislative allies, and knowing the agency will decide if they can't agree, are compelled to bargain seriously, to reach compromises on scientific issues and on how regulatory values should be balanced against concerns about compliance costs. The "dialogic community" arises because the law fosters, rather than undermines, what I earlier called "administratively final, multi-factor balancing."

Corporatist policymaking structures have their own deficiencies, of course. They lack some of the valuable features of the American system—contestability of expert opinion and official plans, openness to a wide array of opinions and interests, sensitivity to individual rights. But in the United States, merely to discuss corporatist models stimulates great suspicion. If administrative discretion and behind-closed-doors negotiation supplant legal constraint and review, Americans ask, how can we be sure that discretion will not be abused, that the politically weak will not be overwhelmed by the politically or economically powerful, that the Corps of Engineers will not revert to environmental insensitivity, that regulators will not be captured by the regulated? In short, the key to diminution of adversary legalism seems to be a bit of

magic—in a disbelieving age, to restore faith in the competence and public-spirited nature of governmental authority.

Similarly, scholars have begun to propose radical surgery on the extravagantly costly and often unjust tort law system. European welfare state models again provide an interesting perspective on possible reform measures. There, the first resort of injured persons and their families is to social insurance programs. Their medical bills are taken care of by governmentally funded national health care systems. Their lost earnings are taken care of by generous governmentally funded or mandated disability pay schemes. There usually is not much more to sue for.[28] Thus American scholars have argued for "no-fault" self-insurance plans or for replacing tort actions with socially funded administrative agencies, which would compensate basic losses without regard to the injured person's or the injuror's fault [see Sugarman, 1989]. (Indeed, American judges' and juries' eagerness over the years to expand tort liability probably reflects the absence in this country of assured guarantees for accident victims' medical expenses and lost earnings.)

But here, too, many Americans (led by, but not limited to, members of the Trial Lawyers Association) are skeptical. Isn't it likely that government-funded compensation entitlements will be drastically cut as a result of budget-cutting pressures? (Workers' compensation benefits in many states have often been capped at very low levels). In our competitive economy, open to unscrupulous as well as responsible entrepreneurs and managers, can one realistically expect that government inspectors (or government-set "injury taxes") will adequately deter dangerous activities—especially since government control efforts are subject to erosion as a result of budgetary and political pressures? Again, reducing coordinate controls, to use Damaska's terminology, seems to require greater faith in governmental reliability—and more willingness to fund and train an adequate, professional, governmental civil service—than American citizens and their legislative representatives usually have been able to muster.

But this need not always be the case. Deadlock sometimes generates institutional changes, designed to make progress on particular problems. Learning from the Port of Oakland's experience, Port of Los Angeles officials work to build a multi-agency, multi-city political forum in which to negotiate port expansion plans. To avoid the delays of litigation, regulatory agencies constantly try new ways of forging consensus on particular regulatory standards and methods of implementation. It would be somewhat risky to wager that twenty years from now American procedures for compensating injured motorists will be as wasteful as the current tort system. And increasing awareness among policy analysts and policy makers of the costs and causes of adversarial legalism may lead, here and there, to policy implementation methods that consciously seek to minimize the costs and distortions of legal contention.

[28] American law requires tort-feasors to pay the victim's medical bills and lost earnings, even if those losses are covered by other forms of public or private insurance (collateral sources). Swedish tort law, in contrast, allows the victim to sue only for *otherwise noncompensated* losses, plus noneconomic losses, such as pain and suffering—although such amounts are not left to the discretion of a jury, but are closely controlled by judge-applied legal rules. Moreover, for several common kinds of injuries—those arising from the workplace, from motor vehicle accidents, from "medical mishaps," and from side effects of pharmaceuticals—Swedish law limits recourse to lawsuits, substituting private self-insurance schemes, funded in a variety of ways [Hellner, 1986; Oldhertz, 1986].

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Dredging Oakland Harbor: Implications for Ocean Governance

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ABSTRACT

In 1987, *the Port of Oakland, California, having obtained a US Army Corps of Engineers permit, was poised to deepen its harbor to accommodate larger ships. But for the next five years, regulatory actions and lawsuits blocked dredging. Tangible economic damage to the community and the shipping industry accumulated while a complex regulatory system worried about* possible *environmental harms. Regulators still have not approved deep-water ocean disposal, the most environmentally acceptable, economically feasible alternative. The Oakland harbor story points to three weaknesses in the regulatory system for ocean uses: statutory demands for unrealistic levels of knowledge before permits can be issued; a fragmented, adversarial, legalistic decision structure that promotes excessive regulatory regimes, by virtue of specialization, to disregard the landside consequences of limiting access to the oceanic commons.*

1 INTRODUCTION

The 'tragedy of the commons'[1] is a recurrent image in discussions of ocean governance. With no individual property rights in the ocean, there are no individual 'owners' to complain when people dump their wastes in the sea, deplete its fisheries, or fill shallow tidal waters. In the case of commonly-held pasture and forest lands, carving them up into regimes of private property rights can generate economic incentives for wise long-term management.[2,3] But private actors cannot easily monitor and defend property boundaries in segments of the ocean. If the seas are to be protected, therefore, it falls to government to *police* the

commons; a burden usually shouldered only reluctantly. Nevertheless, specially created governmental regimes now regulate noxious uses of the ocean, such as disposal of toxic wastes, or permit certain uses only pursuant to carefully delimited permits.

Like all powerful weapons, however, governmental regulation can have unintended side-effects. This article examines a public policy problem engendered by special-purpose ocean regulatory regimes: the tendency to neglect or undervalue the landside consequences of limiting access to the oceanic commons.

The problem can arise because regulatory officials and the advocacy groups that urge them to regulate more strictly do not themselves pay the costs that flow from regulatory decisions that prevent ocean uses or require stricter pollution control measures. To the contrary, the regulators and advocacy organizations, fearful that their legal defenses against economic interests may prove inadequate, often see themselves as a thin green line, the only barrier between rapacious capitalism and an already over-polluted sea. They have rather strong incentives, therefore, to impose ever more stringent (and more costly) regulatory requirements, and to postpone permit decisions until all environmental impacts are scientifically studied and mitigated.

When the commons is closed, however, wastes usually must go somewhere else—to land sites or inland waters that also may be environmentally stressed. *Someone* must pay the costs of more expensive sewage treatment systems and of replacing single-hulled tankers. *Someone* suffers when economically useful development is delayed due to lengthy regulatory processes, studies, and legal proceedings. Ideally, therefore, regulation of the oceans must be viewed in the context of governance of *all* social and economic activity; it should strive for a socially and economically optimal *combination* of land and sea uses.

Yet specialized, separate regulatory regimes for land and ocean uses tend to undercut that goal; each specialized regulatory regime has incentives to shift development to the other. That, at least, is the lesson that emerges from the case study presented in this paper—the efforts of the Port of Oakland, California, to dredge its harbor to accommodate larger ships.

2 THE COSTS OF CLOSING THE OCEAN

The Port of Oakland, in San Francisco Bay, has been a vital participant and in many ways a leader in the 'intermodal transportation' revolution, which in recent years has dramatically reduced the costs and delays of international cargo shipment, tying world economies more closely

together and generating enormous welfare gains.[4] Today, huge dockside cranes unload containerized cargo in a fraction of the time it took to unload 'break-bulk' cargo two decades ago; the cargo ships, which used to spend 70% of their time in port, now can be back out to sea in 24 h. From the port, trucks and specially designed trains whisk the containers across the country. Clipboards full of bills of loading and swarms of tally clerks have given way to electronic data transfer and monitoring of shipments. Refrigerated containers of fruits and vegetables, loaded on ships in Oakland, are trucked directly to the loading docks of Tokyo markets. Containers of shirts and dresses, loaded in a Hong Kong warehouse, reach stores in Cincinnati and Atlanta in two weeks, at transportation costs of pennies per garment. A moving inventory of Toyota parts, stowed in containers, flows from Japan via ship and port and train to an assembly plant in Kentucky. The pilferage, cargo damage, lost shipments, labor exploitation, and crime associated with seaports in earlier eras all have been dissipated.

Modern seaports, no longer guaranteed a geographically based monopoly, are continuously spurred to provide better harbor service, inland connections, and storage facilities. Thus Oakland had to respond when in 1988 shipping lines launched a new generation of giant US$40 million container ships. The vessels require 38 or 40 feet (1 foot = 0·3048 m) of water, and Oakland's harbor is only 35 feet deep, on average. As early as 1972, therefore, Port of Oakland officials began to seek Congressional authorization to deepen the ship channel to 42 feet. In 1986 Congress funded the project. In 1987, the US Army Corps of Engineers, in charge of permits for dredging projects, pronounced the plan environmentally acceptable.

For the next five years, however, a seemingly endless series of regulatory actions and lawsuits blocked any authoritative decision about where the dredged harbor floor sediments—an estimated 7×10^6 yd^3 (1 yd^3 = 0·765 m^3) of material—should be deposited. A small portion of those sediments contained potentially toxic chemical wastes, although precisely how much and how toxic was not known. Environmentalists, fishing interests, and regulatory agencies feared that both the dredging itself and the disposal of the dredged material could endanger water quality, fisheries, and human health. For almost five years, as additional environmental impact studies were conducted and legal proceedings dragged on, the harbor remained undredged.

There is little doubt that deepening Oakland's harbor would be economically desirable, both for the region, where port activity is a vital source of economic sustenance, and for the national economy as a whole.[5] If Oakland should become incapable of handling the most modern vessels, the only major ports on the entire West Coast would

be in Los Angeles and in Puget Sound, reducing the competition that enhances efficiency and reliability. It also seems relatively clear that of the three main alternatives (listed below), *ocean* disposal of non-contaminated sediments dredged from the harbor floor would be the most environmentally acceptable, economically efficient choice:

(1) Disposal of dredged material in shallow San Francisco Bay waters, *near Alcatraz Island,* is the cheapest alternative (with dredging costs of about $2 per cubic yard), but raises significant (although not proven) concerns about damage to aquatic habitats and fisheries.
(2) Disposal *in the delta* further up the San Francisco Bay/Sacramento River Estuary, where the sediments could be used for levees or wetland creation, while *perhaps* environmentally desirable, would cost up to $20 per cubic yard, i.e. *millions* of dollars *more* in total.
(3) Disposal at sea, in very deep water *off the continental shelf,* would cost some $7 per cubic yard—much more costly than in-bay disoposal, but far less costly than wetlands creation. Adverse environmental effects of deep ocean disposal, if any, are far less likely and intense, so far as the extensive record indicates, than in-bay disposal.[6]

Yet as this article is being written, six years after the dredging project was poised to begin, permission has not been obtained to dispose of dredged sediments in the ocean. As described more fully in Appendix A and in another article,[7] in 1988 the Corps of Engineers abandoned initial plans to use the Alcatraz site, after state regulatory agencies and environmental advocacy groups threatened legal action. A multi-agency agreement then split the project into phases, endorsing disposal of non-contaminated Phase I sediments (500 000 yd^3) in the ocean, 10 miles (1 mile = 1·61 km) offshore (but far short of the edge of the continental shelf). The Half Moon Bay Fishermen's Association, however, sued to block that plan; the fishermen lost in federal court but then prevailed in a state court, on grounds that the state coastal zone agency had not scrutinized and signed off on the plan. A third plan, using Phase I material to reinforce levees in the Sacramento Delta, became entangled in a two-year sequence of regulatory and judicial processes; while the Port's environmental analysis ultimately passed legal muster, regulatory requirements drove the cost of delta disposal too high. Throughout, EPA declined to approve an alternative deeper ocean disposal site until it could complete further research.

Meanwhile, large container ships could enter and leave the port only

at high tide, only partly loaded, with small margins of safety. Shipping lines using Oakland sustained millions of dollars of extra operating costs,[5] and tide-induced delays disrupted the schedules of waiting container trains and consignees. Oakland began to lose business to competing ports, diminishing port revenues. Employment in local warehousing, stevedoring, trucking, ship-supply, dredging, and other port-related businesses was adversely affected. Shipping companies scrubbed plans to expand terminals in the Port of Oakland. In short, tangible economic disadvantage to the community and to the shipping industry accumulated while regulatory regimes operated to prevent *possible* harm to aquatic environments.

Finally, in the Fall of 1992, state and federal regulatory agencies, under mounting political pressure, authorized partial Phase I dredging, deepening Oakland's ship channel to 38 feet—barely enough to accommodate the larger ships. Dredged material found to be contaminated, some 4% of the 500 000 yd^3 total, was deposited in a lined upland site. The rest, as the plan returned full circle, was dumped at Alcatraz, probably the least environmentally desirable choice.[8] No decision considering ocean disposal for the bulk of the dredging (over 5×10^6 yd^3) is expected until at least 1994, and any final decision may be further delayed by litigation.

3 THE ROOTS OF REGULATORY CAUTION

If one views the Oakland harbor saga as a story of interest group politics, then it appears that ocean fishermen and ocean-oriented environmental organizations used the regulatory process to avoid small risks of environmental degradation at sea, shifting *larger* risks to Bay fishermen. In doing so, they imposed losses on economically stressed Oakland and on workers who would have benefitted from growth in port-related business. It would seem important to consider *why* this strangely imbalanced result came about.

Perhaps, as some observers maintain, Port of Oakland and Corps of Engineers officials initially were too dismissive of environmentalists' concerns. Conceivably, a more accommodating stance would have led to an earlier settlement of the dredging problem. On the other hand, virtually every major port-dredging plan in the United States seems to become enmeshed in litigation[9] or in expensive 'mitigation projects' extorted by the threat of litigation.[10,11] On the East Coast as well as the West, as a recent dispute and lawsuit concerning the Port of New York illustrates, scientific controversy and inter-agency conflict *often*

engenders costly delays in ocean disposal of dredged material.[12] This pattern suggests that in Oakland, as elsewhere, the causes of regulatory deadlock flowed primarily from fundamental features of the overall system for governing port expansion and ocean use, particularly the character of the relevant laws and decision-making system.

3.1 The legal mandate for analytic perfection

The regulatory statutes implicated in the Oakland case do not prohibit *any and all* environmental impacts. Indeed, they suggest that some uses of the watery commons are acceptable. Rather, the predominant legal requirement is *procedural.* Under the Marine Protection, Research and Sanctuaries Act, for example, the EPA can designate an ocean disposal site, but it first must make *official findings* concerning:

(a) the need for the proposed dumping;
(b) the effect of such dumping on human health and welfare, including economic, esthetic and recreational values;
(c) the effect of such dumping on fisheries resources, plankton, fish, shellfish, wildlife, shore lines and beaches;
(d) the effect of such dumping on marine ecosystems, particularly with respect to
    (i) the transfer, concentration and dispersion of such material and its byproducts through biological, physical and chemical processes,
    (ii) potential changes in marine ecosystem diversity, productivity, and stability, and
    (iii) species and community population dynamics;
(e) the persistence and permanence of the effects of the dumping;
(f) the effect of dumping particular volumes and concentrations of such materials;
(g) appropriate locations and methods of disposal or recycling; and
(h) the effect on alternate uses of oceans, such as scientific study, fishing, and other living resource exploitation, and nonliving resource exploitation.

All of that, of course, is completely logical, precisely what fully rational, environmentally sensitive decision-making would require. But as decision theorists such as Herbert Simon and Charles Lindblom have long tried to teach us, there always are enormous costs, both in money and delay, associated with such comprehensively rational models of decision-making.[13,14] In a world of limited resources, the search for complete information can easily paralyze public policy. Thus American regulatory agencies, legally compelled to provide scientific analyses of

projected risks, costs, and benefits associated with new rules, often have had to delay environmental and safety measures for years, until all potential critiques could be definitively answered.[15–18] Similarly, in the Oakland harbor case, the EPA could do little about approving an ocean dredge disposal site until Congress appropriated funds to do the requisite research, the costs of which run into millions of dollars.[19] And in the federal budgetary process, there are many other competitors for such appropriations, many of them seemingly more compelling than funds to map the ocean bottom in order to identify acceptable dredge disposal sites. In addition, even after research funds have been appropriated, completing the legally required research concerning disposal of dredged material is painstakingly slow. Finally, relevant research methodologies are constantly evolving and often controversial, which further delays decision.[20]

The consequences of legally mandated analytic perfection, therefore, were virtually foreordained. If decisions on ocean use projects cannot be made until all potential effects are carefully researched, the law imposes something close to a *de facto* veto on economically valuable projects, even those that would in fact be environmentally acceptable.

3.2 The decision-making structure: adversarial legalism

In the Oakland harbor case, ocean disposal also was deterred by the fragmented institutional structure for regulating ocean use. While the law calls for comprehensive rationality, it authorizes no single decision-maker to make a definitive choice, balancing all estimates, values, and interests. Instead, the decision-making model, as so often is the case in American policy implementation,[21] reflects both distrust of concentrated authority and faith in adversarial procedure: the best decision, it is assumed, will emerge from the legally structured clash of a pluralistic welter of different perspectives.

Thus in the Oakland case, decisions were made by a jumble of different agencies, their powers and concerns sharply limited by law. For ocean disposal, primary permitting authority was uneasily shared by two agencies with traditionally different perspectives and legal mandates, the development-minded Corps of Engineers and the conservation-minded Environmental Protection Agency. Thus the Corps' methods of assessing toxicity were contested by the EPA, which advocated a more conservative method.[9,22] The Corps claimed it was legally constrained to reject more distant and costly proposed disposal sites, while EPA felt constrained to reject closer-in sites endorsed by the Corps.

In addition, Corps and EPA permitting decisions for ocean disposal were legally subject to veto or formal critique by the National Marine Fisheries Service, the US Fish and Wildlife Service, California Regional Water Quality Boards, and the California Coastal Commission. Each of these agencies was obligated, under its own governing statute, to make findings, based on custom-tailored scientific analyses, concerning sediment analysis and how disposal might affect water quality, fisheries, shellfish, coastlines, and so on.

Finally, every agency's decision-making authority in effect was shared with the courts. No negotiated compromise, agency decision, or official fact-finding was safe from legal challenge by an organization (e.g. the Half Moon Bay Fishermen) or political body (e.g. the Contra Costa Water District) that felt excluded from the process or unhappy about the outcome. The results of litigation, moreover, were unpredictable. And even unsuccessful lawsuits suspended action until the case was heard, while commandeering regulatory and port officials' time.

This fragmentation of authority and adversarial legalism may in the long run make for more complete analysis, avoidance of arbitrariness, and responsiveness to varied interests, as the theory holds. In the shorter run, while big ships barely avoided scraping the bottom of the harbour and port revenues declined, its primary product (as in other policy arenas) was legalistic caution, defensiveness and inaction on the part of the relevant regulatory agencies. After EPA's first ocean disposal decision, in 1988, triggered two lawsuits that challenged the analytic integrity and the procedural propriety of the permitting decision, the agency seemed afraid to try again. Its hesitation was understandable. In late 1990, as EPA considered designating a permanent ocean disposal site in Southern California, it was bombarded with criticism and threats of lawsuits by local fishermens' organizations, a local Member of Congress, and environmental advocacy groups; concerned that its scientific studies would look less than definitive under adversarial scrutiny in court, EPA understandably shied away from making any decision at all. Thus in the Oakland case, too, the better part of valor seemed to be to wait until all the research was in before venturing another decision on ocean disposal.[23]

3.3 Regulatory specialization

In mid-1992, the Corps of Engineers circulated an updated environmental analysis of its last-gasp plan for partial dredging and disposal at Alcatraz. The more specialized environmental protection agencies, federal and state, filed critical comments; they reflected a posture of

profound mistrust *vis-à-vis* the Corps' research findings, a willingness to grasp at any argument against immediate dredging and disposal, and a seeming indifference to cost considerations. Indeed, the record of the Oakland dredging story, taken as a whole, suggests that the relevant environmental agencies, including the EPA, simply did not *care* very much about whether dredging was delayed, or at least not enough to try to find a way to speed it up. Agency officials did not try to change the regulations. They did not argue for an exception based on the urgency of the situation. They did not lobby for a minor legislative amendment authorizing immediate designation of a temporary ocean disposal site on the basis of existing data.

In sum, whether they would consciously put it this way or not, the *de facto* priority of many regulatory officials was fishes first, the port second, and if we cannot be sure about the fishes, let the ships go to Los Angeles and Seattle. Perhaps these attitudes can be explained in part by the legalistic defensiveness engendered by the threat of litigation. But they also seem to reflect the bias that entirely reasonable and public-spirited people acquire by working in a specialized and often understaffed environmental protection agency. After all, officials in the National Marine Fisheries Service, entrusted with the protection and expansion of marine sanctuaries, are *supposed* to care about fish. EPA officials, struggling vainly for adequate funding to police the nation's waters, can hardly be expected to feel motivated to solve the problems of the very industrial and commercial enterprises that always seem about to overwhelm the undermanned environmental police force. When one has problems of one's own, it is often difficult to recognize that someone else's may be worse.

But someone else's problems may indeed be worse. As the budget deficits of democratic welfare states remind us, the most pressing problem of modern government is to set priorities, to decide who needs help and protection *the most.* A single-minded focus on a particular regulatory problem risks loss of perspective about which problems are most pressing.

4 CONCLUSION

The Oakland dredging story suggests that single-purpose regulatory regimes, organized around the enforcement of particular laws, risk loss of perspective. It is usually difficult, if not impossible, for perenially underfunded regulators to meet the ambitious criteria set forth in their authorizing statutes. The harms or hazards they are supposed to

prevent constantly threaten to grow worse. It is natural for specialized regulators to focus on the problems of 'their' jurisdictional area rather than on the problems their decisions (or delays in making decisions) create for other jurisdictions and other spheres of economic activity. For specialized regulators, caught between legal duty and the complaints of the regulated, there is a constant temptation to dismiss the latter as exaggerated.

Consequently, the very virtues promoted by regulatory specialization—dedication to mission, fidelity to law, skepticism about imcomplete information—often impose serious costs on others. In the Oakland Harbor case, legal and scientific caution about permitting ocean disposal of dredged sediments meant the sediments had to be disposed of elsewhere, probably at greater risk to the environment. A single-minded focus on following legal requirements designed to protect the ocean led to unconscionable delay, higher expenditures, and diminished social welfare.

Must it be so? In complex, contemporary societies, it is hard to imagine *non*-specialized regulatory regimes. Division of governmental labor enhances possibilities for generating administrative energy, knowledge and debate. The challenge, therefore, is to devise governmental mechanisms that encourage specialized agencies to attend to and counteract the loss of perspective that specialization can engender.

In most European democracies, those unhappy about decisions or inaction by specialized regulatory agencies typically appeal not to courts but to higher administrative officials or ultimately to cabinet officers with more general political responsibilities. One also can appeal to leaders in opposition political parties. In general, the emphasis is on political rather than legal or judicial accountability. Political accountability does not exclude participation. In many European regulatory regimes, administrators consult extensively—but informally, in private—with affected private interests and pro-regulatory advocacy organizations. And, according to some case studies, since neither business nor advocacy organizations can expect to reverse or delay an administrative regulatory decision by running to court, they have greater incentives to work out compromises at the administrative decision level.[24–26]

In the Oakland story, in contrast, the regulatory guardians of the oceans were not held accountable primarily by legal rather than by political processes. Indeed, regulators remained remarkably unresponsive to the pleadings of representatives of the public at large, such as the Mayor of Oakland, the Governor of California, and Oakland's representives in Congress. Instead, EPA worried about what would

happen if its actions were scrutinized in *court.* And in court, the EPA would be judged in terms of conformity to detailed statutory provisions that focus on *ocean protection.* The environmental problems of San Francisco Bay or on the economic needs of Oakland and the international transportation system were not terms in that legal equation. And finally, the opportunity to challenge EPA or Corps of Engineers decisions in court diminished incentives to compromise on the part of fishermens' associations, environmental groups, and resource agencies.

Of course, it is far from clear that European-style political accountability provides a desirable balance between economic considerations and fragile environmental values. It is still less clear that political rather than legal accountability would be feasible in the United States, where both governmental and economic power are far more fragmented, where political parties are less cohesive, and where mistrust of government runs high. In the American context, aggressive private legal action often has been vitally important in the struggle to protect natural resources, in coastal areas and in the interior. Nevertheless, the Oakland harbor story teaches that significant undesirable consequences are associated with the American alternative. A governmental system that structures regulation legalistically and relies on adversarial litigation to police regulatory processes also tends to induce administrative defensiveness and narrowness of perspective. Thinking about alternative approaches—a topic too complex to address fully in this article—should be high on the agenda of those concerned about ocean governance and regulatory policy in general.[27]

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APPENDIX A: CHRONOLOGY OF OAKLAND HARBOR DREDGING STORY

(1) Dredging Oakland's harbor to a depth of 42 feet, it was estimated, would require digging up some 7×10^6 yd^3 of sediment. The Corps of Engineers originally recommended dumping that material at an established disposal site in San Francisco Bay near Alcatraz Island. But in 1987, when dredging was to begin, San Francisco Bay fishermen and California environmental agencies objected: dredging the sediments, they feared, would release toxic chemicals, and disposal near Alcatraz (where disposed sediments had started to 'mound' on the Bay floor) would increase turbidity in the Bay, harming fishery resources.

(2) The Corps, after further testing, proposed 'special care' disposal and 'capping' methods for about 21 000 yd^3 to be dredged from certain contaminated sites. But the Corps claimed that in-Bay disposal of non-contaminated material would have no adverse effects on water quality and fisheries. State and local regulatory agencies, which had legal power to block in-Bay disposal, disagreed. An advocacy group, Citizens for a Better Environment, was poised to sue, arguing the sediments should be dumped at sea, beyond the continental shelf.

(3) The Corps then considered ocean disposal. Fishermens' associations objected to disposal at sites closer to shore, claiming it would disrupt fisheries. The Corps disputed this on technical grounds. Hence the Corps maintained that it was legally precluded from endorsing off-continental-shelf sites, arguing that disposal there would cost much more than disposal at sites near shore, while not being demonstrably better in environmental terms.

(4) After much wrangling between the Corps and EPA, whose permission is essential for ocean disposal, they reached a compromise, also agreed to by environmental groups and a

federation of Pacific fishing associations. Ocean site B-1-B, off the San Mateo County coast, would be used for the first 500 000 yd^3 of dredged material (except for material from the clearly contaminated area). Further testing and study would precede any decision concerning disposal of the remaining $6{\cdot}5 \times 10^6$ yd^3.

(5) In mid-April 1988, just before the dredging commenced, the Half Moon Bay Fishermen's Marketing Association brought suit in federal court, alleging that the B-1-B disposal decision violated a number of federal regulatory provisions and would disrupt fisheries. First the US District Court judge, then the federal Court of Appeals, decided against the fishermens' legal claims. But on 16 May 1988, a *state* court judge issued a restraining order on different legal grounds, holding that the dredging permit had been issued without a requisite certification from the California Coastal Commission.

(6) By that time, the Spring of 1988, shipping lines using the Port of Oakland were already screaming for deeper water. Desperate port officials announced a plan to dispose of the first 500 000 yd^3 at a Sacramento River Delta site, where it would be used to reinforce levees. Local regulatory processes then creaked into action. After a year or so, some California regional agencies had approved the plan, but the Contra Costa Water District challenged the Port's environmental impact analyses in state court.

(7) In July 1990, the court upheld the Delta plan. But regulatory conditions designed to safeguard water quality had pushed estimated disposal costs to \$21/yd^3, and Oakland abandoned the Delta plan.

(8) Meanwhile, the Regional Water Quality Control Board for San Francisco Bay, hoping to press EPA into approving an *ocean* disposal site, banned deposit of the new dredge project spoils in the Bay. Also, the National Marine Fisheries Service, citing dangers to severely diminished Chinook salmon populations, banned all new project and maintenance dredging disposal near Alcatraz.

(9) Still, EPA did not approve any ocean disposal site for either the first 500 000 yd^3 or for the remaining 6 500 000 yd^3. Agency officials pointed out that the law required them to make scientifically grounded findings about the environmental impact of ocean disposal. The requisite mapping of the ocean bottom and currents had not even been initiated until 1990. No

decision that would hold up in court, EPA indicated, could be made before 1994.

(10) In June 1992, the Corps of Engineers issued a new environmental impact statement. Relying on additional sediment sample analysis, it concluded that disposal of Phase I non-contaminated dredged material at Alcatraz was environmentally acceptable and was the best available choice. Approval for ocean disposal, the Corps EIS noted, was still unobtainable, using dredging spoils for wetlands creation was extraordinarily expensive and had not cleared local regulatory hurdles, and waiting for either alternative to become available was no longer tolerable.

(11) Staff analyses at state and federal regulatory agencies criticized the Corps EIS for not recommending Delta or ocean disposal sites. But under intense pressure from local political and business officials, the relevant federal, state and local regulatory agencies endorsed Phase I disposal at Alcatraz. In October 1992, dredging began and the shipping channel soon was deepened to 38 feet.

(12) Nevertheless, as of September 1993, no disposal site—neither an expensive one in the estuary nor a less expensive one in the ocean—has been approved for the additional $6{\cdot}5 \times 10^6$ yd^3 required by the full-scale harbor-deepening project. The Corps is leading a costly, comprehensive research effort, with participation by a wide range of interested agencies, economic interests and environmental groups, that is designed to formulate a Long Term Management Strategy (LTMS) for dredging needs in the Bay and estuary. But the LTMS recommendations, when they do emerge, will carry no legal weight, and will be subject to judicial review for compliance with the detailed procedural and analytic standards in the relevant environmental protection statutes. Hence any decision based on the carefully studied and laboriously negotiatied LTMS plan can be challenged in court by any dissatisfied organization, holding up action for yet another indeterminate period of time.

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May 29, 2013

Ms. Anne Castle
Assistant Secretary for Water and Science
U.S. Department of the Interior
1849 C Street NW
Washington, D.C. 20240

Re: LC-4000, ADM-1.0

Dear Ms. Castle:

This office represents various farmers in the Imperial Valley, specifically agricultural interests whose entitlement to Colorado River (River) water is served by the Imperial Irrigation District (IID). Some of these clients are parties in a California lawsuit brought by IID with respect to the so-called Quantification Settlement Agreement or QSA. Regional Director Fulp's May 3, 2013 letter to the IID references the QSA, the intra-California water transfer agreements underlying the QSA, and the Salton Sea. In the past several days, media reports reflect that the various River interests are looking with great concern at how water is being managed and used in the Imperial Valley and especially its role with the respect to the Salton Sea. See "Lake Mead shrinks, California uses more than its share," Las Vegas Review-Journal, May 24, 2013 (http://www.reviewjournal.com/news/water-environment/lake-mead-shrinks-california-uses-more-its-share-water)

Our clients spent millions of their own money to develop practical solutions to the water challenges in the Imperial Valley and at the Sea. Among their concerns are the long-term weather cycles and/or climate change and how that will impact Colorado River flows. See e.g., Draft Climate Assessment Report (2013), of the National Climate Assessment and Development Advisory Committee. Their focus was to look for practical approaches without concern for litigation positions, politics, or allocation of credit or blame. Enclosed are three patents that represent their efforts as well as the efforts of others who brought world-class engineering experience to the problems at the Sea. The patent addressing the post-transfer state of the Sea is premised on substantially reduced flows and the potentially serious air quality issues associated therewith.

For whatever reason, all California entities involved with the River have (1) ignored the solutions offered by our clients and/or (2) insisted on continuing the QSA litigation in lieu of a practical regional approach to the River. These California entities include the State of California, the County of Imperial, Imperial County Air Pollution Control District, the

Metropolitan Water District, the Coachella Valley Water District, the San Diego County Water Authority, and the IID. Accordingly, because our clients are among those most directly affected in California by the Bureau's management of the River, our clients are hereby widening their arc of advocacy to those entities that may be in a position to influence the recalcitrant California entities and pressure all of them into standing down on all litigation and political maneuvering – a cease-fire or voluntary injunction on water transfers and all litigation concerning them, as it were -- and instead seek practical regional solutions.

Additionally and in the alternative, our clients have no faith that IID will be able to competently meet the June 30 deadline imposed by the Bureau for "a credible set of actions and a definitive timeline" to get control over IID's water management responsibility. They offer to the Bureau their water management system (two of the three enclosed patents) as a means IID may use as part of a comprehensive approach to better water stewardship of the River water IID manages for Imperial Valley interests.

If you have any questions, let me know.

Sincerely yours,

Patrick J. Maloney

Enclosures:
Patent No. US 7,805,380 B1
Patent No. US 7,832,959 B1
Patent No. US 8,341,090 B1

Copies:
California Parties:
Ralph Cordova, Jr., County Executive Officer, Imperial County
Brad Poiriez, Imperial County Air Pollution Control District
Kevin E. Kelley, General Manager, Imperial Irrigation District
Maureen A. Stapleton, General Manager, Metropolitan Water District
Jeffrey Kightlinger, General Manager, San Diego County Water District
Jim Barrett, General Manager, Coachella Valley Water District
Clifford T. Lee, Attorney General, California Departments of Water Resources and Fish & Game
California Governor Jerry Brown

Seven Basin State Parties:
Sandra Fabritz-Whitney, Director, Arizona Department of Water Resources
Tanya M. Trujillo, Executive Director, Colorado River Board of California
Jennifer Gimbel, Director, Colorado Water Conservation Board
Jayne Harkins, Executive Director, Colorado River Commission of Nevada
Patricia Mulory. General Manager, Southern Nevada Water Authority

Estevan Lopez, Director, New Mexico Interstate Stream Commission
Dennis J. Strong, Director, Utah Division of Water Resources
Patrick T. Tyrrell, State Engineer, State of Wyoming

U.S. Government:

Terrance J. Fulp, Regional Director, Bureau of Reclamation
Michael J. Connor, Commissioner, Bureau of Reclamation
Jerry Melillo, Chair, National Climate Assessment and Development Advisory Committee

Federal and State Representatives:

Senator Dianne Feinstein, United States Senate
Senator Barbara Boxer, United States Senate
Congressman Juan Vargas, United States House of Representatives
Senator Ben Hueso, California State Senate
Assemblyman V. Manuel Perez, California State Assembly

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April 15, 2004

Charles Keene
California Department of Water Resources
770 Fairmont Avenue
Glendale, California 91203.

Re: Salton Sea Ecosystem Restoration Project—Notice of Preparation

Dear Mr. Keane,

Introduction

This office represents landowners of Imperial Valley who own approximately twenty-five percent 25% of the irrigated agricultural land in the Imperial Valley. These landowners will be referred to as the "Imperial Group" throughout this filing. The Website for the Imperial Group is www.imperialgroup.info. The members of the Imperial Group have filed multiple lawsuits against the Imperial Irrigation District and other signatories to the Quantification Settlement Agreement ("QSA"). These suits challenge the validity of the QSA and the mismanagement of water resources by IID. The members of the Imperial Group have asked the Court to make a determination that it represents all of the irrigated agricultural acreage in the Imperial Valley. The Court has not yet acted on this request. The irrigated agricultural acreage in the Imperial Valley uses over 98% of the water used in the Imperial Valley.

In this letter, the Imperial Group formally responds to the Notice of Preparation and raises the following issues: (1) the NOP should address alternative solutions should the QSA be invalidated as the Salton Sea will continue to be a problem regardless of the QSA; (2) alternatives should be considered that do not require state funding; (3) solutions to the Salton Sea must incorporate better water management in the Imperial and

Mexicali Valleys so that the water resource is optimized; (4) the NOP should promote projects that can be implemented quickly rather than continue being studied for years.

The Imperial Group is committed to developing an economically feasible plan to optimize the water resources of the Colorado River and restore the Salton Sea Ecosystem within a six-month period with a build out of five years. The Imperial Group has created a Consortium (see footnote 1) of international construction and engineering firms committed to a feasible Salton Sea Ecosystem Restoration Project, which would optimize the water resources of the Colorado River for all of California and protect the Imperial and Mexicali Valleys. While developing this plan the Imperial Group fully expects to continue its meetings with job trainers in Imperial County, members of the community, environmentalists, and governmental officials both Mexican and American.

The Imperial Group estimates that the landowners of irrigated agriculture in the Imperial Valley and their predecessors in interest have invested in excess of 1.3 billion dollars to develop the water resources of the Imperial Valley over the last 100 years. Without this investment there would be limited agricultural production in the Imperial Valley, the development of Coachella Valley and other Southern California communities would be severely limited, and finally there would be no Salton Sea. Over the years the economy of the Imperial and Mexicali Valleys have become integrated and any action which hurts the citizens and economy of the Mexicali Valley hurts the citizens and economy of the Imperial Valley and vice versa. The Imperial Group is concerned about the efforts of the State of California and its related subdivisions including but not limited to the Imperial Irrigation District, Coachella Valley Water District, Metropolitan Water District, San Diego County Water Authority and Salton Sea Authority to develop a Salton Sea Ecosystem Restoration Project as an alternative to existing conditions in the Salton Sea. The Imperial Group's concern is that the entities will just continue to study the issue and fail to develop a feasible project because there are insufficient financial resources available in the State of California and the Federal Government to finance a Salton Sea Ecosystem Restoration Project. The problem will not be solved and turned into continuing rounds of litigation while the environment and economy of the region suffers. As landowners and citizens of Imperial County the Imperial Group is concerned that the same thing will happen to the Salton Sea and Imperial County that Professor Robert Kagan described in his studies on the dredging delays in the San Francisco Bay. See Exhibit A for copies of Professor Kagan's articles on how the "extraordinarily cumbersome, legalistic, and costly method for

balancing environmental and economic considerations" caused the dredging delays in the San Francisco Bay. The environment and economy will not tolerate such delay on the Salton Sea issues and the Imperial Group will do everything in its power to prevent such delays.

Current Condition

The situation in the Salton Sea is grave. The Salton Sea Ecosystem is rapidly deteriorating. To the extent any bird and fish Ecosystem still exists in the Imperial and Mexicali Valleys, it is due to the continued agricultural investments and activities in the Imperial and Mexicali Valleys. Indeed, the entire Ecosystem of the Western Hemisphere benefits from these continued agricultural activities. The present interpretation of the QSA contemplates massive fallowing in California and the lining of the All-American Canal. These destructive policies are best illustrated by flying over the Coachella, Imperial and Mexicali Valleys during the early Spring. One can see significant economic activities in Coachella. The only exception is the land on the east side of US 10 and the Torres-Martinez Indian Reservation. These are areas where there has been a restriction on the use of water. When you fly over Imperial County and Northern Mexico there are verdant fields and economic development where there is water. If the water is restricted either in the Imperial or Mexicali Valleys without a plan to optimize the water resources of the Colorado River for the benefit of all the people in the region and California, substantial portions of these Valleys will become deserts. The Imperial Group intends to prevent this from happening.

Historical Facts Surrounding Mexico, Imperial Valley and the Salton Sea

The Salton Sea Reference Information supplied by the Department of Water Resources ("DWR") did not describe the Salton Sink prior to 1900. The Imperial Group offers the maps as set forth in Exhibits B1 through B8 to further illustrate the development of the Salton Sea Ecosystem. Understanding the historical development of the Salton Sea and the Alamo and All-American Canals helps to better define the environmental issues involved in considering any Salton Sea Ecosystem Restoration Project. When this analysis is made DWR necessarily must consider the conditions that existed both in Mexicali, Coachella and Imperial Valleys before the Salton Sea and the Alamo and All-American Canals were created. From that analysis a baseline can be developed which will help assess alternatives, optimize the water resources for all three Valleys and restore the historic Ecosystems of the Valleys. The baseline has to be developed

to reflect the situation prior to the investment of the 1.3 Billion Dollars by the members of the Imperial Group and other landowners in the Imperial Valley. Then if the State desires to take advantage of this investment and the opportunities for the future that this investment gives the Imperial and Mexicali Valleys, the State should fully compensate the landowners for their past investment and any loss of the landowners' future economic opportunities. Once the scope and value of the historic investment by the agricultural landowners is understood, the financially feasible alternatives available to the State for any Salton Sea Ecosystem Restoration Project are narrowed.

Legal Basis of Imperial Group's Position

The United States Supreme Court has recognized the unique nature of the water rights held by the landowners in the Imperial Valley. See Bryant v. Yellen (1980) 447 US 352, at n. 23. These rights are inviolate. The Imperial Group vigorously objects to any attempt by any governmental agency to interfere with their exercise of these rights and until this issue is satisfactorily resolved there will be a serious impediment to any Salton Sea Ecosystem Restoration Project. IID has mismanaged the diversions from the Colorado River. See Decision 1600 of the SWRCB. In 2003 the united Stated bureau of Reclamation or BOR commenced a so-called Part 417 Process against IID to determine whether or not IID was appropriately managing its diversions from the Colorado River and permitted extensive briefing by all interested parties including but not limited to the State of California through the California Resources Agency, Imperial Irrigation District and the National Audubon Society. The Imperial Group participated in this process and its position is set forth in Exhibit C and incorporated herein by reference. Many of the positions, which the Imperial Group is taking in this proceeding, were taken in the 417 Proceeding. At the conclusion of its proceeding BOR made recommendations as to how IID could improve its management of the diversion from the Colorado River. A copy of the Decision is attached hereto marked Exhibit D and incorporated herein by reference.

The landowners of Imperial Valley have the right to use the Salton Sea as an agricultural sump or drain. This right is recognized by the State of California and the United States. However, under the principles announced in the Nacimiento Regional Water Management Advisory Committee v. Monterey County Water Resources Agency (1993) 15 Cal.App.4th 200 and the above referenced BOR Decision, the landowners of Imperial Valley have no obligation to maintain the Salton Sink as a sea and no EIR or environmental mitigation is required if the landowners

choose to reduce the flow of water into the Salton Sea. See also the decisions of the SWRCB in Garrapata Water Company, Decision 1639 and Monterey County Water Resources Agency, Order 2001-17.

It is the Imperial Group's position that the following principles promulgated by the BOR in the above-referenced 417 Decision should be the operating principles of IID or its successor and the landowners of Imperial Valley when water is delivered or used in the Imperial Valley:

> The materials reviewed and considered by Reclamation demonstrate that conservation and operating measures recommended below vary widely in cost, ease of implementation and the potential to conserve water. Reclamation recognizes that many of the recommendations relating to conservation measures would require investments by lID and its farmers, however others would not. While Reclamation encourages lID to seriously consider the suggested measures, the mix of measures that are ultimately adopted by lID and by the farmers within lID is a local decision. Many of the measures may be implemented simultaneously. All of the recommended measures are being successfully used in other irrigated areas of the Southwest with conditions similar to those in lID.
>
> In the following section, Reclamation presents these recommendations in order of priority based upon its independent professional analysis, but fully recognizes that implementation and prioritization of the measures identified below remains a matter of local determination.
>
> Based on these considerations, Reclamation recommends the following measures:
>
> **A. Opportunities for conservation that can be implemented by lID within existing lID policy or with some modification of existing policy.**
>
> Recommendation 1. Water Measurement. Reliable water measurement records are essential to the decisions that result in water conservation. Reclamation recommends that lID develop, maintain and use a district- wide network of water measurement devices for the consistent monitoring, recording and reporting of system and on- farm water use data.

Measurements within the lID should include: 1) canal and lateral spills, 2) actual deliveries to farmers' head gates, 3) tail water runoff, 4) drain flows, including discharges from drains, and 5) leach water and other components of water diverted from the Colorado River for use in lID.

IID may consider a carefully planned and executed measurement program approach to install continuous recorders at selected representative sites and conduct regular spot measurements at the remaining sites. This approach could be used at lateral and farm turnouts and well as drain ditches.

Recommendation 2. Scheduling Water Orders. Under current lID policy, a farmer is charged for a full 12-hour period of water delivery, whether or not the farmer needs or uses the water. Modification of this early termination policy by IID would give farmers greater flexibility with water deliveries and enhance their ability to manage and conserve water.

Recommendation 3. Tailwater Management. Currently, hundreds of thousands of acre- feet of water are not consumed by crops, but flow off the ends of fields in lID. Reclamation recommends that lID strictly enforce its ordinance limiting tail water to 15 percent. Reclamation recommends that the 15 percent tail water limit be reduced incrementally over a specified number of years. Additional measures might include implementing a tiered penalty for tailwater discharge or implementing a tiered water rate schedule that increases with additional water ordered above a set allocation. Under current practice lID farmers pay millions of dollars for water that flows off the ends of their fields. Further, Reclamation believes that the 15% is excessive over the long-term and that lID should evaluate, establish and enforce further reductions in tailwater volumes.

Reclamation supports the principal of matching delivery rate and irrigation set time required to refill the crop root zone to have the least possible amount of tail water. Reclamation believes significant efforts in this regard can be accomplished with little or no additional costs and without necessarily constructing on-farm reservoirs or tail water recovery systems.

Recommendation 4. Physical Improvements. Physical improvements can increase flexibility in the system and reduce the possibility of spills. Conservation measures might include implementing the measures identified in lid's draft Agricultural Water Management Plan (March 2002), which include constructing additional mid-lateral reservoirs and constructing both limited flexibility and full flexibility interceptor laterals. Installation of tailwater recovery systems is also addressed in the draft Agricultural Management Plan as a conservation measure, although Reclamation notes that constructing such systems to collect water from more than one field would cost less than the approach proposed in the draft Plan.

Recommendation 5. IID Farmer Outreach. IID through its Irrigation Management Unit provides a multitude of farm evaluations, demonstration projects and water conservation measures that assist till farmers in lID to conserve water. Current programs and services offered include:

Irrigation evaluations to determine best water use on a per- field basis Scheduling of Irrigations
Soil moisture sensors to better determine when to irrigate crops
Flume measurements for measuring tail water accurately
Salinity assessment global positioning system mapping to help with salinity control
Land leveling, which could include level basin, modified level and matching grade.
Field length or irrigation length reduction
Alternative irrigation methods such as high flow level basins, drip irrigation systems, linear move sprinklers, and cut-back irrigation

Reclamation encourages lID to continue and increase the level of participation in outreach activities to provide these services to farmers to assist farmers in making decisions about a wide variety of water conservation.

Recommendation 6. Irrigation Management. The goal of a good irrigation management program is to use water efficiently by scheduling irrigations to meet crop needs. Reclamation

recommends that lID assist farmers in using climatic and evapotranspiration data to help determine when to irrigate and how much water to apply. Potential benefits from scheduling irrigations to meet crop needs include:

The lengthening of irrigation intervals by two to three days on annual crops resulting in at least one less irrigation during crop season
Improved yields both quantitatively and qualitatively
Higher yields for alfalfa and less compaction by harvesting equipment Improved crop management using information gathered during field visits Salt management in areas of highly saline soils by irrigating alternate rows early in the irrigation system
Improved quality of specialty crops such as peppers, tomatoes, watermelons and cantaloupes with properly timed irrigation during bloom development and just prior to harvest

B. On-farm activities that can be implemented by farmers in lID at little or no cost.

Recommendation 7. Cultural Practices. Cultural practices can be implemented by farmers to better manage their irrigation water and control the advancement of the water down a furrow or border to the end of the field. These practices can be implemented at little or no cost to the farmer and can result in water savings and increased yields. Practices such as these are used to some degree within lID and throughout the western United States to save water, reduce costs, optimize yields and improve profits:

The irrigator can terminate the irrigation or change the set (move the water) when the water in the border or furrow reaches a pre-determined point before the end of the field. This early cut-off practice is simple and inexpensive and can reduce the amount of water that flows off the end of the field and minimizes the amount of water standing at the bottom of the field that will cause scalding.

The ends of the rows (furrows) can be blocked to back water up the furrow at the bottom of the field. The ends

of the furrows, or a group of furrows, can be opened after a specific time period to allow water to flow off the field.

Cross-checks can be placed in borders to slow down the advance of water. Furrow dikes (portable) can be placed in furrows to reduce the advance of water down the furrow.

Border crops can be planted on the contour grade rather than in the direction of the border to reduce the advance rate of water.

Longer fields can be divided with new header rows.

Rows can be angled against the field slope at the lower end of the field.

Rows and borders can be angled against the field slope for the entire length of the irrigation run to reduce the advance rate down the row or border on the tight soils.

C. On-farm activities that can be implemented by farmers in lID at higher costs

Recommendation 8. Land Leveling and Grading. The field slopes in lID are not great but are enough to warrant study. There is significant potential for reducing existing slopes in most fields in lID (both clay soils and light textured soils). Tailwater runoff can be reduced by improved uniformity of applied water. The elimination of field slope in either dead level or modified level systems is not recommended for lID at this time but may be appropriate as changes in technology warrant. Reducing one- half-mile irrigation runs to one- fourth mile for fields with medium and light textured soils can result in better management of the irrigation water, better uniformity of application of applied water and the reuse of any tailwater from the upper fields onto the lower fields.

Recommendation 9. Linear Move Sprinklers. Based on the layout and size of fields in the Imperial Valley, linear move systems appear to be a viable irrigation alternative. Although

they are relatively expensive and require more intensive management, linear move sprinkler systems can be used successfully on light textured soils where slopes are relatively steep and the depth of soil is such that grading or leveling is not feasible.

Recommendation 10. Drip Irrigation Many lID farmers use surface or subsurface drip irrigation to irrigate vegetable crops with no runoff from the fields. In 2002 there were approximately 12,000 acres on which drip irrigation is used in lID. Drip irrigation is a proven technology and has been successfully used in IID but its use is limited to high value crops.

See pages 62-66 of the BOR Decision. Exhibit D.

Any DEIR must consider the potential adoption of these principles and the impact they may have on flows into the Salton Sea. The adoption of these principles over an extended period of time will help to optimize the water resources of the Colorado River. If the DWR disagrees with the recommendations of BOR the DEIR should describe in detail where it disagrees with the recommendations. However, one of the ramifications of increased optimization of the water resources by IID and its potential successor and the existing agricultural landowners is that it will reduce the flow of water into the Salton Sea.

Financial Alternatives

The DWR has been directed to look at financial alternatives to finance the Salton Sea Ecosystem Restoration Project. The Imperial Group objects to any attempt by the State of California or any other governmental entity to impose any type of assessments either directly or indirectly on their water rights to finance any modification in the Salton Sea. However, the Imperial Group has developed its own alternative and submitted it in writing to the Resources Agency and the Staff of the Governor. The Consortium consists of the Dutra Group and Bean Stuyvesant, a joint venture between CF Bean and Bosklais.[1] Its submission is attached hereto and marked Exhibit E and incorporated herein by reference. (In Exhibit E you will also find a pamphlet prepared by the Provincie Flevoland in

[1] The respective websites of the members of the Consortium are as follows: www.Boskalis.com, www.Dutragroup.com, ww.cfbean.com/cfbean/default.htm, and www.cfbean.com/beanstuy/defaultcont.htm

Holland entitled "Facts and Figures of the Zuiderzee Project." This pamphlet discusses in detail the issues involved in reclaiming the Zuiderzee. Boskalis, a member of the Consortium, was involved in the project and the project was significantly larger than the Salton Sea Ecosystem Restoration Project.) After worldwide consultation, the Imperial Group chose to develop this alternative because in part this was how Prime Minister Margaret Thatcher solved the Environmental Problems in England. See the Presentation to ACWA entitled "English Experience with the Privatization of its Water and Sewer Industries" prepared by Kathy Neal, Patrick J. Maloney and Norma Morales dated September 9, 1996. A copy of the presentation is attached hereto and marked Exhibit F. In order to accomplish a project to immediately deal with the problems of the Ecosystem of the Salton Sea there has to be recognition of the water rights of the Imperial Valley landowners. The importance of the recognition of these water rights is discussed in detail in the Imperial Group 417 filings. The environment, citizens, and landowners of Imperial Valley and northern Mexico cannot afford to have continued studies about the Salton Sea with nothing accomplished. This has been the practice of the Federal, State and Local Governments for the last 25 years.

Issues that should be considered in the DEIR

Develop an accurate baseline that presents a fair picture of the Coachella, Imperial and Mexicali Valleys before the development of the Salton Sink and the development of agriculture in the Imperial and Mexicali Valleys.

How the water resources of the Colorado River can be optimized so that Imperial and Mexicali Valleys are not stripped of their historic resources and future potential by the current economic power of Coachella Valley and the Coast of California?

What is the extent and nature of the landowners' water rights in the Imperial Valley and the landowners' ability and obligation to control the flows into the Salton Sea?

How can the water rights of the landowners in the Imperial Valley be better protected so they can be used as an engine to help finance the Salton Sea Ecosystem Restoration Project?

How can a feasible plan be developed so the best minds in the world will participate in the design and building of the project?

Conclusion

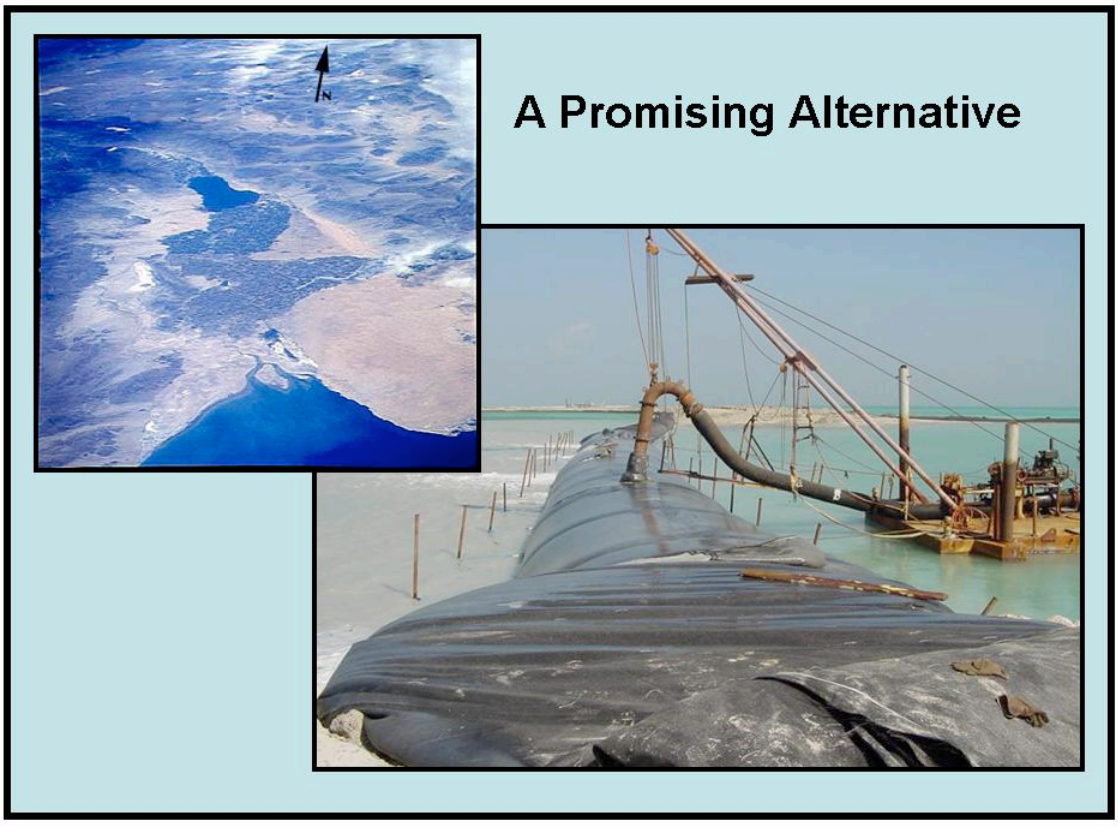
The Department of Water Resources has been charged with preparing a DEIR on the Salton Sea Ecosystem Restoration Project. The Agricultural landowners of Imperial Valley are fully aware of the problems in the Ecosystem of the Salton Sea. They have developed a Consortium with the most competent people capable of solving the problem in the world. Issues relating to the Salton Sea cannot be dealt with in isolation. The Restoration of the Salton Sea Ecosystem impacts multiple publics: Imperial, Coachella, Mexico, Arizona, the Coast of California, and the San Francisco Bay Delta and the problem is urgent. It is essential that an integrated approach be taken that guarantees a rapid solution and involves the parties directly impacted. Only by doing so will a viable solution be developed and successfully implemented.

Respectfully submitted,

PATRICK J. MALONEY

Salton Sea Restoration - The Cascade Alternative

Presented by:
The Salton Sea Restoration Consortium



INTRODUCTION

This project description explains the objectives sought by the Salton Sea Restoration Project, and sets out a general description of the technical, economic, and environmental characteristics of an alternative restoration proposal referred to as the Cascade Alternative. The project description, considers the principal engineering proposals and supporting facilities, and offers an analysis which emphasizes key elements necessary for an evaluation of environmental impacts.

This project alternative is put forward by a consortium of interests led by the Imperial Group. The Imperial Group is comprised of landowners, ranchers and farmers, whose membership owns approximately 25% of the farmland in the Imperial Irrigation District (IID) service area in and around the Salton Sea. See Figure A.

The consortium also includes the Dutra Group of San Rafael and Bean Stuyvesant of New Orleans. Each of the companies is an expert in major dredging operations and environmental restoration projects. These companies are also experienced in utilizing local labor forces for project development.

Examples of recently completed projects include the successful construction of riprap covered Geotextile tube embankments at Amwaj Islan, Bahrain, and the dredging of over 350 million cubic yards of material for both the Changi Airport in Singapore and the Hong Kong Airport. The latter two projects represent the largest and second largest filling projects ever worldwide.

Several international projects have been conducted in areas with known seismic activity, such as the Gorai River project in Bangladesh, and in Esmeraldas, Ecuador. Bean Stuyvesant also designed the winning engineering concept for the San Francisco airport extension (which has not been pursued to date for other reasons).

The Dutra Group also has a wide breadth of experience, beginning over 100 years ago with construction in the Sacramento/San Joaquin delta. More recently, Dutra has performed dredging projects upwards of 7 million cubic yards for the Port of Oakland to create new wetlands. The Dutra Group also has significant experience in areas with seismic activity, and performed the emergency repair of the Bay Bridge following the Loma Prieta earthquake. It also recently repaired a major levee break in the delta at the Jones Tract.

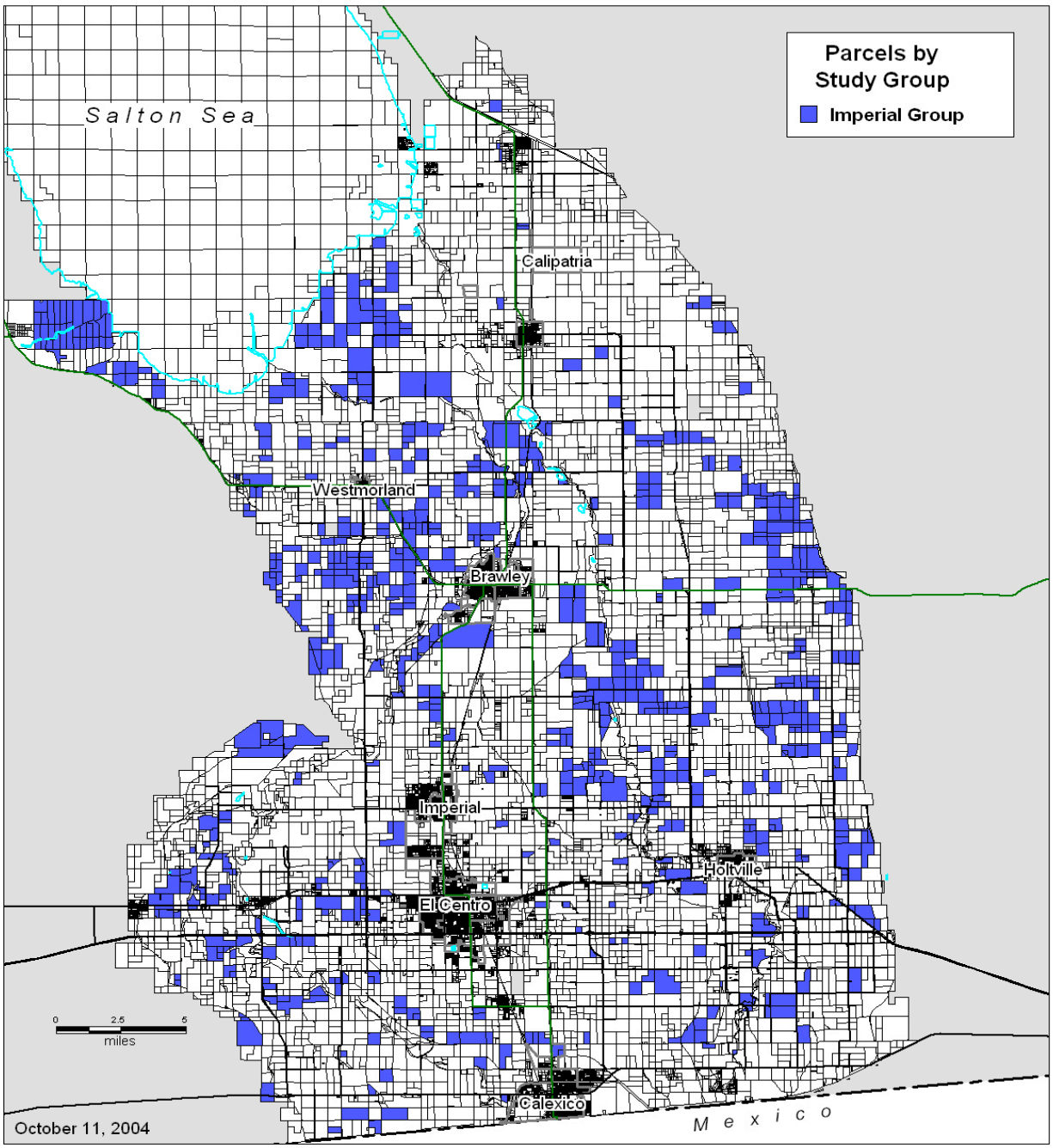


Figure A: Current Map of Imperial Group Land Ownership

C.F. Bean, a world leader in coastal restoration, was the first in the nation to use dredging technology for beach renourishment, and has been actively restoring beaches and wetlands for over 50 years.

Background

The Salton Sea was originally created by an uncontrolled flow of water in the early 1900s from a damaged diversion structure on the Colorado River. Currently, it is filled by the agricultural runoff from the Colorado River Basin; in particular approximately 80% of Salton Sea inflows come from the Imperial Valley. Since the Sea has no outlet, evaporation produces the only export of water. Nearly all constituents in the inflow, such as salts, nutrients and fertilizers remain in the Sea. Currently, the Sea is approximately 25% saltier than ocean water, with a continuing trend of increasing salinity. Eventually, a point will be reached where current biological activity in the Sea will cease, as is the case with other highly saline lakes such as Mono Lake. Under these highly saline conditions the benthic organisms that support the current ecology of the Sea could no longer survive, and the fisheries supported by those organisms would likewise disappear. An ecology based on organisms adapted to highly saline conditions, such as brine shrimp, would result. Thus, even under existing conditions, a project for the restoration of the Sea (including improvement and stabilization of the water quality) is critically needed.

Accelerating these effects would be the reduced inflows to the Salton Sea anticipated under the 2003 Quantification Settlement Agreement (QSA). The QSA provides for the phased transfer of up to 560,000 acre-feet per year of water from agricultural to urban uses, resulting in a significant reduction of agricultural flows to the Sea, of at least 300,000 acre-feet per year. Although the validity of the QSA is the subject of pending litigation, the analysis below assumes that a water transfer of approximately the scale of that contemplated by the QSA will result in reduced inflows to the Salton Sea.

In future years, additional transfers may also occur as demand increases in the expanding urbanized areas of Southern California. For example, the Metropolitan Water District of Southern California (MWD) has pending a water rights application with the State Water Resources Control Board (SWRCB) seeking to divert all of the flows from the Alamo River and other agricultural sources that would otherwise reach the Salton Sea. Application 30661. Filed in 1997, MWD's application contends that it has the right to take much of the inflow of the Salton Sea and divert it to its service area for various uses. MWD supplemented its application in June 2004 and reiterated that it continues to seek the inflows for diversion, although it recognizes that the amount of the inflows may be reduced due to various conservation measures described in the QSA. In Application 30661, MWD did not mention the provisions of the QSA indicating that DWR is to finance restoration by reselling certain water to MWD, thus suggesting that MWD favors a direct diversion rather than a purchase of water

that would provide funds to support restoration. Thus, if an appropriate Salton Sea restoration plan is not implemented (either under the auspices of DWR or otherwise) a substantial portion of the inflow may be diverted permanently from the Salton Sea area such that no restoration would be possible**.** The resulting reduction in inflows would be severe, ranging from approximately 400,000 to 450,000 acre feet per year, with net inflows to the Salton Sea being reduced to as low as 468,000 acre feet per year (assuming diversions comparable to that contemplated under the QSA).

Over time, those smaller inflows will result in a reduction in the surface area of the Sea. Evaporation will further reduce the water volume in the sea. This reduction could expose as many as 153 square miles of previously inundated sediments. The reduced water volume in the Sea will also result in a corresponding increase in salinity. Without affirmative restoration activities, a number of adverse environmental consequences would result, such as a reduction of the Sea's important habitat values for the Pacific Flyway, increased air pollution, and decreased aesthetics values.

In order to avoid these adverse effects, the QSA implementing legislation (Chapters 611, 612 and 613, Statutes of 2003) directs the Department of Water Resources and Department of Fish and Game to prepare an environmental impact report to support the selection of a preferred restoration option and to provide the basis for subsequent regulatory actions by federal and state agencies to review the identified restoration option.

The Development of Restoration Alternatives

Any restoration plan must solve both of the key problems faced by the Salton Sea -- water quality and water quantity. Over the years, a number of options have been explored for addressing these concerns. In 1998, the Salton Sea Authority, in a joint lead with the federal Bureau of Reclamation, initiated an environmental review of a number of alternatives to address the problems that existed at the time. These alternatives primarily focused on "whole-sea" restoration approaches such as the conveyance of water to and/or from the ocean to address the elevation and salinity problems, various evaporation options to facilitate the removal of salt, and desalination options using vertical tube evaporation technology. This effort, however, was not completed, primarily due to critical problems identified with all of the alternatives being evaluated, such as excessive costs or environmental impacts.

In April 2004, the Salton Sea Authority (SSA) evaluated four "reasonable" restoration alternatives: (1) no marine lake; (2) south marine lake without elevation control, (3) south marine lake with elevation control, and (4) north marine lake with elevation control. The SSA dismissed the first two as lacking in any real environmental or economic benefit. The SSA ultimately concluded that the North Lake concept, combined with other features, was its preferred project.

After much discussion between DWR and the interested parties, four alternatives, two of which draw upon the work completed by the Salton Sea Authority in 2004, gained prominence as a reasonable range for the alternatives evaluation: (1) the “Low Sea” alternative, which allows the sea level to drop and involves the construction of a relatively small brine pond, (2) the “Shore Lake” alternative, which involves the creation of a relatively deep short lake along the entire perimeter of the current sea, separated from a dry area and brine pond in the interior by a dike (similar to the SSA’s In-Sea Solar Evaporation Pond alternative, but with a different configuration), (3) the “North Lake” alternative (the SSA’s “North Lake with elevation control” alternative) which separates the sea with a relatively high dam and allows the southern portion of the lake to largely dry out, except for a brine pond, and (4) the “South Lake” alternative (the SSA’s “South Lake with elevation control” alternative) which is similar to the North Lake alternative with the dry areas and brine pond to the north.

A fifth alternative, known as the Cascade Alternative, surpasses the existing four alternatives in its ability to meet restoration objectives and to minimize environmental impacts. The Cascade Alternative enjoys the benefits of the shore lake alternative at a substantially lower cost and with greater design and operational flexibility. Specifically, the Cascade Alternative eliminates the need for the construction of a relatively high dam in the Sea’s interior. Instead, the Cascade Alternative involves a series of relatively low concentric dikes formed through the installation of geotubes, which are used to create “cascade” levels or terraces of wetlands, ponds and marine lakes.

The Salton Sea is now at 227 feet below sea level. Under the Cascade Alternative it would start at 230 feet below sea level and gradually drop to 270 feet below sea level through the dike system. Each terrace would be at a different water level. At each level there would be varying habitats, including lagoons, deep lakes and islands. The bodies of water could stretch as long as seven miles and be a mile wide, allowing open spaces for recreational purposes. The terraces will be interconnected via overflows, rapids and/or siphons, controlling water levels and aerating the flow, thus contributing to improvement of the water quality. In the center of the sea would be two hyper-saline, or brine, ponds that would collect the sea's salts. The brine ponds would vary in size depending upon the inflows. At each level of the sea there would be a system of locks, or gates, that would allow boats to flow from one level to the next.

Since dredging equipment would be mobilized to construct the dikes, the current shoreline would be improved and access from the existing developments would be enhanced as a part of the overall project.

The Cascade plan ensures fairness to interested parties by planning for a Sea that is similar in size and shape at both the north and south end. The Cascade Alternative is also attractive because it provides a wide variation of wetlands,

ponds and marine lakes, from deep to shallow and from nearly fresh to ocean salinity. The range of habitats would meet the needs of eco-tourism, water recreation and fishing while decreasing salinity, protecting the environment and protecting farmland around both the northern and southern portion of the sea, which depends on conditions created by the sea.

The Consortium will be able to construct the project in four to six years and will self finance once the above-referenced litigation is resolved to the Consortium's satisfaction. Since the project's construction can be phased as sea levels decline, as discussed in greater detail below, initial construction costs will be substantially less than with the other alternatives. In addition, the Consortium is actively working on establishing a public-private partnership to build consensus and facilitate decision-making.

The Cascade Alternative can be constructed with substantial participation of the local labor force. The Consortium plans to develop its own academy for training the local labor force and estimates that approximately 85% of the 500 employees used in the construction of the project will be residents of Imperial County. Following construction, approximately 150 employees will be needed to maintain the project, and this long-term labor force would initially be comprised of original employees used in the constriction of the project. The members of the Consortium have had extensive experience around the world in developing labor forces from the local population to undertake project construction. The Consortium will work with the unions in developing the local labor pool.

Any alternative restoration project would need to include enhancements to improve the habitat values of the Sea. As an environmental restoration activity, the selected alternative would also need to include a number of non-structural elements, including established performance standards, monitoring and adaptive management provisions to ensure satisfactory attainment of water level, salinity, and habitat goals.

PROJECT LOCATION

The Salton Sea is located in a closed basin in Riverside and Imperial Counties in southern California, south of Indio and north of El Centro. The Sea is more than 220 feet below sea level and has no natural outlet. The Salton Sea Basin is part of the Lower Colorado River Delta system and historically lakes have existed in this basin as the course of the Colorado River has shifted. The current body of water formed in 1905 when a levee break along the Colorado River caused flows from the Colorado River to enter the basin for about 18 months. Since 1905, the Sea has fluctuated in size with varying inflow, and it recently has had a surface area of 365 square miles.

Figure B: Salton Sea Location

PROJECT OBJECTIVES

The project's objectives are driven by the pertinent federal and state legislation that provide for the water transfer in a way that ensures maintenance and enhancement of the existing values of the Sea, as well as several practical considerations that control the project's successful implementation.

The federal Salton Sea Reclamation Act of 1998 formulates the goals of the restoration as follows:

- Continue to use the Sea as a reservoir for irrigation drainage
- Reduce and stabilize the overall salinity of the Sea
- Stabilize surface elevation of the Sea
- Reclaim, in the long-term, healthy fish and wildlife resources and their habitats
- Enhance the potential for recreational uses and economic development of the Sea

The 2000 Draft EIS/EIR on restoration of the Salton Sea prepared by USBR and the Salton Sea Authority revised the fourth of these objectives as follows:

- Provide a safe, productive environment at the Sea for resident and migratory birds and endangered species.

The state QSA implementing legislation requires that the preferred alternative provide, to the maximum extent feasible, for attainment of three key objectives, which further refine the habitat objective and add an objective relating to air quality impacts:

- Restoration of long-term stable aquatic and shoreline habitat for the historic levels and diversity of fish and wildlife that depend on the Salton Sea
- Elimination of air quality impacts from the restoration projects
- Protection of water quality

Additionally, in order to be successful, the project will need to be economically viable, implying the following objective:

- Plan, construct, develop and operate the restoration project within the practical economic constraints of available funding sources and maximizing economic benefits

As with these economic factors, in order to be successful the project must be one that can receive all required permits and other entitlements, satisfying the following objectives:

- Qualify the project as the Least Environmentally Damaging Alternative under the Clean Water Act 404(b)(1) guidelines

- Ensure that the project avoids jeopardy to endangered or threatened species, or the adverse modification of designated critical habitat, and otherwise meets USFWS permitting requirements

- Comply with Clean Air Act general conformity requirements

- Fully comply with all other regulatory programs

A number of other practical factors also need to be addressed in the selection and implementation of an alternative:

- Ensure timely achievement of project benefits

- Maximize collateral benefits of the project, particularly the provision of effective water storage capacity that can assist in the management of fluctuating Colorado River flows, and conveyance of water from the IID inflows to other potential users

- Allow for flexibility of design and construction, in particular to adjust to the actual pattern of water transfers over the coming decades

- Confirm engineering feasibility for project development and maintenance

- Minimize seismic risks

- Maximize public acceptance

- Maximize the active participation of the local residents in the construction of the project.

These objectives are used below to evaluate and compare the various restoration alternatives, as summarized in Figure R on page 55.

ENGINEERING RATIONALE

To provide context for the detailed project description below, this section summarizes the engineering rationale of the proposed approach by outlining the key considerations applicable to achieving the principal objectives of maintaining water levels and improving water quality.

Water level control

Since the gradual increase of the water transfer contemplated under the QSA or other potential alternatives will cause water levels in the Sea to fall, measures are needed to ensure stability in the Sea's elevation. A steady water level will be maintained only when the inflow to the Sea balances the evaporation. The principle that inflow equals outflow for a steady-state water level is a basic hydrological principle that applies to every impoundment. If the volumes of flow and evaporation are not in balance, the levels adjust gradually over time. This can be a slow process. For example, at the Sea, if a maximum water transfer of 40% is implemented without any restoration project in place, the speed of the falling sea level will be about 2 feet in the first year. This rate decreases since, as the sea shrinks, the total evaporation from the sea surface will decrease.

Water transfers under either the QSA or other transfer programs will reduce inflows to the sea and begin the process of water level reduction. The sea will shrink until the water surface is small enough that evaporation balances the reduced inflow again. This relationship between inflows, water levels, and sea surface area is illustrated in Figure C below.

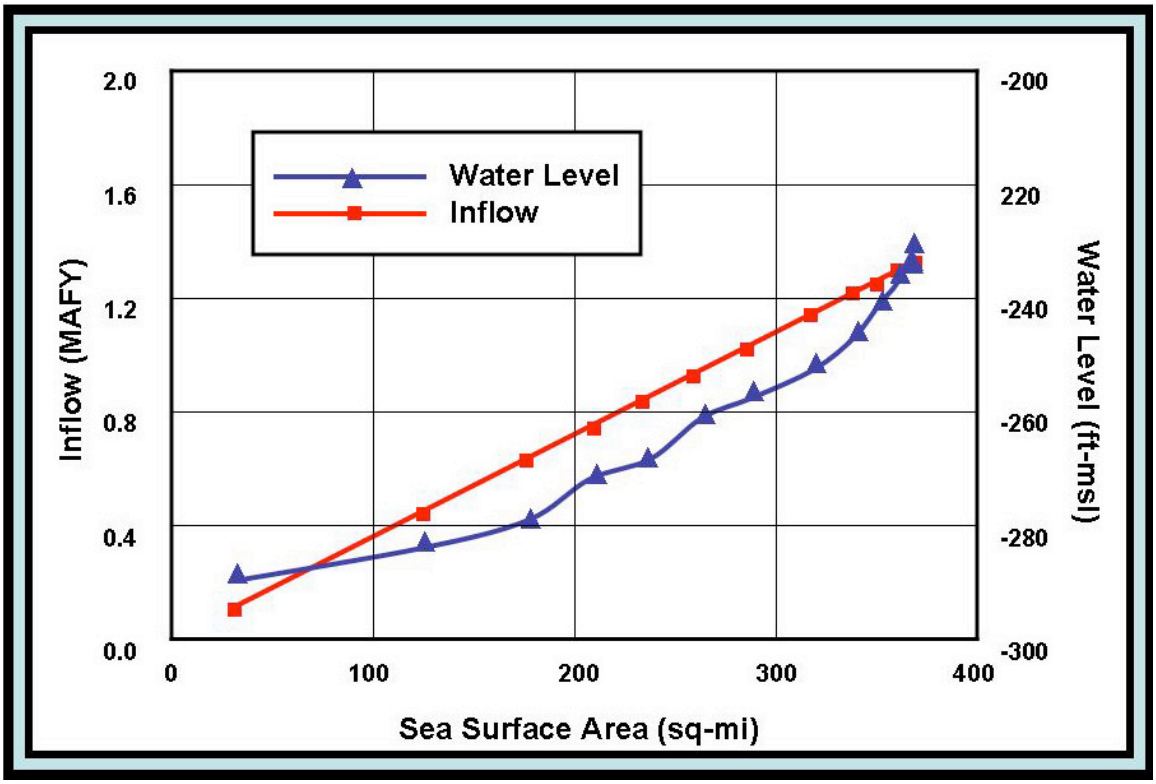


Figure C: Inflow, Water Level and Sea Surface Area

The particular shape of the seabed causes the water level to fall considerably before a substantial reduction of the sea surface is obtained. The figure shows for instance, that if the present inflow of 1.36 million acre-feet per year (MAFY) is reduced to 1.02 MAFY, the surface will shrink from the present 365 sq-mi to about 270 sq-mi and the water level will stabilize around 249 feet. below mean sea level (msl-249). This would reflect a drop of 21 feet from the present Salton Sea water level of msl-228 ft. A maximum transfer of 0.56 MAFY creates a minimum inflow of 0.79 MAFY, causing the sea surface to shrink to about 212 sq-mi with an associated Salton Sea water level of msl-259 ft.

As discussed above, the reductions in inflows could be even greater if MWD's pending application to appropriate water from the Alamo River is granted. The discussion below, however, generally assumes a maximum transfer rate of 0.56 MAFY.

Under steady inflow conditions, steady-state water levels and salinities develop over time, subject to variations in annual rainfall and evaporation. Steady-state water levels require a balance between all water flows, including evaporation. For every wetland, marine lake, etc. the inflow equals the evaporation plus the outflow. As a result, the outflow is always smaller than the inflow in the steady state scenario.

Since the scale of the water transfers is currently uncertain, and since annual variations in inflows can be anticipated for any given water transfer regime, some method of regulating the water levels in the Sea will be necessary. Under the Cascade Alternative, much of this regulation can take place at one or more of the inner lakes, allowing the shoreline sea elevation to remain relatively constant. The other alternatives will require that all such regulation take place in the shoreline lakes, resulting in greater fluctuations in shoreline water levels.

Salinity and Flushing

To stabilize the salinity and maintain water quality, water flows need to be dedicated to the removal of salinity from higher water quality impoundments into a brine pond. Under the Low-Sea, Shore-Lake, North-Lake and South-Lake alternatives, a single high quality pond and a single high salinity pond are created. Under the Cascade Alternative, multiple terraced impoundments are constructed, where the water, including all constituents, will flow from the low-saline outer ponds towards one or more brine ponds in the interior. On the way, waters and salts will pass through a variety of wetlands, ponds, marine lakes, etc. each with their own dimensions, water levels and salinities.

To maintain a constant salinity in each wetland, marine lake, etc. the inflowing salt transport (flow times salinity) must equal the out-flowing salt transport. In order to accomplish this, the volume of the outflow from the higher quality pond needs to be adjusted to the rate that achieves this balance. The size of the receiving pond also needs to be based on this anticipated flow. Generally, along the chain of wetlands, ponds, etc. the salinity will increase in the downstream direction. There may be a variation in the salinity of agricultural runoff. Overall, however, the project will create broader agricultural efficiency and enhance water transfer capabilities, thereby allowing more flexibility in the control of salinity levels.

In contrast, to the extent that the inflow rates are uncertain, the fixed configurations of the Shore-lake, North-lake and South-lake alternatives reduce the management flexibility necessary to optimize performance. Under the Cascade Alternative, the phasing of construction can be adjusted to match the actual inflows in the early years of project development, and future phases can be refined for the same purpose.

The relationship between outflow, salinity, sea surface area, and brine pond dimensions are illustrated in Figure D.

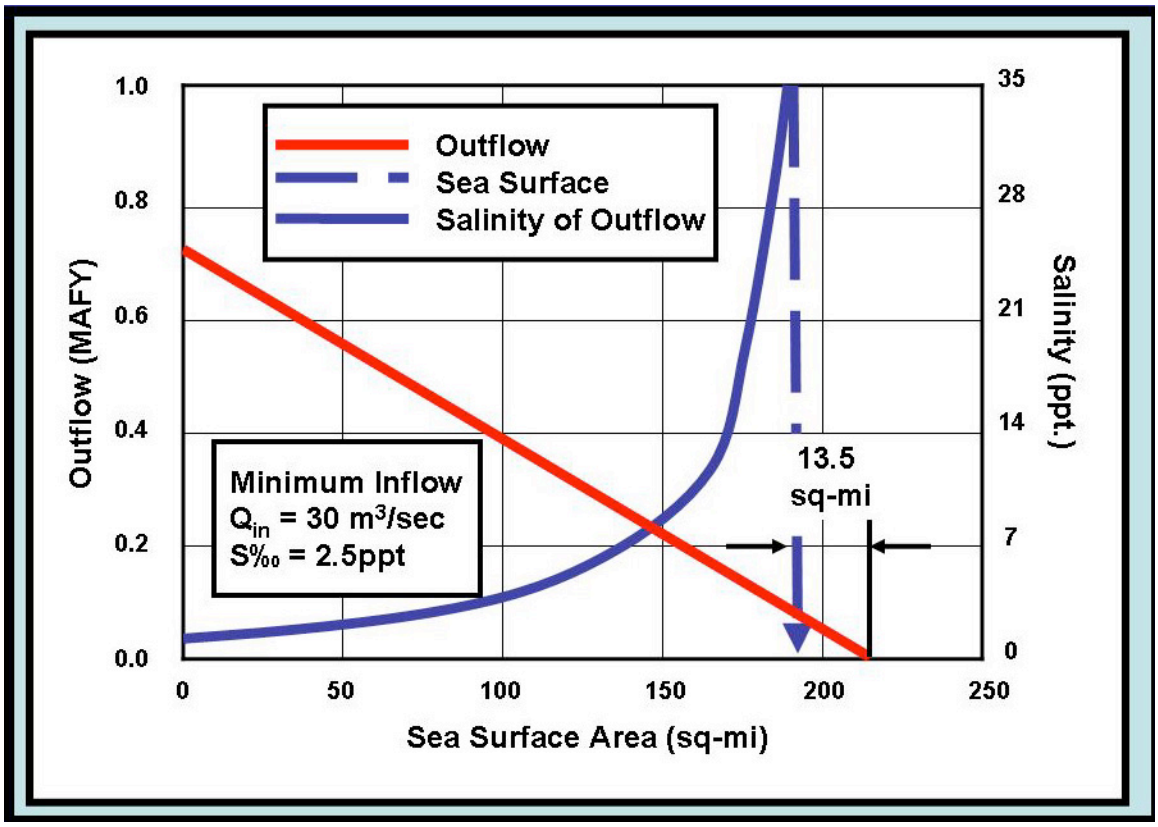


Figure D: Outflow and salinity

Generally, the larger the water surface (total wet surface downstream of the inflow) the less the outflow and the higher the salinity. Given anticipated transfer levels, and assuming that the allowed maximum salinity is 35 ppt (ocean water salinity) then the required total wet area is about 193 sq-mi and the outflow to the brine pond is about 0.05 MAFY.

At this inflow rate, the outflow is zero (inflow balances evaporation) when the total water surface is 206 sq-mi. The size of the required brine pond under this scenario is the difference between these two areas, which means that the remaining area of the brine surface is about 13.5 sq-mi. The area of the brine pond will vary depending upon inflow levels. The brine pond will accumulate salt at the rate of approximately 3 feet per century. The optimum brine pond size varies with the inflow rate, for a given target salinity level.

Actions That May Affect Inflows

Efforts to develop a preferred restoration project are not the only actions that could affect conditions at the Sea. Other activities — being pursued under other initiatives and by other parties — could also influence the effectiveness of salinity/elevation control projects.

- **Applications to Appropriate Water by MWD and others.** As discussed above, MWD has filed an application to appropriate the flow of the Alamo River, which would substantially reduce the overall inflows to the Sea.

- **Constructed Wetlands Projects** — Several pilot wetlands have been constructed on the New and Alamo Rivers. Expansion of constructed wetlands projects in Imperial Valley could improve the quality of water flowing into the Sea, but would also cause some reduction of inflows.

- **Total Maximum Daily Load Program (TMDL)** — This program, being implemented by the Regional Water Quality Control Board, is designed to provide a long-term reduction in key constituents in waters that flow into the Sea. While improving the quality of water that flows into the Sea would be beneficial, it is also possible that TMDL efforts could result in some flow reductions.

- **Mexicali Wastewater System Improvements** — Mexico has been pursuing construction of projects to improve the collection and treatment of wastewater in Mexicali. These projects will improve the quality of water flowing across the international border to Calexico, but will also divert water away from the Salton Sea. It is estimated that these projects could reduce inflows to the Sea by 15,000 acre-feet/year in 2006, increasing to 22,507 acre-feet/year by 2014.

- **Mexicali Power Plants** — Baja California Power, Inc. (BCP) and Sempra Energy Resources (SER) operate power plants that use Colorado River water for cooling. These evaporative cooling systems cause reductions of flow to the Sea. The available data suggests that the range of inflow reductions could be on the order of between 3,000 acre-feet/year to as much as 16,000 acre-feet/year, and likely would be somewhere in between.

- **Lining of the Coachella Canal** — The lining of the Coachella Canal, currently underway, will reduce inflows to the Sea by approximately 27,000 acre-feet per year. Other modifications to water use practices in the Coachella Valley could also reduce inflows.

- **Lining of the All-American Canal (ACC)** — Approximately 3.1 million acre-feet of Colorado River water is delivered annually through the All-American Canal to nine cities and 500,000 acres of agricultural lands throughout the Imperial Valley. Proponents of other projects have assumed that the ACC will be lined when making their inflow calculations. If the ACC is not lined, however, additional water will be lost as a result of losses from the canal. The ACC is thus another source of possible inflow reductions.

Relationship Between Inflow, Salinity and Elevation

A delicate balance between inflow and evaporation has sustained the elevation of the Salton Sea in the past. If the inflow to the Sea is reduced as is anticipated under the QSA or any potential alternative, evaporation will outstrip inflow and the Sea will begin to shrink until a new balance is achieved. Shrinking of the Sea will cause the salts that are currently in the Sea to concentrate. Compounding this problem, approximately 4 million tons of salt are added annually to the Sea from inflows. In addition, sediments that are now under water would be exposed and could possibly add to the existing air quality problems with blowing dust in the Imperial and Coachella Valleys.

Fundamentals of Pond Design

The most important Salton Sea restoration objective is the reduction and control of salinity levels. Therefore, the target equilibrium salinity level determines the size of the ponds. Some first order calculations have been made in order to provide the order of magnitude of the marine lake/wetlands that are in equilibrium at the current inflow level (1.36 MAFY) as well as at reduced inflow scenarios of 0.9 and 0.8 MAFY. In the current situation about 1.36 MAFY flows into the sea, and totally evaporates over the year. This means that, in total, about 5.8 ft/yr evaporates from the sea with a wet surface area of 365 sq-mi. The salinity concentration of the inflow is approximately 2.5 ppt, which means that at the current inflow rate about 4 million tons per year of salt flows into the Salton Sea.

Figure E illustrates a model that allows the comparison of different inflow and salinity concentration scenarios in terms of the corresponding size of the marine lake/wetland that would be associated with the scenario under steady state conditions.

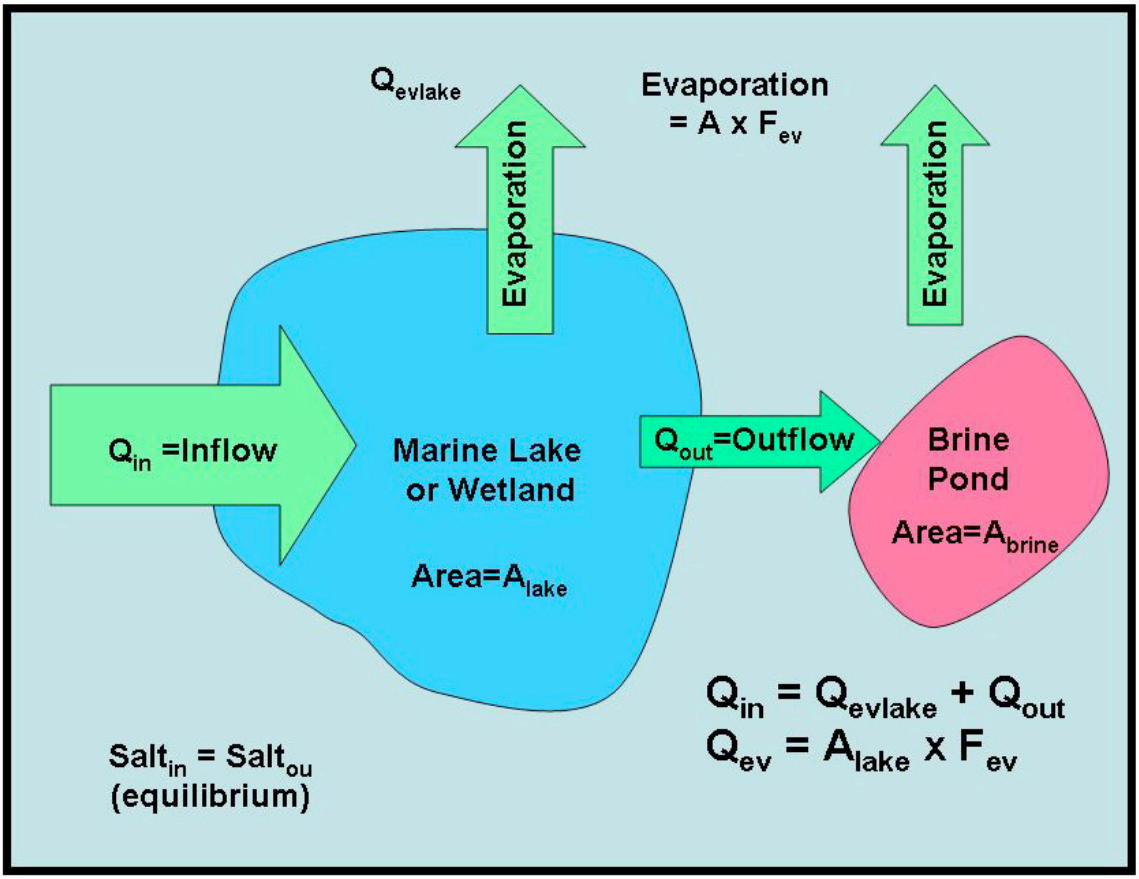


Figure E: Inflow Salinity Scenario Model

This model applies a number of simplifying assumptions that will need to be addressed in the final project design. First, it assumes that the pond or marine lake is well mixed, so that the salinity of the outflow equals the average salinity of the lake. Also, the shrinking wet areas and volumes will result in increasing concentrations of salt (and other constituents) in the transition period between the present situation and the future equilibrium conditions of any alternative. Salinity is also affected by other factors such as temperature, settling, and biological effects. Furthermore, since the source flows from the Colorado Basin are expected to rise in the coming years from the present 2.5 – 3ppt to 5ppt, appropriate adjustments will need to be made. Additionally, changes in irrigation practices will affect salinity (vertical drainage will pick up local salts, so tile-water is saltier than tail-water). All of these factors will need to be considered in the final project design and long term operations planning.

DETAILED PROJECT DESCRIPTION

The following project description addresses all facets of the Cascade Alternative for the restoration of the Salton Sea. It begins with the physical improvements, including the basic design and construction techniques, habitat enhancements, and various contingencies and options. It next describes the planning and management considerations of construction phasing, performance standards, monitoring, and adaptive management.

Design of Basic In-Sea Improvements

The Cascade Alternative involves a series of terraces: strings of wetlands, shore lakes, marine lakes with islands, etc.; each terrace with its own (controlled) water level. By following the existing depth contours the dike heights can be kept very low. Figures F and G illustrate this concept.

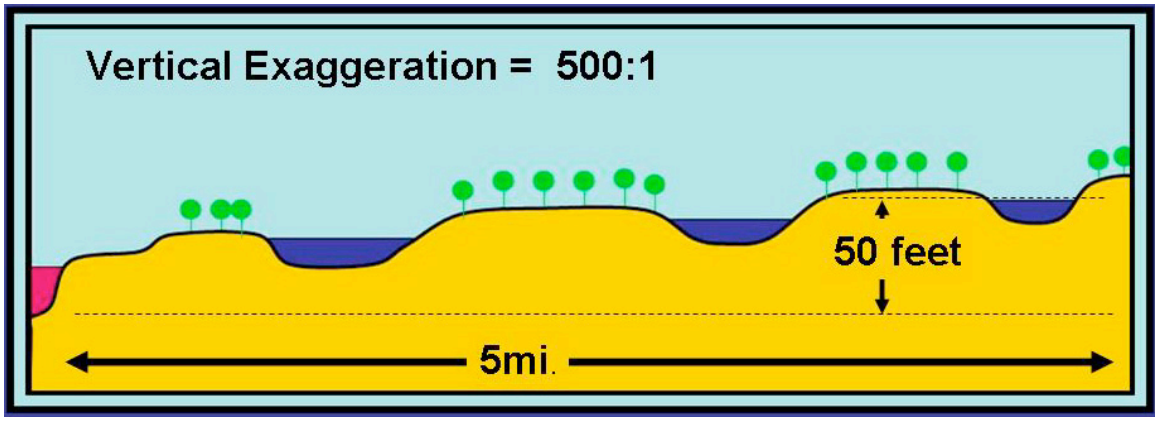
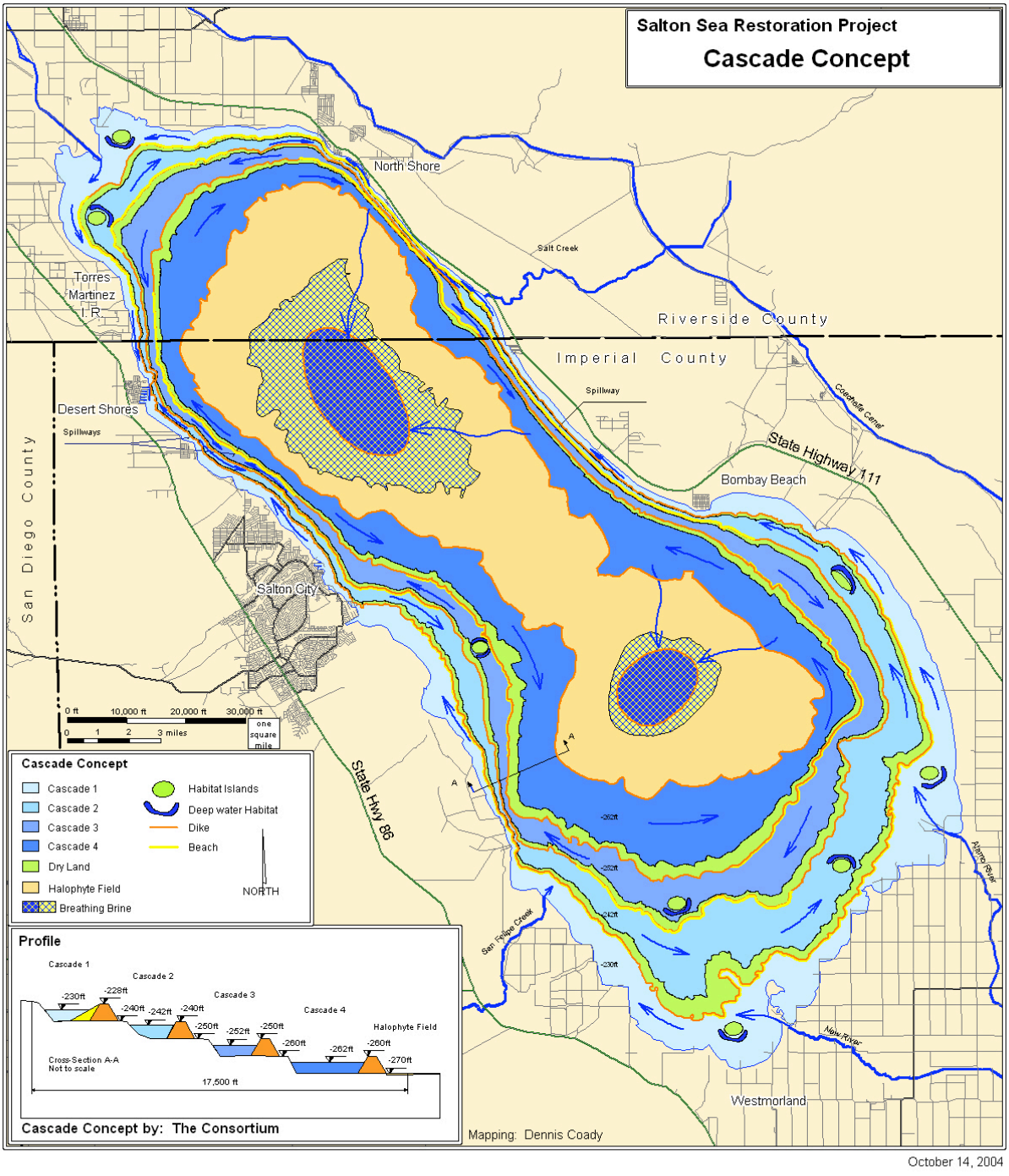


Figure F: Schematic Elevation of the Cascade Alternative

The basic design of the Cascade Alternative would consist of four concentric lakes, each with a capacity of approximately 300,000 acre feet and a surface area of approximately 50 square miles. Water would flow into the outer lake from the New, Alamo and Whitewater Rivers, and be released sequentially to the inner lakes through locks, siphons, rapids or other conveyances. The inner lakes would become progressively more saline. A variably sized brine pond would be located in the middle of the Sea. The concept is illustrated graphically in Figure G on the next page.

Figure G: Cascade Conceptual Design



This presentation of the Cascade Alternative is at a conceptual level. It is based upon the information currently available regarding the existing conditions at the Salton Sea. Since the site investigations performed to date have focused on the site where the Salton Sea Authority's proposed mid-Sea dam would be located, broader scale investigations, particularly regarding geotechnical conditions, would be needed before a more detailed design can be completed. Additional documentation of the concept will be submitted as it is prepared.

The next step to elaborate the Cascade Alternative would include a more detailed plan-form with ridges, islands, layout of wetlands, ponds, marine lakes, etc. The development of these features would be done with appropriate consultation with the environmental and fish and wildlife management communities to ensure that habitat goals are achieved by the plan. The detailed design will also address the various constraints posed by the site. It should be emphasized that the Cascade Alternative allows for considerable design flexibility to address these considerations. Among the more significant design considerations are the maximum avoidance and/or stabilization of high-selenium sediment and heavy metals, and the assurance of adequate foundation conditions through dike routing, dike design, or stabilization through additives.

Construction Techniques

Filling geotextile tubes with dredged material has been practiced for many years, and geotextile tubes have been used in a variety of coastal and inland projects. The tubes, manufactured of high strength polyester or polypropylene geotextile, are hydraulically filled with a dredge. Typical applications of geotubes include: sand dune restoration, dike construction, groin construction, artificial reefs, and simple waste containment. Examples of projects completed by the members of the Consortium are summarized above. Several of these projects have been completed in highly seismically active areas. Several of these projects have been highlighted in published research papers, which have concluded that it is "economically and technically feasible to cover and protect sand filled Geotextile tube embankments with riprap in a coastal and estuarine environment."

Fill retention and the structural integrity of a dredged material-filled geotextile tube is provided by the geotextile envelope. Fabric selection is based on both opening characteristics, which should match the fill particle size and permeability, and strength, which should be sufficient to resist filling pressures. A composite fabric shell that incorporates both a nonwoven and a woven fabric for filtration and strength, respectively, is sometimes used.

The suction dredging technology allows for the transport of construction materials over a considerable distance through the use of submerged slurry pipelines. This permits the flexible selection of borrow sites to ensure that the best available materials are utilized. It is anticipated that deposits of relatively large grained

sediments found near the historic mouths of the San Felipe, Whitewater, New and Alamo Rivers will be utilized in order to obtain the best seismic performance from the constructed dikes. These same locations also generally have relatively low selenium levels. Preliminary engineering analysis performed to date indicates that these materials can be used without substantial risk of seismic failure due to liquefaction. It is also possible to supplement the borrow materials with cement, calcine or other suitable materials if needed in order to produce the necessary seismic performance.

Foundation materials can also be supplemented or otherwise engineered through mechanical vibration or other techniques to produce the required stability. It should be noted that foundation issues would also be faced by the mid-Sea dam that would be the key feature of the North Lake or South Lake alternatives. The much greater weight of this high, rock-filled dam structure would result in a much higher bearing pressure on the subsurface. More complex foundation solutions would therefore be required for the rock-filled dam, resulting in significant costs.

A more detailed seismic evaluation report is in preparation, which will be elaborated further during the detailed design phase. Additional documentation of the proposed approach will also be submitted as it is developed.

The construction of the geotubes is illustrated by the following photograph of a construction site in Bahrain. As shown, the geotube material is laid out along the route of the dike and filled by the suction dredge. Additional material is then deposited over and along side of the tube, either through suction or clamshell dredging, depending upon the design.

Figure H: Construction in Progress

There are three basic dike designs that would be used in the construction of the Cascade Alternative. Most of the dikes would utilize rip-rap on the uphill side of the dike in order to reduce the scouring effects of wave action. The profile of this dike design is illustrated in Figure I.

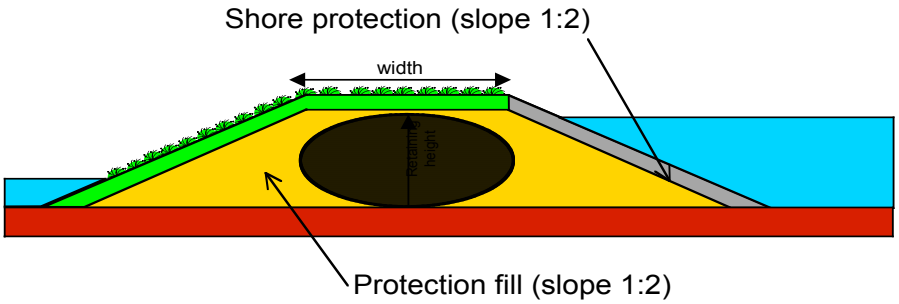


Figure I: Basic Profile

Where existing subsurface conditions will not support the first approach, a broader dike will be utilized, also known as a "beach profile." The relatively low slope of the beach profile allows the dissipation of wave energy without significant scouring and without the use of rip-rap. The beach profile, however, requires a greater volume of dredge material for a given length of dike. The beach profile is illustrated in Figure J.

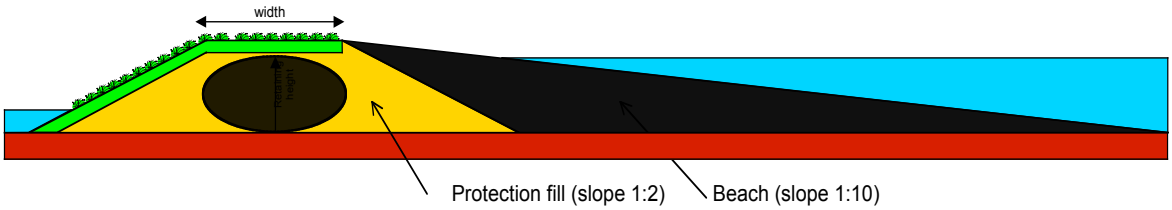


Figure J: Beach Profile

Although most of the water flow between the lakes would be managed through locks, siphons, or other controls, some segments of the dikes would be designed to serve as spillways in order to avoid the uncontrolled overtopping of the dikes during high-flow or other conditions. The profile of such a spillway segment is illustrated in Figure K.

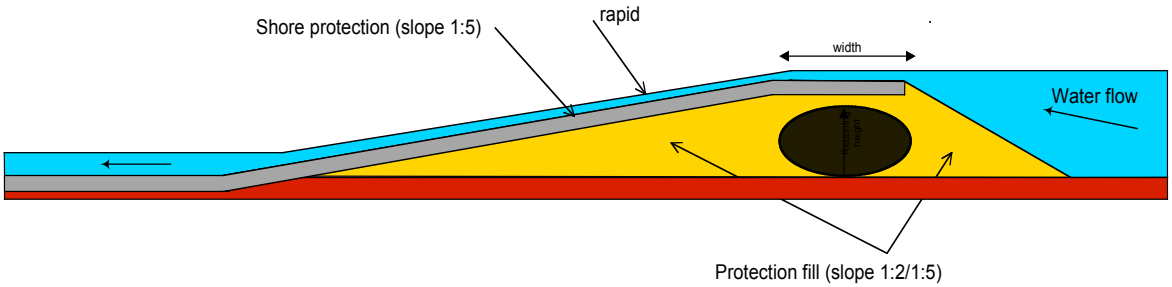


Figure K: Spillway Profile

Under the Cascade Alternative, the total volume to be dredged will be on the order of 20 million cubic yards per cascade level or terrace. Total dredging for the four terraces and for landscaping, islands and deeper ponds, will be on the order of 100 million cubic yards. The amount of rock required for rip-rap will be on the order of 2 million cubic yards. These volumes are only approximate and for comparison purposes, and will be refined during the final design phase.

The volume of construction material is significantly less than that required for the Shore Lake Alternative. Because of the need to follow the contours of the sea bottom at a specific elevation, there is less flexibility in the location of the Shore Lake Alternative than with the Cascade Alternative. Since the Cascade Alternative will require significantly less dredging than the Shore Lake Alternative, fewer heavy metals will be dredged up from the lake bottom under the Cascade Alternative as compared to this alternative

Under the North and South Lake alternatives, no large scale dredging would be needed to create deep water habitats. Dredging would be needed, however, to ensure access to existing seaside communities if the elevation of the marine lake becomes lower than the current Sea elevation. If the lake elevation decreases significantly, under either the North or South Lake option, dredging would be needed to create channels through the Sea-bottom areas exposed by lower lake levels. The North Lake Alternative would also require the construction of canals to convey the water from the New and Alamo Rivers to the lake.

The dam to be constructed as part of the North Lake or South Lake alternatives would require approximately 20 million cubic yards of rock. This rock would all need to be imported from a considerable distance. The Cascade Alternative would only require approximately one tenth the amount of imported rock, and approximately 95% of the volume of the dikes would be constructed with materials found within the boundaries of the current Salton Sea. The per-unit costs of rock filled construction are considerably higher than the per-unit costs of dredging. Taking this into account, in addition to the higher foundation preparation costs for the mid-Sea dam, construction costs of the Cascade

Alternative would be considerably less than either the North Lake, South Lake, or Shore Lake alternatives.

The geotube technology proposed to implement the Cascade Alternative has been proven in applications around the world. Figure L shows examples of the implementation of these concepts in the estuary of the Ijssel River in Holland.

Figure L. Examples of island construction on the Ijssel River, Holland

The lakes which result from the implementation of the Cascade Alternative are long and sinuous, averaging perhaps six miles long by one mile wide. Navigation between the lakes will be through a system of locks which can be operated by individual vessel owners. Such lock systems are common on smaller recreational European waterways. Lock gates are operated by physically moving a counterweighted lever by hand. The lock is then filled by opening a valve. When the lock is full, the upstream gates are opened in the same way. Typical locks are illustrated in Figure M.

Figure M: Typical Locks on European Waterways

Construction Phasing

The Cascade Alternative can easily be executed in phases. Project phasing will depend on the rate of inflows resulting from the of transfer of water, and the falling sea level would then determine when the next cascade level needs to be implemented. In general, during the gradual increase of the water transfer, the water levels will fall. Because the actual pace of water transfers is unknown, project phasing in the manner described below will create optimal adaptability.

The project phasing could be accomplished in the following manner:

- Installation of upstream freshwater wetlands and sedimentation basins coupled with implementation of TMDL measures to improve inflowing water quality could be accomplished as a first step. This step would ensure that once the initial terraces are created, the inflows would be of high quality. In addition, it would create recreational opportunities for hunting and bird watching.

- Dredging of shoreline access areas would begin prior to substantial drops in lake elevation, to begin creating islands and peninsulas. The geotubes to be used for dike creation can be filled with the materials from this dredging activity.

- The construction of the Cascade Alternative could be done in steps by following the fall of the water levels. The upper string of wetlands and lakes would be constructed first and start functioning immediately. The rate of transfer and thus the fall would then determine when the next cascade level could be implemented. This flexibility enables the builders to tune implementation to actual water transfers.

- Each terrace would be at a different water level. The terraces will be interconnected via overflows, rapids and/or siphons, controlling water levels and aerating the flow, thus contributing to improvement of the water quality.

- The brine ponds at the center of the sea would have a variable size, and would expand and contract as inflows vary.

Each of the four terraces will require about eighteen months to construct. The first two terraces could be constructed sequentially, without waiting for the water levels in the sea to drop. Therefore, construction of the first two terraces would occur over an approximately three year period. Construction of the third and fourth terraces would require adequate reduction of the sea levels, the timing of which would depend upon the scale of the water transfers and reduced inflows.

At higher transfer levels, the third and fourth terraces could also be constructed sequentially, resulting in a total construction period of six years for all four terraces.

Proposed Timeline

Implementation of the project would begin with contracting for detailed design, environmental compliance, and permitting. The detailed design phase would include a second phase of geotechnical investigations, geophysical surveys, seismic stability analyses for the geotube installation, site surveys, detailed construction and operation cost estimates, and preparation of permit applications. Figure N sets forth a proposed timeline.

Figure N: Proposed Timeline

Timeframe	Activity
2004	Federal, State, and Local (SSA) Agencies Pledge to Work Together on Restoration, Enter into an MOU and Resolve Pending Litigation
2004	State Advisory Committee Develops Criteria and Reviews Alternatives
2004	Begin Detailed Design
2005	Draft Project - Level Salton Sea Restoration EIR/EIS
2005	Final Project - Level Salton Sea Restoration EIR/EIS
2005	Complete Detailed Design
2006	Commence Construction of Phase One
2007	Phase One Completion of Construction
2007	Additional Habitat Enhancements Associated with Phase One
2008	Phase Two Completion of Construction
2010	Phase Three Completion of Construction
2011	Phase Four Completion of Construction

Cost and Financing

The Cascade Alternative will be constructed using materials from the current seabed for approximately 95% of the volume of the dikes. The amount of imported rock materials for rip-rap will be approximately one-tenth that necessary for the North Lake or South Lake alternatives. As a result, the Cascade Alternative is the lowest cost solution. In addition, since it can be phased, the Cascade Alternative can be more readily financed because anticipated revenue streams better match the construction cost profile. It should be noted that the current uncertainty that results from the pending QSA validation actions would likely impede debt financing of any project. Thus, as a practical matter, the litigation will need to be resolved before debt financing is available for any of the alternatives.

The recommended financing method for the project will be determined based upon the final funding sources. The Consortium is also exploring a public/private partnership for project development and implementation.

Habitat Enhancements

The project design would serve to enhance habitat values by the control of sea elevation and salinity. In addition, other habitat enhancements could be added to the proposal, including but not limited to the following:

- **Control of Sea Elevation and Salinity** — Maintenance of fish resources would benefit piscivorous birds. The Cascade Alternative conceptual management plan is designed to control the salinity and elevation of the Sea in specific project areas through the use of the dike and lock system. The Cascade Alternative is specifically designed to create a series of waterways with descending saline concentrations from the shoreline to the center of the Sea. This method will result in a range of habitats that can accommodate the vast variety of fish species currently in the Sea. Such measures would preserve healthy aquatic habitat, thereby ensuring a supply of healthy food sources for migratory and shoreline birds.

- **Enhanced Bird Nesting Sites** — In addition to addressing the health and vitality of the fish populations in the Sea, and thereby the avian food source, the Cascade Alternative will also create nesting and roosting islands to benefit bird species, including the Gull-Billed Terns and Black Skimmers. Specific design features could be included to enhance these habitat benefits.

- **Establishment of Wetland and Other Vegetation —** A wetland greenbelt area around the New and Alamo rivers may be incorporated to create a river extension. This extension would prevent the rivers from becoming cut-off from the Sea under reduced water elevation conditions. Creation and maintenance of native tree habitat could benefit wildlife associated with the Tamarisk Scrub. Detailed project design and vegetation planting would increase these benefits.

- **Wildlife Corridors —** Aquatic wildlife corridors will be considered and incorporated into the final design of the Cascade Alternative. Specifically, population connectivity along the rim of the Sea would benefit the endangered desert pupfish. In addition, the Imperial Wildlife Area (WA), managed by the CDFG, and the Sonny Bono Salton Sea NWR, managed by the USFWS lies within the project area. Both refuges provide habitat for a wide diversity of resident and migratory waterfowl. The refuges also provide marsh habitat and offer the highest quality, year-round marsh habitat value in the Project area. Efforts will be made to assist in the conservation of this habitat resource, including development of the project

to increase wildlife corridors and facilitate movement of species as the shoreline and elevation of the Sea changes.

- **Monitoring of irrigation related habitat availability**. Currently, IID operates and maintains almost 1,500 miles of agricultural drains. These drains typically are unlined, dirt channels. Water flow in the drains is determined by the irrigation practices on fields adjacent to the drains. Drains contain flows during irrigation, and storms may add to flows in the drains. Water in the drains support the development of mesic (marsh-associated) vegetation and, in some locations, patches of marsh-like habitats. These mesic habitats, in addition to the productive agricultural fields, attract and support wildlife that historically would have been absent or present in low numbers in the native desert habitat. Irrigation drains serve as aquatic habitat for many species. At least 13 species of fish are known to inhabit the surface drains that discharge directly to the Salton Sea. The state and federally endangered desert pupfish is known to inhabit the terminus of irrigation drains that discharge directly into the Salton Sea. The drain habitat is highly dependent on the rate and amount of drainwater from agricultural fields. When the agricultural fields discharging into a drain are not irrigated and there is little surface runoff, the drain water flows are dominated by the highly saline subsurface water. In the upper portions of the drain watershed, the absence of irrigation activity can dry out drains and might negatively impair aquatic habitat.

  Maintenance activities associated with the drains include maintaining the gravity flow of tilewater into the drains, conveyance capacity and efficiency, and structural integrity of the drains. Vegetation is cleared from drains primarily via mechanical means, although controlled burns and/or chemical and biological control methods are sometimes used. Drain maintenance will need to continue and be altered as needed to accommodate new flow patterns. Drains will be cleaned as needed, depending on the extent of sediment and vegetation accumulation.

  The Cascade Alternative could include design features to replace lost habitat values resulting from increasing variations, and overall reductions, in the flows within the irrigation drains.

- **Control of Selenium** — The issue of selenium in the sediments and waters of the Salton Sea must be addressed by any proposed alternative to the restoration of the resource. Selenium in the sediments may be sequestered effectively in the clay minerals as long as they are submerged. Exposing these sediments to subaerial erosion may exacerbate the problem. The Bureau of Reclamation is currently conducting a study of selenium in the sediments, the water column and the surrounding soils which will provide a database to help address the issue. The Cascade Alternative presents no greater risk from selenium

than any of the other proposed alternatives. Moreover, because it keeps much of the sediment in the geotubes or covered with water, the Cascade Alternative will actually mitigate the problem more effectively than the other alternatives. The temporary re-suspension of the sediments during dredging should be more than offset by the permanent sequestration of these selenium-bearing materials in the geotubes.

- **Halophyte Field Enhancement** — The halophyte field could be plowed to submerge the salt and salt-tolerant vegetation could be planted. The area could then be periodically flooded to support this vegetation for dust control and habitat purposes.

- **Institutional Controls** — A variety of institutional controls could be implemented to further enhance habitat values and ensure restoration project success. These could include agreements for guaranteed inflows to the sea and conservation easements to ensure continued agricultural uses, with associated economic and habitat benefits.

Other enhancements to the habitat features of the project will be evaluated as the design of the Cascade Alternative progresses.

Options and Contingencies

The Cascade Alternative may require additional supporting operations and measures. Possible options and contingencies include the following:

- **Appurtenant Structures** — Appurtenances such as spillways and other outlet structures, and channels leading to shallow water habitat areas may be needed.

- **Storage and Conveyance Capacity** — The Cascade Alternative as designed will greatly assist the State in its water management planning. The Cascade Alternative will create a unique water-body with elevation variations that can serve as a receptacle for, and enable the management of, overflows from the Colorado River. The Cascade approach involves the construction of four main water-bodies, or lakes, each with approximately 300,000 acre-feet of capacity. During the final design stage, project engineers will be able to adapt the water flows between the lakes and retention capabilities of each individual lake to the needs of the State's management plan. This may include lowering the height of the dikes along the top terraces. Approximately 200,000 to 400,000 acre feet of annual regulation could be achieved by these improvements, providing what is in effect a new, large terminal reservoir in California's segment of the Colorado River system. In addition, the upper lake, once constructed, will be capable of transporting water from one end of the Sea to the other.

This will significantly enhance the State's ability to deliver water into the Coachella Valley.

- **Dredging to Communities and Island Creation** — The Cascade Alternative, by providing a relatively stable water elevation around the entire perimeter of the sea, would reduce the need for these activities. Dredging is proposed to enhance access to the Sea for existing communities. Dredging could also create islands and peninsulas that would provide recreational and habitat value as well as create opportunities for development.

- **Greenbelt Channels to the Lakes with Wetlands** — The New and Alamo rivers may need to be extended to accommodate any decrease in elevation of the Sea. Again, by stabilizing the water elevation at the current perimeter of the sea, the need for these features would be reduced under the Cascade Alternative. A wetland greenbelt area around these river extensions may also be necessary.

- **Sedimentation Basins** — In the past, consultants have suggested desalting the rivers in the Imperial Valley to provide product water for sale to urban or other communities. To properly operate such desalting plants, river water must be very clear. To reduce turbidity, a rule of thumb is often used that sedimentation basins should have an area of 10 square feet for every gallon per minute of flow. Although the Cascade Alternative would provide for salinity management without the need for desalination, it would also allow for the inclusion of design features that could support desalting plants for other purposes.

- **Locks Between the Lakes** — Locks would be installed between the lakes that would enhance recreational values. The locks would be approximately 100 feet in length, which would accommodate the largest recreational vessels currently on the Sea.

- **Exposure of Geothermal Resource Sites** — The flexible design of the Cascade Alternative would allow the exposure of geothermal resource sites at the southern end of the Sea, allowing economic development of these resources.

These options would all be considered during the detailed project design.

Performance Standards, Monitoring and Adaptive Management

As with other environmental restoration projects, performance standards will be adopted in connection with environmental permitting activities. These performance standards will need to address, at minimum:

- Target Lake Elevation
- Target Salinity Levels
- Habitat Values

The performance standards would be prepared with the assistance of environmental restoration specialists and in consultation with the appropriate regulatory agencies.

The regulatory agencies will adopt monitoring requirements to determine whether the identified performance standards have been specified. Monitoring, and the resulting adaptive management, discussed below, will therefore become an integral part of the habitat restoration project.

Several types of adaptive management options are available to address potential shortfalls in achieving performance standards. These options, which can be implemented in conjunction with the habitat enhancement features discussed above, include the following:

- Adjustment of the design of future construction phases to respond to changes in inflows, and habitat and species populations
- Refinement of water management protocols (transfers between ponds) to optimize levels, salinity and habitat
- Restoration or enhancement of existing degraded or marginal habitat, including the planting of wetland and other vegetation
- Construction of new habitat
- Fish rearing and stocking
- Measures to remove and control exotic species and other pest management measures

- Purchase of conservation easement or fee title lands for long-term preservation

- Construction of nesting boxes and/or platforms

Additional adaptive management measures would be identified during the detailed design and environmental reviews for the project.

PRELIMINARY COMPARATIVE EVALUATION OF ENVIRONMENTAL IMPACTS

The following presentation contains a preliminary evaluation of the environmental impacts of the Cascade Alternative as compared to the four principal alternatives being considered. It begins with a brief description of those alternatives, followed by an impact -by-impact discussion of the comparative effects of the alternatives.

The most recent screening of alternatives was developed by the Salton Sea Authority in April 2004. It concluded that most of the alternatives previously evaluated (extraction alternatives, solar ponds, desalination plants, etc.) had to be discarded for one reason or another, most commonly due to prohibitive costs or unacceptable environmental impacts. Only concepts with an in-sea receptor for waste water (the brine pond) remained, e.g., the North-lake and South-lake alternatives. Two additional alternatives have recently gained prominence, . the Low-sea and the Shore-lake alternatives. All four are illustrated in Figure O.

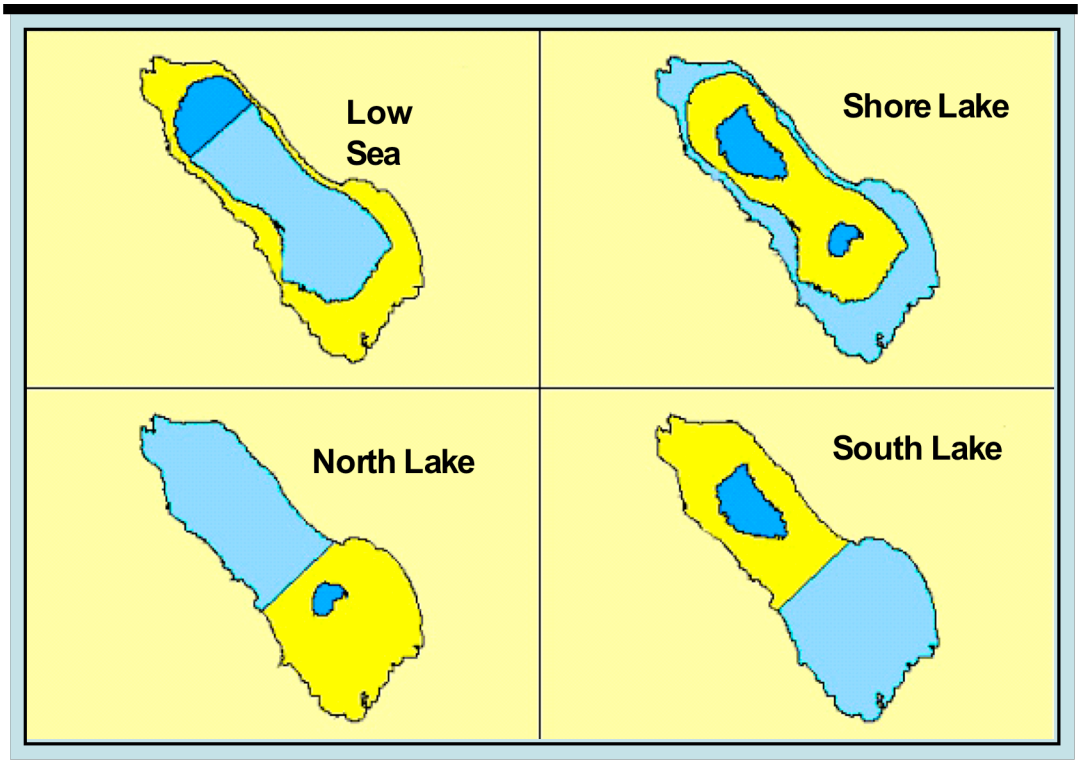


Figure O: Current Principal Alternatives

The Low Sea is essentially the no-project option. As soon as the water level stabilizes, a relatively small dam is built to create a brine pond. The remaining Low Sea is relatively shallow, approximately 15 to 25 feet depending on the

transfer. The water quality will continue to deteriorate until the brine pond starts functioning. Therefore special (temporary) measures, promoting early functioning of the brine pond, would need to be considered. Thereafter, the water quality will improve (until S= 35 ppt). This alternative is attractive in terms of cost, low risk and a “natural” plan-form. A major drawback is the considerable shift of the shoreline.

In the Shore Lake Alternative the wet part is located along the present waterline. Creating a single, relatively deep, shore lake requires a long high dike, which is costly and has other drawbacks

Both the North-lake and South-lake alternatives involve the construction of a dam approximately mid-way down the long side of the lake, with one end or the other allowed to go dry as inflows are reduced. A small brine pond would be located in the center of this dry area. As between the North-lake and South-lake alternatives, from the hydrological point of view the southern lake seems more logical since most of the inflow comes from the south. The North Lake Alternative is that preferred by Salton Sea Authority, since it is perceived as presenting fewer problems from selenium, although more studies are necessary to determine whether this assumption is correct. Both of these alternatives assume limited and predictable water transfer volumes and possess little adaptability to changes in expected transfer quantities. The North Lake Alternative requires a large volume transfer from the southern inflow area to the North Lake through a set of canals which would run north along both sides of the dry southern lakebed produced by damming the Sea.

The Cascade Alternative differs from the other primary alternatives in a number of key respects. First, by taking advantage of the natural contours of the Sea’s basin, it minimizes the amount of material that must be moved to construct dikes and other facilities. It also relies on materials obtained from the current seabed for approximately 95% of the construction. This results in a corresponding reduction of construction related impacts in the areas of aesthetics, air quality, biological resources, cultural resources, water quality, and cost. Second, by relying primarily on suction dredging for construction, construction period impacts to aesthetics, air quality, energy usage, and traffic are minimized. Third, there is more variety in the salinity levels of the ponds, and there are more transition areas between habitat types (ecotones), resulting in a greater diversity and quality of habitat values. The design of the Alternative can also be adjusted more flexibly to address selenium, fugitive dust and other concerns.

With this general description of the principal alternatives, we now proceed to a qualitative comparison of the alternatives in relation to the environmental impacts to be addressed in the EIR.

Aesthetics

Construction of the alternatives will result in temporary aesthetics impacts from the presence of the equipment, and potential fugitive dust emissions. Temporary construction period aesthetics impacts will be reduced with the Cascade Alternative. Suction dredging that involves principally underwater equipment will be utilized for major earthmoving activities. This will both reduce the visual presence of the construction activity, as well as reducing visible fugitive dust emissions.

Once completed, the ponds, islands, dikes and other improvements will affect the visual environment. As compared to several of the other project proposals, the Cascade Alternative would create a more varied visual landscape, which could be seen as an aesthetic benefit. The terraced nature of the development would also help to preserve long-range views, since potential visual obstructions in the interior portions of the sea would be recessed.

Agriculture Resources

The need for the project generally results from water transfers and other external factors that will themselves have various adverse effects on agricultural resources. The project generally will have a beneficial impact by allowing continuation of the agricultural uses in the Imperial Valley by providing a reliable agricultural drainage sump necessary to support those uses. However, the various alternatives differ in their ability to provide these beneficial effects. The Cascade Alternative, by allowing accommodation to a larger range of inflows, and by providing more flexible management of salinity, nutrients, selenium and other factors, best supports the continuing agricultural uses of the upstream lands. Since they involve a fixed size basin, the Shore Lake, North Lake and South Lake alternatives are relatively equal in their ability to accommodate inflows and manage water quality. The Low Sea Alternative offers little management of water quality, and ranks the lowest in terms of this environmental impact.

There is also a concern that the North Sea Alternative would eliminate the temperature-moderating effects of the sea surface adjacent to some of the most productive lands in the Imperial Valley, resulting in a possible reduction in productivity due to the local climate effects of increased temperatures.

Air Quality

The issue of air quality must be addressed by any proposed alternative to the restoration of the Salton Sea.

Newly formed upland areas exposed to wind could be the source of increased fugitive dust emissions. Concerns have been raised that this could exacerbate current air quality problems by cumulatively contributing to a net increase in several pollutants for which Imperial and Riverside Counties are considered in non-attainment.

Fugitive dust emissions are likely to be minimized by the Cascade Alternative since the areas of both water and land within the perimeter of the present Salton Sea are partitioned is such a way as to reduce wind fetch over water, reducing both shoreline erosion and therefore re-suspension of fine material, and the re-suspension of fine material on the newly created islands. Fugitive dust emissions will be further reduced by stabilizing the land exposed on islands with appropriate vegetation cover. In addition, as described above, the halophyte field could be managed with the introduction of salt-tolerant vegetation to help reduce the size of the barren areas and resulting dust emissions.

Air quality problems will be more pronounced with dry areas in the south because the dominant wind direction is from the northwest. The northern part of the Salton Sea is more sheltered against these winds and there are no cities and farmland nearby on the leeside. The Low Sea alternative places the source of this fugitive dust the closest to adjacent uses, with the Shore Lake Alternative placing these dust sources further away. Thus, the ranking order for fugitive dust emissions impacts (from lowest to highest) is the Cascade, Shore Lake, North Lake, South Lake, and Low Sea Alternatives.

For all alternatives, it is wise to incorporate mitigating measures, such as a salt crust and/or the reuse of the brine. Other measures, such as the establishment of halophytic shrub plants in wet and/or sensitive areas during the appropriate season may be useful. The greater amount of water available at certain times of the year could also be used to keep lake levels high as a protective measure for fish and other aquatic species. During the windy season any excess water could also be used to wet critical dust areas.

The Cascade, Shore Lake, South Lake and North Lake Alternatives all score relatively high in terms of ability to use water to reduce fugitive emissions from exposed soils. Conveyance canals or similar systems incorporated into these alternatives would allow for gravity flow of water from the higher elevation marine lake over large areas that would not be inundated by a marine lake. These alternatives also allow the creation of salt crust over the exposed sediments thereby reducing the likelihood of fine-grained sediments being exposed to wind dispersion. The Low Sea alternative would perform poorly in this regard because of the lack of flexibility to disperse water over large areas of exposed Sea sediments. This is due in part to the higher elevation of the exposed sediments relative to the reduced elevation of the Sea. This would make distribution of water over these areas more difficult. Salt water or brine would have to be

pumped to higher elevations to provide a mechanism to create salt crusts over the exposed sediment.

The project would also have adverse impacts on air quality during construction activities. For a given construction technique, the construction vehicle and fugitive dust emissions are generally proportional to the volume of material required to be moved, and the distance that it must be moved. Also, suction dredging techniques will minimize fugitive emissions. Since the Low Sea Alternative does not involve any construction, it has the fewest construction period impacts. Since it does not involve the quarrying and transport of large quantities of rock that would be involved in the North Lake or South Lake alternatives, and involves a smaller total volume of construction than the Shore Lake Alternative, the Cascade Alternative will likely have the second fewest construction period air pollution impacts, followed by the Shore Lake, South Lake and North Lake Alternatives.

Biological Resources

As an environmental restoration project, the anticipated net biological impacts of the project are beneficial. In the short term, however, construction of the improvements and reduction of water levels could have adverse biological resources impacts. In addition, construction and operation of the facilities could mobilize selenium, which in higher concentrations is toxic to some wildlife (this impact is discussed separately under “Hazards” below).

The Cascade Alternative provides the maximum variation in habitat and therefore performs better than the other four alternatives in this category. Under the Cascade Alternative, each terrace would be at a different water level. At each level there would be varying habitats, including lagoons, deep lakes and islands. As a result, the Cascade Alternative provides a wide variation of wetlands, ponds and marine lakes, from deep to shallow and from nearly fresh to ocean salinity.

The Low Sea and separation alternatives have as the major habitat a saline lake. In the Low Sea alternative this is also a shallow water habitat. This is partly compensated by adding some wetlands and special habitat. Under the Shore-lake Alternative there is more habitat variation. The North Lake Alternative allows the continued use of the southern portion of the Sea for wildlife habitat. This alternative incorporates the use of shallow water habitat through a series of ponds that take advantage of inflows from the New and Alamo Rivers as well as the ability to blend saline water from the northern basin. This provides some flexibility for the management of shallow and wetlands habitats.

The South Lake Alternative functions similarly to the North Lake Alternative, except that the habitat is managed in the northern portion of the Sea and takes advantage of flows from the Whitewater River. The habitat created, however, is

not as extensive as in the south due to the reduced inflow from the Whitewater River as compared to the New and Alamo Rivers.

Cultural Resources and Indian Trust Asset Effects

There are six federally recognized Indian Reservations comprising nearly 120,000 acres within the Salton Sea watershed. The Torres-Martinez Indian Tribe's traditional ancestral territory has been associated with the ancient Lake Cahuilla (a precursor to the present Salton Sea). This includes natural features, landscapes, traditional properties, and sacred and historic sites associated with ancient Lake Cahuilla and considered important to tribal heritage and for cultural stability.

The project could disturb or affect archaeological resources, traditional cultural properties and Indian sacred sites. These resources have only been partially surveyed to date.

Since it involves no construction, the Low Sea Alternative would have the fewest impacts to cultural resources. Since it allows the most flexibility in design among the various alternatives, the Cascade Alternative maximizes the ability to protect cultural resources and Indian Trust assets. However, the construction area or "footprint" of the Cascade Alternative would be approximately four times that of the North Lake or South Lake Alternatives, with a corresponding increase in the potential for disturbing cultural resources. Since it has the largest "footprint" of all of the alternatives, the Shore Lake Alternative has the greatest likelihood of disturbing cultural resources.

Impacts on adjacent land uses, including Indian Reservations, are discussed under "Land Use" below. The current Torres-Martinez Indian Tribe owns a substantial portion of the seashore at the north end of the Sea. As a result, the Tribe will benefit from the retention of the current shoreline under the Cascade, Shore Lake, and North Lake alternatives. Since the shoreline lake levels are the most stable and controllable under the Cascade Alternative, these benefits to Trust Assets would be maximized with the Cascade Alternative.

Environmental Justice and Socioeconomics

The project should have overall beneficial socioeconomics effects on the project area. The area would benefit in the short-term from initial project construction activities and in the long-term from a stimulated economy as conditions at the Sea are restored. The Cascade plan ensures fairness to interested parties by planning for a Sea that is similar at both the north and south end. In contrast, under the North and South Lake alternatives, about one-half of the shoreline will be abandoned. This will produce an inequitable result wherein half of a large area of desert is exposed in either the front yards of the Imperial Valley farmers

or the inhabitants of the communities located adjacent to the Sea. Effects from local climate changes, as discussed above under agriculture, would also have associated adverse economic and employment impacts.

Geology and Soils

The Imperial Valley is one of the most seismically active areas of California. Eight earthquakes of magnitude 6.0 or greater shook the area between 1875 and 1979. There is a major seismic event in the Valley about once a decade. In 1979 the Imperial County Services Building was severely damaged. The event caused an estimated $30 million in damages in the area. According to the USGS report on the event, "Instrumental records throughout the region indicate that the occurrence of earthquakes is confined to the upper 8 km of the crust presumably because of the high geothermal gradient in the Salton Trough and the associated plastic behavior of crustal rocks at greater depths…[and that] nearly all of the observed slip in the Imperial Valley is accounted for by earthquakes."

Due to the seismic activity in the area, the proposed dikes will be prone to high earthquake loads, and therefore need to be designed taking into account high safety factors. Therefore, low-head ridges with beach profiles are preferred. Deep water impoundments, where large quantities of water are impounded should not border these ridges, and should be located at a safe distance.

Since it does not involve substantial construction, the Low Sea Alternative poses the fewest seismic hazards. Among the construction alternatives, the design of the Cascade Alternative is seismically preferred. The low-head dikes of the Cascade Alternative will be very broad crested with beach profiles. These ridges could be constructed in such a way that they provide maximum safety in case of an earthquake. As a result, the Cascade Alternative provides a mix of shallow and deep water, without the construction of risky high-head dams. In the event of seismic failure, the relatively small elevation difference between the lakes would mean that flows would be smaller than under the other alternatives, reducing the risks to any recreational or other users of the Sea. In addition, recreational and other uses would be concentrated in the outer lakes, which would become dewatered in the event of a failure, rather than in the dry areas that would be flooded as would be the case in the event of a failure for the North Lake and South Lake alternatives. As a result, the risks to people and property would be much less in the event of a seismic failure.

The North Lake and South Lake Alternatives would both require a relatively high dam head which should be avoided in an area with potentially hazardous seismic conditions. The South Lake and North Lake alternatives pose similar seismic risks. In the event of catastrophic failure of the impoundment structure, the water behind the barrier would flow into the opposite basin until equilibrium is reached. If recreational users or others are in the vicinity of the basin being inundated they

could become flooded by the flow of water emanating from the upstream basin. Thus, while there might be a relatively low risk of failure, the potential for harm is high. Since it involves the longest dam, the Shore Lake Alternative would pose the highest seismic risks among all of the alternatives.

Hazards

The project may involve the disturbance or use of hazardous materials, particularly selenium that has accumulated in sediments. There may also be heavy metals in the sediments that need to be addressed. The extent of this problem will be ascertained after extensive borings and the project's design and construction will take this into account.

Selenium has accumulated in the bottom sediments of the Salton Sea. The highest concentrations of selenium are located in the northern part, as illustrated in figure P.

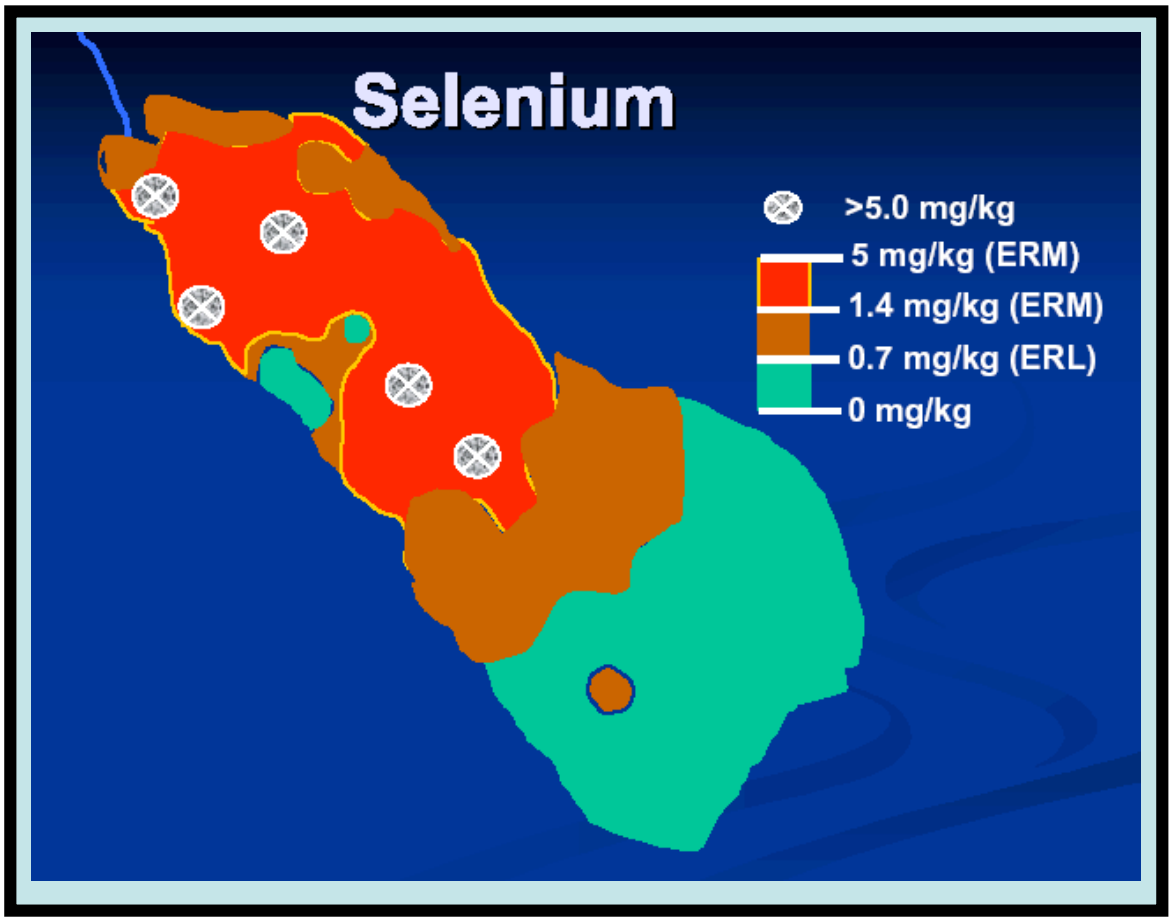


Figure P: Selenium Concentrations in Sediments

Substantial studies have been carried out on the role of selenium in the eco-system: the ways the element enters the food chain, the impact on wildlife and the pathway to its effects on human health. However, the understanding of the metabolic pathways by which selenium moves through the food web is still considered incomplete. It is generally agreed that more selenium should not be allowed to enter the food-chain (e.g. via invertebrates, fish, birds, etc.) than is the case in the present situation. Wetlands appear to be effective in reducing suspended selenium concentrations. However, selenium may accumulate within these wetlands and gradually diminish their viability as wetlands for wildlife habitat. Selenium in the sediments may be sequestered effectively in the clay minerals as long as they are submerged. Exposing these sediments to subaerial erosion may exacerbate the problem.

The Cascade Alternative presents no greater risk from selenium than any of the other proposed alternatives. Under this alternative much of the dry area is comprised of the constructed dikes. The borrow materials for these dikes generally will be obtained from the sandy deposits at the mouths of the inflowing rivers. The same scouring action that has minimized siltation in these areas also generally has minimized the deposition of selenium in these borrow areas. In addition, the geotube construction technique permanently sequesters the selenium-bearing materials in the geotubes. The flexibility in design also allows avoidance of selenium-bearing materials for construction, as well as the minimization of exposed surfaces of higher selenium-bearing sediments.

It has been suggested that by covering the selenium-bearing sediments with water, the North Lake Alternative is superior. However, this factor is unproven, and the factors described above for the Cascade Alternative mean that, based upon current information, the two alternatives should be treated as equivalent in terms of this impact.

The South Lake, Shore Lake, and Low Sea alternatives would all have a much greater uncontrolled exposure of selenium-bearing sediments, and are therefore would pose a greater risk from selenium than the Cascade or North Lake Alternatives.

Hydrology/Water Quality

A high priority of the project is to improve the hydrologic conditions and water quality of the Sea. The Regional Water Quality Control Board - Colorado River Basin Region, lists the Sea, as well as its four main tributaries (the New and Alamo Rivers, Coachella Valley Stormwater Channel, and Imperial Valley Drains) as impaired surface waters.

The principal water quality concerns are salinity, nutrients and selenium. Selenium concerns are addressed under “Hazards,” above.

The Cascade Alternative is superior to all of the other alternatives in terms of salinity control, since it obtains control over salinity much more quickly (soon after the first lake is constructed), includes ponds with a range of salinities, and allows for more flexible design and operation to maximize salinity control benefits.

Since they all involve a single basin of a fixed dimension, the North Lake, South Lake and Shore Lake alternatives are all much less able to flexibly control salinity in both the short and long terms. The Low Sea Alternative would have the greatest negative impacts. Under this scenario, salinity in the Sea would reach a level where the fishery would be unsustainable, and result in the loss of a food-source for fish-eating birds.

The ordering of the alternatives in terms of the ability to address nutrients is similar. Under the Cascade Alternative water level control measures may be combined with aeration devices to improve water quality. The South Lake, North Lake, and Shore Lake alternatives would all be equivalent in terms of the ability to address nutrients. The Low Sea Alternative would offer no nutrient controls.

Land Use/Planning

The principal land use impacts of the various alternatives result from relative conflicts with adjacent land uses. Both the Cascade and Shore Lake alternatives retain a lake frontage around the entirety of the Sea, and thus would be superior in terms of supporting adjacent land uses. As between these two alternatives, the Cascade Alternative is superior, since the primary regulating lake would not be the shoreline lake and therefore the water level adjacent to the existing land uses would not fluctuate as much as it would under the Shore Lake Alternative. The North Lake Alternative would be superior to the South Lake Alternative since it would retain water adjacent to the most existing land uses. The Low Sea Alternative would have the greatest conflicts with existing uses, since it would not retain a waterfront anywhere adjacent to the existing uses.

Noise

Construction activities and implementation of proposed actions could generate noise. The noise impacts would generally be proportional to the degree of construction required, and the alternatives would generally be ranked in the same order as above for construction period air pollution impacts. However, since substantial construction noise would not occur near sensitive receptors for any of the alternatives, noise impacts from all of the alternatives would be less than significant.

Public Services and Utilities

Proposed actions could result in changes to agricultural water delivery and drainage systems, or could possibly involve export of water to fund restoration, resulting in potential impacts to regional public services. By providing the most flexibility in adjusting to variable inflows, and the strongest performance in terms of salinity and sea level controls, the Cascade Alternative would minimize the need for additional facilities. The outer lake of the Cascade Alternative could also serve as a conveyance facility that could substitute for some future facilities. The North Lake, South Lake, and Shore Lake Alternatives would all appear to be equivalent in terms of the resulting need for additional public facilities.

Recreation

Increasing recreational opportunities will be a high priority of the project. Overall, recreational opportunities should be improved at the Sea. Biological resources such as fisheries or waterfowl could be affected, and the other recreational uses of the Sea such as boating and swimming could also be affected.

Under the Cascade Alternative the range of habitats would best meet the needs of eco-tourism, water recreation and fishing while decreasing salinity, protecting the environment and protecting farmland around the southern portion of the sea. Since the shoreline lake would not be the sole regulating reservoir, it would also maximize the recreational use of the existing shoreline.

Since it retains a shoreline around the entire existing seafront, the Shore Lake is the next best in promoting recreational benefits.

The North Lake Alternative provides improvement to recreational opportunities that would be available to the communities surrounding the northern basin. Marinas and other boating facilities in and around Salton City, Bombay Beach, Desert Shores, and North Shore could experience a resurgence in popularity with improved water quality and increased shoreline stabilization under this alternative.

The South Lake Alternative also ranks relatively high because it would provide for increased recreational opportunities associated with the improvement in water quality and stabilization of the shoreline. Recreation associated with the Sonny Bono Wildlife Refuge and Imperial Wildlife Area would be improved as well as duck hunting that occurs in this area. Since existing marinas and boating facilities are not as prevalent in the southern portion of the Sea, there would not be the same sort of increase in recreational opportunities as under the North Lake Alternative.

The Low Sea Alternative offers no positive impacts in the area of recreation. Failure to control salinity and elevation will result in a decrease in fishing opportunities and water sports.

Transportation/Traffic

The project could increase traffic on local roadways during construction activities and after project development as economic conditions improve.

Construction period traffic impacts will generally be proportional to the degree of construction, as discussed above under air pollution. Since those impacts are temporary, and circulation systems in the vicinity of the project are all operating at acceptable levels of service with substantial available capacity, construction period traffic impacts are generally considered less than significant for all of the alternatives.

As recreational opportunities increase in Salton City, Bombay Beach, Desert Shores, and North Shore under the North Lake alternative, there will also be an increase in traffic as the number of visitors rises. The same holds true for the Cascade Alternative which will also likely result in a rise in the number of visitors seeking recreational opportunities related to the Sea. Since the benefits would accrue to the entire lake, and not just a portion, the traffic impacts would likely be spread over a broader area. The shore lake alternative would also result in positive benefits in terms of tourism and economic development, but to a lesser extent than the Cascade and North Lake alternatives. The remaining two alternatives - South Lake and Low Sea - will not have as positive an impact on economic development, and will likely not experience a noticeable rise in visitor traffic.

Summary of Environmental Impact Comparison

The following table presents a summary comparison of the alternatives in relation to each of the environmental impact areas discussed above.

Alternatives → / Impacts ↓	Low sea	Cascade	Shore Lake	North Lake	South Lake
Aesthetics	-	++	+	o	o
Agriculture	-	++	+	o	o
Air Quality	-	++	o	-	-
Biology	-	+	o	+	+
Cultural and Trust Resources	++	o	-	o	o
Geology	++	+	-	o	o
Hazards	o	+	-	+	o
Hydrology/Water Quality	-	++	o	o	o
Land Use	-	++	+	o	o
Noise	++	+	-	o	o
Public Services and Utilities	o	o	o	o	o
Recreation	-	++	+	o	o
Transportation	+	o	o	o	+

++ excellent
+ good
o sufficient
- insufficient

Figure Q: Relative Environmental Impacts of the Alternatives

ABILITY OF THE ALTERNATIVES TO MEET PROJECT OBJECTIVES

As discussed above, the following objectives need to be met by the Salton Sea Restoration Project:

- Use the Sea as a reservoir for irrigation drainage
- Reduce and stabilize salinity
- Stabilize the surface elevation of the lake
- Restore and maintain the aquatic and shoreline habitat
- Enhance recreational uses
- Promote economic development
- Eliminate air quality impacts
- Protect and improve water quality
- Respond to inflow changes
- Ensure economic feasibility and maximize economic benefits
- Satisfy Corps of Engineers permitting requirements, including the LEDPA analysis
- Satisfy USFWS consultation requirements, including the avoidance of jeopardy and adverse modification of critical habitat
- Comply with Clean Air Act conformity requirements
- Comply with other regulatory programs
- Ensure timely achievement of benefits
- Maximize collateral benefits, including storage
- Provide high safety rating / low risk of failure
- Allow for flexibility of design and construction
- Confirm engineering feasibility for project development and maintenance
- Minimize seismic risks
- Maximize public acceptance / overcome institutional barriers
- Maximize participation of the local labor force

Summary and Comparison of Alternatives Based on Project Objectives

1. **Use the Sea as a reservoir for irrigation drainage** —

All alternatives would preserve the Sea as an agricultural drainage repository.

2. **Reduce and stabilize salinity** —

The South and North Lake alternatives control salinity through the use of a mid-Sea barrier that either uses a north or south saline basin as a repository for salinity control. The Cascade alternative conceptual management plan is designed to control the salinity and elevation of the Sea in specific project areas

through the use of the dike and lock system, and is specifically designed to create a series of waterways with descending saline concentrations from the shoreline to the center of the Sea.

The Cascade Alternative provides the quickest and most flexible salinity control of all of the alternatives. With the exception of the Low Sea Alternative, the remaining alternatives perform relatively equally well with respect to salinity control. The South Lake alternative ranks somewhat higher regarding the time needed to achieve water quality and habitat objectives. With direct flows into the South Lake, it is estimated that water quality objectives could be achieved relatively quickly upon closure of the lake.

3. **Stabilize the surface elevation of the lake** —

The Cascade Alternative provides the quickest and most flexible stabilization of the surface elevation of the lake, and also has the advantage maintaining a stable elevation along the entire current shoreline. The Shore Lake Alternative would be the next best in terms of stabilizing the surface elevation. The South Lake Alternative scores slightly higher than the North Lake Alternative because the South Lake would be 42 square miles larger. Elevation stability would be essentially the same for those two alternatives as the elevation control afforded by a mid-Sea barrier and other facilities would allow for management of Sea surface levels. The Low Sea alternative scores worst because it would not meet either of the objectives of a large marine lake or provide any mechanism for stabilizing elevation.

4. **Restore and maintain the aquatic and shoreline habitat** —

The relative ranking of alternatives in terms of this objective is the same as described under environmental impacts, biological resources, above.

5. **Enhance recreational uses —**

The relative ranking of alternatives in terms of this objective is the same as described under environmental impacts, recreation, above.

6. **Promote economic development —**

The Cascade Alternative provides the best opportunities for economic expansion. The range of habitat would facilitate the growth of Sea-related recreation, including eco-tourism and fishing. In addition, because this alternative does not favor one end of the lake over the other, it enjoys a greater potential for economic and community growth. By separating the principal regulating reservoirs from areas of economic development, this alternative would be preferred as well. Geothermal resources could be exploited in the southern portion of the Sea due to the exposure of areas of known geothermal potential

adjacent to existing developed geothermal areas. It is also anticipated that future development will be concentrated in the southern portions of Imperial County, so that the alternatives that preserve the southern shorefront of the Sea will maximize future economic benefits.

The Shore Lake Alternative would be next best in terms of economic development since it would preserve a seashore around the entire current perimeter of the Sea.

The North Lake Alternative scores next highest for this objective due to the potential for the communities in and around Salton City, Bombay Beach, Desert Shores, and North Shore to experience economic development as a result of the linkage to rapidly expanding southern Coachella Valley communities. The potential for developing geothermal resources would be somewhat greater than under the Cascade Alternative due to the increased area of the current southern portion of the Sea that would be exposed.

Under the South Lake Alternative there is some potential for an expansion of boating facilities as well.

The Low Sea alternative would not achieve this objective because the Sea would eventually become hyper-saline and would not support a viable fishery or fish-eating bird populations. There would be little of any incentive to use the Sea for recreational or other purposes under this scenario.

7. **Eliminate air quality impacts —**

The relative ranking of alternatives in terms of this objective is the same as described under environmental impacts, air quality, above.

8. **Protect and improve water quality —**

The relative ranking of alternatives in terms of this objective is the same as described under environmental impacts, hydrology/water quality and hazards, above.

9. **Respond to inflow changes** —

The Cascade Alternative would allow the most flexible response to inflow changes due to the sequential construction of the lakes and ability to manage water levels between the various lakes. The primary regulating reservoirs would also be toward the interior of the Sea, reducing the adverse effects of a fluctuating lake level.

By involving fixed single lakes, the Shore Lake, North Lake, and South Lake alternatives would be roughly comparable in terms of the ability to respond to

inflow changes. The South Lake Alternative is ranked below the North Lake Alternative for this objective because of the larger size of the marine lake in the south than for the North Lake Alternative. Less inflow would therefore have a greater impact on the functioning of this alternative.

10. Ensure economic feasibility and maximize economic benefits —

The Cascade Alternative is the least costly among the alternatives (except for the Low Sea Alternative) and offers the most economic benefits. In addition, construction costs would be phased, so that the required revenue stream would better match the available funds. The North Lake Alternative is the most costly to build and maintain. These costs can be weighed, however, against the potential for significant economic benefits. The South Lake Alternative is less costly, but also provides fewer economic benefits. The Low Sea Alternative offers few benefits and would require costly measures to meet objectives, such as the continuous pumping of salt water or brine to higher elevations to provide a mechanism to create salt crusts over the exposed sediment. The Shore Lake Alternative would be far more expensive to construct than any of the other alternatives, and is likely to prove economically infeasible.

11. Satisfy Corps of Engineers permitting requirements, including the LEDPA analysis —

Since the project will alter onsite water resources, including waters of the United States under the U.S. Army Corps of Engineers jurisdiction, permits will be required under the Clean Water Act Section 404 program. Under Section 404, the Corps is responsible for issuing a permit if a project may result in the placement of material into waters of the United States. In undertaking its review, the Corps applies guidelines established under Section 404(b)(1) of the Clean Water Act which generally require that the Corps select the “Least Environmentally Damaging Practicable Alternative.” (LEDPA).

Since the Cascade Alternative maximizes wetlands and other aquatic resources habitats, it is the most likely to satisfy the LEDPA requirement and therefore be compelled as the alternative selected by the Corps. The North Lake and South Lake alternatives would generally be comparable in terms of ability to satisfy Corps permitting requirements, but the relative benefits of the North Lake Alternative would lead it to be ranked second. The Shore Lake and Low Sea alternatives would rank fourth and fifth under this objective.

12. Satisfy USFWS consultation requirements, including the avoidance of jeopardy and adverse modification of critical habitat —

At least five endangered species are known to use the Salton Sea ecosystem, including the brown pelican, Yuma clapper rail, desert pupfish, razorback sucker, and peregrine falcon. The threatened bald eagle is also found in the area.

The state and federally endangered desert pupfish is known to inhabit the terminus of irrigation drains that discharge directly into the Salton Sea, in addition to tributary streams, washes, and near-shore pools. Because pupfish prefer shallow, slow-moving waters with some vegetation for feeding and spawning habitat, the shallow Salton Sea pools probably do not provide an optiomal habitat.

The razorback sucker is also protected under both state and federal laws. Razorback suckers historically occupied the major river systems of the Colorado River Basin between southwestern Wyoming and northern Mexico. Some individuals are believed to inhabit the canal system in Imperial County, but the population is believed to be made up of old members of a dwindling, non-reproductive stock. Razorback suckers are likely to occur elsewhere in the system.

The incidental taking of these species as a result of the project will most likely be evaluated in the context of a consultation under Section 7 of the Endangered Species Act, as part of the Corps of Engineers' permitting of the facilities.

Since the Cascade Alternative maximizes wetlands and other aquatic resources habitats, it is the most likely to satisfy Section 7 consultation requirements. The Shore Lake, North Lake and South Lake alternatives would generally be comparable in terms of ability to provide habitat. The Low Sea Alternative would rank last under this objective.

13. Comply with Clean Air Act conformity requirements —

The relative ranking of alternatives in terms of this objective is the same as described under environmental impacts, air quality, above.

14. Comply with other regulatory programs —

Other regulatory programs include the California Endangered Species Act, water quality certification under Section 401 of the Clean Water Act, streambed alteration requirements under Fish and Game Code Sections 1600 and following, dam safety regulation, and others. Further analysis under each of these programs would be required to develop a relative ranking of the alternatives.

15. Ensure timely achievement of benefits —

Since it would begin providing benefits as soon as the first lake is constructed, the Cascade Alternative is superior under this objective. The North Lake Alternative would be second best in terms of the timely achievement of benefits, followed by the South Lake Alternative. The Shore Lake Alternative would take much longer to construct given the scale of the required facilities. The Low Sea Alternative would not provide any benefits.

16. Maximize collateral benefits, including storage and conveyance —

The Cascade Alternative could be designed to provide storage and conveyance benefits. The North Lake and South Lake alternatives could provide a roadbed for improvement of the circulation system. Neither the Shore Lake or Low Sea alternatives would allow for any collateral benefits.

17. Provide high safety rating / low risk of failure —

The relative ranking of alternatives in terms of this objective is the same as described under environmental impacts, geology, above.

18. Allow for flexibility of design and construction —

The Cascade Alternative would allow for the most flexibility of design and construction. The Shore Lake, South Lake and North Lake alternatives would be comparable in terms of flexibility of design and construction. The objective is inapplicable to the Low Sea Alternative.

19. Confirm engineering feasibility for project development and maintenance —

The relative ranking of alternatives in terms of this objective is the same as described under environmental impacts, geology, above.

20. Minimize seismic risks —

The relative ranking of alternatives in terms of this objective is the same as described under environmental impacts, geology, above.

21. Maximize public acceptance / overcome institutional barriers —

The Cascade Alternative is most likely to maximize public acceptance because there is no area of the lake (and resulting adversely affected constituency) that loses its waterfront. It is also the least expensive, and the timing of expenditures will more likely match revenue streams, avoiding costly and potentially infeasible debt financing. Since it involves construction throughout the entirety of the lake,

a greater number of sub-sea landowners would need to cooperate, than would be the case for the North Lake or South Lake Alternatives (where the dam site is owned by only two entities, the United States and the Imperial Irrigation District). Other landowners of the seabed include the State of California, Torres Martinez Indian Reservation, and Coachella Valley Water District. The alternative also maximizes local employment.

In terms of benefits, the Shore Lake Alternative would likely be the next best in terms of public acceptance. However, the potentially prohibitive costs of this alternative would likely render this alternative unacceptable, and it is unlikely that debt financing could be obtained for the alternative without major public subsidies that are unlikely to be forthcoming.

The North Lake Alternative has the support of many local influential community organizations and local government agencies. The local Congressional Representative has also endorsed this concept. Additionally, there are many features of this alternative, such as the economic and recreational development potential that provide an added benefit to the local community.

The South Lake alternative is also has community support, but it does not afford the economic and recreational benefits in the northern portion of the Sea where those benefits would likely be more advantageous to economic growth.

The Low Sea alternative is the worst performing alternative because it results in a large hyper-saline lake with little if any ecologic, economic, or recreational potential. It is highly unlikely that the local community, regional, state or federal agencies would support this alternative.

22. Maximize Participation of the Local Labor Force —

The Cascade Alternative can be constructed with substantial participation of the local labor force. The Consortium plans to develop its own academy for training the local labor force and estimates that approximately 85% of the 500 employees needed to construct the project will be residents of Imperial County. Following construction, approximately 150 employees will be needed to maintain the project, and this long-term labor force would initially be comprised of original employees used in the constriction of the project. The construction techniques of the other alternatives would be less able to utilize the local labor force.

Figure R: Relative Ability of the Alternatives to Satisfy Project Objectives

Alternatives → / **Objectives ↓**	Low Sea	Cascade	Shore Lake	North Lake	South Lake
Drainage	-	-	-	-	-
Salinity	5	1	4	3	2
Elevation	5	1	2	4	3
Habitat	5	1	2	3	4
Recreation	5	1	2	3	4
Economic development	5	1	2	3	4
Air quality	5	1	4	3	2
Water quality	5	1	4	2	3
Respond to inflow changes	5	1	2	3	4
Economic feasibility	5	1	4	2	3
Corps permitting	5	1	4	2	3
USFWS permitting	5	1	2	4	3
CAA conformity	5	1	4	3	2
Other permit programs	-	-	-	-	-
Timeliness of benefits	5	1	4	2	3
Collateral benefits	5	1	4	2	3
High safety rating	5	1	4	2	3
Flexibility	5	1	4	2	3
Engineering feasibility	5	1	4	2	3
Seismic	1	2	5	3	4
Public acceptance	5	1	2	3	4
Local labor force	5	1	4	2	3
AVERAGE SCORE	4.95	1.05	3.35	2.75	3.0
NUMBER OF TOP RANKINGS	1	19	0	0	0
NUMBER OF LOWEST RANKINGS	19	0	1	0	0
OVERALL RANKING	5	1	4	2	3