CALIFORNIA OCEAN PROTECTION COUNCIL

MEMORANDUM

TO: Ocean Protection Council

FROM: Christina Cairns, Project Manager

DATE: November 30, 2009

RE: Panel Discussion on Desalination in California

Staff have assembled a panel of experts to: (1) increase the Ocean Protection Council's (OPC) understanding of the role of desalination in California's future water supply, potential environmental impacts associated with desalination, and economic considerations of the industry; (2) discuss existing and future technologies for desalination that mitigate environmental impacts from intake, processing, and discharge activities; (3) compare various water supply measures, including conservation and recycling efforts, and their tradeoffs as alternatives to desalination; and (4) identify future opportunities for the OPC to support coastal and water managers in evaluating and permitting future desalination projects such that impacts to the marine environment are minimized.

Background

As the most populous state within the arid western United States, California faces a particularly tough challenge when it comes to meeting its water supply demands. Recurring drought coupled with exponential growth in human population have left the state's groundwater aquifers depleted and surface water sources overdrawn. Projected reductions in snowpack in the Sierra Nevada mountains and fewer rain events due to climate change will likely further compound the problem and reduce water managers' expectations for recharge in the near future. One hope for relief stems from California's proximity to the largest body of saltwater in the world—the Pacific Ocean.

Seawater desalination is often cited as a reliable and potentially significant, though largely untapped, means of addressing California's continued problems of drought and critically low water supply. The high cost of producing desalinated water has traditionally limited investment in the desalination industry in California. However, the combination of newer, more efficient desalination technologies and the need to reduce water supplies from the Sacramento-San Joaquin Delta and Colorado River have led to the development of numerous desalination plants in California: more than 20 coastal desalination facilities have been proposed to date and a dozen

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more have been approved or are in the pilot testing phase.[1] The majority of these facilities are public-private partnerships between local water districts and private contractors. Poseidon Resources is perhaps the most well-known private company to partner with local water districts, recently acquiring all necessary agency approvals for a 50 million gallon-per-day (MGD) production facility at the existing Encina Power Station in Carlsbad. Poseidon has filed applications with the California Coastal Commission for two more plants, one in Huntington Beach and another at Moss Landing. If approved, these facilities would be the largest desalination plants in California in terms of gross water production.

The State Water Plan and Desalination

The Department of Water Resources, in its 2009 draft update to the state Water Plan, maintains that continually increasing water demand requires the consideration of desalination as a future water source in California; a common estimate is that desalination will comprise up to 10% of California's future water supply portfolio.[2] However, the significant environmental impacts and high energy costs associated with desalination underscore the need to consider this as only one alternative among a larger portfolio of water supply options, which also include cost-effective recycling, water conservation and efficiency measures. In 2002, the state Legislature convened a Water Desalination Task Force to analyze potential opportunities and impediments for using desalination technology in California. In its final report, the Task Force stated as its overarching recommendation: "Desalination should be considered, where economically and environmentally appropriate, as an element of a balanced water supply portfolio, which also includes conservation and water recycling to the maximum extent practicable."[3] In its draft five-year update to the Water Plan, the Department of Water Resources echoes this recommendation, as well as suggests the state provide assistance and funding to potential developers and agencies to take advantage of desalination opportunities.

Experts on water supply issues in the state agree that desalination is not the cure-all to California's water problems; rather, it is one tool in the toolbox that the state can use to address the ongoing depletion of freshwater supplies from other sources. Conservation and recycling and reclamation of wastewater from homes, businesses, agriculture, and stormwater runoff must also be prioritized, and perhaps mandated, if the state is to address the existing water shortage and the growing threat of increased droughts anticipated with climate change.

Economic and Environmental Impacts

Desalination facilities on the California coast can provide a reliable alternative water source, and as stated above are part of the anticipated water supply portfolio for California. However, there are also economic and environmental costs, such as the high energy demand for the desalination process and resulting greenhouse gas emissions, and impacts on marine life from impingement and entrainment due to intake systems (when organisms are killed on the intake screen or within the facility, respectively) and hypersaline discharges from plants.

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[1] Cooley *et al*. Desalination, With a Grain of Salt – A California Perspective, The Pacific Institute. 2006.
[2] Department of Water Resources. Draft California Water Plan Update. October 2009.
[3] Department of Water Resources. Water Desalination - Findings and Recommendations. October 2003.

Desalination requires significant amounts of energy to turn seawater into drinking water. Energy demand comparisons estimate desalination uses between 3.8 and 5.2 MWh/AF (Megawatt hours per acre foot), versus an average of 0.7 MWh/AF to recycle local wastewater and 3.2 MWh/AF to convey water from northern to southern California under the State Water Project (SWP).[4] The energy costs incurred from transportation of freshwater across the state are high—current studies estimate that the transmission and treatment of freshwater supplies across the state under the SWP account for approximately 20% of California's electricity demand.[5] Even with this high energy cost, the desalination process still requires about 19% to 47% more energy on average than transfers of freshwater from the SWP for Southern California.[6] Experts state that the energy consumption of a typical desalination facility accounts for 1/3 to 1/2 of the total operating cost of the plant. However, as new technologies make this process more efficient, desalination is becoming more attractive, particularly as the demand for and price of traditional freshwater supplies, such as water transfers from the Sacramento-San Joaquin Delta and the Colorado River, increases.

There are significant environmental impacts from the desalination process that must be considered in addition to the energy-cost balance. Desalination intake systems can pose major threats to sea life from entrainment and impingement of marine organisms. These impacts are much higher with the use of open water, or surface, intake technologies commonly found in older desalination plants or energy facilities that rely on once-through-cooling for temperature control of their systems. Several of the proposed desalination facilities in California, including Poseidon's plant in Carlsbad, are planned to be co-located with coastal power plants that employ once-through-cooling and open intake systems; this coupling means that the sea water that was drawn in to cool the power plant goes to the desalination plant for desalting rather than being discharged. In 2006, the OPC passed a resolution regarding the use of once-through-cooling at coastal power plants: the resolution called for a 90-95% reduction in impingement and entrainment impacts to sea life from open ocean intake systems. In response to the resolution, the State Water Resources Control Board is currently considering a policy that sets a timeline for the discontinuation of once-through-cooling technology for coastal power plants. Approval of desalination facilities that rely on this traditional intake system may prolong the time frame in which these facilities are allowed to continue using once-through-cooling technology.

Burying the intake structure for desalination facilities below the seafloor or using beach or slant wells eliminates many of the problems associated with entrainment and impingement. Subsurface galleries buried beneath the seafloor allow seawater to percolate downward and use sand as a natural filter for marine organisms and pollutants. This has also been shown to reduce the energy demands of desalination by approximately 28% compared to open intake structures by using gravity as a natural water feed.[7] Pilot projects to test new intake technologies that do not rely on open water sources are underway in several coastal locations, including Dana Point and Long Beach which have proposed using slant wells and subsurface intake galleries, respectively, to eliminate marine life mortality and reduce or eliminate the need for prefiltration.

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[4] California Energy Commission, The Water-Energy Relationship. 2005.
[5] Ibid.
[6] Powers Engineering, p. 4. *Carlsbad- Poseidon Desalination Report: Assessment of Energy Intensity and CO2 Emissions Associated with Water Supply Options for San Diego County.* Oct. 12, 2007.
[7] Powers, p. 4.

Seven of the 21 coastal desalination facilities proposed in California are considering subsurface intake technologies instead of traditional open water intake pipelines to mitigate their environmental impacts and reduce energy loads.[8]

Discharge of hypersaline brine produced as a result of the desalination process poses another potentially significant impact to the ocean environment. Typical saltwater brines are twice as saline as the feed seawater and have a higher density, resulting in sinking and concentration of the discharge at lower levels in the water column where waves and currents do not dilute pollutants as quickly.[9] The concentrated brine may include certain toxic elements, such as chlorine, sulfuric acid, and heavy metals, introduced during the desalination process. As a result, brine discharge can effectively kill or harm marine organisms within vicinity of the desalination outfall, particularly less mobile creatures, and alter nearby marine communities in the long term. To reduce these impacts, operators of desalination facilities can blend their concentrated brine with water outflows from wastewater treatment plants or energy facilities using once-through-cooling to dilute the discharge or place diffusers on outfall pipes in the ocean to mix the discharge in the water column.

Other Considerations

The siting of desalination facilities must also be considered in relation to other human and ecological uses in coastal waters (e.g., shipping, fishing, energy facilities, marine protected areas, recreational areas, etc.). Comprehensive planning of desalination in concert with existing and proposed activities along the coast, as well as in relation to sensitive habitats and protected areas, is necessary to ensure optimal use and protection of marine resources. To make such well-informed decisions with regard to proposed desalination facilities, state regulatory agencies, such as the Coastal Commission, Energy Commission, and State Lands Commission, and local water management districts would benefit from better access to spatial information on existing coastal activities as well as the location of sensitive ocean resources through improved data-sharing and collaboration. Additionally, developing institutional mechanisms to integrate across single-purpose agencies and mandates and encouraging interagency cooperation were recommendations put forward by a consortium of water experts concerned with the current piecemeal approach to the state's permitting of desalination facilities.[10] Given the increasing problems of drought and the compounding stresses climate change will place on water supply, it will be essential to have coordinated state efforts to address these issues.

Other important considerations raised by both sides of the desalination dialogue include the merits and costs of privatization of water (a resource held in public trust); the need to appropriately site desalination facilities given predicted changes in sea level rise and potential for saltwater intrusion of groundwater aquifers; and the need for adequate institutional and regulatory mechanisms to ensure that water provided through seawater desalination is taken into account when considering the amounts of freshwater diverted away from the Sacramento-San Joaquin Delta and the Colorado River.[11]

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[8] Cooley *et al.*, p. 60.
[9] Cooley *et al.*, p. 62-63.
[10] Aquarium of the Pacific and Desal Response Group. "Conclusions and Recommendations from a Conference on Ocean Desalination", 2006.
[11] Aquarium of the Pacific, 2006.

Panel Members

Representatives from the following agencies will participate in an educational panel on desalination in California:

1. Jonathan Bishop, Chief Deputy Director, State Water Resources Control Board
2. Dean Reynolds, Senior Manager, Department of Water Resources
3. Dr. Bob Wilkinson, Lecturer, University of California, Santa Barbara
4. Todd Reynolds, Principal, Senior Engineer, Kennedy/Jenks Consultants
5. Peter Gleick, President, Pacific Institute
6. Peter MacLaggan, Senior Vice President, Poseidon Resources

Additional References

Key reports on desalination and water issues in California include:

- Department of Water Resources. California Water Plan Update 2009 (Pre-Final Draft). October 7, 2009. The California Water Plan, published by the Department of Water Resources, provides a framework for water managers, legislators, and the public to consider options and make decisions regarding California's water future. This report is the most recent 5-year update to the state Water Plan, originally published 50 years ago. A key objective of the California Water Plan Update 2009 is to present a diverse set of resource management strategies to meet the water-related resource management needs of each region and statewide. http://www.waterplan.water.ca.gov/cwpu2009/index.cfm.

- Department of Water Resources. Water Desalination - Findings and Recommendations. October 2003. As called for by Assembly Bill 2717 (Chapter 957, Statutes of 2002), this report by the Department of Water Resources details potential opportunities and impediments for using seawater and brackish water desalination, and examine what role the state should play in furthering the use of desalination technology. The report was prepared with significant input from a Water Desalination Task Force comprised of representatives from twenty-seven organizations, including state and local agencies. http://www.water.ca.gov/desalination/pud_pdf/Findings-Recommendations.pdf.

- Pacific Institute study, Cooley, H., Gleick, P., Wolff, G. Desalination, With a Grain of Salt: A California Perspective. The Pacific Institute. June 2006. This report provides a review of desalination technologies, examples of desalination techniques around the world, and particular environmental, economic, and social issues associated with desalination plants in California. It ends with conclusions and recommendations for water users and planners interested in making desalination a viable water supply option. http://www.pacinst.org/reports/desalination/desalination_report.pdf.

- California Coastal Commission. Seawater Desalination and the California Coastal Act. March 2004. This report provides general information about issues related to desalination and its effects on coastal resources and uses, the status of proposed facilities, how the California Coastal Act applies to desalination and information that will be required for permit review of facilities. http://www.coastal.ca.gov/energy/14a-3-2004-desalination.pdf.

- The National Academies. Desalination: A national perspective. Committee on Advancing Desalination Technology, Water Science and Technology Board, and the Division on Earth and Life Studies. 2008. This report is the result of efforts by the National Research Council Committee on Advancing Desalination Technology. The committee evaluated new desalination technologies, the costs and challenges of implementing desalination, long-term goals for desalination technology, and recommendations for action and research.

COASTAL ENVIRONMENTAL RIGHTS FOUNDATION

November 23, 2009

Mike Chrisman, Chair and Members
California Ocean Protection Council
1416 Ninth Street, Suite 1311
Sacramento, CA 95814

Via Electronic Mail
COPCpublic@resources.ca.gov

RE: OPC Meeting, November 30, 2009, Item #11
Desalination in California

Dear Chair Chrisman and Council Members:

Please accept this letter on behalf of Coastal Environmental Rights Foundation (CERF) regarding your "Desalination in California" discussion scheduled for your meeting next Monday, November 30, 2009. CERF is a nonprofit environmental organization founded by surfers in North San Diego County and active throughout California's coastal communities. CERF was established to aggressively advocate, including through litigation, for the protection and enhancement of coastal natural resources and the quality of life for coastal residents. CERF welcomes the opportunity to provide to the Ocean Protection Council (Council) comments that will help inform the Council's just-announced informational panel on ocean desalination in California.

As our colleagues, the Alliance and the Surfrider explained in detail in their April 2009 written comments and oral testimony to the Council (incorporated by reference and included as Attachment 1), over 20 desalination facilities using open seawater intakes are being considered coastwide, without the benefit of statewide guidance on minimizing the intake and mortality of marine life. Left unchecked, the cumulative impacts of multiple open seawater intake desalination facilities could easily undermine the gains to the marine environment from implementation of the Council's strong resolution to phase out the impacts of open seawater intakes used to cool coastal power plants.

These energy-intensive facilities also undercut the Council's efforts to develop strategies to prevent and adapt to imminent climate change and sea level rise. For the Council's reference, we include as Attachment 2 a summary of the energy and other costs associated with ocean desalination as compared with other sources. We also include as Attachment 3 recent comments provided by the Alliance to the Little Hoover Commission with regard to the significant potential for water conservation in the state as an alternative to energy sources more destructive to the ocean environment. These comments also express the need for a "water loading order" that, similar to the state's energy loading order, sets state policy of encouraging water conservation as the priority water source.

As was articulated in the joint April 2009 letter to the Council, environmental groups and CERF do not have a blanket opposition to ocean desalination facilities. We do, however, oppose the development of ocean desalination facilities that harm the marine environment by, for example, co-locating with power plant open seawater intake pipes that should be in the process of being phased out under Clean Water Act Section 316(b).

Fortunately, as discussed in the April 2009 letter, there are alternative technologies for ocean desalination that protect marine life and reduce energy consumption. We believe that such ocean desalination pilot projects could set the standard for compliance with the Porter-Cologne Act's mandate to minimize the intake and mortality of marine life from such activities through application of best measures.

Porter-Cologne Act Section 13142.5(b) states:

> "[f]or each …industrial installation using seawater for cooling, heating, or industrial processing, the best available site, design, technology, and mitigation measures feasible shall be used to minimize the intake and mortality of all forms of marine life."

However, without action by the Council and/or the State Water Resources Control Board to develop state policy in that regard, additional environmentally destructive, energy inefficient, and costly ocean desalination plants will likely be sited.

Accordingly, we urge the Council to consider the following actions as it moves forward in this area:

1. Encourage the State Water Resources Control Board to expeditiously develop clear statewide guidance on seawater desalination that: (a) implements California Water Code section 13142.5(b) and the California Ocean Plan, as well as Clean Water Act Section 316(b) and the Board's Once-Through Cooling Policy (to be adopted shortly), (b) sets requirements for "best available" seawater desalination facility design, location and intake technologies to minimize the intake and mortality of marine life, and (c) requires water conservation, recycling, and stormwater recharge/(re)use options to be exhausted before new desalination projects are pursued;

2. Encourage the Department of Water Resources and State Water Resources Control Board to work with relevant agencies to assess the cost, environmental and community impacts, and energy demands of various water supply strategies, including desalination, water conservation/efficiency, recycling, and stormwater recharge/(re)use, and to provide that information to the Council, expeditiously and by a date certain;

3. Assist where possible with funds needed for the Department of Water Resources and the State Water Resources Control Board to assess the cost, environmental and community impacts, and energy demands of the various water supply strategies as described above;

4. Encourage the Department of Water Resources and State Water Resources Control Board to work with relevant agencies, including the California PUC, to develop a comprehensive water loading order, expeditiously and by a date certain, that prioritizes California's water portfolio based on cost effectiveness, energy efficiency, environmental impacts, and relative immediacy of the water supply; and

5. As possible, fund (or secure funding for) a study that will research, document, and make available to the public the cumulative and individual impacts of the potential for the 20 or more proposed seawater desalination facilities in the state, including impacts from increased energy demand, greenhouse gas emissions, brine discharges, impingement/entrainment, and other cumulative coastal and marine ecosystem impacts.

Thank you for your attention to this important issue. We look forward to working with you and your staff to develop statewide policy on ocean desalination that protects the health of the marine environment and implements the state's world-renowned greenhouse gas emission reduction programs.

Sincerely,

SARA HONADLE
PROGRAMS DIRECTOR

ENCL.

November 23, 2009

Mike Chrisman, Chair and Members
California Ocean Protection Council
1416 Ninth Street, Suite 1311
Sacramento, CA 95814
VIA ELECTRONIC MAIL: COPCpublic@resources.ca.gov

Re: OPC Meeting, November 30, 2009, Item #11: "Desalination in California"

Dear Chair Chrisman and Council Members:

On behalf of California Coastkeeper Alliance, the Planning and Conservation League, Surfrider Foundation, Heal the Bay, Desal Response Group, and Southern California Watershed Alliance, we welcome the opportunity to provide to the Ocean Protection Council (Council) comments that will help inform the Council's just-announced informational panel on ocean desalination in California.

As California Coastkeeper Alliance and Surfrider Foundation explained in detail in joint April 2009 written comments and oral testimony to the Council (incorporated by reference and included as Enclosure 1), over 20 desalination facilities using open seawater intakes are being considered coastwide, without the benefit of statewide guidance on minimizing the intake and mortality of marine life. Left unchecked, the cumulative impacts of multiple open seawater intake desalination facilities could easily undermine the gains to the marine environment from implementation of the Council's strong resolution to phase out the impacts of open seawater intakes used to cool coastal power plants.[1]

These energy-intensive facilities also undercut the Council's efforts to develop strategies to prevent and adapt to imminent climate change and sea level rise.[2] For the Council's reference,

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[1] Ocean Protection Council, "Resolution of the California Ocean Protection Council Regarding the Use of Once-Through Cooling Technologies in Coastal Waters" (April 20, 2006), available at: http://www.opc.ca.gov/webmaster/ftp/pdf/docs/Documents_Page/Resolutions/Cooling_Resolution.pdf.

[2] Ocean Protection Council, "Resolution of the California Ocean Protection Council On Climate Change" (June 14, 2007), available at: http://www.opc.ca.gov/webmaster/ftp/pdf/docs/0607COPC12_Climate_Change_Rez_Amended.pdf (June 14, 2007);

we include as Enclosure 2 a summary of the energy and other costs associated with ocean desalination as compared with other water sources. We also attach as Enclosure 3 recent comments provided to the Little Hoover Commission with regard to the significant potential for water conservation in the state as an alternative to energy sources more destructive to the ocean environment. Among other things, these comments describe the need for a "water loading order" that, similar to the state's energy loading order,[3] sets state policy of encouraging water conservation as the priority water source.

As was articulated in the joint April 2009 letter to the Council, we do not have a blanket opposition to ocean desalination facilities. We do, however, oppose the development of ocean desalination facilities that harm the marine environment by, for example, co-locating with power plant open seawater intake pipes that should be in the process of being phased out under Clean Water Act Section 316(b).

Fortunately, as discussed in the April 2009 letter, there are alternative technologies for ocean desalination that protect marine life and reduce energy consumption. We believe that such ocean desalination pilot projects could set the standard for compliance with the Porter-Cologne Act's mandate minimize the intake and mortality of marine life from such activities through application of best measures.[4] However, without action by the Council and/or the State Water Resources Control Board to develop state policy in that regard, more environmentally destructive, energy inefficient, and costly ocean desalination plants will likely be sited.

Accordingly, we urge the Council to consider the following actions as it moves forward in this area:

1. Encourage the State Water Resources Control Board to expeditiously develop clear statewide guidance on seawater desalination that: (a) implements California Water Code section 13142.5(b) and the California Ocean Plan, as well as Clean Water Act Section 316(b) and the Board's Once-Through Cooling Policy (to be adopted shortly), (b) sets requirements for "best available" seawater desalination facility design, location and intake technologies to minimize the intake and mortality of marine life, and (c) requires water conservation, recycling, and stormwater recharge/(re)use options to be exhausted before new desalination projects are pursued;
2. Encourage the Department of Water Resources and State Water Resources Control Board to work with relevant agencies to assess the cost, environmental and

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see also Ocean Protection Council, "California Climate Adaptation Strategy: Thank You Ocean Podcast" (Aug. 17, 2009), available at: http://www.thankyouocean.org/news/podcasts; CA Natural Resources Agency, "California Climate Change Adaptation Strategy: Discussion Draft" (Aug. 2009), available at: http://www.energy.ca.gov/2009publications/CNRA-1000-2009-027/CNRA-1000-2009-027-D.PDF; Office of Governor Arnold Schwarzenegger, Executive Order S-13-08 (Nov. 14, 2008) available at: http://gov.ca.gov/press-release/11035/.

[3] California Public Utilities Commission and California Energy Commission, "Energy Action Plan: 2008 Update," p. 1 (Feb. 2008), available at: http://www.energy.ca.gov/2008publications/CEC-100-2008-001/CEC-100-2008-001.PDF; *see also* http://www.energy.ca.gov/energy_action_plan/. California's energy loading order "established that the state, in meeting its energy needs, would invest first in energy efficiency and demand-side resources, followed by renewable resources, and only then in clean conventional electricity supply." *Id.*

[4] Water Code Sec. 13142.5(b) ("[f]or each …industrial installation using seawater for cooling, heating, or industrial processing, the best available site, design, technology, and mitigation measures feasible shall be used to minimize the intake and mortality of all forms of marine life.")

community impacts, and energy demands of various water supply strategies, including desalination, water conservation/efficiency, recycling, and stormwater recharge/(re)use, and to provide that information to the Council, expeditiously and by a date certain;

3. Assist where possible with funds needed for the Department of Water Resources and the State Water Resources Control Board to assess the cost, environmental and community impacts, and energy demands of the various water supply strategies as described above;
4. Encourage the Department of Water Resources and State Water Resources Control Board to work with relevant agencies, including the California PUC, to develop a comprehensive water loading order, expeditiously and by a date certain, that prioritizes California's water portfolio based on cost effectiveness, energy efficiency, environmental impacts, and relative immediacy of the water supply; and
5. As possible, fund (or secure funding for) a study that will research, document, and make available to the public the cumulative and individual impacts of the potential for the 20 or more proposed seawater desalination facilities in the state, including impacts from increased energy demand, greenhouse gas emissions, brine discharges, impingement/entrainment, and other cumulative coastal and marine ecosystem impacts.

Thank you for your attention to this important issue. We look forward to working closely with you and your staff to develop statewide policy on ocean desalination that protects the health of the marine environment and that implements the state's world-renowned greenhouse gas emission reduction programs.

Best regards,

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Enclosures

ENCLOSURE 1:

Letter from California Coastkeeper Alliance and Surfrider Foundation to the California Ocean Protection Council
"Ocean Protection Council Guidance on Eliminating Marine Life Impacts from Open Seawater Intake Structures"
April 22, 2009

ENCLOSURE 2:

California Coastkeeper Alliance
"Summary of Costs and Benefits of Water Supply Alternatives"
August 2009

ENCLOSURE 3:

Letter from California Coastkeeper Alliance to the Little Hoover Commission
"Little Hoover Commission Advisory Committee Meeting on Water Governance: Conservation"
November 17, 2009

April 22, 2009

Mike Chrisman, Chair and Members
California Ocean Protection Council
1416 Ninth Street, Suite 1311
Sacramento, CA 95814

Re: Ocean Protection Council guidance on eliminating marine life impacts from open seawater intake structures.

VIA EMAIL: COPCpublic@resources.ca.gov

Dear Chair Chrisman and Members of the Council:

The California Coastkeeper Alliance and the Surfrider Foundation commend the Ocean Protection Council ("Council") for taking a leadership role in the development of a clear and consistent state policy to protect coastal, estuarine, and marine ecosystems from the devastating impacts of once-through cooling ("OTC"). The OTC resolution you passed in April of 2006 and the draft feasibility and grid reliability studies that you funded provide important guidance and support to the State Water Resources Control Board ("State Board") as it implements state and federal requirements through developing state policy on OTC.[1] It is also critical that the state protect our marine ecosystems from unnecessary entrainment and impingement of marine life from all industrial withdrawals of seawater using open seawater intakes – as mandated in the Porter-Cologne Act.[2] **We respectfully submit the following comments and ask that you continue to lead the agencies tasked with addressing once-through cooling issues to a prompt and timely phase-out of this environmentally devastating technology and ensure that the impacts are not simply replaced by new industrial coastal developments – including ocean desalination.**

California Should Phase Out Once-Through Cooling

It has been three years since the Council passed a resolution on once-through cooling, and yet California still does not have a clear statewide policy on this issue. While we wait for the

[1] *E.g.*, the Resolution "encourages the State to implement the most protective controls to achieve a 90-95 percent reduction in impacts."
[2] California Water Code § 13142.5(b).

State Board to finalize a policy, the daily assault on our delicate marine and estuarine ecosystems continues. State Board staff recently testified at a joint hearing of the California Assembly on Natural Resources and Utilities and Commerce Committees that it intends to release the revised policy in June, with public hearings in July/August and a hearing in front of the Board for possible adoption in November.[3]

Earlier this month, the U.S. Supreme Court ruled in *Entergy v. Riverkeeper*, 556 U.S. __(2009) that cost-benefit analysis ***may*** be used as a factor in mandating the use of "best technology available" as defined by the Clean Water Act Section 316(b), which governs cooling water intake structures.[4] The Court left it to the Environmental Protection Agency ("EPA") to decide whether and how to compare costs to benefits when it issues new regulations for existing power plants. Importantly, the Court did not require that cost-benefit analysis be used, nor did the Court determine how or in which circumstances cost-benefit analysis may be used. The Court also stated that CCKA's, Surfrider Foundation's, and the other co-plaintiffs' view that cost-benefit analysis is not to be used at all, with which the Second Circuit Court of Appeals agreed, is also a reasonable interpretation of the law, and would pass legal muster if EPA adopted it.

Further, the U.S. Supreme Court left stand the other issues decided by the Second Circuit Court of Appeals in *Riverkeeper I* and *Riverkeeper II*, including the prohibition on "after the fact" restoration as a substitute for employing the best technology available to avoid adverse impacts in the first place.[5] The current Administration will now issue new regulations that conform to the lower court decision, as possibly modified in one limited respect by the Supreme Court ruling regarding the option to use cost-benefit analysis, if EPA chooses.

California has the right and responsibility to go beyond whatever federal minimum standard the EPA regulation creates. As the attached analysis from lawyers representing the regulated industry concludes, "[t]he Supreme Court's ruling does not mandate application of the cost-benefit test anywhere, much less in California."[6] The studies funded by the Council show that phasing out once-through cooling in California can be done feasibly and without negative impacts on energy reliability**.**

The Supreme Court decision did not result in any legal constraints that would limit California's authority to set strict standards and feasible timelines for phasing out once-through cooling. We strongly encourage the Council to urge the State Board to stay on course to finalize its policy by November 2009 to phase out once-through cooling.

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[3] Jonathan Bishop, Chief Deputy Director, California State Water Resources Control Board, *Testimony before the California Assembly Joint Informational Hearing Utilities and Commerce and Natural Resources Committees*, March 2, 2009.

[4] Supreme Court Decision available at http://www.cacoastkeeper.org/images/pdf/07-588.pdf.

[5] *See*: *Riverkeeper, Inc. v. EPA*, 358 F.3d 174, 184 (2d Cir. 2004) ("*Riverkeeper I*"); see also: *Riverkeeper, Inc. v. United States EPA*, 475 F.3d 83, 97 (2d Cir. 2007) (*Riverkeeper II*)

[6] Elizabeth Lake & Peter Landreth, "*U.S. Supreme Court Rules Cost-Benefit Analysis Permitted Under the Clean Water Act – But Will it Matter in California*?" Holland & Knight. Available at: http://www.hklaw.com/id24660/publicationid2613/returnid31/contentid54040/

Marine Life Impacts of Open Seawater Desalination

In order to fully protect marine life from the impacts the Council sought to address in its OTC resolution, the state must also implement concise standards on the withdrawal of seawater for all industrial uses. Private industry and water agencies are planning over 20 open seawater desalination facilities statewide without guidance on minimizing the intake and mortality of marine life. **Left unchecked, the cumulative impacts of multiple open seawater desalination facilities could effectively undermine the gains to the marine environment from implementing the Council's resolution on OTC and your efforts to find adaptation strategies for imminent climate change and sea level rise.**

Many of these proposals are planned to utilize the discharge from OTC systems as the desalination facility "source water."[7] Others are relying on the use of new or currently abandoned open seawater intakes. For example, in Carlsbad there is a desalination plant in the final stages of consideration for the continued use of an OTC system as a "stand alone" ocean desalination facility – that is, when the co-located generator is not withdrawing seawater for cooling purposes. This proposal, will withdraw 304 million gallons of estuarine water every day, an annual average of approximately 11% ***more*** seawater than the co-located Encina Power Station (EPS) currently withdraws.[8] Whether the water is used for cooling a plant or for ocean desalination, the impacts on the marine life sucked in through these intake structures is devastating. **If the ocean desalination facility is permitted as planned, the gains of implementing your resolution to *reduce* marine life mortality from OTC by 90 to 95% will have been completely undermined. In fact, the ocean desalination facility will *increase* the intake and mortality of marine by approximately 11% under current operating averages at EPS[9]. It follows that future operations of a "stand alone" desalination facility, once the EPS re-powers, will approximate 111% of current intake and mortality annually.**

Fortunately, there are alternative technologies for desalination that protect marine life. There are more progressive desalination proposals designed to use sub-seafloor intakes that eliminate entrainment and impingement while simultaneously reducing the energy demand of the final product water.[10] We believe these successful ocean desalination pilot projects set the standard for compliance with the Porter-Cologne Act's mandate to locate and design ocean desalination facilities in a manner to minimize the intake and mortality of marine life.[11] **We respectfully ask that the Council direct its staff to investigate and report back on alternative methods for desalination technology at the Council's next meeting.**

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[7] The life expectancy of proposed ocean desalination facilities is a minimum of 30 years – well beyond the acceptable life expectancy of OTC.

[8] See: Flow, Entrainment and Impingement Minimization Plan at: http://www.swrcb.ca.gov/rwqcb9/press_room/announcements/carlsbad_desalination/carslbad_desalination.shtml

[9] There is still on-going controversy over the exact level of impingement that will result from the desalination intake. See: "Statement of Peter Raimondi, PhD" (April 1, 2009) – and associated follow-up comments at: http://www.swrcb.ca.gov/rwqcb9/press_room/announcements/carlsbad_desalination/carslbad_desalination.shtml

[10] See e.g., Long Beach Water Department at; http://www.lbwater.org/desalination/desalination.html ; see also Municipal Water District of Orange County at: http://www.mwdoc.com/Ocean_Desalination.htm

[11] California Water Code § 13142.5(b)

Energy Demand of Open Seawater Desalination

Open seawater desalination is the highest energy user of any water supply strategy.[12] In regard to new ocean desalination facility planning, the Council should take notice of the significant energy demand of these facilities and the potential for undermining the Council's efforts to recommend adaptation strategies for inevitable climate change, sea level rise, and other impacts on future water supply management. First, our current water management system is extremely energy demanding. It is an accepted estimate that the delivery and treatment of water accounts for nearly 20% of the cumulative energy demand in California.[13] If we are serious about reducing greenhouse gas emissions, we should be looking at reducing the "embedded energy" in our current water management as a primary target to meet the goals of the Global Warming Solutions Act of 2006 – not water projects that are more energy intensive.

Open seawater desalination is counter-productive to meeting both the goals of reducing greenhouse gas emissions and adapting to the consequences of inevitable climate change and sea level rise. For example, the Carlsbad-Poseidon Desalination proposal mentioned above will consume approximately 40% more energy than the most energy-intensive available component of the region's water supply portfolio – imported water from the State Water Project.[14] If ocean desalination proposals are constructed closer to the source of State Water Project imports – the Sacramento Delta – that increased energy demand comparison only gets more dramatic. **And, once again, the cumulative impacts of numerous ocean desalination facilities on greenhouse gas emissions has never been thoroughly documented or regulated.**

In addition, much of the southern California region is reliant on local groundwater for a significant portion of the local water supply portfolios. Already these areas are combating seawater intrusion and contamination of coastal freshwater aquifers. Advancing the use of energy-intensive ocean desalination as a response to purported limits on available water supplies, and consequently exacerbating climate change and sea level rise, will only serve to heighten the threat to local groundwater supplies. It would be ironic, if not tragic, to allow the development of one energy-intensive water supply option (ocean desalination) to contribute to the contamination of a local renewable water supply with a relatively low energy demand (groundwater). This would turn sound public policy on its head.

While the ocean desalination proponents in Carlsbad argue that the product water is "replacement water" and will eliminate the need for current State Water Project imported supplies, thereby offsetting much of the energy demand and lowering the "net energy" consumption – there is no enforceable mechanism to ensure that offset. Further, while this one project proponent has promised a new and controversial plan to mitigate the greenhouse gas emissions created by this

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[12] *See* Gregory Freemen, *et al*. "Where Will We Get the Water? Assessing Southern California's Future Water Strategies" Los Angeles County Economic Development Corporation, August 14, 2008. Available at: http://www.laedc.org/sclc/studies/SCLC_SoCalWaterStrategies.pdf; and *see*: Martha Davis "Climate Change Scoping Plan Implementation Workshop Measure W-2 Water Recycling" March 4, 2009 presentation to the California State Water Resources Control Board, Public Utilities Commission, and Water Energy Climate Action Team. Available at: http://www.waterboards.ca.gov/water_issues/programs/climate/docs/ieua_030409.pdf.

[13] *See*: "Energy Down the Drain: the Hidden Costs of California's Water Supply"; NRDC, at: http://www.nrdc.org/water/conservation/edrain/contents.asp.

[14] *See* attached: Powers Engineering report on Carlsbad-Poseidon Desalination Report.

extremely energy-intensive project, there are also no enforceable mechanism to ensure others will follow suit – nor that the carbon offset opportunities are readily available for the cumulative pollutant load.

No After-the-Fact Restoration as Mitigation

The San Diego Regional Water Quality Control Board is considering a proposed "restoration project" as mitigation for the continued marine life mortality. But, as we noted above, the federal Second Circuit Court of Appeals decisions (*Riverkeeper I and II*) made it clear that "after the fact restoration" is not a legal substitute for the mandate to employ the best technology available to avoid the impacts in the first place. Because the mandates of the Porter-Cologne Act make no distinction between cooling water intakes and any other withdrawal of seawater for industrial purposes, it follows that "after the fact restoration" is not allowable mitigation for any new industrial facility in California.

Open Seawater Desalination Conclusion

We are not opposed to ocean desalination per se. There may be circumstances where ocean desalination fills an important niche in a local water supply portfolio. We respectfully request that the Council take note of and inform relevant agencies that:

1) the cumulative impacts of the potential for 20 or more ocean desalination facilities in the State, including energy demand, indirect greenhouse gas emissions and cumulative marine ecosystem impacts, should be immediately documented and made available to the public;
2) readily available alternative ocean desalination intake technology (sub-seafloor intakes) can eliminate the intake and mortality of marine life and should be the statewide regulatory standard for new proposals – consistent with CA Water Code § 13142.5(b);
3) new ocean desalination facilities should be located and designed with a production capacity that is compatible with the use of sub-seafloor intakes – consistent with CA Water Code § 13142.5(b);
4) local, reliable and less energy intensive alternative supply alternatives in every local water supply management plan should be fully implemented before ocean desalination is permitted.

We request that these recommendations be adopted into a new Ocean Protection Council resolution on seawater intakes for industrial purposes.

* * *

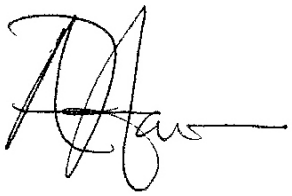
It has been over thirty years since the Clean Water Act and the Porter-Cologne Act first laid out the requirements for power plant cooling technology and the use of seawater for all industrial purposes respectively, and three years since the Ocean Protection Council's and the State Lands Commission's resolutions on once-through cooling. We are long overdue for a clear, consistent statewide policy that protects our coastal, marine and estuarine ecosystems and helps to

move California towards a future with cleaner, more efficient and more sustainable energy production and water supply management. In addition, the state's laws mandating the reduction of greenhouse gas emissions, and the several resource agencies' efforts to draft guidance on responding to the irreversible and inevitable impacts of climate change and sea level rise, demand immediate action.

The Council has the authority to coordinate "activities of state agencies, that are related to the protection and conservation of coastal waters and ocean ecosystems, to improve the effectiveness of state efforts to protect ocean resources…."[15] We respectfully ask that you exercise your authority and continue to lead the way to stopping this needless assault on our resources. We encourage the Council to follow through with your strong resolution to ensure that the State Board moves to expeditiously phase out OTC, which is ravaging our coastal, marine, and estuarine ecosystems and marine life. We also strongly urge you to advise the State Board and other relevant agencies to apply the strictest interpretation of the Porter-Cologne Act to minimize the intake and mortality of marine life when considering current applications for ocean desalination intake permits, and develop clear guidance on acceptable ocean desalination facility design, location and intake technology that, in combination, minimizes the intake and mortality of marine life.

Thank you for consideration of our requests.

Sincerely,



Angela Haren
California Coastkeeper Alliance

Joe Geever
Surfrider Foundation

cc: Charles Hoppin, Chair, State Water Resources Control Board
John Garamendi, State Controller and Chair, State Lands Commission
Bonnie Neely, Chair, California Coastal Commission
Peter Douglas, Executive Director, California Coastal Commission
Sam Schuchat, Executive Officer, California Coastal Conservancy
Karen Douglas, Chair, California Energy Commission
Melissa Jones, Executive Director, California Energy Commission
Michael Peevey, President, Public Utilities Commission
Yakout Mansour, CEO, California ISO

Attachments

[15] California Public Resources Code § 35615 (a)(1).

ATTACHMENT 1:
ASSESSING SOUTHERN CALIFORNIA WATER STRATIES TABLE EXCERPTED FROM "WHERE WE WILL GET THE WATER? ASSESSING SOUTHERN CALIFORNIA'S FUTURE WATER STRATEGIES" LOS ANGELES ECONOMIC DEVELOPMENT CORPORATION, AUGUST 14, 2008.

Assessing Southern California Water Strategies

Strategy	2025 Regional Potential (TAF*)	Typical Project Characteristics							
		Timeframe (years)	Drought-Proof (Reliability)	Risk (Project Aborted)	Enviro Opinion	GHG	Initial Cap. Cost ($millions)	Annual Oper. Cost ($millions)	30-yr cost Treated ($/AF)
Strategies to Replace or Augment Imported Water									
Urban Water Conservation	1,100+	0-2	🟢	🟢	🟢	🟢	$0	$0.5	$210
Local Stormwater Capture	150+	3-5	🔴	🟢	🟢	🟢	$40-$63	$1-$3.5	$350+
Recycling	450+	6-10	🟢	🟡	🟢	🟡	$480	$30	$1,000
Ocean Desalination	150+	6-10	🟢	🟡	🔴	🔴	$300	$37	$1,000+
Groundwater Desalination	TBD	6-10	🟢	🟡	🟡	🟡	$24	$0.7	$750-$1,200
Strategies to Increase Imported Water									
Transfers-Ag to Urban	200+	1-5	🟡	🔴	🟡	🟢	n/a	n/a	$700+
Strategies to Increase Reliability									
Inter-agency Cooperation	**	0-5	🟢	🟡	🟢	🟢	low	low	n/a
Groundwater Storage	1,500+	3-5	🟡	🟡	🟢	🟡	$68-$135	$13	$580
Surface Storage	0	10+	🔴	🔴	🔴	🟡	$2,500+	$7.5-$15.5	$760-$1,400

*TAF-Thousand Acre-Feet
** Improves reliability and efficiency of existing supplies
Source: LAEDC

🟢 **Favorable** 🟡 **Neutral** 🔴 **Unfavorable**

LAEDC Consulting Practice

ATTACHMENT 2:
POWERS ENGINEERING REPORT ON
CARLSBAD-POSEIDON DESALINATION REPORT, OCTOBER 12, 2007.

Powers Engineering

Assessment of Energy Intensity and CO_2 Emissions Associated with Water Supply Options for San Diego County

Prepared for: Surfrider Foundation

Prepared by: Bill Powers, P.E., Powers Engineering

Date: October 12, 2007

Surfrider Foundation contracted Powers Engineering to provide a technical assessment of the energy intensity, in terms of kilowatt-hours per acre-foot of water, and associated carbon dioxide (CO_2) emissions associated with a range of water supply options for San Diego County. These water supply options evaluated include:

- Conservation
- Reuse (non-potable)
- Reuse (potable)
- Desalination (linked to existing once-through cooled power plant)
- Desalination (no linkage to existing power plant)
- Colorado River water transfers
- State Water Project water transfers

Citations for the energy intensity values and CO_2 emission factors for each water source option are provided in this analysis. The CO_2 emission rate calculation for each source option is also provided. Table 1 summarizes the energy intensity and CO_2 emissions associated with the supply and transport of water from each source option.

State Water Project (SWP) water imports are used as the baseline for comparison purposes in this analysis. San Diego County imports a significant amount of its water supply from the SWP. In 2006, SWP imports reached 232,000 acre-feet (AF).[1] This is one-third of the total 2006 water usage of approximately 690,000 (AF). Colorado River water imports reached 347,000 AF in 2006. A recent judicial ruling has called into doubt whether SWP imports will continue to be available in the quantities that San Diego County has historically imported.[2] As a result, in addition to addressing natural growth in water demand, San Diego County must also consider sources of water that can substitute for any reductions in the county's allotment of SWP imports. For this reason, the energy intensity and CO_2 emissions associated with SWP imports are appropriate baseline values to compare the energy intensity and CO_2 emissions of potential options.

[1] E-mail communication from Debbie Discar-Espe, senior water resources specialist - San Diego County Water Authority, to B. Powers, October 12, 2007.
[2] See **Attachment A**, San Diego County Authority Press Release, *SWP may cut-off supplies,* August 31, 2007.

A. Calculation of CO_2 Emission Rate for Reuse and Water Transfer Scenarios

The following energy intensity assumptions are used for calculation of CO_2 emission rates:

- Reuse, non-potable: 400 kWh per AF
- Reuse, potable: 2,246 kWh per AF
- Colorado River water transfers: 2,000 kWh per AF
- State Water Project water transfers: 3,200 kWh per AF
- The source will produce 56,000 AF per year (equal to 50 million gallons per day - Mgd) of water.

Energy intensity estimates for non-potable reuse, Colorado River water transfers, and SWP water transfers are from the August 2004 NRDC report, *Energy Down the Drain – The Hidden Costs of California's Water Supply*, Table 8, p. 34. The energy intensity estimate for potable reuse is from an October 10, 2007 e-mail communication from Jim Burror, engineering supervisor, Orange County Sanitation District (OCSD) to Bill Powers of Powers Engineering. OCSD estimates that the micro-filtration/reverse osmosis process being employed at OCSD to produce potable recycled water has an average energy demand of 20 MW to produce 78,000 AF-year of potable water. This converts to an energy intensity of 2,246 kWh per AF.[3] OCSD produces very high grade potable water that exceeds the quality of many current potable water sources in Southern California. As a result, the energy intensity of OCSD potable recycled water should be considered a conservative, upper-end estimate for potable recycled water. An article describing in detail the OCSD potable recycling process is provided as **Attachment B**. OCSD cites a typical energy intensity range for recycling water to potable grade of 800 to 2,000 kWh per AF in the article.

1. Calculate annual CO_2 emission rate for reuse, non-potable source:

$$\frac{400 \text{ kWh per AF} \times 56{,}000 \text{ AF} \times 0.915 \text{ lb per kWh}}{2{,}000 \text{ lb per ton}} = \textbf{10,248 tons } \mathbf{CO_2} \textbf{ per year}$$

2. Calculate annual CO_2 emission rate for reuse, potable source, per October 10, 2007 OCSD estimate of 20 MW continuous energy demand to produce 78,000 AF per year:

$$\frac{2{,}246 \text{ kWh per AF} \times 56{,}000 \text{ AF} \times 0.915 \text{ lb per kWh}}{2{,}000 \text{ lb per ton}} = \textbf{57,543 tons } \mathbf{CO_2} \textbf{ per year}$$

3. Calculate annual CO_2 emission rate for Colorado River water transfers:

$$\frac{2{,}000 \text{ kWh per AF} \times 56{,}000 \text{ AF} \times 0.915 \text{ lb per kWh}}{2{,}000 \text{ lb per ton}} = \textbf{51,240 tons } \mathbf{CO_2} \textbf{ per year}$$

4. Calculate annual CO_2 emission rate for State Water Project water transfers:

$$\frac{3{,}200 \text{ kWh per AF} \times 56{,}000 \text{ AF} \times 0.915 \text{ lb per kWh}}{2{,}000 \text{ lb per ton}} = \textbf{81,984 tons } \mathbf{CO_2} \textbf{ per year}$$

[3] OCSD potable reuse energy intensity: $\frac{20 \text{ MW} \times 8{,}760 \text{ hr/yr} \times 1{,}000 \text{ kW/MW}}{78{,}000 \text{ AF/yr}} = 2{,}246 \text{ kWh/AF}$

B. Calculation of Energy Intensity and Associated CO_2 Emission Rate for Desalination at Encina Power Plant With and Without Use of the Once-Through Cooling System

Assumptions:

- The EIR prepared by Poseidon Resources LLC for the 50 Mgd desalination project at Encina estimates a peak power demand of 35 MW and an average demand of 29.8 MW. An additional 0.5 MW of power would be required by the Oceanside booster pump station as well. Total average energy demand would be 30.3 MW. For this reason, the desalination plant is assumed to have a continuous energy demand of 30 MW for the purposes of calculating energy intensity.[4]
- The CO_2 emission rate for natural gas is 117 lb per million Btu. The heat rate of the two largest and newest units at Encina, Units 4 and 5, is approximately 10,000 Btu/kWh. These are the two primary operational units at Encina. The three older units, Units 1-3, rarely operate. As a result, the CO_2 emission rate is 1,170 lb CO_2 per MWh (or 1.17 lb per kWh) of power generated at Encina.[5]
- If the desalination project is not linked to the existing once through cooling system at Encina and the developer is not buying power directly from Encina, then a gerenic "market power purchase" CO_2 emission factor must be used. SDG&E assumes a market power purchase CO_2 emission factor of 915 lb CO_2 per MWh.
- The desalination plant will produce 50 Mgd of desalinated water.
- The April 2007 Dana Point cold water desalination feasibility study estimates an average energy demand of 7 MW to produce 16,000 AF per year of desalinated water.

1. Calculate desalination plant energy intensity (average) linked to Encina OTC:

$$\frac{30\ \text{MW} \times 1{,}000\ \text{kW/MW} \times 24\ \text{hours/day} \times 365\ \text{days/yr}}{56{,}000\ \text{AF/yr}} = \textbf{4,693 kWh per AF}$$

2. Calculate CO_2 emissions per year assuming desal plant has power contract with Encina and power is produced from Units 4 and 5 at Encina:

$$\frac{4{,}693\ \text{kWh per AF} \times 56{,}000\ \text{AF} \times 1.17\ \text{lb per kWh}}{2{,}000\ \text{lb per ton}} = \textbf{153,742 tons } \mathbf{CO_2}\textbf{ per year}$$

3. Calculate CO_2 emissions per year assuming the desalination plant is utilizing the once through cooling facilities of the Encina power plant but is buying power directly from the utility or a third party from unidentified sources:

$$\frac{4{,}693\ \text{kWh per AF} \times 56{,}000\ \text{AF} \times 0.915\ \text{lb per kWh}}{2{,}000\ \text{lb per ton}} = \textbf{120,235 tons } \mathbf{CO_2}\textbf{ per year}$$

4. Desalination, non-OTC case. Calculate CO_2 emissions per year assuming the Encina boilers are retired, the desalination plant has no once-through cooling host. Assume that 7 MW is

[4] City of Carlsbad, *Precise Development Plan and Desalination Plant Project Final Environmental Impact Report*, December 2005.

[5] Encina power plant CO_2 emission rate: (117 lb CO_2/million Btu)(10,000 Btu/kWh) = 1.17 lb CO_2 per kWh

required to produce 16,000 AF per year of desalinated water per the April 2007 Dana Point cold water desalination feasibility study. Also assume the desalination plant is buying power directly from the utility or a third party from unidentified sources:

a. Calculate desalination plant energy intensity for cold water desalination with no linkage to OTC:

$$\frac{7\text{ MW} \times 1{,}000\text{ kW/MW} \times 24\text{ hours/day} \times 365\text{ days/yr}}{16{,}000\text{ AF/yr}} = \textbf{3,833 kWh per AF}$$

b. Calculate CO_2 emissions per year assuming cold water desalination with no linkage to OTC discharge from Encina power plant:

$$\frac{3{,}833\text{ kWh per AF} \times 56{,}000\text{ AF} \times 0.915\text{ lb per kWh}}{2{,}000\text{ lb per ton}} = \textbf{98,201 tons } \mathbf{CO_2}\textbf{ per year}$$

Table 1. Energy Impacts of Water Supply and Transport Options for San Diego County

Option	Energy intensity (kWh/AF)	Energy intensity compared to State Water Project imports (%)	CO_2 emitted to produce and transport 56,000 acre-feet, equal to 50 Mgd (tons/year)
1. Conservation	0	**- 100**	**0**
2. Reuse, non-potable	400	**- 88**	**10,000**
3. Reuse, potable	2,200	**- 31**	**58,000**
4. Colorado River Water Transfers	2,000	**- 38**	**51,000**
5. State Water Project Transfers	3,200	**baseline**	**82,000**
6a. Desalination (linked to OTC), power purchased from Encina	4,700	**+ 47**	**154,000**
6b. Desalination (linked to OTC), open market power purchase	4,700	**+ 47**	**120,000**
7. Desalination (non-OTC), sub-seafloor intakes, open market power purchase	3,800	**+ 19**	**98,000**

Footnotes to Table 1, source of energy intensity and CO_2 emission estimates:

1. The relative energy intensity compared to the SWP baseline is calculated in the following manner: (option – SWP baseline) ÷ SWP baseline. For desalination with linkage to OTC the result is: (4,700 – 3,200) ÷ 3,200 = + 47 percent.
2. Conservation energy intensity. Assumed to be zero.
3. Non-potable reuse energy intensitycitation: Natural Resources Defense Council, *Energy Down the Drain – The Hidden Costs of California's Water Supply*, August 2004. San Diego County - Energy and Urban Water (case study), Table 8, p. 34.
4. Potable reuse energy intensity citation: The energy intensity for potable reuse provided by OCSD includes pumping the product water to percolation ponds for groundwater re-charge. A draft report by Wilkinson, Bren School - UC Santa Barbara, estimates water reuse with reverse osmosis at 1,280 kWh per AF. The more energy intensive OCSD figure is used in this analysis as a conservative estimate for potable reuse in San Diego County.
5. Colorado River Water Transfers energy intensity citation. Natural Resources Defense Council, *Energy Down the Drain – The Hidden Costs of California's Water Supply*, August 2004. San Diego County - Energy and Urban Water (case study), Table 8, p. 34.
6. State Water Project Transfers energy intensity citation: Natural Resources Defense Council, *Energy Down the Drain – The Hidden Costs of California's Water Supply*, August 2004. San
7. Energy intensity of desalination linked to NRG Encina plant OTC: See desalination calculations in text.
8. Energy intensity of desalination without OTC: See desalination calculations in text. There are variables that can increase or decrease the energy demand of "cold water" desalination relative to OTC desalination. These include the energy impacts of sub-seafloor intakes compared to using the heated discharge water from OTC. Cold water desalination issues are discussed in: *Engineering Feasibility Report: Dana Point Ocean Desalination Project* April, 2007, Chapter 4, p. 4-4. See: www.mwdoc.com. The executive summary of the engineering report with graphics of the sub-seafloor intakes is available at: http://www.mwdoc.com/documents/ProjectOverviewDanaPointOceanDesalinationProject-ExecutiveSummary.pdf. The assumptions used in Table 1 for the energy intensity of desalination without linkage to an OTC are taken from the Dana Point desalination feasibility study. The estimate for Dana Point is an average of 7 MW continuous energy demand to produce 16,000 AF per year of desalinated water. See p. 5, executive summary: *"The project site is located in Dana Point, California on property owned by South Coast Water District. The project capacity is estimated at 15 MGD or about 16,000 AFY. Electrical energy service provider is San Diego Gas & Electric Company and plant load will be 6 to 8 MW at 12 KV service."* This equates to an energy intensity of 3,830 kWh per AF if an average continuous energy demand of 7 MW is assumed to produce 16,000 AF per year.
9. SDG&E assigns a CO_2 emission rate of 915 lb per MW-hr (or 0.915 lb per kWh) for unidentified power purchased for use in SDG&E service territory.
10. The CO_2 emission rate for natural gas is 117 lb per million Btu. The heat rate of the two largest and newest units at Encina, Units 4 and 5, is approximately 10,000 Btu/kWh. These are the two primary operational units at Encina. The three older units, Units 1-3, rarely operate. As a result, the CO_2 emission rate is 1,170 lb CO_2 per MW-hr (or 1.17 lb per kWh) of power generated at Encina.

Summary of Costs and Benefits of Water Supply Alternatives

Linda Sheehan, CCKA
August 2009

This white paper compiles information regarding the relative costs of seawater desalination versus sustainable water supply strategies. In particular, the paper touches on water recycling, stormwater capture/reuse, and conservation as energy-efficient alternatives that can create millions of acre-feet of "new," local water supplies that are far less costly than seawater desalination and new surface storage. Each of these is briefly discussed below. Attached for reference is a detailed graphic from the recent LAO's October 2008 Water Primer[1] as well as relevant pages from a recent Los Angeles business group report on water strategies and a Pacific Institute report on desalination.

DESALINATION

Seawater desalination has consistently been found in study after study to be more costly and more energy intensive than most if not all other sources of water. The Pacific Institute compared the costs of seawater desalination, water recycling and gravity-fed surface water from 1971 through 2005 and consistently found that desalination was far more costly than the other two sources examined.[2] A more recent Southern California business leader report found that not only was desalination more costly than many other sources, it also scored by far the worst of all sources on greenhouse gas emissions.[3] The report stated that:

> [d]esalination facilities are expensive to build, and they must be located near a large source of salty water like the ocean. A large amount of energy is required in the reverse osmosis process to push salty water at high pressure through a membrane. Because of this, desalination plants will not be economically viable without subsidies unless the price of competing sources go up.[4]

It should be noted that the cost data for desalination in the report, however, were provided by Poseidon Resources, the builder and proponent of desalination facilities. The report accordingly added that:

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[1] CA Legislative Analyst's Office, "California's Water: An LAO Primer," Ch. 6 (Oct. 2008) (LAO Report), available at: http://www.lao.ca.gov/2008/rsrc/water_primer/water_primer_102208.pdf (see Attachment 1). Water savings could also be obtained from such actions as land retirement and groundwater treatment as well; these could be reviewed separately.
[2] Pacific Institute, "Desalination, with a Grain of Salt: A California Perspective," at p. 58, Figures 19 and 20 (June 2006), available at: http://www.pacinst.org/reports/desalination/desalination_report.pdf (see Attachment 2).
[3] LAEDC, "Where Will We Get the Water? Assessing Southern California's Future Water Strategies," at p. 2 (Aug. 14, 2008) (LAEDC Report); available at: http://www.laedc.org/sclc/documents/Water_SoCalWaterStrategies.pdf (see Attachment 3).
[4] *Id.* at p. 16.

> Over half the revenue generated per acre-foot will be used to amortize the debt incurred in constructing the $300 million plant. If the plant operates significantly below capacity, the debt payments will be spread over fewer acre-feet, so the price per acre-foot will rise. This is a real concern—Poseidon developed a plant in Florida that has consistently produced less water than its forecast production capacity.[5]

Finally, as indicated in Attachment 1, the LAO also found ocean desalination to be costlier than most other water supply strategies.

These significant cost figures, moreover, tend to ignore seawater desalination's enormous energy and GHG emission costs. As noted above, the Los Angeles Economic Development Corporation found ocean desalination to emit more greenhouse gases than any water source. The Inland Empire Utilities Agency, in a presentation before the State Water Board in March 2009, similarly reported that ocean desalination uses *over ten times more energy* in its service area than water recycling.[6]

SUSTAINABLE WATER STRATEGIES

Water Recycling

DWR's 2005 Water Plan finds that "[t]here is a potential of about 0.9 million to 1.4 million acre-feet annually of *additional* water supply from recycled water by the year 2030."[7] The costs associated with water recycling can vary significantly with the level of treatment and the amount of infrastructure (pipes, etc.) needed. In light of the wide range of local conditions that can affect costs, the majority of applications would cost between $300 and $1,300 per acre-foot of recycled water.[8]

The more recent Los Angeles County Economic Development Corporation (LAEDC) report identifies more than 30 recycling projects in Los Angeles, Orange County, San Diego and the Inland Empire alone with the potential of yielding more than 450,000 acre-feet of water within five years.[9] This report states that "[w]ater recycling projects require a significant amount of initial capital because expensive treatment and distribution facilities must be constructed and winter storage is required to fully utilize available wastewater"; it then estimates a cost averaging $1,000 per acre-foot to produce highly treated recycled water in Orange County.[10] Recycled water treated for less sensitive uses and with lower infrastructure costs (at the Eastern Municipal Water District) averaged $350 per acre-foot, by contrast.[11]

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[5] *Id.*
[6] Martha Davis, Inland Empire Utilities Agency, Presentation to SWRCB (March 2009), available at: http://www.swrcb.ca.gov/water_issues/programs/climate/docs/ieua_030409.pdf. *See also* California Energy Commission, "Life-cycle Energy Assessment of Alternative Water Supply Systems in California" (CEC-500-2005-101) available at http://www.energy.ca.gov/research/environmental/project_summaries/PS_500-02-004_HORVATH.PDF (evaluating the global warming potential of desalination versus recycling and import of water).
[7] DWR, "California Water Plan Update 2005," DWR Bulletin 160-05, at p. 16-2 (Dec. 2005) (2005 Water Plan) (emphasis added), available at http://www.waterplan.water.ca.gov/docs/cwpu2005/vol2/v2ch16.pdf.
[8] *Id.*
[9] LAEDC Report at p. 13.
[10] *Id.*
[11] *Id.* at p. 14.

The benefits associated with reducing the energy embedded in water must also be considered in assessing overall costs, however. As discussed in the California's AB 32 Scoping Plan,[12] the DWR report, "Water Recycling 2030: Recommendations of California's Recycled Water Task Force,"[13] finds that "approximately ten percent of municipal wastewater in California is being recycled, but as much as 23 percent of the municipal wastewater flow could be recycled." The California Energy Commission has reported that water supply and conveyance of water from northern to southern California consumes an estimated 3.2 MWh per acre foot (AF). In contrast, the estimated energy needed to recycle wastewater is approximately 0.7 MWh per AF (which will vary with the level of treatment required). As a result, the potential energy savings that could be realized through water recycling, based on the 23 percent recycling goal by 2030, is estimated as 2.5 MWh per AF in southern California communities that import water.[14]

Stormwater Capture/Reuse

The AB 32 Scoping Plan specifically promotes low-impact development (LID) as an energy-efficient, sustainable water source, and adds that up to 333,000 acre-feet of stormwater could be captured annually in urban Southern California alone.[15] This would achieve a corresponding 200,000 metric tons of carbon dioxide reductions by 2020.[16] In an August 2008 report covering Los Angeles, Orange, San Bernardino, San Diego, Riverside and Ventura counties, the LAEDC highly ranked "local stormwater capture" as a cost-effective, energy efficient, relatively immediate local water source, ranking far higher than desalination and new dams. The report found a potential for "[h]undreds of thousands of acre-feet" of water from stormwater capture and reuse.[17] Sample projects include the Inland Empire Utility Agency's water recharge project, which will capture 15,000 to 20,000 acre-feet per year, and the Coachella Valley Water District's project in La Quinta, which will capture 40,000 acre-feet per year via 39 recharge basins on 165 acres.[18] An August 2009 report by NRDC and the Bren School at U.C. Santa Barbara estimates that implementing LID practices solely in new and re-developments in urban Southern California and parts of the Bay Area can yield over 400,000 acre-feet of water annually by 2030 – roughly *two-thirds* of Los Angeles' water use each year.[19]

The January 2009 California Little Hoover Commission report on water governance echoes that:

> [a] 2005 report by the Los Angeles and San Gabriel Rivers Watershed Council noted that 500,000 acre-feet of stormwater runoff flow from the Los Angeles County basin to the ocean each year. The report noted that if the region could instead capture that water and reuse it, Southern California would be less dependent on water imports from Northern California.[20]

DWR's 2005 Water Plan reports similarly that:

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[12] California Air Resources Board, "Climate Change Scoping Plan," (Dec. 2008) (AB 32 Scoping Plan), available at: http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm.
[13] http://www.owue.water.ca.gov/recycle/docs/TaskForceReport.htm.
[14] AB 32 Scoping Plan, Volume 1, at p. C-133, available at: http://www.arb.ca.gov/cc/scopingplan/document/appendices_volume1.pdf.
[15] *Id.* at p. C-135.
[16] *Id.*
[17] LAEDC report at pp. 9-10.
[18] *Id.* at p. 10.
[19] NRDC and U.C. Santa Barbara, "A Clear Blue Future," at p. 4 (Aug, 2009) (NRDC Report), available at: http://www.nrdc.org/water/lid/.
[20] California Little Hoover Commission, "Clearer Structure, Cleaner Water," at p. 81 (Jan. 2009), available at: http://www.lhc.ca.gov/studies/195/report195.pdf.

> The Fresno-Clovis metropolitan area has built an extensive network of storm water retention basins that not only recharges more than 70 percent of the annual storm water runoff (17,000 acre-feet) and removes most conventional storm water pollutants, but also recharges excess Sierra snow melt during the late spring and summer (27,000 acre-feet). Los Angeles County recharges an average 210,000 acre-feet storm runoff a year, which reduces the need for expensive imported water. Agencies in the Santa Ana Watershed recharge about 78,000 acre-feet of local storm runoff a year. The Los Angeles and San Gabriel Watershed Council has estimated that if 80 percent of the rainfall that falls on just a quarter of the urban area within the watershed (15 percent of the total watershed) was captured and reused, total runoff would be reduced by about 30 percent. That translates into a new supply of 132,000 acre-feet of water per year or enough to supply 800,000 people for a year.[21]

LID water management strategies are a "major area" of activity for the State Water Board under its 2008-2012 Strategic Plan, which states that LID simultaneously improves water quality and water supply, enhances neighborhoods, and provides flood control. U.S. EPA found that using LID methods rather than traditional storm water management resulted in cost *savings* of between 15% and 80%.[22]

As is the case for water recycling, the costs associated with LID vary and depend on the situation and locale. The LAEDC report found that notable initial costs can be incurred if aquifer storage is sought (boundaries must be established to protect against contamination, rights to the groundwater must be obtained, associated infrastructure must be installed, etc.). Gravity feeds of excess water into the ground can keep maintenance costs low, though a spreading basin can require significant maintenance to optimize the permeability of the soil. In consideration of these variables, though, the LAEDC report still found very low relative costs, on the order of $350 per AF, based on projects planned and operated by the Inland Empire Utility Agencies and the Coachella Valley Water District.[23] Cities such as Seattle also have found significant savings using LID in street design or improvement projects, which they determined "cost about 10 to 20 percent less than traditional street redevelopment with curb, gutter, catch basins, asphalt, and sidewalks."[24]

Water Conservation/Efficiency

Using water more efficiently is one of the key ways to provide water for a growing California. As discussed in the AB 32 Scoping Plan, the Governor directed State agencies to develop and implement a plan to achieve a 20 percent reduction in per capita urban water use by 2020. California should achieve approximately 1.8 million acre-feet of urban water use efficiency by 2020 to meet the Governor's call.[25] This would achieve a corresponding 1.4 million metric tons of carbon dioxide reductions by 2020.[26] Another study (Pacific Institute's "Waste Not, Want Not") indicated even greater potential savings of 2 to 2.3 million acre-feet per year from existing urban conservation techniques.[27] The LAEDC report found that in Los Angeles, Orange, San Bernardino, San Diego, Riverside and Ventura

[21] 2005 Water Plan at p. 21-3, available at http://www.waterplan.water.ca.gov/docs/cwpu2005/vol2/v2ch21.pdf.
[22] *See* U.S. EPA LID website at: http://www.epa.gov/nps/lid/.
[23] LAEDC Report at pp. 10-11.
[24] NRDC Report at p. 14.
[25] AB 32 Scoping Plan, Volume 1, at p. C-132.
[26] *Id.*
[27] 2005 Water Plan at pp. 22-2 – 22-3, available at: http://www.waterplan.water.ca.gov/docs/cwpu2005/vol2/v2ch22.pdf.

counties, "[u]rban water conservation could have an impact equivalent to adding more than 1 million acre-feet of water to the regional supply (about 25% of current annual use."[28]

The California Bay Delta Authority (CBDA) sponsored a study of urban water conservation potential as part of its comprehensive review of the Water Use Efficiency Element of the CALFED Bay-Delta Program. The CBDA estimated the technical potential for water savings by 2030 at approximately 3.1 million acre-feet per year. Advances in water-saving technology over the next 25 years, which the CBDA analysis did not evaluate, potentially could push savings beyond that.[29]

Costs also favor increased water conservation/efficiencies. The LAEDC report cost out Santa Monica's conservation strategies in its Sustainable Cities Plan at $210 per AF of water saved.[30] The Legislative Analyst's Office wrote recently that according to DWR estimates, urban water use efficiency costs about $1,000 to achieve one acre–foot of water savings per year, making urban water use efficiency "both the most cost–beneficial and the highest potential water producer of all of the solutions evaluated." By contrast, CALFED surface storage (a longer–term solution) costs about $10,000 to achieve one acre–foot of water savings per year.[31]

With respect to agricultural water use efficiency, the 2005 Water Plan reports that the CALFED Record of Decision "estimates that efficiency improvements will result in a water savings (reduction in irrecoverable flows also referred to as net water use) ranging between 120,000 to 563,000 acre-feet per year by 2030. The study also showed a 1.6 million AF per year reduction in applied water (combined recoverable and irrecoverable flows) that provides environmental and crop production benefits."[32] The referenced ROD further "estimates the cost of 563,000 acre-feet net water savings at $35 to $900 per acre-foot."[33] Additional information on costs associated with agricultural water conservation can be found in a just-released report by the Pacific Institute.[34]

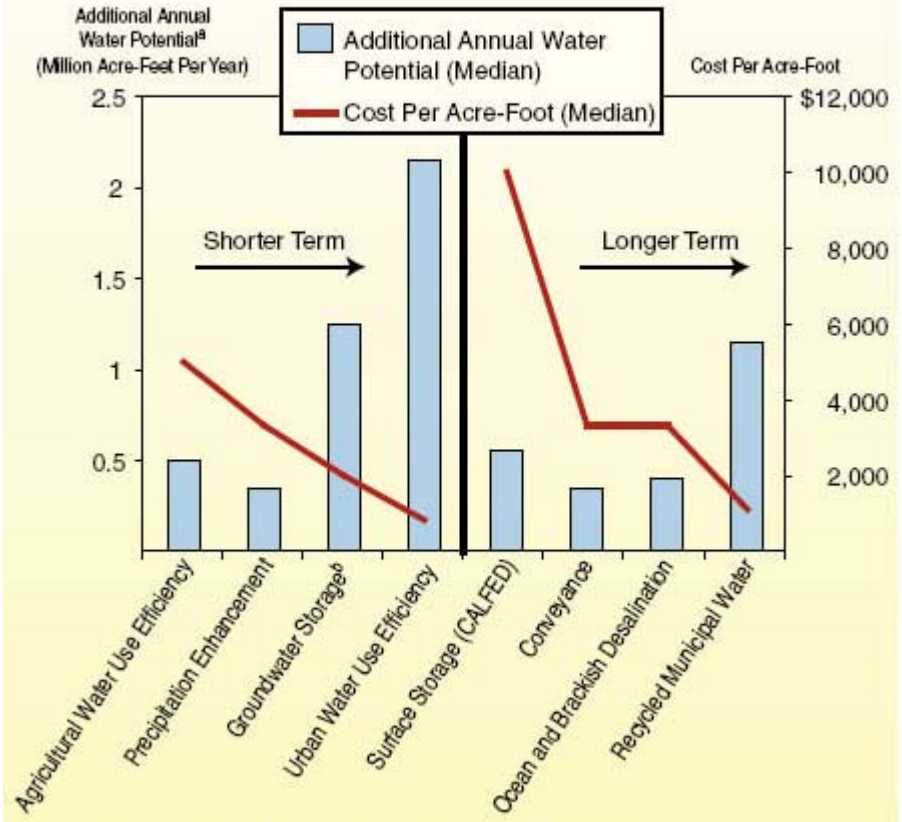
[28] LAEDC Report at p. 6.
[29] 2005 Water Plan at pp. 22-3 – 22-4.
[30] LAEDC Report at pp. 7-8.
[31] LAO Report at pp. 65-67.
[32] 2005 Water Plan at p. 3-5, available at http://www.waterplan.water.ca.gov/docs/cwpu2005/vol2/v2ch03.pdf.
[33] *Id.* at p. 3-7 (costs would need to be normalized to ensure a consistent statewide baseline, such as in the LAEDC report – *see* attached LAEDC table).
[34] Pacific Institute, "Sustaining California Agriculture in an Uncertain Future" (July 2009), available at: http://www.pacinst.org/reports/california_agriculture/final.pdf.

ATTACHMENT 1:

LAO ANALYSIS OF BENEFITS AND COSTS OF WATER SUPPLY ALTERNATIVES

Figure 2

Options for Additional Water Supply: Benefits and Costs



[a]Reflects the midrange of estimates of water supply development potential of particular solutions, Department of Water Resources, California Water Plan 2005.
[b]Includes integrated management of groundwater and surface water.

Legislative Analyst's Office, "California's Water: An LAO Primer" (Oct. 22, 2008), http://www.lao.ca.gov/2008/rsrc/water_primer/water_primer_102208.pdf

ATTACHMENTS 2 AND 3

ATTACHMENT 2:

COMPARATIVE COSTS OF DESALINATION, WATER RECYCLING AND GRAVITY-FED SURFACE WATER

Pacific Institute, "Desalination, with a Grain of Salt: A California Perspective," Fig. 19-20 (June 2006), http://www.pacinst.org/reports/desalination/desalination_report.pdf

ATTACHMENT 3:

ASSESSMENT OF SOUTHERN CALIFORNIA'S FUTURE WATER STRATEGIES

LAEDC, "Where Will We Get the Water?" (Aug. 14, 2008), http://www.laedc.org/sclc/documents/Water_SoCalWaterStrategies.pdf

without accounting for energy price increases.

Figures 19 and 20 show the cost time trends for the relative cost of potable water from a typical ocean desalination, wastewater recycling, and gravity surface water source, in Northern and Southern California, using the electricity price time series described above, from 1971 through 2005. By relative cost, we mean that the cost of each option has been normalized to "1" in the first year of the time series. This does not mean that the three options have equal costs in that year. The normalization simply makes the comparison of options over time more convenient. The figures show that the upward trend in cost, and the year-to-year volatility in cost, varies significantly by source as a function of energy intensity. Potable water produced by seawater desalination rises in cost more rapidly than other sources, and has greater year-to-year variability, because less of its cost is due to fixed capital expenses.

Figure 19
Relative Cost of Potable Water from a Typical Ocean Desalination, Wastewater Recycling, and Gravity Surface Water Source in the Los Angeles Metropolitan Area

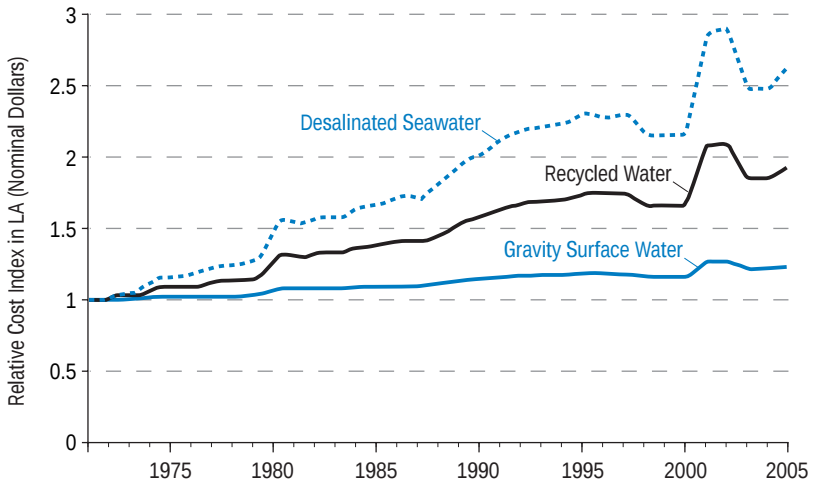
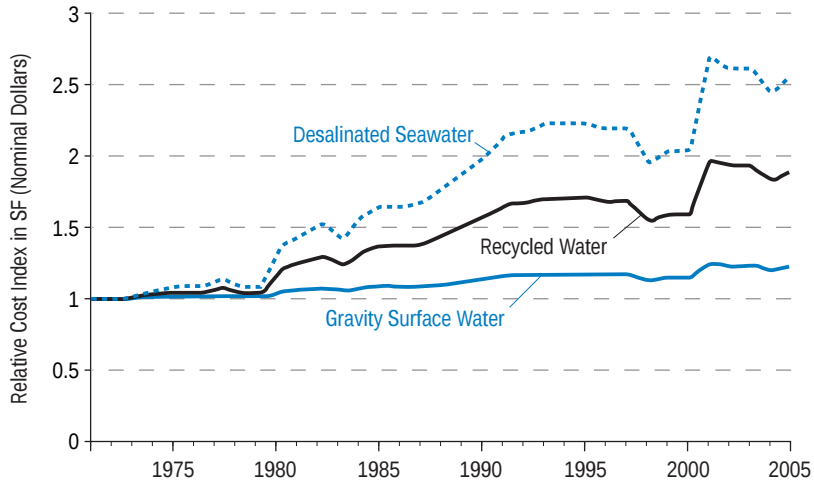


Figure 20
Relative Cost of Potable Water from a Typical Ocean Desalination, Wastewater Recycling, and Gravity Surface Water Source in the San Francisco-Oakland-San Jose Area



Assessing Southern California Water Strategies

Strategy	2025 Regional Potential (TAF*)	Typical Project Characteristics							
		Timeframe (years)	Drought-Proof (Reliability)	Risk (Project Aborted)	Enviro Opinion	GHG	Initial Cap. Cost ($millions)	Annual Oper. Cost ($millions)	30-yr cost Treated ($/AF)
Strategies to Replace or Augment Imported Water									
Urban Water Conservation	1,100+	0-2	🟢	🟢	🟢	🟢	$0	$0.5	$210
Local Stormwater Capture	150+	3-5	🔴	🟢	🟢	🟢	$40-$63	$1-$3.5	$350+
Recycling	450+	6-10	🟢	🟡	🟢	🟡	$480	$30	$1,000
Ocean Desalination	150+	6-10	🟢	🟡	🔴	🔴	$300	$37	$1,000+
Groundwater Desalination	TBD	6-10	🟢	🟡	🟡	🟡	$24	$0.7	$750-$1,200
Strategies to Increase Imported Water									
Transfers-Ag to Urban	200+	1-5	🟡	🔴	🟡	🟢	n/a	n/a	$700+
Strategies to Increase Reliability									
Inter-agency Cooperation	**	0-5	🟢	🟡	🟢	🟢	low	low	n/a
Groundwater Storage	1,500+	3-5	🟡	🟡	🟢	🟡	$68-$135	$13	$580
Surface Storage	0	10+	🔴	🔴	🔴	🟡	$2,500+	$7.5-$15.5	$760-$1,400

*TAF-Thousand Acre-Feet
** Improves reliability and efficiency of existing supplies
Source: LAEDC

🟢 **Favorable** 🟡 **Neutral** 🔴 **Unfavorable**

LAEDC Consulting Practice

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November 17, 2009

The Honorable Daniel Hancock, Chair and Commissioners
Little Hoover Commission
925 L Street, Suite 805
Sacramento, CA 95814
VIA ELECTRONIC MAIL

Re: Little Hoover Commission Advisory Committee Meeting, November 18, 2009
Water Governance: Conservation

Dear Chair Hancock and Commissioners:

On behalf of the California Coastkeeper Alliance (CCKA), which represents 12 Waterkeepers from the Oregon border to San Diego, I welcome the opportunity to submit these responses to the some of the questions raised by the Little Hoover Commission's (Commission) for its advisory committee meeting on water conservation. CCKA and its member Waterkeepers advocate regularly at the local, regional and state level in support of clean, abundant water flows in our waterways and sustainable water supplies. We have submitted written comments to the Commission on overall water governance issues dated June 23rd, and on water rights issues dated August 14th; these are incorporated by reference.

HOW CAN THE STATE IMPROVE ITS CONSERVATION STRATEGIES AND HOW MUCH CAN LEADERS EXPECT TO GAIN FROM CONSERVATION EFFORTS?

Using water more efficiently is one of the key ways to ensure water for a growing California, and at the same time reduce the state's carbon footprint. In California, the extraction, conveyance, local distribution, treatment and use of water accounts for 19 percent of the total demand for electricity and 30 percent of the non-power plant natural gas consumption.[1] As discussed in California's groundbreaking plan for reducing greenhouse gas emissions,[2] the Governor called on the state in 2008 to develop and implement a plan to achieve a 20 percent

[1] California Energy Commission, "California's Water-Energy Relationship," p. 1 (Nov. 2005), available at: http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF.
[2] California Air Resources Board, "Climate Change Scoping Plan," (Dec. 2008) (AB 32 Scoping Plan), available at: http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm.

reduction in per capita water use statewide by 2020.[3] California would need to achieve approximately 1.8 million acre-feet of urban water use efficiency by 2020 to meet the Governor's call.[4] These reductions are discussed in the AB 32 Scoping Plan because they would achieve a corresponding *1.4 million metric tons* of carbon dioxide reductions by 2020.[5]

Pacific Institute's 2003 state-sponsored study found that such water use reductions are feasible and cost-effective, and indeed identified an even greater potential savings of 2 to 2.3 million acre-feet per year just from existing urban conservation techniques.[6] This report found that "[e]ven without improvements in technology . . . indoor residential use could be reduced by . . . almost 40 percent."[7] The same report found that with respect to outdoor residential use, "cost-effective[8] reductions of at least 32.5% . . . could be made relatively quickly with improved management practices and available irrigation technology."[9] A consortium of business entities in Southern California similarly found that in Los Angeles, Orange, San Bernardino, San Diego, Riverside and Ventura counties alone, "[u]rban water conservation could have an impact equivalent to adding more than 1 million acre-feet of water to the regional supply (about 25% of current annual use)."[10]

The California Bay Delta Authority (CBDA) sponsored yet another study of urban water conservation potential, as part of its comprehensive review of the Water Use Efficiency Element of the CALFED Bay-Delta Program. The CBDA estimated the potential for water savings by 2030 at approximately 3.1 million acre-feet per year, again well over the 20% called for in the Governor's Executive Order. Expected advances in water-saving technology over the next 25 years, which the CBDA analysis did not evaluate, potentially could push savings beyond that figure.[11]

Though the greatest research attention has been paid to residential water use, studies have also been done of savings specific to California's commercial, industrial and institutional water users. These sectors consume roughly 2.5 million acre-feet of water annually, or about one-third of all the water used in California's urban areas. There are numerous, cost-effective strategies that

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[3] Letter from Governor Arnold Schwarzenegger to Senators Don Perata, Darrell Steinberg Mike Machado (Feb. 28, 2008), available at: http://www.swrcb.ca.gov/water_issues/hot_topics/20x2020/docs/govltr_to_legislature022808.pdf. The Department of Water Resources' later plan to implement this goal limited the proposed 20% per capita reduction to urban water use only, despite the fact that the Governor's letter did not include the same limitation.

[4] AB 32 Scoping Plan, Volume 1, at p. C-132.

[5] *Id.*

[6] Pacific Institute, "Waste Not, Want Not: The Potential for Urban Water Conservation in California," p. 1 (Nov. 2003), available at: http://www.pacinst.org/reports/urban_usage/waste_not_want_not_full_report.pdf ("Waste Not, Want Not"); cited in DWR, "California Water Plan Update 2005," DWR Bulletin 160-05, at pp. 22-2–22-3 (Dec. 2005) (2005 Water Plan), available at: http://www.waterplan.water.ca.gov/docs/cwpu2005/vol2/v2ch22.pdf.

[7] "Waste Not, Want Not" at p. 6.

[8] The report defines measures as being "cost-effective" when their unit cost is "less than the unit cost of the cheapest alternative for new or expanded water supply." *Id.* at p. 11.

[9] *Id.* at p. 7.

[10] Los Angeles County Economic Development Corporation (LAEDC), "Where Will We Get the Water? Assessing Southern California's Future Water Strategies," at p. 6 (Aug. 14, 2008) (LAEDC Report); available at: http://www.laedc.org/sclc/documents/Water_SoCalWaterStrategies.pdf (Attachment 2).

[11] 2005 Water Plan at pp. 22-3 – 22-4.

can be applied to achieve significant water savings in this sector, with a potential for savings from 710,000 to 1.3 million acre-feet per year, and a best estimate of 975,000 AF/yr.[12]

Additional attention also should be made to improving efficiency by reducing losses during water transport. Many drinking water systems, for example, "lose as much as 20 percent of treated drinking water each year due to leaks in their pipe networks."[13] Basic infrastructure upkeep of pipes, canals, and other conveyances can yield significant water savings.

Costs also favor increased water conservation and efficiencies. Based on Department of Water Resources (DWR) estimates, the nonpartisan Legislative Analyst's Office found that urban water use efficiency conservatively costs $1,000 to achieve one acre–foot of water savings per year, making urban water use efficiency "both the most cost–beneficial and the highest potential water producer of all of the solutions evaluated."[14] By contrast, surface storage can cost roughly $10,000 to achieve one acre–foot of water savings per year.[15] The LAEDC report estimated that Santa Monica's water conservation strategies in its Sustainable Cities Plan in fact would *save* $210 per acre-foot of water conserved.[16]

With respect to agricultural water use efficiency, the CALFED Record of Decision "estimates that efficiency improvements will result in a water savings (reduction in irrecoverable flows also referred to as net water use) ranging between 120,000 to 563,000 acre-feet per year by 2030," as well as a projected "1.6 million AF per year reduction in applied water (combined recoverable and irrecoverable flows)."[17] The cost of the higher-end net water savings level of 563,000 acre-feet was estimated to range from $35 to $900 per acre-foot."[18]

A recently-released Pacific Institute report similarly found significant feasible water savings from agriculture.[19] The report explored three technology and management options for improving the efficiency of water use in California agriculture: efficient irrigation technology (*i.e.*, "shifting a fraction of the crops irrigated using flood irrigation to sprinkler and drip systems"), improved irrigation scheduling ("using local climate and soil information to help farmers more precisely irrigate to meet crop water needs"), and regulated deficit irrigation ("applying less water to crops during drought-tolerant growth stages to save water and improve crop quality or yield"). The report concludes that all three scenarios evaluated "conservatively

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[12] "Waste Not, Want Not" at 77. *See also* NRDC, "Making Every Drop Work: Increasing Water Efficiency in California's Commercial, Industrial and Institutional (CII) Sector" (May 2009), available at: http://www.nrdc.org/water/cacii/.

[13] NRDC, "Water Efficiency Saves Energy: Reducing Global Warming Pollution through Water Use Strategies," p. 3 (March 2009), available at: http://www.nrdc.org/water/files/energywater.pdf (citing Congressional Budget Office, Future Investment in Drinking Water and Wastewater Infrastructure," p. 8 (Nov. 2002), available at: www.cbo.gov/ftpdocs/39xx/doc3983/11-18-WaterSystems.pdf).

[14] California Legislative Analyst's Office, "California's Water: An LAO Primer," at pp. 65-67 (Oct. 2008) (LAO Report), available at: http://www.lao.ca.gov/2008/rsrc/water_primer/water_primer_102208.pdf.

[15] *Id.*

[16] LAEDC Report at pp. 7-8.

[17] 2005 Water Plan at p. 3-5, available at http://www.waterplan.water.ca.gov/docs/cwpu2005/vol2/v2ch03.pdf.

[18] *Id.* at p. 3-7 (costs would need to be normalized to ensure a consistent statewide baseline, such as in the LAEDC report – *see* attached LAEDC table).

[19] Pacific Institute, "Sustaining California Agriculture in an Uncertain Future" (July 2009), available at: http://www.pacinst.org/reports/california_agriculture/final.pdf ("Sustaining California Agriculture").

show the potential for significant water savings," with a combined potential savings of "between 4.5 million acre-feet in a wet year and 6.0 million acre-feet in a dry year," or a *17 percent reduction in agricultural water use* from only the three scenarios studied.[20] The Pacific Institute report concludes that:

> [b]y investing in "drought-proof" strategies, California farmers can reduce their vulnerability to the kinds of water-supply constraints experienced in the past three years due to drought. Because climate change is expected to increase the frequency and intensity of droughts, these measures can also help California farmers improve their resilience to a changing climate.[21]

The Governor's 2008 letter to the Legislature calling for a 20% reduction in water use per capita statewide was a step in the right direction in terms of increasing conservation around the state. The recently-signed SB X7 7, however, scaled back on these initial steps. For example, the new statute does not mandate conservation strategies for agriculture, which uses 80% of the water in the state, despite their feasibility. This leaves a huge gap in the state's conservation potential. Moreover, SB X7 7 establishes loopholes that may allow some urban areas to avoid further conservation completely.[22] Finally, while violators may become ineligible for state (though not federal) grants and loans, there are no enforcement provisions or fines for not meeting the set targets. These provisions may have the unfortunate effect of creating the impression that water conservation has been addressed, thereby stalling additional needed efforts that would lead to meaningful, swift, sustainable water use reductions and increased efficiencies.

WHAT INCENTIVES CAN BE USED TO GET URBAN AREAS AND AGRICULTURAL WATER USERS TO REDUCE THE AMOUNT OF WATER THEY USE?

Incentives, which are discussed further in the following section of this comment letter, are a key component of a successful water policy. They can be focused on very specific uses (such as rebates for low-flow shower heads), and can also cut across broad categories of uses. For example, one coordinated urban-agriculture incentive approach could be for the state to develop new mechanisms by which municipal water entities invest in agricultural irrigation systems in exchange for some portion of the water conserved.[23] Incentive programs have a long track record of success and should be reviewed further, as discussed below.

Immediate focus should additionally be placed on *erasing disincentives* to conservation. There are numerous hurdles that block effective implementation of conservation programs. A number of these will be politically difficult to address, but they must be corrected for California to have a sustainable water future. For example, a major hurdle to improving water conservation lies

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[20] *Id*. at p. 6. *See also* California Agricultural Water Stewardship Initiative, "Dry Farming," available at: http://agwaterstewards.org/txp/Resource-Center-Articles/22/dry-farming.

[21] "Sustaining California Agriculture" at p. 6.

[22] *See, e.g*., Paul Rogers, "Schwarzenegger signs water conservation bill in San Jose," *San Jose Mercury News* (Nov. 10, 2009), available at: http://www.mercurynews.com/breaking-news/ci_13757425 ("The new law also allows urban districts to measure the 20 percent by taking a 10-year average starting as far back as 1994 and comparing per-capita use then and in 2020. Because of population growth, agencies could meet the target while using more water in 2020 than today.")

[23] "Sustaining California Agriculture" at p. 7.

in the pricing of water. As noted by the Pacific Institute, water is often wasted when it is not properly priced.[24] Proper pricing encourages appropriate investment in conservation and efficiency (though a lifeline rate should be set to ensure that basic human needs are met regardless of ability to pay).[25]

On the urban side, tiered rate structures are already being adopted to help advance conservation.[26] Effective pricing is similarly key in the agricultural sector, including re-examination of inefficient and inappropriate subsidies related to low-value, water-intensive crops.[27] Another example of removing pricing disincentives to conservation would be for the U.S Bureau of Reclamation to "re-visit its water rate structures, ensuring that all water use does not fall within the first tier and that there are large increases between tiers."[28] Moreover, California "should require that all water deliveries, including the settlement contractors . . . be subject to tiered pricing."[29]

Disincentives to conservation could be broadly redressed, and incentives supported, through adoption of a "water loading order" similar to the state's energy loading order, which was adopted as part of the state's first Energy Action Plan.[30] California's energy loading order:

> established that the state, in meeting its energy needs, would invest first in energy efficiency and demand-side resources, followed by renewable resources, and only then in clean conventional electricity supply. This concept is now widely understood and respected both nationally and internationally.[31]

A "loading order for water" would similarly establish and implement state policy for supporting and investing in water conservation as a top priority, followed by capture and reuse of water as the next priority (including water recycling and use of low-impact development techniques that capture stormwater), followed lastly by the development of efficient, low-polluting conventional water supply strategies. The need for, and strategy for developing and implementing, a water loading order was discussed as well in NRDC's "Transforming Water Use,"[32] which among other

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[24] "Waste Not, Want Not" at p. 14.
[25] AB 1242 (Ruskin, 2009) would have established state policy that "every human being has the right to clean, affordable, and accessible water for human consumption, cooking, and sanitary purposes, that is adequate for the health and well-being of the individual and family." The bill was passed by the Legislature but vetoed by Governor Schwarzenegger.
[26] Letter from Karen Franz, San Diego Coastkeeper to Chair Donna Frye and Council Members, San Diego City Council. "City of San Diego Emergency Water Regulations - Water Allocation Methodology" (March 25, 2009), available at: http://www.sdcoastkeeper.org/assets/pdf/campaigns/waterSupply/SDCKLevel2DroughtResponseLtr5-5-09.pdf.
[27] Pacific Institute, "California Water 2030: An Efficient Future," p. 7 (Sept. 2005), available at http://www.pacinst.org/reports/california_water_2030/ca_water_2030.pdf ("California Water 2030").
[28] "Sustaining California Agriculture" at p. 8.
[29] *Id.* at p. 9.
[30] California Public Utilities Commission and California Energy Commission, "Energy Action Plan: 2008 Update," p. 1 (Feb. 2008), available at: http://www.energy.ca.gov/2008publications/CEC-100-2008-001/CEC-100-2008-001.PDF; *see also* http://www.energy.ca.gov/energy_action_plan/.
[31] *Id.; see also* SB 1037 (Kehoe 2005).
[32] NRDC, "Transforming Water Use: A California Water Efficiency Agenda for the 21st Century" (Sept. 20, 2007), available at: http://deltavision.ca.gov/BlueRibbonTaskForce/Feb28_29/Handouts/BRTF_Item_5A_HO2.pdf.

things called for a public good surcharge on every acre-foot of water delivered in California to fund water conservation and efficiency programs.[33]

Efforts similar to those that would populate a statewide water loading order are already taking place in the private water arena. The CPUC's "Water Action Plan"[34] addresses the 20% of water that is delivered by private water utilities. This Plan "identifies the policy objectives that will guide the [CPUC] in regulating the investor-owned water utilities and highlights the actions that the Commission anticipates or will consider taking in order to implement these objectives."[35] Included in the Plan, and reproduced in Attachment 1, is a discussion of the CPUC's strategy to strengthen water conservation programs among regulated utilities to a level comparable to energy utilities.[36]

Finally, closely related to the issue of pricing disincentives is the perverse discouragement of conservation due to its integration with water district revenues. Specifically, in some areas of the state, conservation has been so successful that it is now impacting water districts' short-term revenues. Incredibly, this in turn is causing some districts to scale back on their conservation in order to ensure enough water sales to keep up their cash flow.[37] There is an obvious need to decouple water conservation from revenues to avoid spread of this phenomenon. A well-crafted loading order again will help address this unnecessary but significant hurdle to maximizing conservation.

SHOULD POLICY BE GEARED TOWARD A REGULATORY OR MARKET-BASED APPROACH, OR BOTH?

Both regulatory and market-based approaches are valuable in the critical effort to maximize water conservation, though it should be noted that there can never be a true "market" in an essential element for life such as water. On the market incentive side, expansion of programs such as U.S. EPA's WaterSense[38] can encourage consumers to invest in water-efficient appliances and strategies, just as they have done to great effect on the energy side. Existing market incentive programs in California have proven popular despite unfortunately intermittent funding. For example, in May 2009 the MWD moved to suspend a highly successful program that provided rebates for installation of water-saving toilets and appliances, despite that fact that MWD could barely keep up with demand.[39] By contrast, MWD voted in November to support the allocation of hundreds of millions in public subsidies for the construction of the Poseidon desalination facility

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[33] *Id.* at p. 3.
[34] California Public Utilities Commission, "Water Action Plan," (Dec. 15, 2005), available at: ftp://ftp.cpuc.ca.gov/PUC/hottopics/3water/water_action_plan_final_12_27_05.pdf (Attachment 1) ("CPUC Water Action Plan").
[35] *Id*. at p. 3.
[36] *Id*. at pp. 7-11.
[37] *See* Mike Lee, "Consumers' cuts drying up revenue for districts," *San Diego Union-Tribune* (Sept. 13, 2009), available at: http://www3.signonsandiego.com/stories/2009/sep/13/consumers-cuts-drying-revenue-districts/
[38] http://www.epa.gov/watersense/; *see also* "California Water 2030" at p. 8.
[39] *See, e.g.*, Nicole Santa Cruz, "MWD stops paying rebates for water-saving devices," *Los Angeles Times*, (July 21, 2009 and Aug. 2, 2009), available at: http://articles.latimes.com/2009/jul/21/local/me-water21.

in Carlsbad, a relatively unproven, more polluting, and far less cost-effective alternative to conservation.[40]

On the regulatory side, some insight may be had from other efforts to reduce waste in the state. For example, in 1990 the Integrated Waste Management Act, (AB 939) took effect to build up the state's recycling-based infrastructure and place new, unprecedented responsibility on California cities and counties to cut waste disposal to landfills 25 percent by 1995 and in half by 2000. The statewide waste diversion rate topped 50% percent in 2005, from a rate of about 10 percent in 1989.[41] Enforcement provisions were important to advancing this goal: if a jurisdiction does not meet its 50 percent solid waste diversion, the Integrated Waste Management Board may place it under a compliance order, with further inaction subject to fines of up to $10,000 per day. Similar regulatory provisions applied to water – *i.e.*, clear metrics, plans for implementation, enforcement with fines, and funding for agency oversight – could significantly assist the state in meeting its conservation goals. However, metrics would have to be carefully targeted to conservation: AB 939's metrics focused on diversion of waste from landfills, which has increased recycling but generally not waste reduction.

The success of both incentive- and regulatory-based efforts cannot be effectively determined, and necessary course corrections made, without adequate data. Currently a lack of comprehensive information on water use and conservation, and a failure to effectively compile and disseminate existing data, hinders effective action on conservation. California must collect, compile and report publicly on water use data across use spectrums, and similarly track changes due to applied conservation strategies.[42] AB 1404 (Laird 2007) requires DWR, the State Water Board and CDPH to coordinate the collection, management and use of agricultural and urban water measurement information provided to each agency. The bill also requires the Water Board, in coordination with these entities and a named Delta authority, to prepare and submit a report to the Legislature evaluating the feasibility, estimated costs and potential means of financing a coordinated water measurement database. This report was due to the Legislature on January 1, 2009; though it has been written, it is still sitting at the Governor's office, awaiting release. We ask for the Little Hoover Commission's assistance in obtaining the release of this report to the Legislature and the public, as well as the subsequent adoption of its recommendations to increase the regular availability of standardized water use and conservation data.

Finally, California must begin implementing and enforcing its constitutional and statutory mandate to "prevent waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion of water in this state."[43] Water needs should be demonstrated as

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[40] *See, e.g.*, Bettina Boxall, "Public subsidies approved for San Diego County desalination project," *Los Angeles Times*, (Nov. 11, 2009), available at: http://www.latimes.com/news/local/la-me-desalination11-2009nov11,0,1148730.story; *see also* Dr. Peter Gleick, "Doing Desalination Wrong: Poseidon on the Public Dole," *San Francisco Chronicle* (Nov. 3, 2009), available at: http://www.sfgate.com/cgi-bin/blogs/gleick/detail?blogid=104&entry_id=50931.

[41] *See* "The History of the California Environmental Protection Agency: Integrated Waste Management Board," available at: http://www.calepa.ca.gov/about/history01/ciwmb.htm; and California Integrated Waste Management Board, "Statewide Profile for the State of California," available at: http://www.ciwmb.ca.gov/Profiles/Statewide/SWProfile1.asp.

[42] "Waste Not, Want Not" at pp. 14-15.

[43] Water Code Sec. 275; California Constitution Art. X, Sec. 2.

"reasonable and beneficial," and uses (and methods of use and diversion) should be shown to prevent waste. Standards and processes will need to be adopted to implement these mandates across urban[44] (residential, commercial, industrial and institutional) and agricultural[45] sectors.

* * *

Thank you for the opportunity to submit these comments. We look forward to working with you to ensure that the state establishes a water governance system that recognizes the great value of clean, abundant water by establishing and implementing appropriate conservation and efficiency initiatives.

Best regards,

Linda Sheehan
Executive Director
lsheehan@cacoastkeeper.org

cc: Edward Hard, Little Hoover Commission, Edward.Hard@lhc.ca.gov

[44] *See* NRDC's "Transforming Water Use" at p. 3 (recommending that the State Water Board require urban water suppliers to conduct water loss audits and develop plans to reduce economically recoverable losses).
[45] *See* "Sustaining California Agriculture" at pp. 8-9 (calling for "[m]ore aggressive efforts" by the state to apply Article X, Section 2 and Water Code 275's mandate to prevent waste and unreasonable use, including calling on the U.S. Bureau of Reclamation to "require all project contractors to provide a valid 'Needs Assessment' that conforms to state law by demonstrating reasonable and beneficial use of water and prohibiting the waste of water").

ATTACHMENT 1:

CALIFORNIA PUBLIC UTILITIES COMMISSION
WATER ACTION PLAN
(Dec. 15, 2005)
Pages 7-11 (footnotes omitted)

Source: ftp://ftp.cpuc.ca.gov/PUC/hottopics/3water/water_action_plan_final_12_27_05.pdf

California Public Utilities Commission
W A T E R ACTION PLAN
15 December 2005

Objective: Strengthen Water Conservation Programs to a Level Comparable to those of Energy Utilities.

1. Promote metered water service to encourage conservation.

One major conservation incentive is the elimination of flat-rate and un-metered water service. Metering water is essential to send a clear price signal and give the customer a financial incentive to conserve. In addition, installation of Automated Meter Reading (AMR) equipment can provide accurate real time water usage information, reduce labor costs associated with meter reading, and provide more detailed data of customer usage. Section 781 of the Public Utilities Code requires a showing that the metering will be cost-effective, results in a significant reduction in water use, and will not impose unreasonable costs. The CPUC will work to ensure that such a showing is made as often as possible in future water cases, and will then require metered water service. This will be accompanied by appropriate rate designs, as discussed below.

2. Educate water industry stakeholders regarding policies and practices which reduce water and energy consumption.

Education is a vital component of conservation efforts. For decades, energy ratepayers have funded extensive education efforts by energy utilities, which have been critical in California's energy efficiency efforts. A similar approach is needed for water conservation. A "Water Conservation Summit" with, for example, the Department of Water Resources, Department of Health Services, and other interested state agencies and knowledgeable water conservation experts, could be a useful forum to identify and highlight successful conservation policies and practices for public and investor-owned water utilities. The CPUC's own consumer education and web site will also be expanded to include water conservation information.

3. Direct participation by all California Class A and B water utilities in the Urban Water Conservation Council and encourage implementation of the Council's Best Conservation Management Practices.

Statewide urban water conservation is coordinated by the California Urban Water Conservation Council. This organization's membership consists of three groups: water suppliers, public advocacy organizations, and other interested groups. As part of an overall program of promoting conservation, the Commission will encourage development and implementation of best conservation management practices as promoted by the California Urban Water Conservation Council and will direct all Class A and B Water Utilities to participate in the Council. A good first step in this process would be for water IOUs to sign the California Urban Water Conservation Council's Memorandum of Understanding. Water IOUs would be required to demonstrate that they are up-to-date in meeting coverage requirements with Best Management Practices when cost-effective. Cost-effective water conservation above and beyond the Best Management Practices will also be evaluated. In order to facilitate their participation, water utilities and other qualified

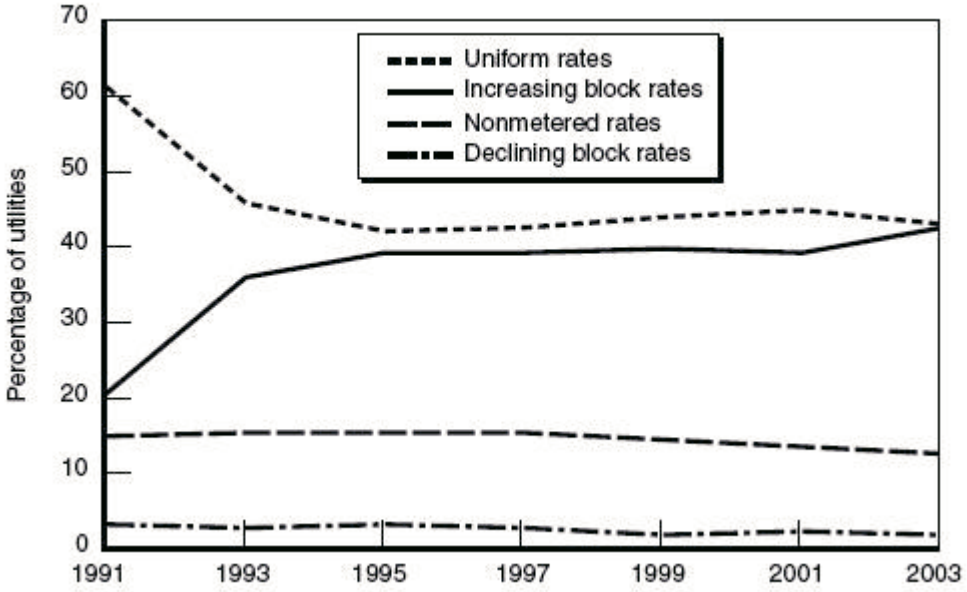
stakeholders will be allowed to seek recovery of expenses related to participation in this effort in their General Rate Case filings.

Further, we will encourage smaller (Class C & D) water IOUs to implement those best practices that make sense for a smaller provider to implement and will seek the assistance of the larger water providers and the California Water Association in disseminating these conservation tools to the smaller water companies.

4. Encourage increasing conservation and efficiency rate designs (such as increasing block rates) where feasible to promote greater conservation.

Various rate designs can help promote efficient use of water. Increasing block rates, in which rates increase with usage, provide a financial incentive for customers to reduce water consumption. The figure below shows the relative use of alternative rate design programs by a sample of California water utilities. There is a significant growth in the use of increasing block rates in the early 1990's in direct response to the severe drought. Approximately half the California water ratepayers in 2003 had increasing block rates. However, among CPUC-regulated water utilities, increasing block rates are virtually non-existent. Thus, there is significant opportunity to implement this approach to rate design. Before instituting increasing block rates, however, the Commission will carefully consider the impact on low income customers and may develop specific low income water rates, similar to its approach for low income energy ratepayers.

Water Utility Rate Structures in California, 1991-2003



Note: The chart reports the share of utilities with each rate structure (total = 100%), using data from 214 utilities present in the survey in all years.

5. Remove current financial disincentives to water conservation.

Because water utilities recover their costs through sales, there is a disincentive associated with demand side management: a successful campaign to reduce water use leads to less revenue and less profit. The Commission will consider de-coupling water utility sales from earnings in order to eliminate current disincentives associated with conservation.

6. Establish utility financial incentives for greater conservation.

In order to provide utility management with the incentive to encourage conservation, the Commission will consider allowing:

1. Financial rewards for utility management when conservation goals are met, and financial penalties when conservation goals are not met.
2. An opportunity for higher earnings resulting from successful conservation efforts, and a sharing of savings with customers.

7. Consider energy usage as an important outcome of all water policy decisions and work toward a 10% reduction in energy consumption by the utilities over the next three years.

California water and wastewater utilities (both publicly and privately owned) consume substantial amounts of energy. Customer consumption and use of water constitutes about 19 percent of all electricity, and about 32 percent of all natural gas consumed in California. The table below summarizes the water-related energy consumption data (excluding incomplete data on diesel fuel consumption, which nonetheless must also be subject to conservation).

2001 Water-Related Energy Use in California

	Electricity (GWh)	Natural Gas (Mill. Therms)
Water Supply and Treatment		
Urban	7,554	19
Agricultural	3,188	
End Uses		
Agricultural	7,372	18
Residential	27,887	4,220
Commercial		
Industrial		
Wastewater Treatment	2,012	27
TOTAL	48,012	4,284
2001 Consumption	250,494	13,571
Percent of Statewide Energy Use	19%	32%

Source: California Energy Commission, *Integrated Energy Policy Report*, September, 2005, p. 121.

There are many supply-side and demand-side policies and technologies which can help reduce this substantial energy consumption. The U.S. Environmental Protection Agency's ENERGYSTAR® program estimates that 10 percent energy savings can be achieved in the water and wastewater industry. The American Council for an Energy-Efficient Economy recommends that regulators ensure energy efficiency is recognized and rewarded, and that all stakeholders be educated on the importance of improving the energy efficiency of water and wastewater facilities.

The CPUC will identify and assess options for energy efficiency strategies for water utilities to reduce energy use associated with water pumping, purification systems, and other water processes such as desalinization. Additional policies which can contribute to increased energy efficiency include addressing sources of energy waste, such as system leaks, poorly maintained equipment, defective meters, unused machines left idling, and improperly operated systems.

8. Collaborate with the California EPA to reduce California greenhouse gas (GHG) Emissions.

The CPUC is actively working with California EPA to implement programs that will reduce GHG emissions, consistent with the Governor's Executive Order establishing specific emission reduction goals for California.

The CPUC recognizes that water supply planning should take into account the likely effects of global warming. Reduced snowpack as a result of rising temperatures is an expected consequence of global warming, possibly resulting in greater water runoff and less runoff percolating into the groundwater. The Department of Water Resources identifies some highly likely results: "Temperatures will rise, which will affect the extent and amount of winter snowpack in the mountains. However, the range in projections of the amount of temperature increase to expect is still quite large." The Department of Water Resources concludes that further studies are required, including better hydrologic monitoring to more accurately assess the trends and changes underway.

Just as we have done on the energy side, we will identify actions that our water utilities can take to reduce GHG emissions. The most obvious, of course is to reduce consumption of electricity, natural gas, and vehicle fuels. We will also encourage California's largest water utilities to join the California Climate Action Registry, a voluntary greenhouse gas registry to promote early actions to reduce greenhouse gas emissions.

NATURAL RESOURCES DEFENSE COUNCIL

November 25, 2008

The Honorable Mike Chrisman
Secretary for Resources/Chair
State of California Resources Agency/
California Ocean Protection Council
1416 Ninth Street, Suite 1311
Sacramento, CA 95814

Re: NRDC Comment on OPC Panel Discussion on Desalination in California, November 30, 2009

Dear Secretary Chrisman & Ocean Protection Council Members,

On behalf of the Natural Resources Defense Council (NRDC), which has 1.3 million members and activists, 250,000 of whom are Californians, we submit the following comments to help inform the Ocean Protection Council's (OPC) consideration of desalination in California.

1. The Ocean Protection Council should seek to review the environmental impacts of desalination in a balanced light by soliciting opinion from the full spectrum of stakeholders.

We appreciate OPC's intent in organizing this panel to collect information about desalination in California, including: environmental impacts and their possible mitigation, comparison of desalination to other water supply measures, and identification of future opportunities for OPC to support coastal water resource managers in evaluating and permitting future desalination projects. The consideration of these challenging issues, which involve the authority of multiple California agencies, fits well with OPC's mandate to improve coordination of the state agencies, "related to the protection and conservation of coastal waters and ocean ecosystems, to improve the effectiveness of state efforts to protect ocean resources…."[1]

While we appreciate OPC's effort, we were disappointed that, although desalination industry representatives were invited to participate in the panel, the panel does not include anyone from the conservation or environmental community. Numerous ocean conservation organizations have expressed strong interest in working with OPC to provide information and perspective on the complicated environmental implications of desalination. The lack of an environmental or conservation representative on the panel is a significant omission. The panel also lacks a

[1] California Public Resources Code § 35615 (a)(1); The California Ocean Protection Council's A Vision for Our Ocean and Coast: Five Year Strategic Plan, 2006 at 11,*available at* http://www.opc.ca.gov/strategic-plan/.

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representative who could speak to the alternatives to open seawater intakes. For example, it would have been helpful to include someone from the Municipal Water District of Orange County or Long Beach Water Department to talk about their sub-seafloor intake pilot projects.

California's economy is fueled by the health of our coastal resources.[2] We must therefore proceed with extreme caution when considering desalination, especially desalination facilities that would utilize open seawater intakes, because these intakes have severe negative impacts on coastal and ocean resources. These negative impacts are well known and new desalination projects employing existing open seawater intakes would undermine California's longstanding effort to phase out once through cooling techniques.

2. OPC should call for a unified statewide policy on the development of desalination plants in California.

Given the many issues and potentially conflicting California policies implicated by the construction of new desalination plants that use open seawater intakes, OPC has an important opportunity to help unify the efforts of relevant state agencies. Similar to, and consistent with, OPC's approach to once-through cooling[3], we suggest that the Council prepare a resolution calling for a statewide policy on desalination that ensures all facilities are evaluated in light-of and operated consistent with existing state priorities including: the protection of coastal and ocean ecosystems; water conservation and efficiency reforms; phase-out of once-through cooling under the soon-to-be adopted Statewide Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling[4]; and the state's energy efficiency, greenhouse gas reduction, and climate change adaptation strategies and goals.

a. Desalination plants must not undermine California's efforts to protect and restore our coastal and ocean ecosystems.

California ocean habitats are among the most productive and diverse in the world. Major upwelling centers nourish the state's coastal waters, fueling them with nutrients from the deep. A vast range of habitats, including kelp forests, eel grass, estuarine nurseries, wetlands, rocky reefs and pinnacles, intricate hydrocorals, diverse sponges, sandy beaches, steep canyons and the margins of offshore islands, supports a remarkable variety of ocean life, including dozens of

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2 National Ocean Economics Program, *California's Ocean Economy: Report to the Resources Agency, State of California*, (July 2005), at 1, *available at*, resources.ca.gov/press_documents/CA_Ocean_Econ_Report.pdf. Finding that "The total GSP of California's Ocean Economy in 2000 was approximately $42.9 billion. California's Ocean Economy directly provided approximately 408,000 jobs in 2000, and almost 700,000 jobs when multiplier effects are included. It provided more than $11.4 billion in wages and salaries in 2000, and more than $24 billion when multiplier effects are included. The NOEP also evaluated the total value of all economic transactions within 19 coastal counties (mainland coast and four additional counties added within San Francisco Bay and the Sacramento River Delta) and identified approximately $ 1.15 trillion of economic activity, (86% of total state economic activity), that is referred to as the "Coastal Economy." The natural resources of the coast and coastal ocean are a solid foundation for California's economy and these resources must be sustained to maintain the strength in the six sectors evaluated within the Ocean Economy and the much larger Coastal Economy."

[3] California Ocean Protection Council, *Resolution Regarding the Use of Once-Through Cooling Technologies in Coastal* Waters (adopted April 20, 2006), *available at:* http://www.opc.ca.gov/2006/04/resolution-of-the-california-ocean-protection-council-regarding-the-use-of-once-through-cooling-technologies-in-coastal-waters/ ("OPC Resolution").

[4] *See,* http://www.waterboards.ca.gov/water_issues/programs/npdes/cwa316.shtml

marine mammal species and about 65 species of rockfish. The ocean off California has many iconic places that are also diversity hot spots. For example, the Farallon Islands support a growing population of the almost extirpated northern fur seals, threatened Steller sea lions, numerous other marine mammals and the largest seabird colony in the continental U.S, with thirteen different species breeding on the islands.[5] The ocean economy generated about $43 billion for the state in 2000.[6] Uncounted in that number is the enormous contribution oceans make to our quality of life and the high value of coastal real estate. According to a report prepared by the Sea Grant Programs, seventy-seven percent of Californians live in coastal counties. California has the highest value ocean tourism and recreation sector in the nation.[7]

The ecological, social, and economic value of California's coast and ocean depends on maintaining and restoring healthy natural systems. The State of California, private, and public supporters have invested millions of dollars and tens of thousands of hours to protect and improve the health of our ocean ecosystems, for example, through the implementation of the Marine Life Protection Act (MLPA), which establishes marine protected areas (MPAs) throughout the state's waters.[8]

In addition to OPC, multiple federal and state agencies, including the U.S. Environmental Protection Agency, the California Energy Commission, and the State Lands Commission, have recognized that the use of open seawater intakes – in the context of once-through cooling ("OTC") in power plants, which use similar or identical open seawater intakes to be used to provide the water supply for 13 of the 21 coastal desalination facilities proposed in California[9] – cause ongoing devastation to our valuable marine resources and significant efforts to protect and restore these resources.[10] Coastal power plants are permitted to withdraw more than 16 billion gallons of cooling water off of the California Coast daily and kill an estimated 79 billion fish and other marine life annually.[11] Desalination using open seawater intakes could add many billions of gallons more to that number.

New desalination facilities utilizing open seawater intakes could easily undermine the gains to the marine environment from implementation of the State Water Resources Control Board's

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[5] Farallon National Wildlife Refuge, *at* http://www.fws.gov/refuges/profiles/index.cfm?id=81641 (last visited 21 Sept. 2009).

[6] Kildow, Judith T, Charles S.Colgan and Jason Scorse. *State of the U.S. Ocean and Coastal Economies 2009*, National Ocean Economics Program, (2009) at 25, *available at:* http://www.oceaneconomics.org/download.

[7] *Id.*

[8] *See,* http://www.dfg.ca.gov/mlpa/index.asp. The state has committed an estimated $33 million to map its ocean floor and collect baseline data necessary for designing and monitoring the success of the MPAs.

[9] Memo from OPC Project Manager to Ocean Protection Council, Re: Panel Discussion on Desalination, November 30, 2009, *available at*: http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20091130/0911OPC_11_desal.pdf.

[10] Clean Water Act Section 316(b); California Energy Commission *Issues and Environmental Impacts Associated with Once-Through Cooling at California's Coastal Power Plants: Staff Report*. (2005), *available at*: www.energy.ca.gov/2005publications/CEC-700-2005-013/CEC-700-2005-013.PDF. ("Issues and Environmental Impacts Associated with OTC"); California State Lands Commission, *Resolution of the California State Lands Commission Regarding Once-Through Cooling in California Power Plants* (adopted April 17, 2006); OPC Resolution.

[11] State Water Resources Control Board, *Scoping Document: Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling* (March 2008) p.1. ("2008 Scoping Document"). *available at:* http://www.waterboards.ca.gov/plans_policies/docs/coastal_estuarine/scope_doc031808.pdf.

impending once-through cooling policy and OPC's policy on open seawater intakes used to cool coastal power plants, as well as the substantial Council and other state funds being spent to restore the marine environment, for example, through the Marine Life Protection Act.[12]

b. Desalination plants are an extremely energy intensive source of water – conservation, low-impact development, and other techniques should be prioritized over capital intensive projects that undermine our state's greenhouse gas reduction and climate change adaptation goals.

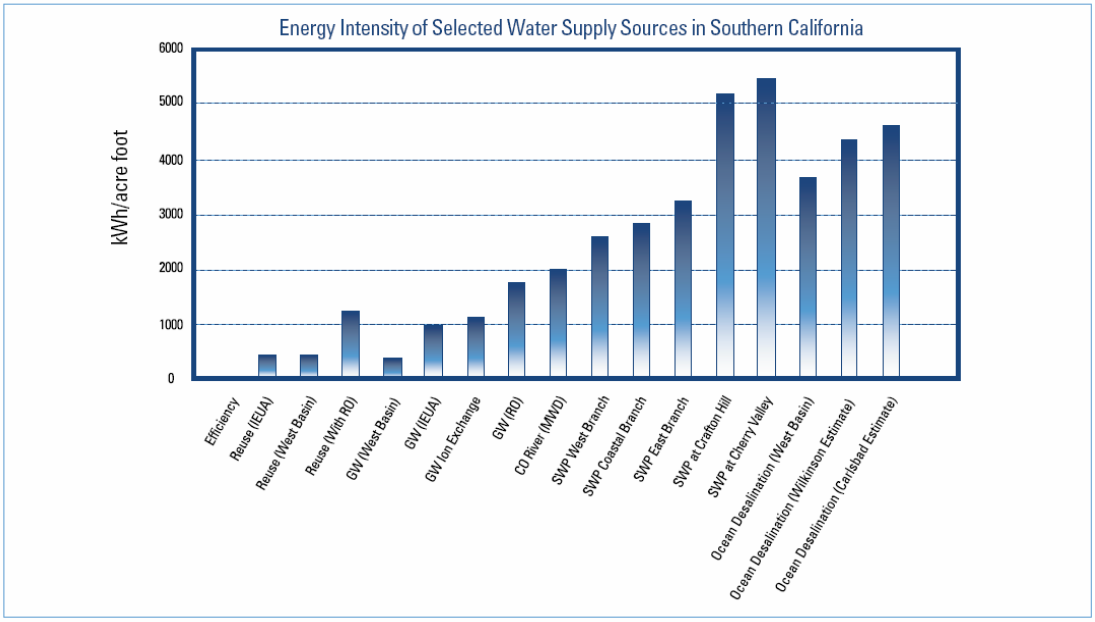
As OPC reviews desalination and water source alternatives, it is very important to consider that, not only does desalination have very high environmental costs, it is also very energy intensive. Recently release analysis prepared by NRDC and the University of California, Santa Barbara found that, of San Diego's water source alternatives, desalination has significant energy usage implications, while conservation and water recycling are the least energy intensive sources of potential supply:

> The California State Water Project (SWP), which pumps water a distance of 444 miles from the Sacramento-San Joaquin Delta to southern California, and lifts the water from just above sea level at the Delta nearly 3,000 feet over the Tehachapi Mountains in the process, is the single-largest individual user of electricity in the state. … 20 ocean desalination plants have been proposed statewide, each of which would supply water at an energy cost comparable to conveying water through the SWP. By contrast, the energy required to supply groundwater can be 5 to 20 times less than that required to supply water through the SWP or ocean desalination, and the energy required for capture and onsite use of stormwater can be 8 to more than 25 times less—if there are any energy requirements at all. [13]

[12] Ocean Protection Council, "Resolution of the California Ocean Protection Council Regarding the Use of Once-Through Cooling Technologies in Coastal Waters" (April 20, 2006), available at: http://www.opc.ca.gov/webmaster/ftp/pdf/docs/Documents_Page/Resolutions/Cooling_Resolution.pdf.

[13] Beckman, David S., et. al, A Clear Blue Future: How Greening California Cities Can Address Water Resources and Climate Challenges in the 21st Century, NRDC Technical Report, August 2009, at 7, *available at,* http://www.nrdc.org/water/lid/files/lid.pdf.

Figure 7. Energy intensity of major water supply options in southern California. Robert Wilkinson, based on data from IEUA, West Basin MWD, DWR, and desalination estimates.



Source: A Clear Blue Future at 23.[14]

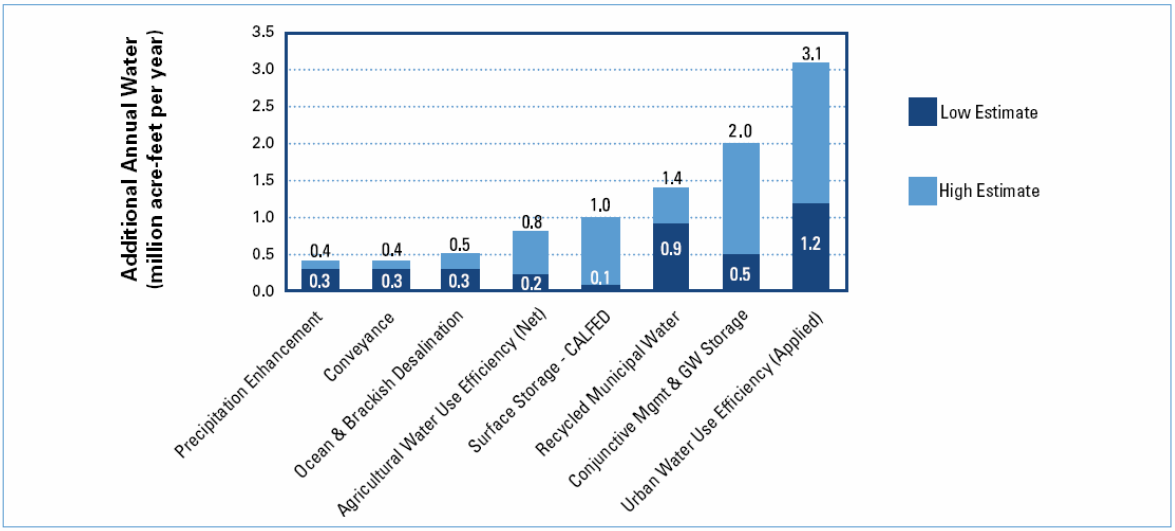
NRDC analysis also shows that for San Diego:

> satisfying all growth in water demand via conservation would reduce the overall energy intensity of the [San Diego County Water Authority] water supply by 13 percent. In comparison, satisfying all growth in water demand via recycling would reduce overall energy intensity by only 4 percent, while using seawater desalination to satisfy growth would increase overall energy intensity by 5 percent.[15]

[14] A Clear Blue Future at 23.

[15] The Natural Resources Defense Council, Energy Down the Drain: the Hidden Costs of California's Water Supply, August, 2004, at 34, *available at,* http://www.nrdc.org/water/conservation/edrain/edrain.pdf .

Figure 6. Water management and supply options for the next 25 years. From the California State Water Plan 2005, California Department of Water Resources, 2005.[4]



The Energy Intensity of Water in California

Source: A Clear Blue Future at 23.[16]

In addition prioritizing the use of sub-seafloor intakes, we recommend that OPC and desalination proponents carefully examine opportunities to minimize the energy and environmental impacts of desalination by:

1) looking for opportunities to use this technology on brackish and contaminated groundwater;
2) exploring desalination for use as peak or drought supply rather than base supply; and
3) seeking opportunities to reduce freshwater diversions.[17]

Furthermore, implementing low impact development (LID) techniques,

> that emphasize rainwater harvesting, which includes infiltration of water into the ground as well as capture in rain barrels or cisterns for later use onsite, at new and redeveloped residential and commercial properties in the urbanized areas of southern California and limited portions of the San Francisco Bay area has the potential to increase local water supplies by up to 405,000 acre-feet (af) of water per year by 2030. This volume represents roughly two-thirds of the volume of water used by the entire City of Los Angeles each year. The water savings translate into electricity savings of up to 1,225,500 megawatt hours (MWh), avoiding the release of as much as 535,500 metric tons of CO2 per year, as the increase in energy-efficient local water supply from LID results in a decrease in the need to obtain water from imported sources of water such as the California State Water Project (SWP) or the use of processes such as ocean desalination, both of which require tremendous amounts of energy.[18]

[16] A Clear Blue Future at 23.
[17] Energy Down the Drain, at 58.
[18] Beckman, David S., et. al, A Clear Blue Future: How Greening California Cities Can Address Water Resources and Climate Challenges in the 21st Century, NRDC Technical Report, August 2009, at 4, *available at,* http://www.nrdc.org/water/lid/files/lid.pdf

Multiple federal and state agencies have recognized that open seawater intakes cause significant, ongoing devastation to our valuable marine resources and significant efforts to protect and restore these resources. Pursuit of desalination using open seawater intakes – over conservation[19], LID, or even desalination using less harmful subsea intakes – undermines the states' efforts to phase out OTC because of its well known negative impacts. We strongly urge OPC to prepare a resolution calling for a statewide policy on desalination that ensures all facilities are evaluated in light of existing, state priorities including those related to marine ecosystem protection and restoration, energy conservation, greenhouse gas emission reduction, climate change adaptation, and OTC phase-out.

Respectfully Submitted,

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[19] *See,* Cohen, Ronnie, et.al, Making Every Drop Work: Increasing Water Efficiency in California's Commercial, Industrial and Institutional (CII) Sector, NRDC Issue Paper, May 2009 at 6, *available at,* http://www.nrdc.org/water/cacii/files/cii.pdf