Thirsty for Change: Desalination As a Practical and Environmentally Friendly Answer to California's Growing Water Shortage

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> *Even with the recent rainfall, California faces its third consecutive year of drought and we must prepare for the worst—a fourth, fifth or even sixth year of drought. . . . Last year we experienced the driest spring and summer on record and storage in the state's reservoir system is near historic lows. This drought is having a devastating impact on our people, our communities, our economy and our environment. . . . This is a crisis, just as severe as an earthquake or raging wildfire, and we must treat it with the same urgency by upgrading California's water infrastructure to ensure a clean and reliable water supply for our growing state.*[1]
>
> —Governor Arnold Schwarzenegger
> February 27, 2009

Introduction

CALIFORNIA IS IN THE MIDST of a major drought.[2] In February 2009, Governor Arnold Schwarzenegger declared a state of emergency and directed state agencies to take immediate action.[3] After multiple years of below-average precipitation, snowpack, and runoff, the state's

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1. Press Release, Office of the Governor of Cal., Governor Schwarzenegger Takes Action to Address California's Water Shortage (Feb. 27, 2009), http://gov.ca.gov/index.php?/press-release/11556/ [hereinafter Governor's Office Press Release].

2. *See generally California's Drought Update (Mar. 30, 2010)*, MONTHLY DROUGHT UPDATES (Cal. Dep't of Water Res., Sacramento, Cal.), Mar. 30, 2010, *available at* http://www.water.ca.gov/drought/updates.cfm [hereinafter March 2010 Drought Update].

3. Proclamation, Governor Arnold Schwarzenegger, State of Emergency—Water Shortage (Feb. 27, 2009), *available at* http://gov.ca.gov/proclamation/11557.

water supply is "near historic lows."[4] According to the Department of Water Resources ("DWR"), California received just seventy-six percent of its average precipitation during water year 2009.[5] Through December of 2009—three months into water year 2010—precipitation levels stood at just seventy-eight percent of average.[6] Water year 2009's runoff statistics painted the same dire picture.[7] As a result, cities and counties are being forced to implement conservation measures,[8] and farmers throughout the Central Valley and Southern California are increasingly likely to be forced to fallow their fields.[9]

The drought, though (hopefully) short-term, has hastened the discussion about how to fix California's long-term water problems. Global climate change has intensified the frequency and length of droughts worldwide; even if the current drought ends soon, another is likely right around the corner.[10] California's growing population[11] is aggravating the problem. As the population increases, water managers and state legislators are forced to think seriously about how to increase the quantity and quality of available water, and how to lessen the impact on environmental resources that are damaged or destroyed by water development.[12]

4. Governor's Office Press Release, *supra* note 1.

5. March 2010 Drought Update, *supra* note 2, at 3. By the end of March 2010, total precipitation had risen to approximately average levels, but the Department of Water Resources continued to release its Drought Update. *Id.* The "water year" runs from October of the previous year through September of the year stated—for example, the 2009 water year ran from October 2008 through September 2009.

6. *Id.*

7. Dep't of Water Res. Cal, Data and Exch. Ctr., Runoff Data for Water Year 2009 (Oct. 15, 2009), http://cdec.water.ca.gov/cgi-progs/iodir/FLOWOUT.200909. The fifty-year average runoff figure exceeds 43.7 million acre-feet. *Id.* The total for water year 2009 was just over 28.7 million acre-feet, about sixty-five percent of average. *Id.*

8. *See, e.g.*, *Water Conservation Advisory*, CITY OF PITTSBURG PUB. WORKS DEP'T UTILS. NEWSLETTER, May 2009, *available at* http://www.ci.pittsburg.ca.us/Modules/ShowDocument.aspx?documentid=1131.

9. *National Brief: West: California: Federal Water is Allocated*, N.Y. TIMES, Apr. 22, 2009, at A18. Many farmers in the central valley rely heavily on the DWR-operated State Water Project and federally-operated Central Valley Project for the water their crops need. In 2009, "some of the nation's largest farms in that region [received only] 10 percent of the amount [of water] they are entitled to under government contracts." *Id.*

10. Rebecca Tsosie, *Indigenous People and Environmental Justice: The Impact of Climate Change*, 78 U. COLO. L. REV. 1625, 1634 (2007).

11. State of California, Dep't of Finance, Population Projections for California and Its Counties 2000–2050 (July 2007), *available at* http://www.dof.ca.gov/research/demographic/reports/projections/p-1/documents/P-1%20Report%20Tables.xls (predicting California's population will nearly double by the year 2050).

12. *See* Karl Kohlhoff & David Roberts, *Beyond the Colorado River: Is an International Water Augmentation Consortium in Arizona's Future?*, 49 ARIZ. L. REV. 257, 282 (2007) (discussing possibilities for developing new water sources).

One such option is desalination—the process of turning ocean water into drinking water. Even at current population levels, many of California's rivers and streams are fully appropriated; some even run completely dry before reaching the ocean.[13] California is nearing a point where the environment simply will not be able to tolerate any more water being taken from its rivers. Given the high costs, both financial and environmental, of importing water from those areas with a surplus, the state needs to employ the more viable alternative of desalination. This is especially true if drought persists and the population continues to grow.

This Comment argues that desalination is a practical, environmentally friendly, and long-term water solution for California. Part I briefly details the desalination process. Part II addresses the California Coastal Act and the issues considered by the California Coastal Commission in reviewing proposed desalination projects. Part III discusses the California Environmental Quality Act, specifically, its application to desalination projects. Part IV assesses the obstacles to desalination projects created by the Endangered Species Act. Finally, Part V identifies how improving technology will diminish the environmental concerns associated with turning salt water into fresh water and how, consequently, the benefits of desalination will continue to grow.

I. The Desalination Process

> *If we ever competitively, at a cheap rate, get fresh water from salt water, it would be in the long range interests of humanity [and] would really dwarf any other scientific accomplishments.*[14]
>
> —President John F. Kennedy

A. The Process

Since President Kennedy expressed the importance of desalination more than forty years ago, many technologies have been developed to remove salt from water.[15] These technologies have been used

13. Dave Owen, *Law, Environmental Dynamism, Reliability: The Rise and Fall of CALFED*, 37 ENVTL. L. 1145, 1177 (2007); *see also* Cal. State Water Res. Control Bd., Declaration of Fully Appropriated Streams, Exhibit A to Water Right Order 98-08 (Nov. 19, 1998), *available at* http://www.waterboards.ca.gov/waterrights/water_issues/programs/fully_appropriated_streams/docs/fas_list.pdf.

14. Aaron Schwabach, *Using International Law to Prevent Environmental Harm from Increased Use of Desalination*, 34 TEX. INT'L L.J. 187, 187 (1999) (quoting President John F. Kennedy).

15. *See id.* at 185–89.

around the world, though the bulk of desalination development has taken place in areas "where energy is cheap and water is scarce."[16]

The primary desalination method that would be used for large-scale projects in California is called "reverse osmosis."[17] First, the water is pumped out of the ocean and into the desalination plant. The water is then pre-filtered to remove "sand, clay, debris and bacteria."[18] Next, the water goes through the actual desalination process, where salt is removed through "reverse osmosis." Osmosis is defined as follows:

> [T]he diffusion of fluids (including dissolved solids) through a membrane from areas of higher concentration to areas of lower concentration. Thus, if a permeable membrane contains salt water on one side and fresh water on the other, fresh water will flow through the membrane to dilute the salt water until the concentration of dissolved salt is equal on both sides of the membrane.[19]

Reverse osmosis works by applying external pressure that exceeds the osmotic pressure of the salt solution, thereby reversing the natural flow and forcing the water from the salt water side through the membrane, which removes the salt and other minerals from the water.[20] At the end of the process, fresh water remains on one side of the membrane, which is pumped into the water supply; water with a concentrated salinity ("brine") is left on the other, and must be disposed of—typically by pumping it back into the ocean.

B. The Problems

1. Costs

Desalination has not yet become commonplace in California or, for that matter, anywhere in the United States. The primary reason is cost. The best processes possible with available technology have historically been too expensive to be practical. As the technology continues to improve, however, and water demand and population steadily increase, the cost—both actual and relative—of desalinated water con-

16. *Tapping the Oceans*, THE ECONOMIST TECH. Q., June 7, 2008, at 20.

17. *See, e.g.*, Poseidon Resources, The Carlsbad Desalination Project, Desalination 101, http://www.carlsbad-desal.com/desal_101.asp (last visited Apr. 20, 2010) [hereinafter Carlsbad Desalination Project]; Poseidon Resources, Huntington Beach Seawater Desalination Facility, Facility Facts, http://www.hbfreshwater.com/index.php?p=2 (last visited Apr. 20, 2010) [hereinafter Huntington Facility Facts].

18. Huntington Facility Facts, *supra* note 17.

19. Schwabach, *supra* note 14, at 192.

20. *Id.* (citations omitted).

tinues to fall.[21] Given the ongoing development by private companies of large-scale California desalination projects and the ongoing research of cheaper methods,[22] the cost of local desalinated water will soon compete directly with freshwater imported from far away, even out-of-state rivers.

2. Pump Intakes Endanger Marine Life

The most common environmental concern regarding desalination comes with the first step of the process: pumping water out of the ocean and into the plant for treatment. Large-scale desalination involves removing millions of gallons of seawater each day from the ocean. This requires vigorous pumping that can have a deleterious effect on local marine life. Fish, birds, invertebrates, and other larger marine creatures may be killed when trapped against the intake screens ("impinged"), which are intended to prevent those creatures from being sucked into the plant.[23] Smaller organisms are also at risk; they may be sucked through the screens ("entrained") and killed during the water treatment process.[24]

These problems are not new to the water community. Any pumping of water in natural environments creates impingement and entrainment dangers for wildlife. Courts recognize this danger. The Delta pumping operations of the Central Valley Project and State Water Project provide one example. In 2007, the U.S. District Court for the Eastern District of California found that the pumping operations of these two projects would jeopardize the continued existence

21. William M. Sloan, *Seawater Desalination: Urban Myth or Urban Supply?*, MORRISON & FOERSTER LEGAL UPDATES & NEWS (July 2006) ("In the 1950s, the cost to treat seawater was estimated at $12 to $14 per 1000 gallons of water. In 1990, with the advancement of desalination technology, that estimate fell to $6 per 1000 gallons of water. Still, that cost dwarfed the price from other sources—the same amount of water from the State Water project or the Colorado River was less than $1. . . . The current technology of choice, reverse osmosis[,] can now be implemented at an approximate cost of $2 to $3 per 1000 gallons.").

22. HEATHER COOLEY, PETER H. GLEICK & GARY WOLFF, DESALINATION, WITH A GRAIN OF SALT: A CALIFORNIA PERSPECTIVE 36 (2006), *available at* http://www.pacinst.org/reports/desalination/desalination_report.pdf (discussing research indicating that abandoning reverse osmosis membranes and instead using multiple passes through different membranes could potentially achieve "up to a 30% energy savings," thus significantly lowering the cost of desalination).

23. Tim McRae, Comment, *Coastal Desalination, "Coastal-Dependency" and the California Coast: How Today's Desalination Proposals Could Affect Tomorrow's Coastline*, 31 ENVIRONS ENVTL. L. & POL'Y J. 103, 111 (2007).

24. *Id.*; *see also* COOLEY, GLEICK & WOLFF, *supra* note 22, at 59.

of an endangered local fish (the famous Delta smelt).[25] Desalination plant intake pumps can be equally dangerous to ocean wildlife, and finding a way to avoid harming the sea's creatures is an essential element in pursuing desalination opportunities.

3. Outfalls Also Endanger Marine Life

While the water being sucked into the plant creates one danger for wildlife, the water being pumped out creates another. Desalination produces waste salt in the form of brine that must be returned to the ocean.[26] While there is no risk that "increased desalination will appreciably increase the salinity of the oceans as a whole," there is a danger that even "a slight increase in local salinity may prove fatal" to many of the ocean organisms that live within a few miles of shore.[27]

The harmful effects of brine discharge can be diffused somewhat by locating the "outfalls" in "habitats that are relatively abundant in California."[28] The result of well-placed outfalls—mere displacement, rather than destruction, of organisms that would otherwise be living there—is not a major concern. When it is difficult or expensive, however, to locate an outfall in such a "relatively abundant" area, finding a place to discharge brine safely can present a significant hurdle for any desalination project.[29]

4. Large-Scale Desalination Means Large-Scale Energy Consumption

The reverse osmosis process requires a tremendous amount of energy.[30] Not only is energy needed to create an adequate amount of pressure to force seawater through the filtering membranes,[31] but also it is needed to pump water into the plant and then back out again.

25. Natural Res. Def. Council v. Kempthorne, 506 F. Supp. 2d 322, 333 (E.D. Cal. 2007). This is just one in a string of decisions by the district court in this case, and the dispute is ongoing. This opinion is cited simply to present an example of a case in which the court recognized the effect that pumping can have on fish.

26. Schwabach, *supra* note 14, at 197. Salt is not the only byproduct of desalination—the brine being discharged generally includes other "constituents typically found in seawater, such as manganese, lead, and iodine" in addition to chemicals used in the filtration process. COOLEY, GLEICK & WOLFF, *supra* note 22, at 60–61.

27. Schwabach, *supra* note 14, at 197.

28. Symposium, *Desalination in California: Should Ocean Waters Be Utilized to Produce Freshwater?*, 57 HASTINGS L.J. 1343, 1353 (2006).

29. *Id.*

30. McRae, *supra* note 23, at 111.

31. *Id.* at 110–11.

Plants are often "co-located" with already-existing power plants in order to provide the necessary energy.[32] But even with co-location, desalination facilities would "rely on, and possibly strain, the [California] power grid."[33] Increasing energy production poses numerous environmental challenges of its own, and desalination's energy requirements could serve to make those problems only more serious.

Recent research has indicated that improvements to membranes and filtration processes could potentially achieve "up to a 30% energy savings" over current technology.[34] Therefore, as technology advances, the amount of energy required for desalination should continue to decline.

5. More Water Means More Growth and Development

In 2004, the California Coastal Commission cautioned, "[a] desalination facility's most significant effect could be its potential for inducing growth."[35] California takes controlling development very seriously: both the Coastal Act[36] and the California Environmental Quality Act ("CEQA")[37] require a project's "growth-inducing" impacts to be evaluated prior to project approval.

Controlling development is an important goal: "While only a tiny portion of the earth's biomass consists of human beings, a far greater portion consists of our crops, livestock, pests, and parasites; already ten percent of the earth's land surface is cultivated."[38] As the world's—and California's—population continues to increase, a water supply bolstered by desalination may allow increased development and cultivation, such that "the only uncultivated, undeveloped land remaining on the planet may be in the polar regions and on very

32. *Id.*; *see also* Huntington Facility Facts, *supra* note 17.

33. McRae, *supra* note 23, at 111.

34. Cooley, Gleick & Wolff, *supra* note 22, at 36.

35. California Coastal Commission, Seawater Desalination and the California Coastal Act 12 (March 2004), *available at* http://www.coastal.ca.gov/energy/14a-3-2004-desalination.pdf [hereinafter Commission Report].

36. Cal. Pub. Res. Code §§ 30000–30900 (Deering 2008). The Coastal Act focuses on protecting "existing developed uses," and ensuring that future projects are "carefully planned and developed." *Id.* § 30001(d).

37. *Id.* §§ 21000–21189. "All lead agencies shall prepare, or cause to be prepared by contract, and certify the completion of, an environmental impact report on any project which they propose to carry out or approve that may have a significant effect on the environment . . . . The environmental impact report shall include . . . [t]he growth-inducing impact of the proposed project." *Id.* § 21100(b)(2)(B)(5).

38. Schwabach, *supra* note 14, at 195.

high, very steep mountains."[39] Many believe that this level of development would not be a positive step for humankind.[40]

One way that California controls development is by linking the ability to develop to the availability of water in the area. Under CEQA, the responsible agency must make a determination as to whether a project has "significant impacts" on the environment. If a project's growth-inducing effects are deemed to be a significant impact due to a lack of water, CEQA requires the developer to mitigate that impact.[41] Large-scale desalination would increase the water supply, removing—or at the very least, weakening—one of the state's tools for limiting development and sprawl.

6. Other Environmental Concerns

Many chemicals are used throughout the desalination process; chemicals are used in pre-treatment, the primary filtration process, and the cleaning and storage of the membranes.[42] Because desalination plants are necessarily located on coastlines, when chemicals run off the site they often run into coastal waters, polluting them and potentially harming marine life.

A more abstract problem created by desalination springs from the potential over-development discussed above. More water in the general water supply would likely induce further development of land for agricultural purposes. This would, in turn, encourage over-watering of those lands, leading to erosion and increased runoff of nutrients into freshwater and coastal ecosystems, causing pollution and eutrophication, again harming wildlife.[43]

Though not insignificant, none of the problems discussed in this section are insurmountable. These concerns present hurdles that must be overcome in order to make desalination the practical and environmentally friendly answer many hope it to be. But as desalination technology improves, it is simultaneously becoming easier both to clear these hurdles and to comply with the environmental regulations that govern coastal development.

39. *Id.* at 196.

40. The debate about "good" versus "bad" development—who development hurts, and who it helps—is a discussion for another comment. For the purposes of this Comment, it is simply important to note that some believe "overdevelopment" should be avoided.

41. COOLEY, GLEICK & WOLFF, *supra* note 22, at 68.

42. *Id.* at 61.

43. Schwabach, *supra* note 14, at 195.

II. The Coastal Act

The California Coastal Act ("CCA") declares, "the California coastal zone is a distinct and valuable natural resource of vital and enduring interest to all the people and exists as a delicately balanced ecosystem."[44] The broadest goal of the CCA is to "[p]rotect, maintain, and, where feasible, enhance and restore the overall quality of the coastal zone environment and its natural and artificial resources."[45] In order to avoid "long-term costs to the public and a diminished quality of life resulting from the misuse of coastal resources," the CCA declares that "it is necessary to provide for continued state coastal planning and management through a state coastal commission."[46] The CCA goes on to establish the California Coastal Commission ("Commission")[47] and grants it broad powers and responsibilities.[48]

The Commission's primary mission is to assist in the adoption and implementation of local coastal plans.[49] These local plans then govern local developments. However, the Commission is also charged with the maintenance of "procedures for the submission, review, and appeal of coastal development permit applications."[50] The end result of the mixing of these two duties is that the Commission is the final authority on whether a coastal development permit will be granted.

In a report released in 2004 ("Report"), the Commission acknowledged that it "will be involved in nearly all coastal desalination proposals, either through planning, permitting, permit appeals or other forms of review."[51] Considering the Commission's broad authority over coastal development, the Report is likely the single most instructive document available for the purpose of determining the obstacles to desalination development. The Report specifically docu-

44. CAL. PUB. RES. CODE § 30001(a) (Deering 1987).

45. *Id.* § 30001.5(a).

46. *Id.* § 30004(b).

47. *Id.* §§ 30300, 30301.

48. *Id.* §§ 30330–30344.

49. *Id.* § 30340.5(a) (explaining that it is the policy of the state that "no less than 50 percent of funds received by the state from the federal government pursuant to the Federal Coastal Zone Management Act . . . be used for . . . implementation of local coastal programs").

50. *Id.* § 30620(a).

51. COMMISSION REPORT, *supra* note 35, at 5. The Commission Report is over ninety pages long and delves deeply into the application of the Coastal Act to desalination proposals. I will not attempt to reproduce that discussion here, but will rather touch on only a few of the important points presented in the Report.

ments the issues that the Commission will consider for each proposal and discusses the potential difficulties presented by each issue.[52]

A. Danger to Marine Life

One of the Commission's primary concerns with desalination plants is the potential danger to marine life. The components of a desalination plant that have the greatest potential of harming the environment—and violating the CCA—are the intake and discharge systems: "The intake system can cause significant levels of impingement and entrainment . . . and the facility's discharge of brine and possibly other contaminants can be harmful to marine life."[53] The Commission does not see these effects as fatal to every project, however, recognizing that "[t]he severity of these [potentially substantial] impacts can be mitigated, and in some cases avoided entirely, through proper facility design, siting, and operation."[54]

For intakes, the best mitigation measure is subsurface placement;[55] but for open water intakes the Report suggests lower intake velocity rates, velocity caps,[56] and various types of screens.[57] As for the discharge system, the only possible mitigation measures are to distribute the brine over a large area, or to discharge all brine in a location where absolutely no sea life would be affected (if such a location exists).[58] If project proponents do not take the necessary steps to mitigate—or, where required, completely avoid—the impacts on marine life caused by intakes and outfalls, the Commission will not allow the project to go forward.

B. Growth Inducement

Another serious concern of the Commission is the effect a larger water supply may have on inducing development in coastal regions. The Report notes the possibility that "[i]n some areas along the coast,

52. *Id.* at 5–8.

53. *Id.* at 66.

54. *Id.*

55. Subsurface intakes are the best alternative because, after having already passed through many layers of soil that act as a "natural filter," the water being pumped will contain far fewer organisms. Open water intakes, even if they can be designed to avoid taking fish and larger marine life, will inevitably take the smaller organisms (many of which are microscopic or nearly so) that cannot be kept out with a screen. *Id.* at 70–72.

56. "Velocity caps" are installed on the intake system to ensure that the "predominant intake water flow" is horizontal. Fish are better able to sense these movements and thus are better able to avoid being impinged against the screens protecting the intake. *Id.* at 72.

57. *Id.* at 72–73.

58. *Id.* at 77–78.

the water supply provided by desalination may remove the primary constraint to growth and result in significant effects on coastal resources."[59]

There are two CCA provisions that require the Commission to review a proposed project's propensity for inducing growth. First, section 30250 reads as follows:

> New residential, commercial, or industrial development . . . shall be located within, contiguous with, or in close proximity to, existing developed areas able to accommodate it or, where such areas are not able to accommodate it, in other areas with adequate public services and where it will not have significant adverse effects, either individually or cumulatively, on coastal resources.[60]

This section of the CCA is intended to prevent new developments from proceeding more quickly than the ability of the local community to provide necessary public services.[61] This requirement works hand in hand with section 30254, which states that "[n]ew or expanded public works facilities shall be designed and limited to accommodate needs generated by development," and declares, "[w]here existing or planned public works facilities can accommodate only a limited amount of new development, [vital pubic services] shall not be precluded by other development."[62] These policies mandate that the size of a proposed public works facility must be based on the ability to "maintain, enhance, [and] restore coastal resources."[63] Consequently, in areas that are fully developed or almost fully developed, a desalination plant designed to increase the water supply (thereby allowing further development) may violate the CCA and the Commission may refuse to allow the project.

C. The CCA's Application to Desalination Projects

The authority granted to the Commission under the CCA ensures that the Commission could stop development of a large-scale desalination plant. Thus far, the Commission has not disapproved of any local coastal plan that provides for the possibility of desalination development; nor has it explicitly refused to approve a specific desalination project. Whether or not projects are approved going forward could depend largely on the make-up of the Commission at the time of a project's application. The Commission has thus far appeared willing

59. *Id.* at 54.
60. CAL. PUB. RES. CODE § 30250(a) (Deering 2008).
61. COMMISSION REPORT, *supra* note 35, at 55.
62. CAL. PUB. RES. CODE § 30254 (Deering 2008).
63. COMMISSION REPORT, *supra* note 35, at 55.

to support desalination development,[64] and absent significant problems with specific projects in particularly sensitive coastal areas, that support is likely to continue. However, as discussed above, the Commission does have at least two major tools under the CCA—danger to marine life and growth inducement—that it could use to deny approval for a project, if its members wished to do so.

III. The California Environmental Quality Act

CEQA is explicitly intended to maintain "a quality environment for the people of [California] now and in the future."[65] In adopting CEQA, the California legislature acknowledged that "[t]he capacity of the environment is limited," and directed the government to "take immediate steps to identify any critical thresholds for the health and safety of the people of the state and take all coordinated actions necessary to prevent such thresholds being reached."[66]

Adopted shortly after the National Environmental Policy Act ("NEPA"),[67] CEQA was conceived "primarily as a means to require public agency decisionmakers to document and consider the environmental implications of their actions."[68] CEQA casts a wide net, as it applies to any discretionary project that is proposed to be carried out or approved by a public agency.[69] The definition of public agency includes "any state agency, board, or commission, any county, city and county, city, regional agency, public district, redevelopment agency, or other political subdivision."[70] Any large-scale desalination project would require approval in the form of permits from multiple agencies

64. *See, e.g.*, California Coastal Coalition, *Monterey Desalination Plant Approved*, ASSOC. PRESS (Aug. 9, 2008), http://www.calcoast.org/news/water0080809.html.

65. CAL. PUB. RES. CODE § 21000(a) (Deering 2008).

66. *Id.* § 21000(d).

67. The National Environmental Policy Act, 42 U.S.C. §§ 4321–4370 (2006), is generally characterized as being a purely "procedural" statute. Vt. Yankee Nuclear Power Corp. v. Natural Res. Def. Council, 435 U.S. 519, 558 (1978). In contrast, CEQA provides a much more powerful "substantive mandate," directing public agencies to avoid approving any project that has significant environmental effects, so long as there are "feasible alternatives or feasible mitigation measures" that would serve to minimize those effects. Mtn. Lion Found. v. Fish and Game Comm'n, 939 P.2d 1280, 1298 (Cal. 1997). Because it contains this "substantive mandate," CEQA essentially goes further than NEPA, creating a greater hurdle for a project to clear. As such, in the interest of avoiding redundancy, this Comment focuses on CEQA as opposed to NEPA.

68. MICHAEL H. REMY ET AL., GUIDE TO THE CALIFORNIA ENVIRONMENTAL QUALITY ACT 1 (10th ed. 1999).

69. CAL. PUB. RES. CODE § 21080(a) (Deering 2008).

70. *Id.* § 21063.

that fall under this definition. Therefore, any such project would be subject to the environmental review required under CEQA.

The substantive requirement under CEQA is for an agency to prepare an Environmental Impact Report ("EIR") for any project that "may have a significant effect on the environment."[71] Prior to conducting a full EIR, the agency conducts an initial study in order to determine whether the project may have a significant impact on the environment.[72] If the initial study concludes that there is "no substantial evidence that the project or any of its aspects may cause a significant effect on the environment," then the agency may prepare a "negative declaration" instead of an EIR.[73] The purpose of a negative declaration is simply to declare that the project will not have any significant effects on the environment, and thus does not require an EIR.

If, however, the agency concludes the initial study and determines that some aspect of the project will have a significant environmental effect, the agency must perform a detailed study and prepare an EIR.[74] The CEQA Guidelines define "significant effect" as "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic and aesthetic significance."[75]

Current desalination technology would almost certainly be found to have significant environmental effects. Intakes and outfalls both typically present risks to the surrounding environment, particularly to the wildlife, or "fauna,"[76] as do the chemicals used in the filtration process. In many cases, the coastal construction process alone could create significant environmental effects that would require an EIR. Similarly, the large amount of energy that a desalination plant requires could be found to constitute a significant environmental effect entirely by itself. It is safe to assume that, under CEQA, an EIR will be

71. *Id.* §§ 21100(a), 21151(a).

72. CAL. CODE REGS. tit. 14, § 15063(a) (2009). This initial study may be foregone, but only if the "agency can determine that an EIR will clearly be required for the project . . . ." *Id.*

73. *Id.* § 15063(b)(2).

74. *Id.* § 15063(b)(1).

75. *Id.* § 15382; *see also* CAL. PUB. RES. CODE § 21068 (Deering 2008).

76. Under the proper conditions, it is possible to place intakes and outfalls below the surface of the ocean floor. Subterranean placement significantly reduces the risk to wildlife, and in the case of intakes, such placement may completely eliminate any risk. With outfalls, however, it is less likely that the environmental effects could be completely avoided.

required for the development of any large-scale desalination project in California.

A. The Environmental Impact Report

An EIR is a detailed statement "describing and analyzing the significant effects of a project and discussing ways to mitigate or avoid the effects."[77] The purpose of an EIR is to ensure that the agency has considered all the potential ill effects of the project—but the conclusions drawn in the EIR "do not control the lead agency's discretion to approve or disapprove a proposed project."[78]

A proposed desalination plant will likely have a long list of potential significant environmental effects. This is due in part to the coastal location and the chemicals used in the filtration process. All of these effects must be addressed in a project's EIR. For example, in the Final EIR for the Carlsbad Desalination Project, just the *summary* of the significant environmental effects is twelve pages long.[79] The Carlsbad EIR identifies and addresses significant effects in eleven separate categories: aesthetics, air quality, biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, land use/planning, noise and vibration, transportation and traffic, and public utilities and service systems.[80]

An EIR must address each significant impact and recommend mitigation measures or project alternatives that would avoid these effects.[81] Before approving a project, the lead agency must make one or more of the following findings regarding each significant environmental effect:

> [1] the project has been changed to avoid or substantially lessen the effects; [2] the necessary changes are within the responsibility and jurisdiction of another public agency, and have been or should be adopted by that agency; and/or [3], due to specific economic, legal, social, technological, or other considerations, . . . the mitigation measures or project alternatives recommended in the final EIR are infeasible.[82]

77. CAL. CODE REGS. tit. 14, § 15362 (2009); *see also* CAL. PUB. RES. CODE § 21061 (Deering 2008).

78. REMY ET AL., *supra* note 68, at 351.

79. POSEIDON RESOURCES, THE CARLSBAD DESALINATION PROJECT, FINAL ENVIRONMENTAL IMPACT REPORT (Dec. 2005), *available at* http://www.carlsbad-desal.com/EIR.asp.

80. *Id.* ch. 4.

81. CAL. CODE REGS. tit. 14, § 15362 (2009); *see also* CAL. PUB. RES. CODE § 21061 (Deering 2008).

82. REMY ET AL., *supra* note 68, at 351.

Any finding made by the agency must be supported by "substantial evidence in the record."[83]

When a challenge is brought against an agency's approval of a project following an EIR, courts "scrupulously enforce all legislatively mandated CEQA requirements."[84] But the courts tend to defer to an agency's "substantive judgments," including the decision to approve a project.[85] In *Citizens of Goleta Valley v. Board of Supervisors* ("*Goleta*"),[86] a coalition of groups challenged the certification of a hotel development's EIR on the grounds that the document did not sufficiently consider feasible alternatives.[87] The California Supreme Court found the EIR to be sufficient, holding that the substantive decision process is "a delicate task which requires a balancing of interests, [and] is necessarily left to the sound discretion of the local officials and their constituents who are responsible for such decisions."[88] If local decisionmakers reviewing a desalination project are diligent in ensuring that the EIR is complete, they will be given significant leeway by the court to choose what they believe to be the best course. This high level of deference can make it difficult to successfully challenge an approved project.

B. CEQA's Application to Desalination Projects

There is a dearth of published legal opinions documenting CEQA challenges to desalination plants. This is most likely due to the fact that few large-scale desalination plants operate in the state. The lack of CEQA challenges may also be due to the quality of the work that has gone into the EIRs for the projects that have reached that point in the process.[89] Courts will only reverse agency approvals if there are significant problems with the EIR—not simply because the court disagrees with the conclusion the agency reached.[90] A CEQA challenge is therefore difficult to win if the challenged EIR has been well-prepared.

83. CAL. PUB. RES. CODE § 21081.5 (Deering 2008).
84. Citizens of Goleta Valley v. Bd. of Supervisors, 801 P.2d 1161, 1167 (Cal. 1990).
85. REMY ET AL., *supra* note 68, at 591.
86. 801 P.2d 1161 (Cal. 1990).
87. REMY ET AL., *supra* note 68, at 559.
88. *Id.* at 576.
89. For example, the EIR prepared for the Carlsbad Desalination Project was awarded the 2007 Focused Issue Award by the American Planning Association. Dudek, Dudek's Carlsbad Desalination Plant EIR Receives Honors from American Planning Association (June 12, 2007), http://www.dudek.com/av-68.aspx.
90. *Citizens of Goleta Valley*, 801 P.2d at 1175 (noting the substantial deference given to local officials when determining the sufficiency of an EIR).

As evidenced by the desalination projects that have succeeded in meeting CEQA's requirements,[91] the challenges presented by CEQA are far from insurmountable. CEQA can present a large and costly hurdle: preparing a sufficient EIR can be incredibly expensive.[92] But project proponents who are committed to making the necessary changes to comply with the law will generally be able to do so and proceed with desalination development, despite CEQA's stringent requirements.

IV. The Endangered Species Act

The dangers inherent in pumping water out of the ocean, as well as discharging high-salinity brine back *into* it, may be overcome in most projects by minimizing the effects on surrounding wildlife. Under the Endangered Species Act ("ESA"), however, the presence of an endangered species in the area can make this problem much more difficult—or even impossible—to overcome.

The ESA is intended to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, [and] to provide a program for the conservation of such endangered species and threatened species . . . ."[93] There are two ways in which the ESA could apply to the development of a coastal desalination plant: (1) by prohibiting the project's development through the permitting process; or (2) by punishing an already-operating plant for violations of the Act.

A. The Jeopardy Clause

In the event a proposed desalination plant requires federal involvement,[94] the responsible agency—under a provision of the ESA

91. For example, the Carlsbad project has received final approval and construction on the project began in 2009. Carlsbad Desalination Project, *supra* note 17.

92. The time and expense of the CEQA EIR process alone can sometimes be enough to kill a project, even if the project would ultimately be able to withstand a challenge on the merits. In Monterey, the developers of a small desalination plant at Ocean View Plaza received approval on their project's EIR in October 2002. Since that time, there have been numerous court challenges, a supplemental EIR, and tremendous expenses incurred. COOLEY, GLEICK & WOLFF, *supra* note 22, at 34. But in that case, the project seems to have outlasted the barrage of challenges—in August 2008, the California Coastal Commission gave the project what presumably will be the final approval it needs to move forward. California Coastal Coalition, *supra* note 64.

93. 16 U.S.C. § 1531(b) (2006).

94. *See e.g.*, COOLEY, GLEICK & WOLFF, *supra* note 22, at 35 (describing a proposed desalination project in the Cambria Community Services District that "would be funded with federal money" and managed by the Army Corps of Engineers).

commonly referred to as the "Jeopardy Clause"—is obligated to evaluate the project under the ESA prior to providing funds or granting a permit: "Each Federal agency shall . . . insure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species . . . ."[95] If the agency determines that the project will "jeopardize" the continued existence of an endangered species, the project will have to be modified so as to avoid that harm. If the harm cannot be avoided, the agency will be required to halt plant development.

If there is no way for a project to avoid jeopardizing a listed species and the necessary permit application is denied, the only option left to the project proponents is to apply for an exemption.[96] The decision whether to grant an exemption is made by the Endangered Species Committee.[97] The Committee will only grant an exemption if it determines,

> (i) there are no reasonable and prudent alternatives to [granting the permit];
>
> (ii) the benefits of [granting the permit] clearly outweigh the benefits of alternative courses of action consistent with conserving the species or its critical habitat, and such action is in the public interest;
>
> (iii) [granting the permit] is of regional or national significance; and
>
> (iv) neither the Federal agency concerned nor the exemption applicant made any irreversible or irretrievable commitment of resources . . . .[98]

If the Committee does grant an exemption, it must also establish "reasonable mitigation and enhancement measures" that are "necessary and appropriate to minimize the adverse effects of the [permit approval] upon the endangered species, threatened species, or critical habitat concerned."[99]

95. 16 U.S.C. § 1536(a)(2) (2006). This section of the ESA is commonly referred to as the "jeopardy clause."

96. *Id.* § 1536(g).

97. *Id.* § 1536(e)(2). The Committee, sometimes referred to as the "God Squad," includes the Secretaries of Agriculture, the Army, and the Interior, the Chairman of the Council of Economic Advisors, the Administrators of the Environmental Protection Agency and the National Oceanic and Atmospheric Administration, as well as the President. *Id.* § 1536(e)(3).

98. *Id.* § 1536(h)(1)(A).

99. *Id.* § 1536(h)(1)(B).

For many desalination plants, federal permitting will not be required because they are not funded by federal funds, and this section of the ESA will not apply. But if a federal agency's approval *is* required and the agency refuses to grant the permit on ESA grounds, the bar for receiving an exemption is set extremely high.[100]

B. The Take Prohibition

Although a large portion of the ESA applies only to federal agencies, the Act also includes a blanket prohibition against the killing, or "taking," of endangered species. The Act states that "it is unlawful for any person subject to the jurisdiction of the United States to . . . take any [endangered] species within the United States or the territorial sea of the United States . . . ."[101] The term "take" means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."[102] A violation of any element of the ESA, including the take provision, can lead to both civil and criminal penalties, including imprisonment.[103]

According to the U.S. Fish & Wildlife Service ("FWS"), there are 123 animal species in California that are listed as endangered or threatened.[104] At least half of these species are coastal or oceanic, and could potentially be affected by the development of a desalination plant.[105] Consequently, any desalination plant will be required to address the possibility that its intakes may kill endangered or threatened species. If a plant's intakes kill any listed species, the plant will be liable for penalties under the ESA.

However, similar to the possibility of receiving an exemption under the Jeopardy Clause, the prohibition on taking allows for some exceptions.[106] The most commonly used of these exceptions is a permit for "incidental" taking, given in the form of an "incidental take

100. The bar is set so high, in fact, that it is difficult to locate examples of cases where an exemption has actually been granted. J.B. Ruhl, *Is the Endangered Species Act Eco-Pragmatic?*, 87 MINN. L. REV. 885, 914, 914 n.27 (2003). It is difficult to imagine an exemption being granted for any desalination plant—at least until we reach a point (as a state, or a nation) where our population simply does not have enough freshwater to survive.

101. 16 U.S.C. § 1538(a)(1)(B) (2006).

102. *Id.* § 1532(19).

103. *Id.* § 1540.

104. U.S. FISH & WILDLIFE SERV., ENVIRONMENTAL CONSERVATION ONLINE SYSTEM, SPECIES REPORT, LISTING AND OCCURRENCES FOR CALIFORNIA, *available at* http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=CA (last updated April 20, 2010).

105. *Id.*

106. 16 U.S.C. § 1539 (2006).

statement" ("ITS").[107] In order to be considered for an exception, an applicant must submit a conservation plan that specifies (1) the likely impacts of the incidental taking, (2) the steps the applicant will take to minimize those impacts, (3) any alternative actions the applicant has considered but rejected, and (4) any other measures required by the Secretary. At that point, the Secretary may permit "any taking otherwise prohibited . . . if such taking is *incidental* to, and not the purpose of, the carrying out of an otherwise lawful activity."[108]

The upshot of this exception is that a desalination plant may be able to operate despite the occasional "taking" of local endangered species, so long as such taking would not violate the Jeopardy Clause. There have been no published cases regarding desalination plants and takings. But the U.S. Court of Appeals for the Ninth Circuit has upheld incidental take permits in analogous situations. In *Center for Biological Diversity v. U.S. Fish & Wildlife Service*,[109] the FWS issued an ITS to applicant CEMEX, exempting the company from the ESA's take prohibition for a sand and gravel mining operation that included pumping water from the Santa Clara River.[110] Though the river was home to the endangered threespine stickleback, and pumping operations could cause the river to run dry at certain times, the court upheld FWS's decision to allow some incidental taking of the endangered fish. FWS's decision was based on its finding that the pumping operations would "not jeopardize the existence of the endangered species."[111] The court found that once FWS has made this finding, the agency "*must* issue the ITS."[112] This is because the agency has no discretion to deny issuance of an ITS once it has been determined that the project does not place the existence of the endangered population in jeopardy.

C. The ESA's Application to Desalination Projects

The ESA presents a much larger hurdle for proposed desalination plants that would require the permission of a federal agency—the Jeopardy Clause is more likely to present a problem than is the taking prohibition. But still, the ESA will rarely be an insurmountable obstacle to desalination development. Unless a proposed plant threatens to

107. *See id.* § 1539(a)(1)(B).
108. *Id.* §§ 1539(a)(2)(A), 1539(a)(1)(B) (emphasis added).
109. 450 F.3d 930 (9th Cir. 2006).
110. *Id.* at 933.
111. *Id.* at 941.
112. *Id.* at 942.

completely destroy an endangered species, even the powerful Jeopardy Clause will not prevent the development or operation of desalination plants.

Conclusion

As of 2006, there were upwards of twenty proposed desalination plants along the California Coast.[113] Twelve of these plants would be significantly larger than any desalination plant previously built in California.[114] Even if all of these plants are built, however, desalination will still only supply about six percent of the state's urban water use.[115] Locally, the addition of desalinated water to a municipal water supply can have a large effect, but desalination is nowhere near being a major source of water on the state level. As the actual and relative price of desalination continues to fall, California should begin to take the process more seriously—but only if the environmental challenges of desalination development are dealt with simultaneously.

As California's population grows, desalination will become a necessary component of the state's water supply. Beyond necessity, desalination technology may be desirable for improving the state's environment as well. As our society attempts to address climate change, technologies will be developed that should assist in improving and streamlining the desalination process to make it more environmentally friendly, more energy-efficient, and less dangerous to marine life and coastal ecosystems. If scientists and engineers can continue to develop these technologies to a point where desalination can provide a significant portion of California's water, the possibilities for positive environmental changes will be staggering.

Many environmentalists dream of a day when we can stop removing water from our river systems and leave it in the stream for the creatures that need it. This may seem like a completely unattainable goal, but that does not necessarily mean we should not strive to achieve it. Environmentally friendly desalination technologies and processes may give us the opportunity to leave more water in rivers and take better care of our environment.

113. COOLEY, GLEICK & WOLFF, *supra* note 22, at 29. It is difficult to find comprehensive information regarding the number of desalination projects that have been proposed, completed, or are currently under construction. This 2006 report appears to be the most up to date comprehensive listing of ongoing desalination projects in the state.

114. *Id.*

115. *Id.* Note that this is only *urban* water use—if we factor desalination into California's *total* water use (including agricultural and industrial uses in our calculations), the percentage is significantly lower.

The CCA, CEQA, and the ESA exist to protect what is arguably California's most valuable asset—its natural environment. The legal requirements of these three acts present considerable obstacles to developing desalination capabilities in California. But it is clear that these obstacles are not insurmountable. As desalination technology progresses, California will be in an even better position to develop practical desalination capabilities—increasing the state's water supply without harming the environment.