July 9, 2018

Hope Smythe
Executive Officer
California Regional Water Quality Control Board, Santa Ana Region
3737 Main Street, Suite 500
Riverside, CA 92501

Sent via electronic mail to: hope.smythe@waterboards.ca.gov

RE: Evidence to Demonstrate ISTAP Flaws in the Poseidon – Huntington Beach Subsurface Feasibility Analysis

Dear Ms. Smythe:

California Coastkeeper Alliance (CCKA) is a network of California Waterkeeper organizations working to protect and enhance clean and abundant waters throughout the state for the benefit of Californians and California ecosystems. CCKA engaged in the development of the State Water Board's Desalination Ocean Plan Amendment (OPA), and we remain interested in ensuring the OPA is properly implemented. The Santa Ana Regional Water Quality Control Board (Regional Board) review of the proposed Poseidon – Huntington Beach seawater desalination project will mark the first regulatory review of a seawater desalination project under the OPA. The Regional Board thus has an important opportunity to establish a practice and precedent of rigorous application of the OPA in a way that advances statewide policy objectives for the protection of marine life and water quality.

A principal purpose of the OPA is to advance rigorous implementation of California Water Code Section 13142.5(b), a "technology-forcing" statute that requires new or expanded industrial facilities, including seawater desalination plants, to use "best available site, design, technology, and mitigation measures feasible … to minimize the intake and mortality of all forms of marine life." Like related California laws and policies, such as California's Once-Through Cooling Policy for coastal power plants (adopted under Section 316(b) of the federal Clean Water Act, a similar technology-forcing statute), the OPA aims to prevent altogether any entrainment and impingement of marine life by strictly limiting the use of open-ocean water intakes by desalination facilities. The OPA establishes a strong preference for the use of subsurface water intakes for seawater desalination facilities and provides an analytical framework for regulating proposed desalination facilities to ensure the selection of appropriate sites, facility designs, and control technologies in the first instance, with mitigation measures available only after such selections have been made. Specifically, the OPA requires a stringent analysis of the feasibility of subsurface intakes for a range of reasonable facility sites and designs (including facility sizes, layouts, forms, and functions), and directs regional boards to *require* subsurface intakes unless they determine that subsurface intakes are not feasible with respect to each of those considerations.

In light of these goals and legal requirements, we write to express concerns about the insufficiency of the findings of the Independent Scientific Technical Advisory Panel (ISTAP) that was convened twice to review the Poseidon project in 2014 and 2015. Furthermore, Poseidon has submitted application materials – relying upon the ISTAP reports – asserting that subsurface intakes are infeasible for the Poseidon – Huntington Beach Project proposal. The expert reports discussed below are evidence to be considered as part of the administrative record and demonstrate the legal flaws with Poseidon's assertions that subsurface intakes are infeasible. For purposes of its analysis under the OPA, the Regional Board may not rely in full on the ISTAP's two reports for reasons that we summarize here and detail in the below memo.

Expert reports[1] prepared subsequent to the final ISTAP reports show that the Regional Board may not rely on the ISTAP's two reports for the following reasons:

1. TECHNICAL FEASIBILITY: The ISTAP Phase 1 Report did not adequately assess the technical feasibility of slant wells in light of criteria that are expressly provided by the OPA, looked to factors outside of the OPA, and omitted consideration of factors that are necessary to an adequate assessment of OPA compliance.
    - ISTAP improperly considered "aquifer drawdown," which is not a feasibility criterion set forth in the OPA.
    - ISTAP improperly considered "performance reliability," which is not a feasibility criterion set forth in the OPA.
    - ISTAP did not consider the feasibility of subsurface intakes at alternative project sites.
    - ISTAP did not consider the feasibility of a combination of subsurface and open-ocean intakes.
    - ISTAP relied on an undisclosed model to conclude aquifer drawdown was a fatal flaw for slant wells, but an independent review identified limitations and uncertainty with the model and concluded the results were inconclusive until physical tests could verify the computer modeling.
    - Independent analysis found slant wells would improve management of seawater intrusion.
2. ECONOMIC FEASIBILITY: The ISTAP made incomplete and erroneous economic analyses, and reached erroneous conclusions, that have been rebutted by independent experts.
    - ISTAP did not properly consider an appropriate reliability premium.
    - ISTAP did not assess life-cycle costs, including avoidance of pretreatment, as required by the OPA.
    - ISTAP did not consider real-world examples of desalination facility construction and life-cycle costs that demonstrate the feasibility of subsurface intakes in California.
    - ISTAP erred by using "willingness to pay" as a standard of economic feasibility.
3. DESIGN ALTERNATIVES: The ISTAP did not consider relevant information that the Regional Board must consider in making its own determination.
    - ISTAP did not consider alternative project sites and sizes when assessing subsurface feasibility.
    - Poseidon's permit application does not include a defined and documented need for 50 MGD in water supply that cannot otherwise be met by alternative means.
    - Independent expert review demonstrated that the urban water management plans cited by Poseidon are flawed and do not demonstrate demand for the proposed project.

For the reasons described above and in the below memo, we respectfully state that (1) ISTAP Phase 1 erred in concluding slant wells were not technically feasible for the proposed facility, (2) the ISTAP Phase 2 Report did not adequately support the conclusion that subsurface intakes are economically infeasible, and (3) the Regional Board cannot legally rely on the ISTAP conclusion that subsurface intakes are infeasible for the Poseidon – Huntington Beach project because the rationale and evidence used does not adequately support the conclusions. We request that the Regional Board conduct a new, independent, and more comprehensive analysis of the feasibility of subsurface intakes for the Poseidon – Huntington Beach project using the criteria set forth in the

[1] *See* HydroFocus Inc., Huntington Beach Seawater Desalination Facility Groundwater Model Evaluation (September 23, 2016); *available at* https://www.waterboards.ca.gov/santaana/water_issues/programs/Wastewater/Poseidon/2018/HydroFocus_Expert_Report.pdf. *See* James Fryer, A Review of Water Demand Forecasts for the Orange County Water District (July 2016); *available at* https://www.waterboards.ca.gov/santaana/water_issues/programs/Wastewater/Poseidon/2018/Fryer_Expert_Report.pdf. *See* Professor Michael Hanemann, AN ASSESSMENT OF THE REPORTS ON THE PROPOSED HUNTINGTON - POSEIDON SEAWATER DESALINATION PROJECT PREPARED BY THE INDEPENDENT SCIENTIFIC TECHNICAL ADVISORY PANEL (June 16, 2018); *available at* https://www.waterboards.ca.gov/santaana/water_issues/programs/Wastewater/Poseidon/2018/Hanemann_Expert_Report.pdf.

OPA. At a minimum, a new, independent study should be conducted to ascertain the technical feasibility of slant wells that includes both the proposed site and design capacity, as well as other site locations and design capacities that may increase the feasibility of subsurface intakes for the project. We strongly recommend a third-party review of the Geosyntec and HydroFocus analyses prior to issuance of a Tentative Decision. We further recommend the Regional Board employ the team of experts analyzing and testing slant wells for the proposed Doheny seawater desalination proposal ─ experts who already have experience in similar analyses at a nearby site. This technical feasibility study should then be followed by an economic analysis that evaluates the full cost and economic opportunity of subsurface intake.

Sincerely,

Sean Bothwell
Policy Director
California Coastkeeper Alliance

MEMO OF POINTS AND AUTHORITY

For reasons contained herein, the findings of the Independent Scientific Technical Advisory Panel (ISTAP) that was convened to review the Poseidon – Huntington Beach seawater desalination project are insufficient to support the Santa Ana Regional Water Quality Control Board (Regional Board) analysis of the project's compliance with Section 13142.5(b) of the California Water Code, and with the State Water Resources Control Board (State Water Board) Desalination Ocean Plan Amendment (OPA) which was adopted to implement that statute. Accordingly, the Regional Board must conduct a new, independent, and more comprehensive analysis of the feasibility of subsurface intakes for the Poseidon – Huntington Beach project using the criteria set forth in the OPA.

I. BACKGROUND

A. Technology-Forcing Requirements in the California Water Code and the Desalination Ocean Plan Amendment.

California Water Code Section 13142.5(b), which provides the underlying policy goal of the OPA, is clear and strict: "minimize the intake and mortality of all forms of marine life." Much like the Clean Water Act, Section 13142.5(b) is "technology forcing"; that is, it requires all projects that fall within its scope to use "best available technology" to ensure compliance with the policy goal. In applying Section 13142.5(b) with respect to new or expanded desalination facilities, the OPA requires the Regional Board to analyze four statutory elements – site, design, technology, and mitigation measures – for compliance with the policy mandate to minimize intake and mortality. The Regional board must analyze a range of feasible alternatives for best available site, best available design, best available technology, and best available mitigation measures independently and collectively to determine the best combination of feasible alternatives under the OPA.

The law mandates using best available technology when it is "feasible." "Feasible" has been defined by the State Water Board to include both technical and economic feasibility criteria. Technical feasibility is often shown through computer modeling of the hydrogeology of the site. We have learned from the CalAm – Monterey and Doheny seawater desalination proposals, however, that computer models are not always exact and often require test wells to ground-truth the models. If, after test wells have verified the accuracy of the computer model conclusions that subsurface intakes are infeasible at the proposed site and design, the "combination of elements" required by the OPA then applies, which requires the applicant to prove by preponderance of the evidence that an alternative site or intake capacity would not make the use of subsurface intakes feasible.

The determination of feasibility includes the following inquiry: Did the applicant choose a "site" where subsurface intakes are feasible? If not, is there a nearby site that would be a better choice for the subsurface intake? If the applicant has chosen a site where subsurface intakes are feasible, then they have met the mandate to use the best combination of site and technology to minimize intake and mortality. If they chose a site for another reason (e.g., to co-locate with a power plant), then the applicant has triggered its burden to prove that subsurface intakes would not be feasible at another site.

The Regional Board must also consider the best available design, which includes the size and intake capacity of the facility. For example, if an applicant is seeking permits for a facility that produces 50 million gallons a day (MGD) of freshwater, a seawater withdrawal of approximately 100 MGD would be required. That volume may be more than a subsurface intake can feasibly produce – making it technically infeasible. This volume may also mean the construction of a gallery is extremely expensive, which could make subsurface intake economically infeasible. The applicant not only needs to prove a subsurface intake is infeasible for the proposed project but must prove by preponderance of the evidence that a smaller facility cannot be built that would be compatible with the use of subsurface intakes. The OPA states that if there is an "applicable" Urban Water Management Plan (UWMP) for the area being served by the facility, that UWMP must identify a "need" for the water. That is, the UWMP cannot simply mention that desalination is under consideration, or that it is one of several alternatives for future supplies

– there must be evidence sufficient to prove that a smaller facility is not feasible. If there are alternatives in an Urban Water Management Plan that would meet all or part of the future demand, then the applicant has not proven they could not build a smaller facility using a subsurface intake – excluding the project from the exception to the rule that the best available technology be employed to minimize intake and mortality of marine life.

Finally, if subsurface intakes are found infeasible for a proposed intake volume, it is also the applicant's burden to prove that a combination of subsurface and screened open ocean intakes are not feasible for minimizing intake and mortality of marine life.

B. Subsurface Intakes are the Best Technology Available and it's the Applicant's Burden to Show the Need for an Exemption.

There is no dispute that subsurface intakes are the most effective technology solution for minimizing intake and mortality of marine life – far more effective than the use of screens or flow velocity reductions on open-ocean intakes. As the State Water Board found in the substitute environmental document for the OPA:

> Operation of surface water intakes can result in significant intake and mortality of all forms of marine life. … Organisms may become trapped against surface water intake screens by the suction power of the surface water intakes, referred to as impingement. Smaller organisms in the water column such as algae, plankton, fish larvae, and eggs, that pass-through surface water intake screens are drawn into the facility and *will perish when exposed to the high pressure and heat of a cooling water or desalination system*. This process is referred to as entrainment. (Emphasis added.)[2]
>
> Overall, impingement and entrainment result in the loss of biological productivity.[3] Impingement typically involves the loss of adult aquatic organisms, which reduces the reproductive population of an affected species.[4] Entrainment of eggs and larvae will reduce the recruitment of juveniles to parent populations, and reduces available food for fish and wildlife dependent on the aquatic organisms lost to impingement and entrainment.[5]
>
> [T]here is only an approximate one percent reduction in entrainment mortality between screened and unscreened [open ocean] intakes.[6]
>
> Section 13142.5(b) requires that the Ocean Plan consider all forms of marine life, regardless of size. Subsurface intakes are more protective of marine life than surface water intakes.[7]

Pursuant to this analysis, the State Water Board decided to require use of subsurface intakes as a general rule "because they are the best method for minimizing intake and mortality of all forms of marine life."[8]

Accordingly, a permit application that would provide for a seawater desalination project to use an open-ocean intake rather than a subsurface intake, regardless of the project's use of any screens or other impact reduction technologies for the open-ocean intake and/or after-the-fact mitigation, is effectively a request

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[2] State Water Resources Control Board, Final Staff Report Including the Final Substitute Environmental Documentation addressing DESALINATION FACILITY INTAKES, BRINE DISCHARGES, AND THE INCORPORATION OF OTHER NON-SUBSTANTIVE CHANGES, pg. 51 (May 6, 2015); *available at* https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2015/rs2015_0033_sr_apx.pdf.
[3] *Id* at 52.
[4] *Id*.
[5] *Id*.
[6] *Id* at 61.
[7] *Id* at 69.
[8] *Id*.

for an exemption from the OPA's general requirements to minimize intake and mortality of marine life. A project proponent bears the burden of presenting evidence and analysis that show why subsurface intakes are not feasible for the project as proposed.

C. Origins and Limitations of the ISTAP Reports with Respect to the Desalination Ocean Plan Amendment.

A significant portion of the ISTAP's analyses were made without consideration of OPA criteria and requirements.

In November 2013, the California Coastal Commission (Commission) held a public hearing on the Poseidon – Huntington Beach Project to determine whether to issue a coastal development permit (CDP) to Poseidon for the offshore portions of the project and to determine how to resolve an appeal of a CDP from the City of Huntington Beach. At the hearing, Poseidon withdrew its CDP application after a discussion that focused in large part on the project's choice of intake technologies. Prior to Poseidon's withdrawal, the Commission indicated that it might consider a third-party study of the feasibility of subsurface intakes if Poseidon should return to seek a CDP.

In January 2014, the Coastal Commission and Poseidon agreed to undertake an independent review regarding the feasibility of potential subsurface intake designs in *at least two phases and* convened the ISTAP to undertake the review. In Phase 1, the ISTAP's scope was to assess "the technical feasibility of subsurface intake technologies that could potentially be applicable for the desalination facility proposed by Poseidon for the Huntington Beach site."[9] The Phase 1 review concluded in October 2014. In Phase 2, the ISTAP's scope, in the words of the ISTAP, was to assess "the broader feasibility of the two technically feasible options [identified in the Phase 1 report] for subsurface intake technologies, with the directive to consider economic, environmental and social factors consistent with the definition of 'feasibility' considered applicable to the proposed project."[10] To define "feasibility," the ISTAP considered several sources of information including the Coastal Act, the California Environmental Quality Act (CEQA), and the draft OPA, as well as several "sub factors" that, in its opinion, informed consideration of economic, environmental, and social elements of feasibility as defined by the Coastal Act. The ISTAP's Phase 2 review concluded in August 2015.

Notably, neither of the two ISTAP reports tracked the OPA's approach for determining feasibility of subsurface intakes, which the State Water Board adopted in May 2015. The ISTAP Phase 1 Report was finalized well before the OPA was adopted. The ISTAP began its Phase 2 review before the OPA was adopted and undertook most of its analysis on the basis of factors provided by other sources of guidance or information.

D. Legal Standard of Review.

Water Code section 13330, subdivision (a) allows any aggrieved party to file a petition for writ of mandate seeking review of a State Board decision.[11] Under that section, courts review agency decisions for prejudicial abuse of discretion as set forth by Code of Civil Procedure section 1094.5.[12] "Abuse of discretion is established if the respondent has not proceeded in the manner required by law, the order or decision is not supported by the findings, or the findings are not supported by the evidence."[13]

Under this standard of review, the "question is not whether any rational fact-finder could make the finding

[9] Independent Scientific Technical Advisory Panel, Phase 2 Report: Feasibility of Subsurface Intake Designs for the Proposed Poseidon Water Desalination Facility at Huntington Beach, California, pg. 8 (August 17, 2015); *available at* https://documents.coastal.ca.gov/assets/press-releases/huntington-beach-desal/CCC-Poseidon_ISTAP_Draft_Phase_2_Report_for_Public_Review_8-14-15.pdf.
[10] *Id.*
[11] Wat. Code, § 13330, subd. (a).
[12] *Id.*, § 13330, subd. (e).
[13] Code Civ. Proc., § 1094.5, subd. (b).

[determined by the agency], but whether the reviewing court believed the finding actually is correct."[14] An agency's decision may then be overturned if the petitioner shows its evidence outweighs the agency's evidence.[15]

After detailed expert review and opinion, we respectfully find that (1) ISTAP Phase 1 erred in concluding slant wells were not technically feasible for the proposed facility, (2) the ISTAP Phase 2 Report did not adequately support the conclusion that subsurface intakes are economically infeasible, and (3) the Regional Board cannot legally rely on the ISTAP conclusion that subsurface intakes are infeasible for the Poseidon – Huntington Beach project because the rationale and evidence used does not adequately support the conclusions.

II. THE REGIONAL BOARD WILL NOT PROCEED IN A MANNER REQUIRED BY LAW IF IT ACCEPTS POSEIDON'S POSITION THAT SUBSURFACE INTAKES ARE TECHNICALLY INFEASIBLE BASED ON THE ISTAP REPORTS.

A. The Regional Board cannot rely on ISTAP's technical feasibility analysis because the criteria used to determine slant wells are infeasible does not comport to the legal requirements in the OPA.

1. ISTAP's technical feasibility criteria does not match the feasibility criteria set forth in the OPA.

The ISTAP analyses were for the Coastal Commission, not the Water Boards. The ISTAP 1 Report evaluated whether any of several subsurface intake designs would be technically feasible to build and operate as part of the Poseidon – Huntington Beach project. The Report was a "product of coastal development permit (CDP) review, the California Coastal Commission (CCC or the Commission) recommendations, and a scientific and technical review conducted by an independent expert panel (the Independent Scientific Technical Advisory Panel, or ISTAP) convened jointly by staff of the Commission and Poseidon."[16] The ISTAP also "determined that 'Technical Feasibility' should be further defined by generally recognized factors as documented in the California Coastal Act of 1976."[17] The ISTAP 1 Report to determine technical feasibility was part of the Coastal Commission's regulatory structure and does not meet the regulatory structure of the State Water Board's OPA.

The OPA requires a different set of technical feasibility criteria. The Final ISTAP 1 Report acknowledged that their technical feasibility analysis should be "informed by the recent State Water Resources Control Board Draft Desalination Policy published July 3, 2014." First, the ISTAP erred in counting "14 factors" in the July 3rd, 2014 Draft OPA – there were 15. The ISTAP identified 14 feasibility factors:

1. Geotechnical data
2. Hydrogeology
3. Benthic topography
4. Oceanographic conditions
5. Presence of sensitive habitats
6. Energy use
7. Impact on freshwater aquifers
8. Local water supply and existing users
9. Desalinated water conveyance
10. Existing infrastructure
11. Co-location with sources of dilution water
12. Design constraints (engineering, constructability)
13. Project lifecycle costs
14. Other site- and factory-specific factors

The ISTAP missed one feasibility criteria – Presence of Sensitive Species.[18] From the feasibility criteria in the Draft OPA, the ISTAP "determined that the following six factors are technological in nature, namely:

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[14] *Alberda v. Bd. of Retirement of Fresno County Employees' Retirement Assn.* (2013) 214 Cal.App.4th 426, 435-436.
[15] *Id.*; *Fukuda v. City of Angels* (1999) 20 Cal.4th 805, 811-12.
[16] Independent Scientific Technical Advisory Panel, Technical Feasibility of Subsurface Intake Designs for the Proposed Poseidon Water Desalination Facility at Huntington Beach, California, pg. 5 (October 9, 2014); *available at* https://www.ocwd.com/media/2275/istap-phase-1-report-10-9-2014.pdf.
[17] *Section 30108 of the California Public Resources Code.*
[18] See State Water Resources Control Board, Draft Amendment to the Water Quality Control Plan for Ocean Waters of California Addressing Desalination Facility Intakes, Brine Discharges, and to Incorporate Other Nonsubstantive Changes (July 3, 2014); *available at* https://www.waterboards.ca.gov/water_issues/programs/ocean/desalination/docs/draft_desal_amend070314.pdf.

(1) geotechnical data for the site,
(2) hydrogeology,
(3) benthic topography,
(4) oceanographic conditions,
(5) impact on freshwater aquifers, and
(6) other site and project-specific factors."[19]

ISTAP concluded that the "six factors thus comprise the "Technical Factors" considered in this Phase 1 assessment..."[20] The six factors considered in ISTAP 1 do not match the final feasibility factors in the Final OPA.

2. *The ISTAP reports considered "aquifer drawdown," which is not a feasibility criterion set forth in the OPA.*

ISTAP should not have concluded slant wells are infeasible due to a publicly undisclosed report. ISTAP 1 concluded that slant wells were infeasible at the Huntington Beach site because the "[s]lant wells completed in the Talbert aquifer would draw large volumes of water from the Orange County Groundwater Basin, which in itself is considered a fatal flaw." This conclusion was drawn from a public comment made by Orange County Water District:

> *As was noted by Mr. Roy Herndon of the OCWD during the public meeting, the proposed groundwater pumping would be about 45% of the total Orange County Groundwater Basin pumping. Pumping would result in very large drawdowns, which would pull freshwater from the landward direction resulting in a high-water quality risk*[21].

At the time, environmental NGO stakeholders were not aware of the origin of the "large drawdown" claim. Only after the ISTAP finalized their first Report did we become aware of the Geosyntec study of potential aquifer drawdown caused by subsurface intakes. Environmental NGOs were never given an opportunity to rebut OCWD's claims.

The State Water Board made a deliberate decision to remove "impact on freshwater aquifers" as a feasibility criterion under the OPA. On May 1st, 2015 the State Water Board released a Change Sheet that deleted "impact on freshwater aquifers" from the OPA's list of feasibility criteria.[22] And on May 6th, 2015 the State Water Board adopted the final OPA without the feasibility criteria of "impact on freshwater aquifers." However, impact on freshwater aquifers was a primary factor in the ISTAP 1 Report that led to the conclusion that slant wells were infeasible for Poseidon's selected site. ISTAP 1 determined that slant wells at Poseidon's proposed site was technically infeasible because they "would draw large volumes of water from the Orange County Groundwater Basin, which in itself is considered a fatal flaw."[23] Assuming there is adequate proof of "large volumes" of freshwater drawdown, this may have been a fatal flaw under the draft feasibility criteria of the July 2014 Draft OPA, but it should not be considered a fatal flaw under the Final OPA that the Regional Board must adhere to.

ISTAP 1 concluded that slant wells are not technically feasible because of the drawdown of "large volumes" of freshwater without any independent studies or comment from public review, and consequently did not meet a burden of proof required in a permit application to the Regional Board. ISTAP then compounded that error by relying on the draft feasibility criteria set forth in the draft OPA of July 2013. That draft criteria included "impact

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[19] *Supra* note 16, at 12.
[20] *Id*.
[21] *Id* at 55.
[22] *See* State Water Resources Control Board, Change Sheet 1: Draft Amendment to the Water Quality Control Plan for Ocean Waters of California Addressing Desalination Facility Intakes, Brine Discharges, and Incorporating Other Nonsubstantive Changes (May 1, 2015); *available at* https://www.waterboards.ca.gov/water_issues/programs/ocean/desalination/docs/desalamend_050115cs1.pdf.
[23] *Supra* note 16 at 56.

on freshwater aquifers", which was later deliberately removed from the feasibility criteria. The ISTAP largely relied on the impact slant wells would have on the Talbert Aquifer to conclude slant wells are technically infeasible at Poseidon's proposed site. Given the inadequacies of the ISTAP and Geosyntec analyses and conclusions of freshwater drawdown, and since impact on freshwater aquifers is no longer a legal reason to conclude slant wells are not technically feasible under the OPA, the Regional Board cannot rely on ISTAP 1's conclusions based on aquifer drawdown. The ISTAP 1 report has not demonstrated that slant wells are not technically feasible using the criteria set forth in the Final OPA.

3. *Performance reliability is not a feasibility criterion under the OPA.*

ISTAP 1 erred in concluding slant wells are technically infeasible because of performance reliability. The OPA does not allow "performance reliability" to be a technical feasibility criterion. The State Water Board states a clear preference for subsurface intakes by requiring that "the regional water board in consultation with State Water Board staff *shall require subsurface intakes* unless it determines that subsurface intakes are not feasible based upon a comparative analysis of the factors listed below for surface and subsurface intakes."[24] Again, none of the factors includes "performance reliability."

The State Water Board's Substitute Environmental Document for the OPA reiterates the possibility of using subsurface intakes reliably. The State Water Board concluded that it is "possible to install multiple subsurface intakes to withdraw the amount of water desired and the well heads can be buried to reduce or eliminate aesthetic impacts."[25] Beach galleries specifically have design potential for large scale facilities and have been demonstrated to be able handle large volumes of water.[26] In making subsurface intakes the "best available technology" under Water Code Section 13142.5(b), the State Water Board concluded that the technology was reliable.

The ISTAP erred in using performance reliability to bolster their conclusion that slant wells were technically infeasible. The ISTAP 1 Report concludes that "there is very little data on the long-term reliability of the wells. Maintainability is also a critical unknown issue." These conclusions were drawn without a legal basis from the OPA feasibility criteria and contradict the current studies of slant wells at both the nearby Doheny site and CalAm – Monterey.

CCKA contracted Dr. Michael Hanemann, Professor of Agricultural and Resource Economics, University of California, Berkeley, to review reports prepared by ISTAP to analyze the technical and economic feasibility of subsurface intakes for the proposed Poseidon – Huntington Beach project. We determined it was necessary to hire an expert economist after realizing that the ISTAP reports are being relied upon by the applicant as evidence that subsurface intakes are neither technically nor economically feasible, making the Poseidon project eligible for an exemption to the regulatory preference compelling the use of sub-surface intakes.

Resource economist, Dr. Hanemann, notes his concern for the ISTAP 1's conclusions regarding performance reliability. In his report, Dr. Hanemann states that the "2015 Ocean Amendment declares a policy preference for the use of a subsurface intake for desalination, a requirement that did not previously exist.[27] It is not a valid response to say: 'There is not a lot of experience with this technology therefore it should be declared infeasible.'"[28] Dr. Hanemann concluded that a "correct response, instead, is to conduct the appropriate testing–as

[24] State Water Resources Control Board, WATER QUALITY CONTROL PLAN: OCEAN WATERS OF CALIFORNIA, pg. 39 (2015); *available at* https://www.waterboards.ca.gov/water_issues/programs/ocean/docs/cop2015.pdf.
[25] *Supra* note 2 at 65.
[26] *Id*; *See* T.M. Missimer et al., Subsurface Intakes for Seawater Reverse Osmosis Facilities: Capacity Limitation, Water Quality Improvement, and Economics; Desalination 322 (2013) 37–51.
[27] As the SWRCB staff notes in the *Final Staff Report* (p. H-287), the proposed Desalination Amendment "does not take a technology neutral approach for intakes."
[28] Michael Hanemann, AN ASSESSMENT OF THE REPORTS ON THE PROPOSED HUNTINGTON - POSEIDON SEAWATER DESALINATION PROJECT PREPARED BY THE INDEPENDENT SCIENTIFIC TECHNICAL ADVISORY PANEL, pg. 10 (June 16,

has been done elsewhere in California."[29] He goes on to find that "[c]learly the industry disagrees with the ISTAP finding on the feasibility of slant wells based on performance risks, as witnessed by designed and tested proposals to use slant wells for the Doheny and CalAm-Monterey projects."[30]

The ISTAP erred in using performance reliability to discount the technical feasibility of slant wells. In making subsurface intakes the "preferred alternative" under Water Code Section 13142.5(b), the State Water Board concluded that the technology is reliable.[31] The OPA further omits any mention of performance reliability as a feasibility criterion. There was no basis for the ISTAP to use performance reliability as a reason to justify slant wells were technically infeasible. Further, recent seawater desalination proposals in Doheny and Monterey show that, contrary to the ISTAP conclusions, the industry does not consider performance reliability a factor that makes slant wells technically infeasible. The Regional Board therefore cannot rely upon ISTAP 1's conclusions that slant wells are technically infeasible at Poseidon's proposed site.

4. *ISTAP did not consider whether slant wells were technically feasible at other sites as required by the OPA.*

Even if slant wells were adequately analyzed and found infeasible, the ISTAP erred in accepting Poseidon's predetermined site for its proposed Huntington Beach desalination proposal. This error was further compounded by ISTAP 1 failing to consider the site predetermined by Poseidon to produce a volume of water for a smaller desalination facility, as explained below. These errors were repeated more recently in responses to the Regional Board's request for data to analyze alternative sites. The recent responses from Poseidon and Geosyntec fail for the same or similar inadequacies in the Geosyntec 2015 analysis of the Talbert Aquifer technical feasibility cited above.

The Desalination OPA requires Poseidon to assess alternative sites to minimize marine life mortality. No longer can a desalination proposal be co-located with an OTC power facility for cost saving purposes – the proposal must assess the best site to minimize marine life mortality. As the OPA's CEQA document explains "site- and facility-specific feasibility factors would be evaluated to determine the feasibility of a subsurface intake at all of the possible site locations."[32] Moreover, an "owner or operator will need to consider a wide range of siting options to ensure that the possibility of using subsurface intakes is not eliminated because the siting options were too narrow."[33] Additionally, "California has a long history of moving water so the siting locations do not have to be in close proximity to the destination of the product water."[34]

The Porter-Cologne Act requires a project proponent to use the best available site to minimize the mortality of marine life.[35] However, the ISTAP 1 Report only focused on Poseidon's proposed site. ISTAP was clear that the "specific question posed to the ISTAP in Phase 1 then is: Will any of the currently available subsurface intake designs be technically feasible at the proposed site at Huntington Beach"?"[36] As explained in the Report, Poseidon's proposed location for the desalination facility is approximately 2 miles south of the Huntington Beach Municipal Pier, and 1 mile north of the mouth of the Santa Ana River. This location was selected in the late 1990s, as Poseidon attempted to save money by avoiding the costs of constructing modern intakes and the cost of pumping seawater to the desalination facility.

2018); *available at* https://www.waterboards.ca.gov/santaana/water_issues/programs/Wastewater/Poseidon/2018/Hanemann_Expert_Report.pdf.

[29] *Id*.

[30] *Id*.

[31] *See supra* note 24.

[32] *Supra* note 2, at 67.

[33] *Id*.

[34] *Id*.

[35] Water Code §13142.5(b).

[36] *Supra* note 16, at 11-12.

On May 6th, 2015, at the State Water Board's Adoption Hearing for the Desalination OPA, the Board added key language to the best available site section of the Amendment. Chapter III.M.2.b. states that:

> Site is the general onshore and offshore location of a new or expanded facility. There may be multiple potential facility design configurations within any give site. *The regional water board shall require that the owner or operator evaluate a reasonable range of nearby sites, including sites that would likely support subsurface intakes.* For each potential site, in order to determine whether a proposed facility site is the best available site feasible to minimize intake and mortality of all forms of marine life, the regional water board shall require the owner or operator to (1) Consider whether subsurface intakes are feasible.[37]

The ISTAP cannot analyze only one site and then proclaim subsurface intakes are infeasible. Poseidon cannot rely on its pre-selected site, because the company will need a new independent review of alternative sites that would identify more favorable locations for sub-surface intakes in terms of hydrogeology and ocean conditions. An analysis of a single site and a single subsurface intake volume design is wholly inadequate when regulatory regimes call for an analysis of alternative sites and alternative project descriptions to reduce marine life mortality.

5. *ISTAP did not consider whether a combination of both subsurface and open ocean intakes was feasible as required by the OPA.*

The ISTAP erred by not analyzing whether a combination of slant wells and surface intakes would be feasible. The OPA states a "regional water board may find that a combination of subsurface and surface intakes is the best feasible alternative to minimize intake and mortality of marine life and meet the identified need for desalinated water as described in chapter III.M.2.b.(2)."[38] This analysis was not done by either the ISTAP, nor has the Regional Board considered this alternative to date. The Regional Board, therefore, cannot rely on the ISTAP reports to conclude that a combination of slant wells and surface intakes would be technically feasible to minimize intake and mortality of marine life.

B. <u>The Regional Board cannot rely upon assertions made in the ISTAP Phase 1 Report without conducting physical tests to determine slant well performance.</u>

1. *OCWD's aquifer drawdown assertions were made from an undisclosed Geosyntec report that prevented environmental stakeholders from rebutting those claims until after ISTAP 1 concluded.*

Even though "drawdown" was excluded in the OPA as a criterion for finding subsurface intake infeasible, the ISTAP Phase 1 conclusions are inadequate to show the extent of freshwater drawdown. The public did not have an opportunity to rebut OCWD's drawdown claims during the ISTAP 1 study, so we felt it was critical to have an independent review of the Geosyntec study prior to the Regional Board's permit application analysis. We requested HydroFocus to perform the independent review. HydroFocus' principals have over 50 years' experience solving problems associated with agricultural, mining, urban, and industrial activities; water-rights disputes; groundwater pumping; waste disposal; and groundwater contamination and remediation. They are recognized hydrologic experts in the San Francisco Bay Area, San Joaquin Valley, and Sacramento-San Joaquin Delta.[39] Further, HydroFocus has extensive experience conducting the same analyses for the current CalAm – Monterey proposed seawater desalination facility intake.

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[37] *See* State Water Resources Control Board, May 6, 2015 Board Hearing, available at http://www.swrcb.ca.gov/board_info/video.shtml; *Supra* note 24, at 37.
[38] *Supra* note 24, at 40.
[39] Hydrofocus Inc., Website; *avalable at* http://www.hydrofocus.com/.

HydroFocus critically reviewed and analyzed outputs from the groundwater-flow model developed by Geosyntec to evaluate the impacts and feasibility of subsurface intakes for the Poseidon – Huntington Beach facility in the Talbert Gap.[40] The Geosyntec groundwater-flow model simulated the effects of pumping 127 MGD of groundwater from 40 slant wells located along the coast and screened in the Talbert Aquifer. HydroFocus reviewed model structure, ran the model to verify output and assess groundwater flow patterns, and evaluated model sensitivity. They used particle tracking to determine the source of groundwater flowing to the slant wells and evaluate groundwater travel times for various scenarios. HydroFocus verified that the model geometry, boundary conditions, and aquifer properties generally agreed with information reported by Geosyntec Consultants with some exceptions.[41] However, HydroFocus noted improvements that could be made to the analyses and illustrated different outputs and conclusions from the computer modeling when different input variables were included.

2. *HydroFocus's independent review identified limitations and uncertainty with the Geosyntec model and concluded the results were inconclusive until physical tests could verify the computer modeling.*

HydroFocus's independent review concluded that there was not enough data to accurately conclude that the freshwater drawdown predicted in the Geosyntec modeling would occur from offshore slant wells in the Talbert Aquifer. HydroFocus conducted a model sensitivity analysis to assess the effects of varying model inputs on model results.[42] Specifically, HydroFocus evaluated the effect on simulated flow to the slant wells from inland groundwater and the wetlands and the average water-level decline due to varying model inputs for aquifer transmission properties (i.e. hydraulic conductivity), pumping rates, well location and length, and water levels at the seawater intrusion barrier.[43] HydroFocus identified model limitations and uncertainty that affect the ability of the model to accurately predict impacts of project pumping. The Geosyntec model was not calibrated or verified using observed water level data. The review concluded that there is "very limited information on the water transmitting and storage properties of the aquifers and aquitards in the Talbert Gap on which to base model inputs."[44] Groundwater flow paths suggest that model results may be affected by the lateral boundaries of the model domain.[45] The constant water levels specified for the seawater intrusion barrier assumes that the quantity of injection water will be available to maintain the water levels at the barrier regardless of the impact of the slant well pumping.[46] Variable head cells representing parts of the ocean may result in an inaccurate estimation of the contribution of the ocean to the slant wells.[47] HydroFocus concluded that "[p]umping at lower rates than originally simulated will reduce impacts on the groundwater system."[48] The model was most sensitive to changes in the aquifer properties of the Talbert Aquifer and the overlying sediments.[49] HydroFocus concluded that "[v]arying these properties produced large changes in model-estimated groundwater-level drawdowns and inland flow to the slant wells" and as a result HydroFocus concluded that the large changes in model estimates demands "that more data is needed for these inputs to improve model certainty."[50]

The Regional Board must consider HydroFocus's recommendations when evaluating the technical feasibility of slant wells at Huntington Beach. HydroFocus offered several additional steps that can be taken to improve the model and increase confidence in evaluating impacts of the project. HydroFocus recommended (1) aquifer tests to determine properties of the Talbert Aquifer, the overlying sediments, and the wetland sediments; (2) an

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[40] HydroFocus Inc., Huntington Beach Seawater Desalination Facility Groundwater Model Evaluation, pg. 1 (September 23, 2016); *available at* https://www.waterboards.ca.gov/santaana/water_issues/programs/Wastewater/Poseidon/2018/HydroFocus_Expert_Report.pdf.
[41] *Id*.
[42] *Id*.
[43] *Id*.
[44] *Id* at 2.
[45] *Id*.
[46] *Id*.
[47] *Id*.
[48] *Id*.
[49] *Id*.
[50] *Id* at 1.

assessment of the effects of the lateral model boundaries; (3) correction of inconsistencies in model construction; (4) calibration/verification using water level data; and (5) incorporation of the US Geological Survey MODFLOW Subsidence Package to preliminarily evaluate the subsidence potential due to slant well pumping.[51] The improved model can then be used to more effectively simulate potential impacts and project feasibility.

In brief, the HydroFocus review highlights inadequacies in the Geosyntec modeling and provides methods to improve the reliability of the computer modeling, including test wells to "ground truth" model outputs. To date, those improvements to the computer modeling and necessary physical testing have not been conducted.

3. *Conducting physical tests for slant well performance and impact on aquifer drawdown is a standard practice for other desalination projects in California.*

Two seawater desalination proposals in California have studied and tested slant wells and found both technically and economically feasible, which makes the reasoning and conclusions in the ISTAP 1 report suspect. Dr. Hanemann found that as "evidenced by the CalAm-Monterey and Doheny desalination project proposals, slant well intakes are considered "technically feasible" regardless of the potential drawdown of inland waters.[52] "Clearly the industry disagrees with the ISTAP finding on the feasibility of slant wells based on performance risks, as witnessed by designed and tested proposals to use slant wells for the Doheny and CalAm-Monterey projects.[53]

The Municipal Water District of Orange County (MWDOC) in partnership with five participating agencies, investigated the feasibility of slant wells to extract ocean water for the planned Doheny Ocean Desalination Project. In 2003/04, MWDOC undertook preliminary studies to assess alternative approaches to produce ocean water in the vicinity where the San Juan Creek discharges to the ocean in Dana Point. Options included a conventional open intake, a subsurface infiltration gallery, and various types of beach wells. To investigate the feasibility of a subsurface slant well intake, a phased hydrogeology and subsurface well technology investigation was undertaken. In 2004/05, four exploratory boreholes were drilled along the beach to a depth of 188 feet below the ground surface. In 2005/06, after a thorough review of several technologies, it was determined that the most cost-effective approach for this location was the use of slant wells with a dual rotary drill rig constructed from the beach out to the ocean floor.

The CalAm project in Monterey has also conducted physical testing to validate slant well performance. CalAm has "operated a test well at the CEMEX property in Marina since April 2015."[54] The "water drawn from the test well is on average 92 percent ocean water – a percentage that continues to increase with time."[55] With those physical tests showing positive slant well performance – that continues to improve over time – the CalAm project is moving forward with subsurface intakes.

Physical testing at the CalAm – Monterey site has also demonstrated the viability of slant wells to help manage seawater intrusion. The project proponents have found that the "[p]roject will actually slow the progress of saltwater intrusion in the Salinas Valley Groundwater Basin (SVGB)."[56] The CalAm project "will draw seawater and brackish inland water from the western edge of the aquifer which, over time, is expected to facilitate the

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[51] *Id* at 2.
[52] *Supra* note 28, at 10; *See* Hydrogeologic Working Group, Monterey Peninsula Water Supply Project – HWG Hydrogeologic Investigation Technical Report (Nov. 6, 2017); *available at* *https*://docs.wixstatic.com/ugd/28b094_e3255ac3069c4b6b83bce80604ae6703.pdf; *see* Municipal Water District of Orange County, Final Summary Report Doheny Ocean Desalination Project Phase 3 Investigation (January 2014); *available at* http://docplayer.net/46522220-Final-summary-report-doheny-ocean-desalination-project-phase-3-investigation.html; and *see* http://www.mwdh2o.com/FAF%20PDFs/10_MWDOC_SlantWell_FactSheet.pdf.
[53] *Id*.
[54] California American Water, Website Monterey Peninsula Water Supply Project; *available at* https://www.watersupplyproject.org/faq.
[55] *Id*.
[56] *Id*.

retreat of the seawater intrusion front."[57] Moreover, CalAm is dealing with any aquifer drawdown by recharging "the basin with a volume of desalinated water equal to the amount of brackish groundwater that is drawn by the Project. Cal-Am will return this water to the SVGB by delivering it to the Castroville Community Services District and the Castroville Seawater Intrusion Project, both of which will use the water in lieu of pumping groundwater from the SVGB."[58] The marginal cost of basin recharge was not enough to make the use of subsurface intakes "economically infeasible."

The independent review of the Geosyntec study relied on by ISTAP to conclude slant wells are technically infeasible must be considered inconclusive until physical tests verify the results of computer modeling. HydroFocus's independent review concluded that slant wells would help manage seawater intrusion for the Talbert Aquifer similar to the experience in Monterey. Therefore, the ISTAP 1 conclusion that slant wells were not technically feasible was premature and inadequate to meet the burden of proof necessary for an exemption to the preference for subsurface intakes to minimize intake and mortality of all forms of marine life.[59]

4. Independent analysis found slant wells would improve management of seawater intrusion.

ISTAP 1 erred in rejecting stakeholder assertions that slant wells would help manage seawater intrusion. ISTAP 1 noted "[r]ecent public comments have suggested that pumping seawards of the Talbert Salinity Barrier could have beneficial impacts in managing seawater intrusion."[60] The ISTAP 1 Report stated that in "the Panel's opinion, however, this benefit is too uncertain to overcome the ISTAP conclusion about the fatal flaw of this technology as applied to the proposed Huntington Beach site."[61]

HydroFocus's independent review affirmed assertions made during ISTAP 1 public comment that slant wells would help manage sweater intrusion. HydroFocus concluded that:

> *Operation of the slant wells will affect the extent of seawater intrusion in the Talbert Aquifer; pumping will likely increase the gradient from inland areas toward the project wells which will enhance the movement of inland freshwater toward the coast and move the seawater/freshwater interface closer to the coastline. This increase in seaward gradient along with capture of seawater by the slant wells will have the effect of reducing the inland migration of seawater.*[62]

Operation of the slant wells will affect the extent of seawater intrusion in the Talbert Aquifer. Further, pumping will likely increase the gradient from inland areas toward the project wells, which will enhance the movement of inland freshwater toward the coast and move the seawater/freshwater interface closer to the coastline.[63]

Recent communications from Geosyntec to Poseidon[64] in response to questions from the Regional Board regarding alternative sites analyses and an extended well length have failed to respond to important findings in the HydroFocus review of the initial Geosyntec report relied on by ISTAP. Responses to the Regional Board requests

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[57] *Id*.
[58] *Id*.
[59] *See supra* note 41.
[60] *Supra* note 16, at 56.
[61] *Id*.
[62] *Supra* note 41, at 2.
[63] *Id*.
[64] *See* Santa Ana Regional Water Quality Control Board, Request for Review of the Geosyntec Report prepared for Poseidon to Evaluate the Feasibility of Subsurface Seawater Intakes in Bolsa, Sunset, and Alamitos Gaps for the Proposed Huntington Beach Desalination Plant dated July 25, 2017, See Attachment from Geosyntec (April 23, 2018); *available at* https://www.waterboards.ca.gov/santaana/water_issues/programs/Wastewater/Poseidon.html.

for information from Geosyntec and OCWD staff[65] have not addressed the beneficial aspects that offshore slant wells will create for the seawater intrusion barrier.

During the initial inception of OCWD's seawater barrier, a system was considered that used both inland injection wells and extraction wells at the coast. This design would have established a "double-barrier" by creating a groundwater "trough" from coastal well pumping, and a groundwater "ridge" from inland injection wells. In the end, the coastal wells were not built because the injection wells on their own were sufficient. Thus, installing a series of slant wells at the coastline, in addition to the existing injection barrier, would create a steeper groundwater gradient, which exceeds what is currently used to protect inland aquifers from seawater intrusion. The groundwater level at which OCWD maintains its injection barrier is termed the "protective elevation". The protective elevation that Geosyntec used in its scenarios assumed that OCWD will maintain its current protective elevations. In practice, as noted in the Hydrofocus analysis, the creation of a trough from pumping coastal slant wells would allow OCWD to operate with a lower protective elevation at the injection barrier. This would:

(1) Maintain the same protection against seawater intrusion, while lowering the amount of water that OCWD would need to inject into the barrier and making that injection water available for other beneficial uses, and;

(2) Lower the coastal groundwater gradient by decreasing the "ridge" caused by injection. As Hydrofocus has shown in their model analysis, these lower protective elevations would result in greater percentages of seawater, and less inland freshwater, pumped by the coastal wells.

It is clear from the recent responses to the Regional Board's requests for information that OCWD adjusts the volume of water injected into the seawater barrier to ensure the loss of freshwater to the ocean is maintained at approximately 2.3 million gallons a day, while serving the dual function of fending against inland seawater movement and replenishing the basin for nearby freshwater withdrawals. However, given the benefits of offshore withdrawals of seawater through slant wells on the gradient, it is feasible that OCWD could adjust the volume of freshwater injected into the barrier and dramatically reduce the volume of "drawdown" of freshwater predicted by the models. While this may mean adjusting the volume of water injected elsewhere in the aquifer to ensure nearby replenishment, it does not mean that freshwater drawdown in the dramatic volumes predicted in the Geosyntec modeling is inevitable and consequently "infeasible." While OCWD has the authority to object to compulsory adjustments to their management of the seawater intrusion barrier to minimize freshwater "drawdown", they cannot simultaneously object to the use of slant wells because that avoidable drawdown renders their use "infeasible."

Further, the recent communications posted on the Regional Board's project webpage[66] have failed to address the paucity of actual testing of the offshore strata and the conductivity of seawater into the aquifer. The assumptions used in the model of regarding the hydraulic conductivity in aquifers and confining layers that underlying the ocean has a substantial impact on model predictions. As noted in the HydroFocus report, actual test wells are necessary to make any scientifically sound predictions about offshore vertical conductivity to the aquifer and the slant well intakes, as these variables are a major component of the prediction of freshwater drawdown.

In brief, while the Geosyntec modeling is sound given the parameters chosen, important considerations and parameters were excluded in the computer modeling. In both the Doheny project proposal and the CalAm – Monterey proposal, where the project proposals aligned with the regulatory preference for subsurface intakes,

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[65] *See* Orange County Water District, Review of Geosyntec Report prepared for Poseidon to Evaluate the Feasibility of Subsurface Seawater Intakes in Bolsa, Sunset, and Alamitos Gaps for the Proposed Huntington Beach Desalination Plant dated July 25, 2017, (May 18, 2018); *available at* https://www.waterboards.ca.gov/santaana/water_issues/programs/Wastewater/Poseidon/2018/OCWD_Letter_to_RWQCB_2017_Geosyntec_Report_5-18-18.pdf.

[66] *Id*. *Supra* note 64.

more extensive analyses and testing proved that slant wells were not only technically feasible but also included economic benefits that the ISTAP reports excluded in error. We strongly recommend a third-party review of the Geosyntec and HydroFocus analyses prior to issuance of a Tentative Decision. We further recommend the Regional Board employ the team of experts who conducted similar analyses for the proposed Doheny seawater desalination project.

C. <u>The Regional Board cannot rely on ISTAP's technical feasibility analysis because aquifer drawdown is an economic feasibility consideration.</u>

The ISTAP Phase 1 rejects slant wells as an option because they "would draw large volumes of water from the Orange County Groundwater Basin, which in itself is considered a fatal flaw".[67] From expert economist, Dr. Hanemann's perspective, "this is not a valid criterion of technical feasibility – it is an economic consideration."[68] The economist sets up an example to illustrate how drawdown is an economic consideration: suppose "a desalination facility with subsurface slant-wells pumps 100 mgd for a usable supply of 50 mgd of desalinated water, and suppose that a fraction, θ, of the amount pumped actually originates from the freshwater aquifer. Then, when 100 mgd of seawater is pumped, the *net* additional supply of usable water obtained is (0.5-θ)*100 mgd instead of 0.5*100 = 50 mgd. Suppose that 5% of the amount pumped with the slant-wells originates from the freshwater aquifer (θ = 0.05)."[69] He goes on to state that "each mgd of seawater pumped for "source water" generates a net "product water" supply of 0.45 mgd instead of 0.5 mgd. The main significance of this adjustment is that it raises the unit cost of the water supplied."[70] OCWD has also recognized the freshwater drawdown as an economic consideration and posited that the cost would equal an increase in the Replenishment Assessment to replace the lost freshwater.

Dr. Hanemann states that the unit cost of the deasalinated water supply needs to be adjusted to reflect the drawdown of aquifer water.[71] Suppose the cost had been estimated at $2,000 per acre-foot ignoring the drawdown of aquifer water.[72] With the drawdown of aquifer water, the true cost per acre-foot of additional supply from desalination becomes $2,222:

$$2000 * \frac{0.5}{0.5-\theta} = 2000 * \frac{0.5}{0.45} = 2222.$$ [73]

The drawdown of aquifer water is a factor that increases the effective cost per MGD supplied via desalination using a slant-well subsurface intake but, by itself, it does not constitute a "fatal flaw."[74] In summary, and as discussed below, the effective cost of freshwater drawdown was not considered in the ISTAP Phase 2 Report on economic feasibility and was not found to be so excessive that it would render the project economically infeasible.

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[67] *Supra* note 16, at 56.
[68] *Supra* note 28.
[69] An independent report by Hydrofocus, *Huntington Beach Seawater Desalination Facility Groundwater Model Evaluation*, September 23, 2016 presents a preliminary estimate that θ = 0.04. The Hydrofocus report found that a wide range of potential drawdown volumes were dependent upon the variables used in computer modeling. It recommended utilizing test wells to verify the computer modeling. The report "identified model limitations and uncertainty that affect the ability of the model to accurately predict impacts of project pumping. The model was not calibrated or verified using observed water level data." The report went on to recommend "(1) aquifer tests to determine properties of the Talbert Aquifer, the overlying sediments, and the wetland sediments; (2) an assessment of the effects of the lateral model boundaries; (3) correction of inconsistencies in model construction; (4) calibration/verification using water level data; and (5) incorporation of the US Geological Survey MODFLOW Subsidence Package to preliminarily evaluate the subsidence potential due to slant well pumping." Only then can the improved model "be used to more effectively simulate potential impacts and project feasibility."
[70] *Supra* note 28, at 9.
[71] *Id*.
[72] *Id*.
[73] *Id*.
[74] *Id*.

In conclusion, the ISTAP Phase 1 Report was not scoped to assess the feasibility of subsurface intakes in light of criteria that are expressly provided by the OPA, looked to factors outside of the OPA, and omitted consideration of factors that are necessary to an adequate assessment of OPA compliance. The ISTAP reports considered "aquifer drawdown," which is not a feasibility criterion set forth in the OPA. The ISTAP report considered "performance reliability," which is not a feasibility criterion set forth in the OPA. The ISTAP reports did not consider alternative project sites and sizes. The ISTAP report did not consider the feasibility of slant wells at alternative project sites. The ISTAP report did not consider the feasibility of a combination of subsurface and open-ocean intakes. Further, the ISTAP reports improperly considered "aquifer drawdown" to be a technical feasibility issue. Therefore, we request that the Regional Board conduct a new, independent, and more comprehensive analysis of the feasibility of slant wells for the Poseidon – Huntington Beach project using the criteria set forth in the OPA.

III. ANY REGIONAL BOARD FINDINGS THAT CONCLUDE SUBSURFACE INTAKES ARE ECONOMICALLY INFEASIBLE AT POSEIDON – HUNTINGTON BEACH WOULD NOT BE SUPPORTED BY THE EVIDENCE.

The project proponent has a duty, as required by the law, to prove subsurface intakes are not economically viable. The burden of demonstrating economic infeasibility falls squarely on the project proponent, and regulatory agencies should not merely accept the infeasibility claims of the project developers. Rather, regulators must actually study and analyze any claim of infeasibility.[75] Moreover, to pass legal muster, the feasibility analysis may not simply conclude that more environmentally protective options are infeasible because they will place the proponent at a competitive disadvantage or make project financing more expensive or difficult.[76] Rather, to constitute substantial evidence in the record, the feasibility analysis must contain and assess "meaningful comparative data" and concrete information about lender positions.[77]

In interpreting feasibility under CEQA, California courts have repeatedly held that the decision record must show that alternative or mitigation measures are "truly infeasible," not merely undesirable from the proponent's perspective.[78] The appropriate question for the feasibility analysis is whether the project as mitigated can be "economically successful" – that is, whether the mitigated project "cannot operate at a profit so as to render it impractical."[79]

The ISTAP Phase 2 Report is deficient in any discussion, nor includes any evidence in the record, regarding the profit Poseidon will realize from the project, much less whether a lesser profit would completely preclude Poseidon, another developer, or the Water District themselves from developing the project with a subsurface intake. Further, the fact that seawater desalination, in and of itself, is dramatically more expensive than alternatives that achieve the purpose of the project must be considered. The stated purpose of the project – to provide additional "reliability" to the local water supply portfolio – broadens the scope of whether "more environmentally protective options are infeasible."

Significantly, "[t]he fact that an alternative may be more expensive or less profitable is not sufficient to show that the alternative is financially infeasible. What is required is evidence that the additional costs or lost profitability are *sufficiently severe as to render it impractical to proceed with the project*."[80] That is, an environmentally superior technology or mitigation must be "truly infeasible," not just undesirable from the proponent's perspective.[81] Recent case law makes it clear that the courts will demand a robust, credible, and well documented

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[75] Citizens of Goleta Valley v. Bd. of Supervisors [(1990) 52 Cal. 3d 553, 564, 276 Cal. Rptr. 410 at 1187.
[76] *Id*.
[77] *Center for Biological Diversity v. County of San Bernardino*, 185 Cal. App. 4th 866, 884-85 (2010).
[78] *City of Marina v. Board of Trustees of the California State University*, 39 Cal. 4th 341, 269 (2006) (finding that mitigation is not infeasible merely because funding for the measure is uncertain).
[79] *Maintain Our Desert Environment v. Town of Apple Valley*, 120 Cal. App. 4th 396, 449 (2004).
[80] *Goleta Valley*, 197 Cal. App. 3d at 1181 [Emphasis Added].
[81] *City of Marina v. Board of Trustees of the California State University*, 39 Cal. 4th 341, 269 (2006).

analysis to support any claim of economic infeasibility, even under the less stringent and more procedural California Environmental Quality Act.[82]

The Regional Board must evaluate whether subsurface intakes are economically feasible unless a project proponent has proven through a robust, credible and well documented analysis that the additional costs shall be sufficiently severe as to render it impractical to proceed with the project.

Further, because the Phase 1 report erred in dismissing slant wells, the Phase 2 report was void of any analyses of the economic feasibility of slant wells and other similar technologies.[83] Dr. Hanemann stated in his expert review that the "absence of an economic analyses of slant wells is a critical error because the construction costs of slant wells are significantly less than the Seawater Infiltration Galleries analyzed in the ISTAP Phase 2 Report."[84] Other desalination projects in California proposing to use slant wells have shown that technical risks with slant wells can potentially be mitigated and that there would be significant savings in the costs of operation and maintenance compared to the screened open ocean intakes proposed for the Huntington - Poseidon project."[85]

Dr. Hanemann "concluded that the ISTAP Phase 1 and Phase 2 reports are inadequate for showing that slant wells are neither technically nor economically feasible according to the requirements set forth in the Ocean Desalination Amendment to the California Water Quality Control Plan for Ocean Water."[86]

A. <u>ISTAP failed to properly consider an appropriate Reliability Premium.</u>

The ISTAP should analyze the "reliability premium" in its economic analysis of subsurface intakes. Desalinated ocean water is the most expensive source of water globally, but water agencies are willing to pay the cost over cheaper alternatives due to perceived "reliability." The "benefit" of the project is not simply the water itself; it is the reliability of the water and the solution of purported "unreliability" in the current portfolio. A true cost-benefit analysis would be based on the current unreliability in the portfolio, the additional reliability to the portfolio from the project, and the marginal cost of that additional reliability.[87]

Reliability factors should be fully explored in the ISTAP final report. The "allocation formula" used by Metropolitan Water District (MWD) ensures that much of the "reliability" benefit from the addition of desalinated water in the portfolio accrues to MWD members outside Orange County who have already provided funds to subsidize the project through the Local Reliability Program.[88]

A proper economic cost-benefit analysis would include the reliability benefits of the project based on the characteristics of a perceived or real "unreliability" in the portfolio. For example, if the region is perfectly reliable for 9 out of 10 years, then the 10 years of paying for more expensive water only translates to 1 year of reliability. Therefore, the cost of a subsurface infiltration gallery is a minor additional cost to the true economic cost of "reliability" from the project.

Reliability of the water supply may also be dramatically reduced by external factors, such as the occurrence of algal blooms. It is unclear how the simultaneous occurrence of an algal bloom during a disruption to imported water deliveries would affect the value of reliability (i.e., the "reliability premium"). As discussed below, subsurface intakes effectively eliminate the risk of plant shutdowns from algal blooms and consequently increase

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[82] *Center for Biological Diversity*, 185 Cal. App. 4th at 885; *Save Round Valley Alliance v. County of Inyo*, 157 Cal. App. 4th 1437, 1461-62 (2007); *Sierra Club v. Friends of the West Shore*, 916 F. Supp. 2d 1098, 1124-29 (E.D. Cal. 2012).
[83] *Supra* note 28, at 15.
[84] *Id* at 3.
[85] *Id*.
[86] *Id*.
[87] *See Supra* note 28.
[88] *See* Municipal Water District of Orange County, Reliability Benefits in OC from the Poseidon Project (July 7, 2015).

the value inherent in a "reliability premium" for a desalination plant.

Dr. Hanemann finds that if the ISTAP analyses were to be corrected by the Regional Board or a future independent review, several questions need to be addressed more transparently:

(1) How is the water from the Huntington Beach desalination facility to be used, and priced? Will it be held in reserve primarily for use at times of shortage, and will it be priced specially on those occasions so as to capture the higher value of an increment in water supply during a shortage? Or will it serve mainly as additional baseload supply, and will it be priced no differently than other water sold for baseload supply?[89]

(2) Who will contract with Poseidon? It is not obvious that OCWD is the party best placed to be the buyer of this water since it is a groundwater management agency. To maximize the economic value of water obtained by desalination, namely as insurance against disruption of regular surface water supplies, the plant should connect to as extensive a surface water distribution network as possible. Groundwater injection seems like a sub-optimal solution. Perhaps MWD would be a better fit as the party that contracts with Poseidon and would be better placed to maximize the economic value of this water.[90]

(3) What should the scale be? Alternatives smaller than 50 MGD should be considered. It could be that a smaller scale desalination plant would have greater economic value as substitute source of water when the conventional surface water sources of supply are disrupted.[91]

(4) There is also the question of timing. Why build now – or rather, why build 50 MGD now? Desalination is a relatively modular source of supply. It may not be optimal to invest now to build out the full desalination supply that will be needed in, say, 2060.[92]

B. <u>ISTAP failed to assess Life-Cycle Cost Savings, including the avoidance of pretreatment, as required by the OPA.</u>

The Regional Board cannot rely on the ISTAP conclusions that subsurface intakes are not feasible when the ISTAP never considered the cost savings of slant wells from the avoided need for full conventional pretreatment.

Subsurface intake systems use the natural geological properties of sediments and rocks to strain and biologically remove organic matter, suspended sediment, and dissolved organic compounds before they enter the treatment processes. The use of subsurface intake systems improves water quality, increases operational reliability, reduces the pretreatment train complexity, and reduces operating costs. All these factors must be considered when determining "economic feasibility" under the Desalination Ocean Plan Amendment – in particular, the cost and benefit from providing reliability during times of reductions in imported water availability.

The ISTAP did not consider the cost savings of subsurface intakes by avoiding full conventional pretreatment that is required for the proposed open ocean intake. The ISTAP failed to consider life-cycle costs as required by the Desalination Ocean Plan Amendment. Studies have concluded that life-cycle cost analyses show significant cost saving over operating periods of 10 to 30 years.[93] California pilot studies have demonstrated subsurface intakes do

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[89] *Supra* note 28, at 17.
[90] *Id*.
[91] *Id*.
[92] *Id*.
[93] *See* T.M. Missimer et al., Subsurface Intakes for Seawater Reverse Osmosis Facilities: Capacity Limitation, Water Quality Improvement, and Economics; Desalination 322 (2013) 37–51.

not require full conventional pretreatment, have cheaper life-cycle costs compared to open ocean intakes, and that subsurface intakes may produce water cheaper than the proposed Poseidon – Huntington Beach proposal.[94] While cost savings may vary based on site specific characteristics, the ISTAP Report is void of any consideration of this critical information in their analysis.

1. *International expert studies and California's Desalination Ocean Plan recognize that the use of subsurface intakes can avoid full conventional pretreatment.*

Natural seawater contains a variety of macro- and micro-organic components that affect the ocean desalination treatment process. Open-ocean intakes are seasonally clogged in some regions by seaweed and some pretreatment systems are periodically fouled by influx of jellyfish.[95] Natural environmental events, such as harmful algal blooms and red tides, can overwhelm full conventional pretreatment systems and cause temporary shut-downs of ocean desalination plants.[96] In comparison, when subsurface intakes are used, improvements in the raw water quality can lead to reduction in the complexity of pretreatment systems, thereby reducing the need for physical cleaning and the amount of chemicals used, and increasing the operational reliability of facilities (e.g., avoid loss of production during algal blooms).[97] Commonly, feeding higher quality raw water into the primary membrane process leads to a reduction in the rate of organic biofouling, reduced capital cost for construction of pretreatment processes, and reduced operating costs for maintenance, chemical use, and accessory operations. Further, eliminating the use of chemicals required for full conventional pretreatment also eliminates the discharge of these chemicals into the municipal wastewater treatment facilities or direct ocean discharges.

A key issue in assessing the economic feasibility of slant wells and other subsurface intakes is how to improve the quality of the feedwater and, as a result, decrease the life-cycle cost of desalination or total cost per unit volume of product water. The use of subsurface intake systems is one method to improve water quality, to increase operational reliability, to reduce the pretreatment train complexity, and to reduce operating costs.[98] Subsurface intake systems use the natural geological properties of sediments and rocks to strain and biologically remove organic matter, suspended sediment, and dissolved organic compounds before they enter the treatment processes.[99] Of course, it is important to add that subsurface intakes also eliminate pre-treatment to remove marine life that has been "entrained" into the system despite the use of small mesh screens, as well as the maintenance costs of keeping the screens free of marine life "impinged" in the process.

The State Water Board's CEQA documentation for the Desalination Ocean Plan concludes subsurface intakes eliminate the need for conventional pretreatment, thus reducing capital and operational costs. The natural filtration process of a subsurface intake significantly reduces or eliminates the need for pretreatment requirements.[100] For instance, subsurface intakes typically allow for higher quality raw water to be fed into the intake system, minimizing pretreatment and significantly lowering operation and maintenance costs.[101] Surface intakes have

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[94] Municipal Water District of Orange County, Final Summary Report Doheny Ocean Desalination Project Phase 3 Investigation, pg. 14 (January 2014).
[95] *Supra* note 93, at 37.
[96] *See* Ry Rivard, Desal Plant Is Producing Less Water Than Promised, Voice of San Diego (August 29, 2017); available at https://www.voiceofsandiego.org/topics/science-environment/desal-plant-producing-less-water-promised/; In April, for instance, the plant shut down for 15 days when an algal bloom along the coast soured the water. The plant was unable to treat any water without fouling up the expensive filters it uses to remove salt and other impurities from water; Loreen O.Villacorte et al., Seawater Reverse Osmosis Desalination and (Harmful) Algal Blooms, Elsevier, Volume 360, 16 March 2015, Pages 61-80; The potential issues in SWRO plants during HABs are particulate/organic fouling of pretreatment systems and biological fouling of RO membranes, mainly due to accumulation of algal organic matter (AOM).
[97] *Supra* note 93, at 39.
[98] *Id*.
[99] *Id* at 38.
[100] *Supra* note 2, at 51.
[101] *Id*; Pacific Institute. 2013a. Key Issues in Seawater Desalination in California: Marine Impacts; National Research Council (NRC). 2008. Desalination: A National Perspective. Washington, DC: The National Academic Press; Bartak, R., T. Grischek, K. Ghodeif and C. Ray. 2012. Beach Sand Filtration as Pre-Treatment for RO Desalination. International Journal of Water Sciences; San Diego Water

lower capital costs relative to subsurface intakes, although a life-cycle analysis shows that surface intakes result in higher operational costs compared to subsurface intakes.[102] The higher quality of feed water with a subsurface intake reduces capital costs for construction of pretreatment processes.[103] Furthermore, subsurface intakes collect water through sand sediment, which acts as a natural barrier to organisms and thus eliminates impingement and entrainment.[104] This gives subsurface intakes a significant environmental advantage over surface water intakes because mitigation for surface intake entrainment will have to occur throughout the operational lifetime of the facility.[105] Overall, subsurface intakes can lower desalination operational plant costs and minimize associated environmental impacts.[106]

2. *The Doheny Pilot Project has demonstrated the significant cost savings of using subsurface intakes to avoid traditional pretreatment.*

The Doheny Pilot Project demonstrates that conventional pretreatment is not necessary for subsurface intakes, leading to additional capital and operational savings. From four exploratory boreholes, the Doheny Pilot Project discovered that "…[t]he produced water showed a very low silt density index (average around 0.5 units) and turbidity (averaged around 0.1 NTU), indicating excellent filtration by the aquifer which eliminates the need for conventional pretreatment filtration and saves costs."[107] Furthermore, "…the produced water showed no presence of bacterial indicator organisms which were found to be present in high concentrations in the ocean and seasonal lagoon," and that "[b]iofilm growths by the end of the test were found to be less than 10 μ in thickness, a level of no concern for biofouling."[108] Pumped well water was run directly to the test RO units continuously for over four months. No fouling or performance deterioration was observed during the test or in the post-membrane autopsy as all the dissolved iron and manganese was easily removed as anoxic conditions were maintained throughout the test period.[109]

The MWDOC study concluded that for the Doheny Project, "slant wells are less expensive than open intakes which also require pretreatment systems to remove sediments and organic materials."[110] This conclusion was due to the finding that "slant wells provide highly filtered water via the natural filtration process provided by the marine aquifer, thus avoiding the cost of having to construct and operate conventional pretreatment strainers, filtration and solids handling/disposal facilities."[111] MWDOC "determined from the results of the extended pumping test that the use of a slant well intake system will avoid the need for conventional pretreatment costs estimated at $56 million in capital and about $1 million in O&M costs, thus reducing the costs compared to other sites by more than $300 per AF."[112] The ISTAP failed to do any similar analysis demonstrated by the MWDOC study. As such, the Regional Board cannot rely on the ISTAP's conclusions.

The MWDOC study also compared the total cost of the Doheny Project using subsurface intakes versus the cost

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Authority Camp Pendleton. December 2009. Seawater Desalination Project Feasibility Study Report Executive Summary.

[102] *Supra* note 2, at 51.

[103] *Id*; San Diego Water Authority Camp Pendleton. December 2009. Seawater Desalination Project Feasibility Study Report Executive Summary.

[104] *Supra* note 2, at 64; Municipal Water District of Orange County (MWDOC). 2010. Memorandum to B. Richard from N. Davis; Supra Note 4; Hogan, T. 2008. Impingement and Entrainment: Biological Efficacy of Intake Alternatives. Presented at the Desalination Intake Solutions Workshop. 16-17 Oct. 2008. Alden Research Laboratory, Holden, MA; Pankratz, T. 2004. An overview of Seawater Intake Facilities for Seawater Desalination, The Future of Desalination in Texas. CH2M Hill, Inc. Vol 2: Biennial Report on Water Desalination, Texas Water Development Board. Water Research Foundation. 2011. Assessing Seawater Intake Systems for Desalination Plants [Project #4080] http://www.waterrf.org/ExecutiveSummaryLibrary/4080_ExecutiveSummary.pdf.

[105] *Supra* note 2, at 64.

[106] *Id*.

[107] *Supra* note 94, at 14.

[108] *Id*.

[109] *Id*.

[110] *Id* at 42.

[111] *Id*.

[112] *Id*.

estimates of the Poseidon – Huntington Beach project. MWDOC concluded that the:

> *Poseidon Huntington Beach project unit cost as of February 2013 is around $1,800 per AF, including all costs and assuming a contribution from MET of $250 per AF. The Doheny Desal Project cost, assuming an escalation of debt repayment similar to the Huntington Beach Project at 2.5%, is currently estimated around $1,200/AF including all costs and assuming a contribution from MET of $250 per AF.*[113]

MWDOC's Doheny study concluded that subsurface intakes do not need full conventional pretreatment because the natural filtration by the aquifer eliminates the need for conventional pretreatment filtration. The Doheny study further demonstrated that the use of subsurface intakes – and the avoidance of full pretreatment – resulted in significant cost savings, including $56 million in capital costs and $1 million annually in O&M costs. And finally, the Doheny study determined that the Doheny Project using subsurface intakes would produce water for $600 per AF cheaper than that of the Poseidon – Huntington Beach open ocean intake proposal.

3. *The OPA requires the Regional Board to assess the life-cycle costs associated, including the avoidance of pretreatment, with the economic feasibility of subsurface intakes.*

The Regional Board cannot rely upon the ISTAP's findings that subsurface intakes at Huntington Beach are not feasible. The ISTAP Report noted "that the Phase 2 ISTAP was not asked to assess the feasibility of the other components of the SWRO Plant including the pretreatment systems, the membrane system or the brine disposal system."[114] The exclusion of these components in the ISTAP Report is not an acceptable feasibility analysis under the Desalination Ocean Plan Amendment. The Amendment requires regional water boards to consider numerous factors when determining feasibility of subsurface intakes, including "energy use for the entire facility…and project life cycle cost."[115] According to the Desalination Ocean Plan Amendment's Final Substitute Environmental Document, "[p]retreatment increases costs and energy requirements, and is an additional step that is often not necessary when using subsurface intakes."[116] Both factors were intentionally omitted from the ISTAP Phase 2 Report, but are pertinent to an economic feasibility analysis and are required by a regional board to consider. Furthermore, the Ocean Plan Amendment requires the project life cycle cost to "be determined by evaluating the total cost of planning, design, land acquisition, construction, operations, maintenance, mitigation, equipment replacement and disposal over the lifetime of the facility, in addition to the cost of decommissioning the facility." The ISTAP Report did not adequately analyze all these factors when determining whether subsurface intakes are feasible.

4. *ISTAP purposefully ignored assessing the pretreatment avoidance cost savings.*

The ISTAP did not consider the cost saving of subsurface intakes not needing full conventional pretreatment. Recent investigations of the improvement in water quality made by subsurface intakes show lowering of the silt density index by 75 to 90 percent, removal of nearly all algae, removal of over 90 percent of bacteria, reduction in the concentrations of TOC and DOC, and virtual elimination of biopolymers and polysaccharides that cause organic biofouling of membranes.[117] Economic analyses show that overall seawater desalination plants operating costs can be reduced by 5 to 30 percent by using subsurface intake systems[118] with significant cost savings over

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[113] *Id* at 43.
[114] Independent Scientific Technical Advisory Panel, Phase II Report: Feasibility of Subsurface Intake Designs for the Proposed Poseidon Water Desalination Facility at Huntington Beach, California, pg. 9 (November 9, 2015).
[115] State Water Resources Control Board, California Ocean Plan, pg. 39 (2015); *available at* https://www.waterboards.ca.gov/water_issues/programs/ocean/docs/cop2015.pdf.
[116] *Supra* note 2, at 51.
[117] *Id* at 37.
[118] *Id*.

operating periods of 10 to 30 years."[119]

These important factors in life cycle costs were not included into the ISTAP Report, as required by the Desalination Ocean Plan Amendment. The intentional omission of pretreatment considerations in the ISTAP Phase 2 Report, and the requirement to include them expressly stated in the Ocean Plan Amendment, renders the ISTAP Phase 2 Report inadequate for granting an exception to the stated preference for subsurface intakes. The Regional Board should conduct a new independent study of subsurface intakes at Huntington Beach to consider all factors of a project-life cycle cost, as defined by the Ocean Plan Amendment, including the cost savings over the lifetime of the project from not needing pretreatment for subsurface intakes.

5. *The ISTAP should have analyzed the cost savings associated with the use of subsurface intake to avoid pretreatment to properly assess the feasibility of subsurface intake through slant wells.*

The OPA requires a thorough consideration of life-cycle costs must be conducted before the Regional Board can consider an exemption to the preference for subsurface intakes. Further, as documented in the Ocean Plan Amendment SED, it is clear that there are significant life-cycle cost savings from the use of subsurface intakes, as well as avoided discharges of chemicals from the use of conventional pretreatment.[120]

The ISTAP did not analyze the cost savings of avoiding pretreatment, but had the ISTAP included this analysis, the analysis would have included considerable cost savings associated with the economic feasibility of slant wells. Dr. Hanemann agrees with us that "the construction cost for slant wells might be as much as an order of magnitude lower than the cost of the subsurface infiltration gallery considered by ISTAP 2."[121] Further, Dr. Hanemann recognized the Abt Associates economic analysis commissioned by the SWRCB suggests,[122] "there could be significant cost savings for slant wells because they would not need the full conventional pretreatment that is required for the open ocean intake proposed by Poseidon."[123] Dr. Hanemann's review concluded that the "ISTAP 2 report did not consider the cost savings of subsurface intakes when the need for conventional pretreatment is reduced or eliminated, a surprising omission."

The Regional Board cannot rely on the ISTAP conclusions that subsurface intakes are not economically feasible because the ISTAP never considered the cost savings of slant wells from avoiding the construction and operating costs of full conventional pretreatment required for surface intakes. As compared to open ocean intakes with screens, the use of subsurface intakes likely improves water quality, increases operational reliability, reduces the pretreatment train complexity, and reduces operating costs. The ISTAP failed to consider life-cycle costs of subsurface intakes where studies show significant cost saving over operating periods of 10 to 30 years. While the benefits and costs of using subsurface intakes may be site-specific, the Doheny study demonstrates that subsurface intakes in Huntington may not require full conventional pretreatment, have cheaper life-cycle costs compared to open ocean intakes, and that may produce water cheaper than the proposed Poseidon – Huntington Beach proposal. Further, these avoided costs also come with increased benefits in the avoidance of plant shutdowns during algal blooms, and/or from toxic discharge conditions possibly linked to chemicals used in the pretreatment process.[124] The ISTAP Report fails to factor any of this critical information into their economic

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[119] *Id*; *Supra* note 2, at 64.
[120] *Supra* note 2, at 64; Pacific Institute. 2013a. Key Issues in Seawater Desalination in California: Marine Impacts; National Research Council (NRC). 2008. Desalination: A National Perspective. Washington, DC: The National Academic Press; Bartak, R., T. Grischek, K. Ghodeif and C. Ray. 2012. Beach Sand Filtration as Pre-Treatment for RO Desalination. International Journal of Water Sciences; San Diego Water Authority Camp Pendleton. December 2009. Seawater Desalination Project Feasibility Study Report Executive Summary.
[121] *Supra* note 28, at 15-16.
[122] Abt Associates, Economic Analysis of the Proposed Desalination Amendment to the Water Quality Control Plan for Ocean Waters of California, Appendix G, Final Staff Report, pp. 4-5, Exhibit 12-4, and Exhibits A-14 and A-15.
[123] *Supra* note 28, at 16.
[124] *Supra* note 96.

feasibility analysis because of an intentional decision not to consider pre-treatment, membrane system and discharge components of the proposal – all of which are critical considerations of life-cycle costs.

The Regional Board needs to determine whether slant wells are economically feasible as defined by the Desalination Ocean Plan. Due to the ISTAP's flawed determination that slant wells were not technically feasible, the ISTAP did not perform an economic analysis of whether slant wells are economically feasible. The Regional Board cannot rely upon the ISTAP's determination that slant wells are infeasible because it incorrectly dismissed slant wells as technically infeasible, and because a proper economic feasibility analysis was never conducted.

Before the Regional Board can approve an exemption to the Ocean Plan's preference for subsurface intakes to minimize the intake and mortality of marine life, an independent analysis of whether slant wells are feasible under the Ocean Plan Amendment is necessary.

C. Real world construction costs demonstrate the feasibility of subsurface intakes in California.

Estimating the cost of developing slant wells is arguably a site-specific task. The cost of mitigating for freshwater drawdown, contaminated water, and potential well performance varies by site characteristics. However, developing slant wells is clearly a lower cost alternative compared to the estimates for developing a SIG in the ISTAP Phase 2 report. Therefore, the ISTAP conclusion that subsurface intakes are not economically feasible is inadequate for an exemption to the Ocean Plan's preference for subsurface intakes.

Below we use real world slant well cost estimates to demonstrate the significant cost savings of constructing and operating slant wells as compared to the infiltration galleries. The existing slant well cost estimates demonstrate that slant well construction cost about $120 to $150 million per MGD as compared to the ISTAP's cost estimate for infiltration galleries at $1,000 to $15,000 million per MGD. The CalAm cost estimate also demonstrates that economies of scale may provide additional unit cost savings from higher production capacity.

First, a report on the feasibility of slant wells for the proposed Doheny project was finalized in January 2014.[125] The proposal was a facility producing 15 MGD of potable water based on a 30 MGD withdrawal of source water through slant wells. The estimated cost of constructing the intake and raw water conveyance system was $44,759,000.[126] For purposes of rough cost comparisons, that cost estimate is approximately $1.5 million for each MGD of water withdrawn. Extrapolating that cost estimate to the proposed 100mgd intake for the Poseidon project results in an estimated construction cost of $150 million.

Second, cost estimates for developing slant wells for CalAm – Monterey project were prepared in 2015.[127] The winning bid estimated the cost of constructing slant wells at a lower per unit cost than the Doheny estimate:

No. of Wells	Total Well Production Capacity (MGD)	Well Construction[128]	Design and Construction Management[129]	Wellhead Completion and Equipping[130]	Total	Cost Per Well	$/MGD of Intake Capacity
7	22.2	$ 19,424,000	$ 2,136,640	$ 5,250,000	$ 26,810,640	$ 3,830,091	$ 1,208,994
9	28.5	$ 24,746,000	$ 2,227,140	$ 6,750,000	$ 33,723,140	$ 3,747,016	$ 1,182,770

[125] *Supra note 14.*
[126] *Id* at 33.
[127] *See* Monterey Peninsula Water Supply Project website: https://www.watersupplyproject.org/about1.
[128] *See* Boart Longyear, Salt Lake Rotary Drilling Services Project Proposal, Prepared for California American Water (Nov. 6, 2015).
[129] *Id.*
[130] *Id.*

This cost estimate of approximately $1.2 million per million gallon of intake volume is marginally lower than the Doheny per unit cost estimate for constructing slant wells. Also, importantly, this bid shows that there are potential "scale economies" for drilling more wells at a site to withdraw increased volumes.

Regardless of which estimate for slant well construction (Doheny or Monterey), the cost is a small fraction of the ISTAP cost estimate of $1 billion to $1.5 billion for constructing galleries. While a site-specific analysis is required, a rough estimate for developing slant wells for a 100 MGD withdrawal and conveyance to the treatment plant would be in the range of $118,277,000 (CalAm 1 MGD estimate times 100) to approximately $150,000,000 (approximate Doheny 1 MGD estimate times 100). While these are admittedly rough estimates, and actual cost estimates and any economies of scale would be site-specific, the ISTAP Phase 2 report is void of any cost and economic analysis of a system of slant wells compared to a seawater infiltration gallery and/or the proposed addition of screens to the existing open ocean intake.

1. *Real California projects demonstrate the voided costs of slant wells compared to screened open ocean intakes.*

Studies show that slant wells may have significant life-cycle cost savings compared to open ocean intakes.[131] For example, there are cost savings from eliminating the need to construct full conventional pre-treatment required for open ocean intakes, as well as operation and maintenance cost savings from not including full conventional pre-treatment.[132] For example, the Doheny report estimated that annual savings from operation and maintenance costs by avoiding the need for full conventional pretreatment were approximately $1 million for a 30 MGD intake system. Arguably, the annual savings from avoided operation and maintenance costs for the proposed Poseidon – Huntington Beach project would be approximately 3 times the savings for the proposed Doheny facility.

However, slant wells may have additional operating costs. For example, if the slant wells withdraw some inland freshwater, that adds to the unit cost of the product water to replace the lost freshwater. Further, there may be costs for mitigating the risk of source water contamination and/or partial well failures to produce the intended volume of 100 MGD intake. These potential additional costs need to be identified and included in the economic feasibility analysis.

2. *The Regional Board needs to consider avoided risks when analyzing whether subsurface intakes are feasible.*

Scientific papers recognized in the Ocean Plan Amendment Substitute Environmental Documentation (SED) found that subsurface intakes have a benefit of eliminating risks of damage to the reverse osmosis treatment train and/or the risk of having to shut down the plant during natural occurrences like algal blooms.[133] And experience with unplanned shut-downs at the recently opened Poseidon – Carlsbad facility shows the papers' analysis of risks from using open ocean intakes are valid and have been confirmed in Southern California.

In conclusion, the ISTAP Phase 1 report erred in concluding slant wells were not technically feasible. This in turn resulted in an inadequate analysis of all available subsurface intakes for economic feasibility, and the ISTAP Phase 2 Report failed to document the reliability benefits of subsurface intakes protecting against unplanned

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[131] Supra note 2, at 5; National Research Council (NRC). 2008. Desalination: A National Perspective. Washington, DC: The National Academic Press; San Diego Water Authority Camp Pendleton. December 2009. Seawater Desalination Project Feasibility Study Report Executive Summary.

[132] *Ibid.*

[133] See supra note 96; In April, for instance, the plant shut down for 15 days when an algal bloom along the coast soured the water. The plant was unable to treat any water without fouling up the expensive filters it uses to remove salt and other impurities from water; Loreen O.Villacorte et al., Seawater Reverse Osmosis Desalination and (Harmful) Algal Blooms, Elsevier, Volume 360, 16 March 2015, Pages 61-80; The potential issues in SWRO plants during HABs are particulate/organic fouling of pretreatment systems and biological fouling of RO membranes, mainly due to accumulation of algal organic matter (AOM).

shutdowns of the project. This is a critical omission given that the economic feasibility of the project itself is dependent on showing a rationale for the so-called "reliability premium." That is, arguably, paying the "reliability premium" is only a sound economic choice if the project actually produces the reliability it claims. The added benefit of insurance against plant shutdowns provided by slant wells, especially during times when imported water is in short supply, is an important consideration in determining whether or not a project is economically feasible.

Therefore, the implication that all subsurface intakes are not economically feasible is inadequate as evidence that the Poseidon proposal should be exempted from the stated regulatory preference mandating subsurface intakes to minimize the intake and mortality of marine life. The Regional Board cannot rely upon the ISTAP's determination that slant wells are infeasible because it incorrectly dismissed slant wells as technically infeasible, and a proper economic feasibility analysis was never conducted. The Regional Board must produce an independent new technical and economic feasibility study prior to considering an exemption to the Ocean Plan preference for subsurface intakes.

D. <u>The Regional Board cannot rely upon the ISTAP's economic feasibility analysis for infiltration galleries because a 'willingness to pay' standard must include a cost-benefit analysis.</u>

ISTAP wrongly interpreted the Desalination OPA's term of "not economically viable" to mean what a local water agency was willing to pay. The Report finds that an "open ocean intake option for a product capacity of 50 MGD may be economically feasible in the near future, depending on outcome of negotiations with OCWD."[134] The ISTAP rationalized this conclusion by stating that:

> Under the current term sheet, OCWD might be willing to pay these water costs in 2018 (Figure ES-1). The corresponding unit cost using a 7% discount rate is $2,189/AF. Our analysis indicates that OCWD *would be willing to pay* this amount for water in 2024. Therefore this option may be economically viable, consistent with the Ocean Amendment definition of economic feasibility.[135]

A project proponent cannot self-select what constitutes economic feasibility. If a project proponent's self-defined price for the product water is accepted as a "willingness to pay" baseline, any project proponent can easily negotiate a Water Purchase Agreement with a participating agency and have a term sheet approved by a water agency pre-determining the cost of using an existing open ocean intake. Or, if the proponent is a water agency, they can simply draft a project outline for themselves based on the cost (or absence of any cost) for utilizing an existing open ocean intake and self-approve their willingness to pay.

The ISTAP's willingness to pay standard leaves California with a dangerous precedent of allowing project proponents to ignore their legal requirements to use the best available technology to minimize marine life mortality. An existing, open ocean intake may, at least in the short-term, be cheaper than implementing the best available technology; however, the Desalination OPA makes clear that "[s]ubsurface intakes shall not be determined to be economically infeasible solely because subsurface intakes may be more expensive than surface intakes." To get around this barrier, the ISTAP has interpreted "not economically infeasible" to mean "willingness to pay" based on a term sheet. What a water agency is willing to pay – based on a term sheet – does not mean the cost of a subsurface intake is economically inviable. Further, because the ISTAP 1 erred in excluding slant wells as technically infeasible, the ISTAP 2 conclusions are fatally void of a thorough and proper analysis of all subsurface intake alternatives.

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[134] *Supra* note 9, at 18.
[135] *Id*.

1. *Dr. Hanemann's expert review concluded that the ISTAP erred by using an economic feasibility standard of 'willingness to pay'.*

Clearly the test for "economic feasibility" of subsurface intakes is not to simply show that financial benefits outweigh the financial costs and/or lowered profits for the project applicant.[136] As an economist, Dr. Hanemann argues "that reasonableness in a water purchase agreement requires some form of a cost-benefit test. Whether or not an item is economically practical is determined in large part as a function of the benefit that it generates, and by how those who receive the benefit value it."[137] One cannot meaningfully decide that an item is too costly without also considering its benefit.[138] Dr. Hanemann summarized that a "purely cost-based determination without reference to benefit is neither rational nor reasonable."[139]

The ISTAP Phase 2 Report interprets the criterion for the economic viability of an intake technology as an amount "that OCWD might be willing to pay for the water supplied" by the proposed Poseidon facility.[140] Dr. Hanemann concludes that from "an economic perspective, that interpretation is very problematic."[141] The mere fact that "OCWD states it is unwilling to pay for a subsurface intake for the proposed Huntington Beach facility is not, by itself, a meaningful demonstration of economic non-viability."[142] One has to know what factors were being taken into consideration when the economic viability was being assessed by OCWD.[143]

Dr. Hanemann finds that two factors are "certainly relevant: (1) The reliability premium – the economic value of the heightened reliability associated with desalinated water compared to other sources of water supply for Orange County. And (2) the economic value of the environmental damage avoided when a subsurface intake is used instead of an open ocean intake. There is no evidence that either factor was properly considered by OCWD or by the ISTAP reviews."[144]

The ISTAP Phase 2 Report states that it evaluated the price that OCWD might be willing to pay for water from the Poseidon facility "using OCWD's Water Purchase Agreement Term Sheet with Poseidon … as a starting point and assessing the change in that price over time with appropriate escalation factors."[145] It elaborates: "We based the OCWD water price on the amount that OCWD will likely have to pay for water supplied by the Metropolitan Water District (MWD) of Southern California in the future (which OCWD would rely on in the absence of the desalination facility). On top of this price, we have factored in a subsidy that MWD provides local communities for developing local water supplies, as well as a premium that OCWD has indicated it is willing to pay for the increased water supply reliability that the desalination plant will provide."[146]

The ISTAP Phase 2 Report continues: "Consistent with our understanding of the ongoing contract discussions, in our projections we assume that the reliability premium amounts to 20% of MWD's Tier 1 water price for 10 years after construction. The premium drops to 15% of the Tier 1 price for the next 10 years, to 10% for 10 more years, to 5% for ten years, and then finally to 0%."[147]

Dr. Hanemann had two comments on this calculation. First, if this calculation were intended as an estimate of the

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[136] *Supra* note 28, at 11.
[137] *Id*.
[138] *Id*.
[139] *Id*.
[140] *Supra* note 9, at 13.
[141] *Supra* note 28, at 11.
[142] *Id*.
[143] *Id*.
[144] *Id*.
[145] *Supra* note 9, at 13.
[146] *Id* at 51.
[147] *Id* at 60.

reliability premium associated with a drought-proof water supply from desalination, it entirely lacks foundation.[148] Where does the 20% premium come from? Why is the premium not 40%? Or, 17%?[149] The value used for the reliability premium appears to be an after-the-fact justification for the cost of seawater desalination, not a meaningful analysis of the final customers' willingness to pay for additional reliability.[150]

Second, Dr. Hanemann found "these estimates have no credibility as a reliability premium."[151] It appears unlikely that the economic value of increased reliability for water supply in Southern California would *decline* over time, having a lower value in 2030-2039 than in 2020-2029, a lower value still in 2040-2049, and zero value from 2060 onwards when the population of Southern California will be growing over time, and climate change will likely reduce Southern California's effective surface water supply compared to the present.[152] It is implausible to presume the projected economic value of increased reliability in Orange County's water supply will decline over the next 40 years and will be zero from 2060 onwards.[153]

2. *Dr. Hanemann's expert review concluded that the ISTAP analysis is missing 3 key components to properly evaluate subsurface economic feasibility at Huntington Beach.*

The expert report provided by Dr. Hanemann may assist the Regional Board in understanding how a proper economic feasibility analysis should be conducted. He states that there is a "technically correct way to estimate the value of a more reliable source of water supply for OCWD as compared to a less reliable source of supply."[154] It would involve three general components.

First, one has to measure the change in the overall reliability of OCWD's water supply portfolio with desalinated water from Huntington Beach versus without it.[155] This would be based on (i) assumptions as to the composition of OCWD's water supply portfolio in 2020-2029, 2030-2039, 2040-2049, onward, with and without the supply from Poseidon, and (ii) probabilistic forecasts of the changed occurrence of shortage (i.e., projected annual demand exceeds projected annual supply) during those time periods with desalinated water in the supply portfolio versus without.[156]

Second, one has to calculate the loss of economic value associated with the occurrence of shortages in each time period.[157]

Third, one has to estimate the risk aversion premium that water users affected by shortage (e.g., water users subjected to rationing) would be willing to pay to reduce or avoid this risk.[158] Dr. Hanemann conducted the first two elements of this analysis in a study for the California Energy Commission in 2006.[159] That study assessed the economic loss for urban water users in Southern California under a climate change scenario.[160] In 2016, Dr. Hanemann conducted all three elements of this analysis for the Central Valley, including the calculation of an estimate for the risk aversion premium of Central Valley agricultural water users (i.e., estimating what water users may be willing to pay to avoid the increased risk of economic loss due to a reduction in their water supply under a

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[148] *Supra* note 28, 12.
[149] *Id*.
[150] *Id*.
[151] *Id*.
[152] *Id*.
[153] *Id*.
[154] *Id*.
[155] *Id*.
[156] *Id*.
[157] *Id*.
[158] *Id*.
[159] *Id*.
[160] Michael Hanemann et al., *The Economic Cost of Climate Change Impacts on California Water: A Scenario Analysis*. California Climate Change Center at U.C. Berkeley, Working Paper 06-01, January 2006.

climate change scenario).[161]

As shown in a presentation by Municipal Water District of Orange County (MWDOC) staff, the "allocation formula" results in a smaller amount of imported water delivered to Orange County during a shortage if the region is less dependent on MWD deliveries after inclusion of the Poseidon water in the portfolio.[162] While the MWD "allocation formula" is somewhat complicated and dependent on real-life variables, the MWDOC report summarizes the impact of the formula on "reliability" as: "The average person might expect OC to be more reliable by 56,000 AF per year with the Poseidon Project. This is not the case under either of these definitions."[163] But the ISTAP report failed to consider the actual value of paying for 56,000 ac/ft/yr of Poseidon water as risk mitigation, given that inclusion of the water into the local portfolio will reduce imported water available to local agencies from MWD during periods of interruptions.

In Dr. Hanemann's view, the "finding by the ISTAP Phase 2 Report that a subsurface intake at Huntington Beach would not be economically viable lacks foundation. The quantity offered as a measure of the economic value of the increased reliability provided by desalination – the time-varying premium that OCWD is willing to pay to Poseidon – is flawed and does not in any way measure the (likely increasing) economic value of supply reliability in Orange County."[164]

3. *ISTAP did not consider whether the Project itself, with or without subsurface intakes, is economically feasible.*

Dr. Hanemann flagged that it remains unclear as to how the desalinated water from the Poseidon facility would actually be put to use because this has not yet been determined by OCWD.[165] The water might be sold directly to water providers or used in some manner for groundwater recharge. Dr. Hanemann opines that "different options may have different implications both for the final cost of the water to users and for the ultimate change in supply reliability as a result of putting the Poseidon project on line."[166]

Additionally, the extent to which the supply of desalinated water from the Huntington Beach facility would actually increase supply reliability in Orange County in a future drought, versus merely augmenting the County's normal baseline supply, remains unclear.[167] If the supply of desalinated water were to end up merely augmenting the normal baseload supply, the cost of this project would likely *not* be justified because there are cheaper alternative sources of baseload supply from enhanced conservation efforts, the reuse of treated wastewater,[168]or water market purchases. For example, the Irvine Ranch Water District (IRWD) has purchased farmland in Palo Verde Irrigation District (PVID) possibly with the purpose of transferring the water directly or indirectly into Orange County.[169] As understood by Dr. Hanemann, "this water was acquired for a one-time, up-front cost of approximately $3,400/AF, which will turn out to be significantly cheaper than the ultimate cost of water from Poseidon."[170]

Given the potential to obtain additional water supplies for Orange County from water market purchases like those

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[161] Michael Hanemann et al., The Downside Risk of Climate Change in California's Central Valley Agricultural Sector, *Climatic Change* (2016) 137: 15-27.
[162] *See* Robert Hunter, Municipal Water District of Orange County, Reliability Benefits in OC from the Poseidon Project: P&O Committee presentation, pg. 3 (July 7, 2015).
[163] *Id* at 4.
[164] *Supra* note 28, at 16.
[165] *Id* at 14.
[166] *Id*.
[167] *Id*.
[168] *See* eg, "Carson project" at: http://www.mwdh2o.com/DocSvcsPubs/rrwp/assets/mwd_board_item_6-b_staff_presentation_march_2018.pdf (slide 16 illustrates 60 mgd delivered to the Orange County basin.
[169] *Supra* note 28, at 13.
[170] *Id*.

planned by IRWD or other agencies (including MWD), the potential for expanded the re-use of treated wastewater in Orange County (including 60 MGD from the "Carson project"), and that MWD is said to be considering building its own desalination facility that would serve the entire Southern California region, OCWD must determine the value added for Orange County by obtaining 56,000 AF every year from Poseidon at a cost of $2,200/AF, particularly if it is only intended as mitigation for intermittent shortages of imported water.[171]

Dr. Hanemann summarized his findings by stating that the "ISTAP Phase 2 analysis fails to demonstrate that a subsurface intake is not economically viable compared to the screened open ocean intake proposed for the Poseidon facility. It also fails to demonstrate that the Poseidon facility with any type of intake is economically justified."[172] Therefore, The Regional Board cannot rely upon the ISTAP's economic feasibility analysis.

IV. THE ISTAP DID NOT CONSIDER WHETHER ORANGE COUNTY WATER DEMAND ALLOWS POSEIDON TO PROPOSE A 50 MGD DESIGN CAPACITY.

A. The Ocean Plan Amendment requires the Regional Board to consider the need for desalinated water before determining subsurface intakes are infeasible.

The OPA requires the Regional Board to consider the need for desalinated water under the analysis for the best available site for the project. OPA Section III.M.2.b.(2) requires the Regional Board to:

> *Consider whether the identified need for desalinated water is consistent with an applicable adopted urban water management plan prepared in accordance with Water Code section 10631, or if no urban water management plan is available, other water planning documents such as a county general plan or integrated regional water management plan.*[173]

To the best of our knowledge neither the Regional Board, nor the ISTAP, have performed any consideration as to whether the identified need for desalinated water is consistent with an applicable urban water management plan or other water planning documents.

The Regional Board has not determined the best available design for Poseidon – Huntington Beach to minimize marine life mortality. The OPA Section III.M.2.c. states that design is defined as "the size, layout, form, and function of a facility, *including the intake capacity* and the configuration and type of infrastructure, including intake and outfall structures."[174] The ISTAP never considered the best available intake capacity that would make subsurface intakes feasible. The ISTAP considered "subsurface intake technologies that would be capable of producing 100 to 127 million gallons per day (MGD), the hydraulic capacity needed to meet a production goal of 50 MGD using the SWRO desalination technology. The maximum capacity of 127 MGD was *determined by Poseidon* to meet water quality discharge standards, using 27 MGD to dilute the concentrate from the SWRO desalination process."[175]

Finally, the Regional Board cannot determine subsurface intakes are not the best available technology solely because of the project's design capacity. Poseidon's self-determined design capacity cannot be used as the reasoning to consider subsurface intakes infeasible. The OPA states that a "design capacity in excess of the need for desalinated water as identified in chapter III.M.2.b.(2) shall not be used by itself to declare subsurface intakes as not feasible."[176] Neither the ISTAP, nor the Regional Board, has properly assessed whether the design capacity

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[171] *Id* at 14.
[172] *Id* at 14 – 15.
[173] *Supra* note 24, at 37-38.
[174] *Id* at 38 (*Emphasis added)*.
[175] *Supra* note 16, at 26-27.
[176] Supra note 24, at 39.

is in excess of the need; and therefore, cannot conclude that subsurface intakes are infeasible without first analyzing the feasibility at smaller design capacities.

B. ISTAP did not consider whether there was a documented need for 50 MGD design capacity as required by the OPA.

The ISTAP 1 technical feasibility analysis is insufficient to comply with the OPA because there was no analysis of different design capacities. ISTAP acknowledged this issue when it stated that one "initial challenge in this approach was the specification of the Project design attributes, particularly the desired maximum hydraulic capacity of the proposed Project needed to meet the proposed goal of producing 50 MGD of potable water."[177] ISTAP 1 stated it was only analyzing technical feasibility for a design capacity specified by Poseidon. The ISTAP considered "subsurface intake technologies that would be capable of producing 100 to 127 million gallons per day (MGD), the hydraulic capacity needed to meet a production goal of 50 MGD using the SWRO desalination technology. The maximum capacity of 127 MGD was *determined by Poseidon* to meet water quality discharge standards, using 27 MGD to dilute the concentrate from the SWRO desalination process."[178]

The OPA requires the Regional Board to consider other design capacities when analyzing subsurface feasibility. On May 4th, 2015 the State Water Board released a Change Sheet that added a critical provision to the OPA:

> If the regional water board determines that subsurface intakes are not feasible for the proposed intake design capacity, *it shall determine whether subsurface intakes are feasible for a reasonable range of alternative intake design capacities*.

Neither Poseidon nor its project partner, OCWD, have provided evidence of a definitive need for a 50 MGD production facility. Therefore, the Regional Board cannot rely upon the ISTAP 1 conclusions that slant wells are technically infeasible for Poseidon's proposed site, and the elimination of slant wells from consideration in ISTAP 2 undermines the value of the economic feasibility study. Further, ISTAP 2 relied on the Geosyntec report's findings that a smaller design capacity, and consequently a lower volume intake, would result in a greater percentage of freshwater withdrawn from slant wells. However, as noted above, the HydroFocus review of the Geosyntec 2015 report found that lowering the volume of the intake may reduce the percentage of freshwater drawdown[179] and be both technically feasible and more economically beneficial.

C. The Fryer expert report[180] demonstrates that applicable Urban Water Management Plans and OCWD's Long Term Facility Plan do not prove a demand for the proposed facility.

Given the critical importance of identifying and demonstrating the water supply need for the development of a new desalination plant and in determining its design capacity, Orange County Coastkeeper contracted James Fryer, an expert environmental scientist,[181] to assess the demand forecasts used by the Orange County Water District as the rationale for new water supply projects.

Mr. Fryer's report shows that the water planning documents relied upon by Poseidon are not adequate evidence of future demand for 50 MGD in the region, as required in the OPA. Mr. Fryer's expert report concluded that the

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[177] *Supra* note 24, at 26.
[178] *Id* at 26-27.
[179] *See supra* note 41.
[180] *See* James Fryer, A Review of Water Demand Forecasts for the Orange County Water District (July 2016); *available at* https://www.waterboards.ca.gov/santaana/water_issues/programs/Wastewater/Poseidon/2018/Fryer_Expert_Report.pdf.
[181] Mr. Fryer has over 27 years of experience working on freshwater, estuarine, and marine conservation policies, programs, and projects. Mr. Fryer has produced numerous papers and reports on water management policies, practices, and economics. He has conducted sophisticated GIS analyses of watershed and water management issues and helped establish and conducted research and monitoring on marine protected areas. Mr. Fryer holds an M.S. in Environmental Management from the University of San Francisco.

"Orange County Water District (OCWD) uses outdated water demand forecasts for the year 2035 that are 91,846 acre-feet per year, or 17.5%, higher than the more recent water demand forecasts for its service area retailers."[182] Furthermore, the "previous Urban Water Management Plans consistently overestimated future demand. Starting in the year 2000, for each cycle of the 5-year UWMPs, based on declining actual demand trends the retailers repeatedly reduced demand forecasts for subsequent years compared to previous forecasts."[183] Finally, the report finds that the "Orange County Reliability Study used by the retailers' water for their new water demand forecasts, uses multiple instances of conservative assumptions that, as with past UWMPs, can be expected to overestimate future demand" and that some "fundamental assumptions in the water demand model are inconsistent with historic and recent water use patterns."[184]

Additionally, the Fryer expert report found that the water planning documents used by Poseidon do not account for new sources of water already under construction. The report finds that the "Long-Term Facilities Plan 2014 Update does not account for an additional 65,000 acre-feet per year of high quality treated wastewater that is expected to become available within the next 5 to 10 years."[185] The "new source of treated wastewater would be equal or better than the quality of water that is currently used to replenish groundwater basins and would not be subject to shortages during drought."[186] Therefore, the water planning documents relied upon by Poseidon omits 65,000 acre-feet per year that is expected to become available for groundwater recharge into the Orange County Water District basin.

Further, water users have repeatedly demonstrated the willingness and ability to substantially curtail water use during serious, multi-year drought events rather than pay for new water supplies. The expert report concludes that "[m]any of the early year UWMPs acknowledged that water users would curtail use during serious drought years. But by the 2005 UWMPs, water use was generally assumed to increase 6% to 9% during single and multiple drought years."[187] Since water shortages during drought drives the need for new supplies, underestimating the ability and willingness of water users to curtail demand during serious drought years can lead to unnecessary and expensive new supply projects and financial difficulty for water suppliers.

The Orange County water retailers' 2015 Urban Water Management Plan demand forecasts, as with the earlier plans, do not account for ongoing conservation innovation. Mr. Fryer concludes that ongoing "conservation innovation, unforeseen at the time of past demand forecasts, is now a well-established pattern that has contributed to actual demand remaining well below forecasted levels."[188] Ongoing innovations in conservation devices and practices can be expected to continue reducing urban per-capita water demand during the demand forecast period.

The retailers' 2015 Urban Water Management Plans indicate that most of the service areas are at or near build-out. The expert report concludes that since "there is relatively little undeveloped space in the OCWD service area, most future development will be in-fill development. This can be expected to lower average per-capita water use and will be an important dynamic that should be addressed in water demand projections."[189]

Water providers with service areas at or near buildout substantially overestimate future demand risk, perpetuate inefficient use of limited financial resources on unnecessary capital projects, and encounter revenue stability problems and ratepayer backlash. Mr. Fryer concludes that historically "water demand forecasts used multiple conservative assumptions to reduce the risk of uncertainties, particularly for rapid growing service areas. However, the situation is different for service areas not experiencing rapid growth, and at or near buildout.

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[182] *Supra* note 180, at 1.
[183] *Id*.
[184] *Id*.
[185] *Id*.
[186] *Id*.
[187] *Id*.
[188] *Id* at 2.
[189] *Id*.

Overestimating future demand for service areas at or near build-out creates long-term risks that should be carefully considered."

The Urban Water Management Plans and other water planning documents Poseidon relied upon to demonstrate supply need is inadequate to serve as an exemption to the mandate to use subsurface intakes. The ISTAP did not consider need when assessing the feasibility of subsurface intakes. Further, the Regional Board has not properly evaluated the demonstrated need for the desalinated water in order to forgive the use of screened surface intakes in lieu of the best available technology of subsurface intakes. The Regional Board must evaluate whether the demonstrated need exists for Poseidon's self-proposed intake capacity. As required by the OPA, if the intake capacity is larger than the adequately demonstrated need for the project, the Regional Board must re-assess whether subsurface intakes are feasible at lower intake capacities.

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The Regional Board cannot rely upon the ISTAP conclusions to determine subsurface intakes are not feasible for the Poseidon – Huntington Beach Project because (1) ISTAP Phase 1 erred in concluding slant wells were not technically feasible for the proposed facility, (2) the ISTAP Phase 2 Report did not adequately support the conclusion that subsurface intakes are economically infeasible, and (3) the Regional Board cannot legally rely on the ISTAP conclusion that subsurface intakes are infeasible for the Poseidon – Huntington Beach project because Poseidon has not demonstrated that subsurface intakes are infeasible.

Poseidon has not demonstrated that subsurface intakes are infeasible for the proposed Poseidon – Huntington Beach Project for the following reasons:

Expert reports prepared subsequent to the final ISTAP reports show that the Regional Board may not rely on the ISTAP's two reports. The ISTAP Phase 1 Report did not adequately assess the technical feasibility of subsurface intakes in light of criteria that are expressly provided by the OPA, looked to factors outside of the OPA, and omitted consideration of factors that are necessary to an adequate assessment of OPA compliance.

- ISTAP considered "aquifer drawdown," which is not a feasibility criterion set forth in the OPA.
- ISTAP improperly considered "performance reliability," which is not a feasibility criterion set forth in the OPA.
- ISTAP did not consider the feasibility of subsurface intakes at alternative project sites.
- ISTAP did not consider the feasibility of a combination of subsurface and open-ocean intakes.
- ISTAP relied on an undisclosed model to conclude aquifer drawdown was a fatal flaw for slant wells, but an independent review identified limitations and uncertainty with the model and concluded the results were inconclusive until physical tests could verify the computer modeling.
- Independent analysis found slant wells would improve management of seawater intrusion.

The ISTAP made incomplete and erroneous economic analyses, and reached erroneous conclusions, that have been rebutted by independent experts.

- ISTAP did not properly consider an appropriate reliability premium.
- ISTAP did not assess life-cycle cost savings, including the avoidance of pretreatment, as required by the OPA.
- ISTAP did not consider real-world examples of desalination facility construction and life-cycle costs that demonstrate the feasibility of subsurface intakes in California.
- ISTAP erred by using "willingness to pay" as a standard of economic feasibility.

The ISTAP did not consider relevant information that the Regional Board must consider in making its own determination.

- ISTAP did not consider alternative project sites and sizes when assessing subsurface feasibility.
- Poseidon's permit application does not include a defined and documented need for 50 MGD in water supply that cannot otherwise be met by alternative means.
- Independent expert review demonstrated that the urban water management plans cited by Poseidon are flawed and do not demonstrate demand for the proposed project.

The underlying policy of the OPA is clear and strict: "minimize the intake and mortality of all forms of marine life." The Regional Board must determine whether slant wells or other subsurface intake technologies are technically and economically feasible as defined by the Desalination Ocean Plan. The Regional Board cannot rely upon the ISTAP's determination that slant wells are infeasible because the ISTAP incorrectly dismissed slant wells as technically infeasible, and because a proper economic feasibility analysis was never conducted. Further, because the record is void of any analysis of alternative design intake volumes, the Regional Board must consider lower volume intakes as a consideration of the "combination" of elements to minimize intake and mortality through use of the best technology available.

After the above detailed expert review, we respectfully state that (1) ISTAP Phase 1 erred in concluding slant wells were not technically feasible for the proposed facility, (2) the ISTAP Phase 2 Report did not adequately support the conclusion that subsurface intakes are economically infeasible, and (3) the Regional Board cannot legally rely on the ISTAP conclusion that subsurface intakes are infeasible for the Poseidon – Huntington Beach project because the rationale and evidence used does not adequately support the conclusions. We request that the Regional Board conduct a new, independent, and more comprehensive analysis of the feasibility of subsurface intakes for the Poseidon – Huntington Beach project using the criteria set forth in the OPA. At a minimum, a new, independent study should be conducted to ascertain the technical feasibility of slant wells that includes both the proposed site and design capacity, as well as other site locations and design capacities that may increase the feasibility of subsurface intakes for the project. We strongly recommend a third-party review of the Geosyntec and HydroFocus analyses prior to issuance of a Tentative Decision. We further recommend the Regional Board employ the team of experts analyzing and testing slant wells for the proposed Doheny seawater desalination proposal ─ experts who already have experience in similar analyses at a nearby site. This technical feasibility study should then be followed by an economic analysis that evaluates the full cost and economic opportunity of subsurface intake.