Clearly Identifying the Local Need for 50 Million Gallons per Day of Desalinated Ocean Water for the Huntington Beach Desalination Project's Planned Design Capacity

As part of the consultation process between the State and Regional Water Board staffs and the Coastal Commission staff, Poseidon has been asked to provide additional information necessary for a Water Code 13142.5(b) determination. In the February 8, 2016 letter from Jonathan Bishop of the State Water Board to Alison Dettmer of the Coastal Commission staff initial comments were provided about additional information that Poseidon will likely need to submit to the Santa Ana Regional Water Board. One of the topics requiring additional information was identified as:

2. Best available site: project need (Ocean Plan, Chapters III.M.2b.(2) and III.M.2.d (1)(a)). The Desalination Amendment requires that the need for desalinated water be identified in appropriate planning documents. And that a design capacity for proposed facility that is greater than the identified need not be used to justify a determination that subsurface intakes are not feasible. The information does not appear to include a clearly identified local need for 50 million gallon per day (MGD) of desalinated water, so additional information may be needed to support the proposed Facility's planned design capacity. This additional information also will be relevant to any determination that subsurface intakes are infeasible for the proposed facility.

Poseidon responded to this request and provided the Orange County Water District (OCWD) Long Term Facilities Plan and the Orange County Water District Water Reliability Agreement Term Sheet as documents that supported the local need for the Huntington Beach Desalination Project (HBDP). Further discussions between Poseidon and Water Board staffs on April 4th and April 12th, identified the need for additional information:

- UWMP information from the Metropolitan Water District of Orange County (MWDOC) and from member agencies.
- More current distribution plan from Orange County Water District.
- Nexus of need from overall plan to the more specific local agency(s) plans.

In response to these requests and acknowledging the complex nature of managing water supplies in California and Orange County, Poseidon has developed this white paper to assist the Water Board staffs. The development of this paper has proved helpful to Poseidon as well as we were able to identify the most appropriate planning document for this determination, the Orange County Water District's Groundwater Management Plan (GWMP.

Poseidon's understanding of the Desal Amendment is that it did not require that Water Boards determine the need for desalinated water. But it does require that the need for desalinated water be found consistent with an appropriate water plan. In addition to need, the Desal Amendment

also identifies questions related to both capacity and size. Recognizing the importance of this topic, as it relates to the need to minimize intake and mortality of all forms of marine life, Poseidon has prepared this document to assist the Water Board staffs in determining that they have sufficient information to perform the necessary analysis for a 13142.5(b) determination for the proposed Huntington Beach Desalination Project (HBDP).

EXECUTIVE SUMMARY

This whitepaper addresses three central questions posed by the Desal Amendment: (1) Is the HBDP consistent with the applicable urban water management plan(s) and other adopted water planning documents; (2) Why, other than design capacity, are subsurface intakes infeasible for the HBDP; and (3) What evidence supports the HBDP's design capacity? Detailed responses to each of these three questions are set forth in this whitepaper, and summary responses follow:

- **Consistency with Applicable Water Plans** –OCWD is the primary water agency involved in the HBDP. As the manager of the Orange County Groundwater basin, the appropriate planning document for OCWD is the 2015 Ground Water Management Plan which identified a local and regional need for the 56,000 acre feet per year (afy) of desalinated water. This need is based on three key factors: limited imported water supplies; declining Santa Ana River flows; and increased demand for water. The GWMP explicitly identifies the HBDP as a planned source of 56,000 afy in the next five year period of 2015 to 2020.

  The GWMP's assumptions regarding need are echoed in OCWD's 2014 Long-Term Facilities Plan (LTFP). Additionally, each of the local retail agencies that could receive HBDP water has an adopted Urban Water Management Plan (UWMP) that includes a description of HBDP as one of the potential seawater desalination projects in the region. On a regional basis, the Metropolitan Water District of Orange County's (MWDOC) current Regional UWMP identifies HBDP as one of three potential regional desalination projects, while its 2015 draft UWMP specifically identifies HBDP as a planned water supply project for 56,000 afy. Similarly, the Metropolitan Water District of Southern California's (MWD or MWDSC) 2015 Integrated Water Resources Plan (IRP) update identifies 238,000 acre-feet from the local supply reliability target, which is consistent with the HBDP. The Integrated Water Management Plans in Orange County support the importance of enhancing local water supplies and reducing reliance on imported water. Finally, the State's California Water Action Plan, California Water Plan, and Delta Reform Act all also include policy objectives that emphasize increased regional self-reliance and reduced dependence on imported water.

  By any measure, the HBDP's 56,000 afy design capacity is therefore consistent with, and in furtherance of, existing planning documents at multiple local, regional, and state levels of water planning.

- **Subsurface Intake Infeasibility** – The question of subsurface intake feasibility was a central focus of the Coastal Commission's 2013 consideration of the HBDP. In light of that focus, Poseidon and the Coastal Commission staff spent over two years working with

independent experts to investigate the feasibility of subsurface intakes for the HBDP. This Independent Science and Technical Advisory Panel (ISTAP) process was jointly convened by Poseidon and the Coastal Commission staff and was open to public participation.

- The Phase ISTAP Report found that only the seabed infiltration gallery and the surf zone (beach) gallery survived the fatal flaw analysis, and both were deemed technically feasible. Each of the other seven subsurface intake options for the desired capacity range (100-127 MGD) had at least one technical fatal flaw that eliminated it from further technical consideration.
- The Wells Investigation Team (WIT) analysis demonstrated that reducing the capacity of slant wells increased the portion of the intake water from the Talbert injection barrier and reduced the portion from the ocean. The OCWD staff determined that the wells at any scale produce an unacceptable amount of inland groundwater.
- The ISTAP's November 2016 final report concluded that a beach infiltration gallery was infeasible and that subsurface intake gallery (SIG) was not economically viable for the HBDP regardless of scale.

Based on the ISTAP's and WIT's findings and the documented need for the HBDP's 56,000 afy production, it is clear that the HBDP is not proposed at an unnecessary design capacity based on inflated water needs. Design capacity was not the determining factor in the intake feasibility analysis for the HBDP.

- **HBDP Design Capacity** – Based on the evaluation by the OCWD, the 50 million gallons per day (mgd) HBDP is appropriately sized to have a meaningful impact on reducing demand for imported water. Under long-term stand-alone operations, the 50 mgd HBDP will be designed for direct intake of seawater at a rate that has been reduced in accordance with the Desalination Amendment to an average annual 106 mgd using the existing seawater intake and discharge facilities once they are retrofitted to meet the technology requirements of the Desalination Amendment. The intake would be retrofitted with 1 millimeter screens with a through-screen velocity of no more than 0.5 feet per second. The existing discharge pipe would be retrofitted with a diffuser.

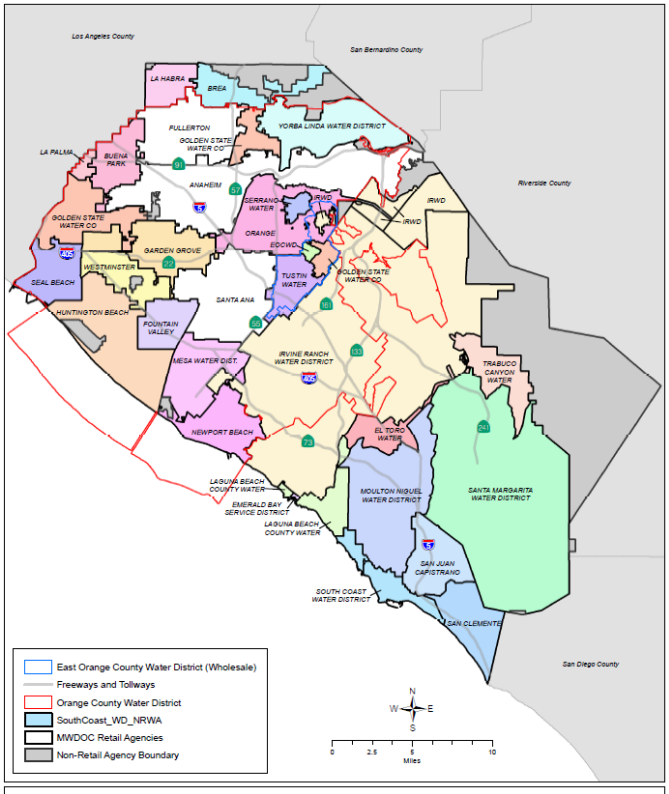
BACKGROUND

The management of water supplies in Orange County may be one of the most complex systems found in California. There are over thirty different agencies (cities, water districts and private companies) involved in supplying and delivering water in the county.

Orange County relies on numerous sources of water and water purveyors to meet the needs of its growing population, sources include imported water, groundwater, surface water, and recycled water. Imported water provided by MWD from Northern California and the Colorado River meet approximately half of the County's water needs. However, this dependence of 50 percent imported water does not apply evenly over the entire service area. South Orange County relies on imported water to meet approximately 95 percent of its water demand. The remaining five percent is provided by surface water, limited groundwater, and water recycling. North Orange County relies roughly 30 percent on imported water, as a result of their ability to rely on the Orange County Groundwater Basin to meet a majority of their demands.

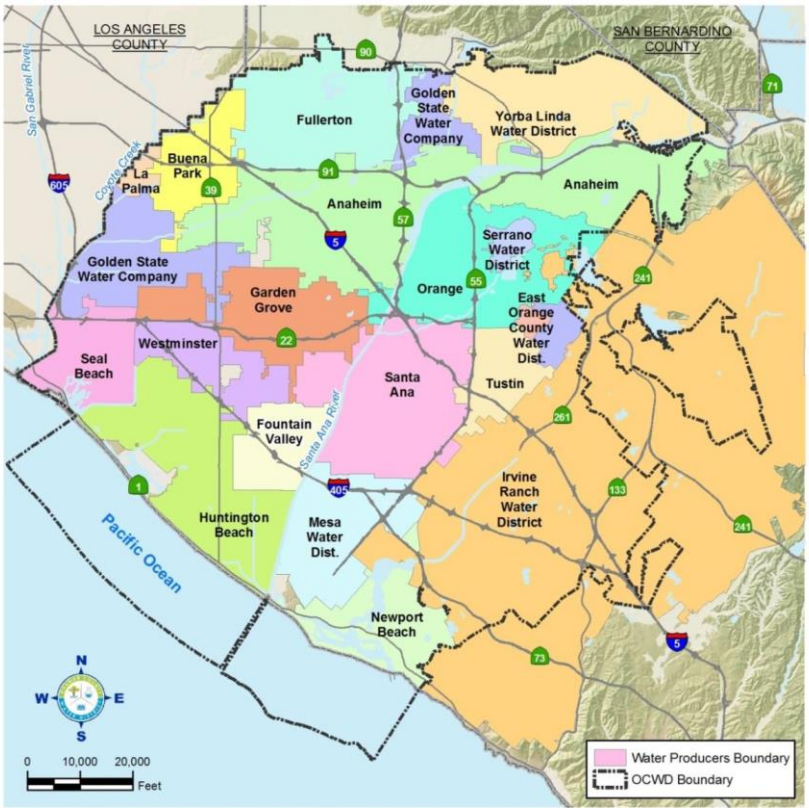
There are two regional water supply agencies in Orange County: The Metropolitan Water District of Orange County (MWDOC) and the Orange County Water District (OCWD).

- MWDOC serves imported water in Orange County to 28 retail water agencies. These entities, comprised of cities and water districts, are referred to as MWDOC retail agencies and provide water to approximately 2.3 million customers.

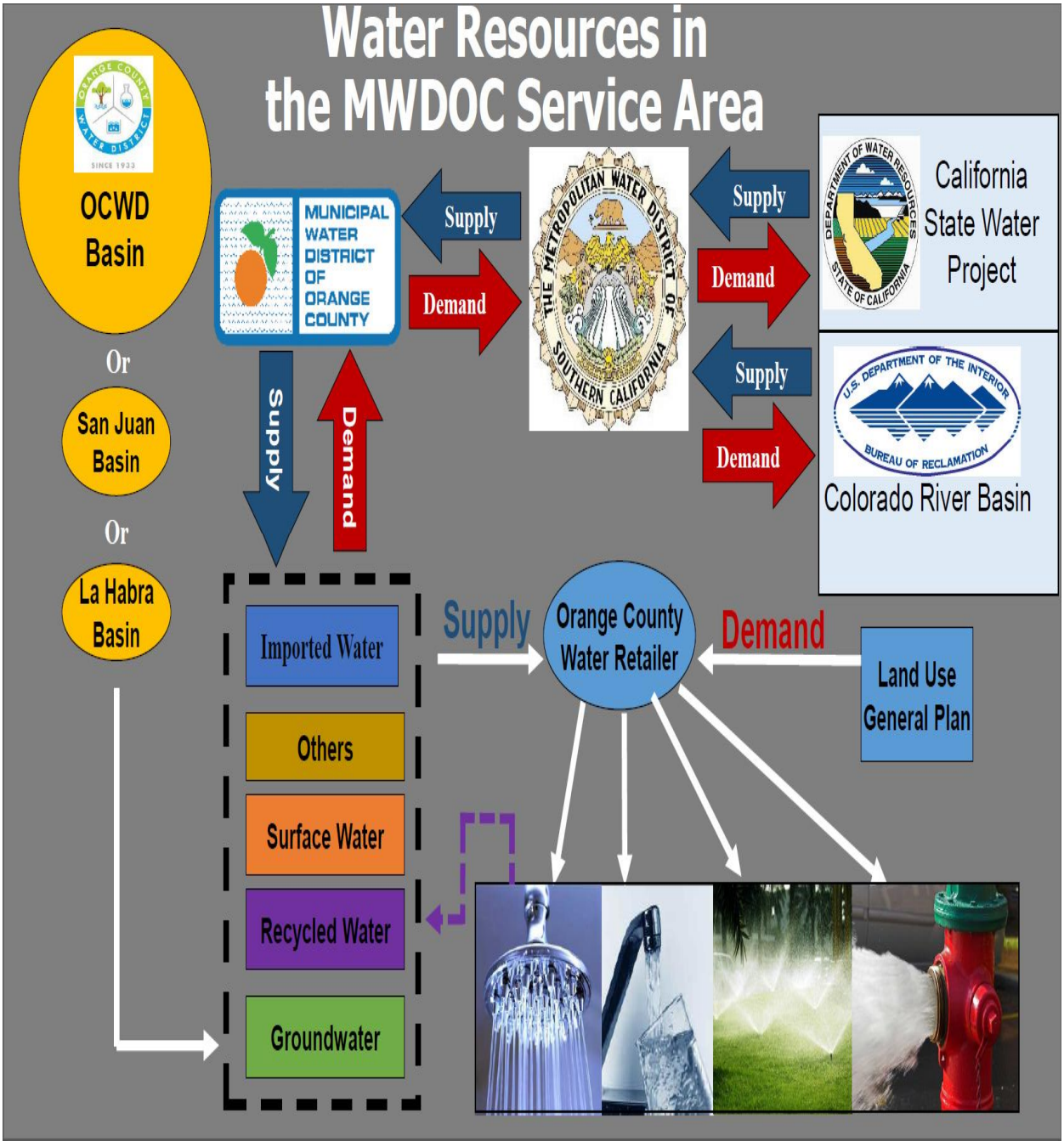


MWDOC Service Area and Member Agencies

- OCWD manages the Orange County Groundwater basin. The groundwater basin, which underlies north and central Orange County, provides approximately 62 percent of the water needed in that area; with imported water meeting the remaining balance of the water demand. Groundwater is pumped by producers before being delivered to customers.



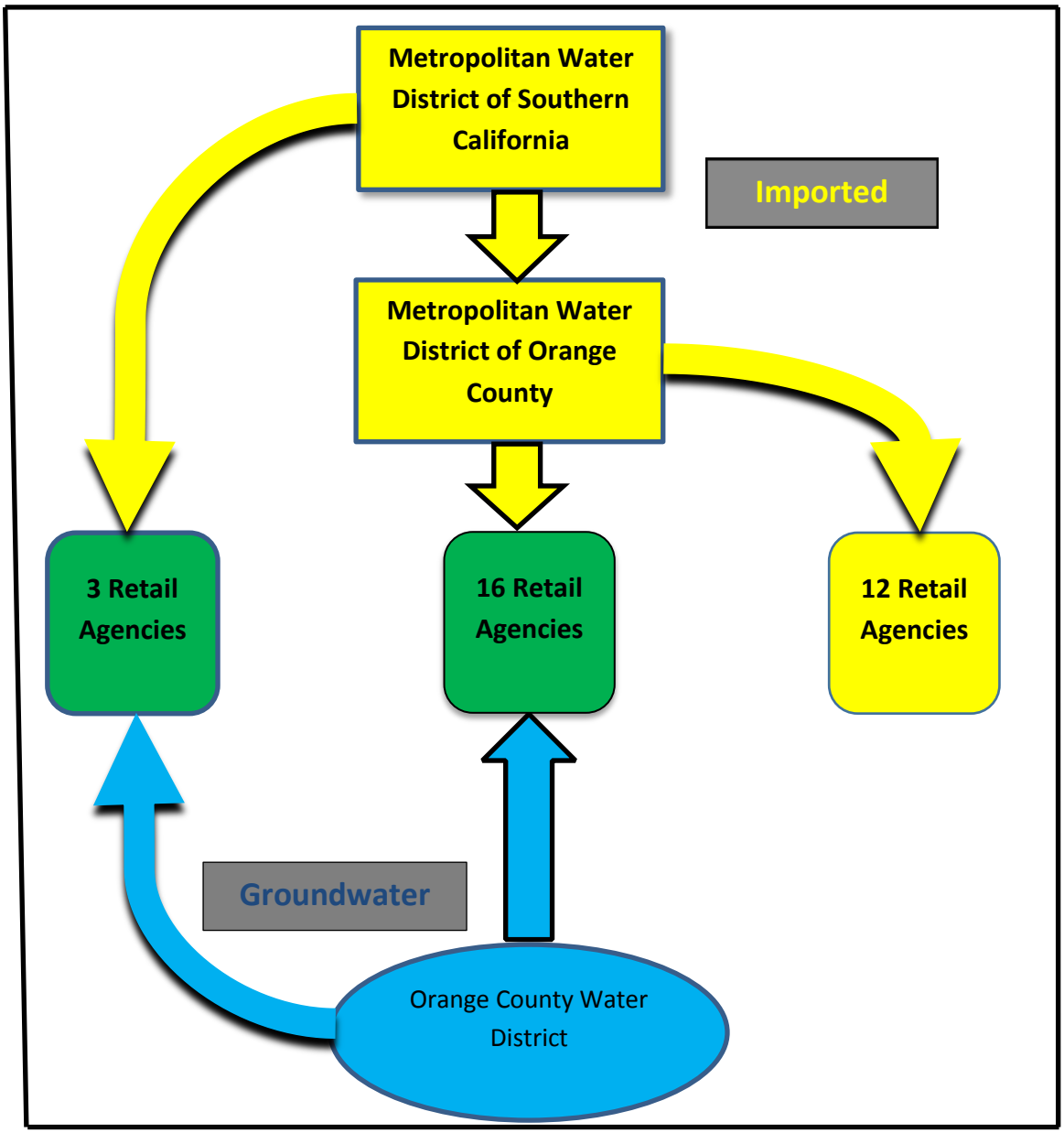
The figure below illustrates the water service organization in the MWDOC service area.



As demonstrated above, this is a fairly complex water supply management structure, but the basic relationships are shown in the simplified chart below. The key regional agencies concerning water supply are MWDOC for imported water and OCWD for groundwater. In the

case of the HBDP it is the OCWD that is the primary Orange County water agency involved and the need for the desalinated supply should be demonstrated in the appropriate plan for that agency. Nevertheless, it is also important that the MWDOC planning is consistent with the OCWD plan and both of these regional agencies planning be reflected in plans for the local retail agencies. Conversely, the plans for the Orange County agencies should be consistent with the plans for other regional water planning processes, with MWDSC plans and ultimately with the plans and polices of the State of California. All of these relationships will be reviewed in the following section I. NEED. Information taken directly from planning documents is shown in shaded text boxes in the remaining sections of this paper.

BASIC ORGANIZATION OF ORANGE COUNTY POTABLE WATER SUPPLY



I. NEED

The topic of "need" appears in the Site section of the Desal amendment:

> *III.M.2.b. (2) - 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.*

In this context it appears that the intent is to ensure that the desalination facility has been appropriately scaled to meet water supply needs. This is determined by comparing for consistency the water demand assumptions used to determine the need for the desalinated water with demand assumptions in other water planning documents that were prepared for other purposes. The question posed for the issue of need is what were the water demand assumptions that support the Orange County Water District (OCWD) interest in 56,000 acre feet per year (afy) of desalinated seawater and where are those assumptions found in appropriate planning documents?

OCWD's Interest in Poseidon's Huntington Beach Desalination Project

On March 17, 2010 the Orange County Water District signed a Memorandum of Understanding with Poseidon Resources for the consideration of the purchase of water from the proposed Huntington Beach desalination Project. On July 24, 2013, the District's Board of Directors voted unanimously to evaluate the financial feasibility of purchasing up to the full 56,000 acre feet per year capacity of drinking water that will be produced by Poseidon's proposed project. On May 14, 2015 the Orange County Water District's Board of Directors voted to approve a non-binding Water Reliability Agreement Term Sheet for the purchase of 50 million gallons per day (56,000 acre feet per year (afy)) of drinking water from the proposed Huntington Beach Desalination project (HBDP). The District's staff presentation at the May 14, 2015 Board meeting included information about how the ocean desal water would replace imported water as part of the District's water supply portfolio:

SOURCE	CURRENT WATER SUPPLY PORTFOLIO 450,000 afy	WATER SUPPLY PORTFOLIO WITH OCEAN DESAL 450,000 afy
MWD	154,000	98,000
Poseidon		56,000
Santa Ana River Base Flows	65,000	65,000
Santa Ana River Storm Flows	50,000	50,000
Natural Incidental Recharge	60,000	60,000
GWRS	103,000	103,000
MISC.	18,000	18,000

In summary, OCWD expressed interest in this water supply because:

- It could be base-loaded, locally controlled and drought proof. As such it would provide Orange County with greater supply reliability than afforded by imported water.
- The Huntington Beach project's 56,000 afy capacity is the single largest source of new, local drinking water supply available to the County.
- It would reduce the need to import water while enhancing the County's water independence.
- OCWD has been a leader in the use of recycled water as the Water District's 100 MGD Groundwater Replenishment System is the largest Indirect Potable Reuse plant in the world.
- Orange County is meeting the Governor's conservation mandates and Orange County's water consumption is lower today than it was in 1989, notwithstanding an over 20% increase in population since that period of time.
- Despite the District's investments in waste water recycling and commitment to conservation, the groundwater basin is 80% depleted today, the District is taking more than their entitlement of Santa Ana River water and they still must import about 50% of their water supply to meet current demand.

OCWD Background

The OCWD was formed in 1933 by a special legislative act of the State of California Legislature to protect and manage the County's vast, natural, underground water supply with the best available technology and to defend its water rights to the Orange County Groundwater Basin. Groundwater is pumped by producers before being delivered to customers. Indirect water use in Orange County includes the use of water to replenish groundwater basins and to serve as a barrier against seawater intrusion. The Orange County Water District (OCWD) is the entity responsible for managing and replenishing the Orange County Groundwater Basin.

OCWD protects, manages, and replenishes the basin with purchased imported water, storm water, and recycled water. OCWD further protects the groundwater basin from seawater intrusion through the injection of imported and recycled water along the coast, known as the Talbert Injection Barrier.

Since demands for replenishment for groundwater basin storage and seawater barriers are driven by the availability of supply to the groundwater basin in Orange County, the demand forecast for this type of use is based on the projection of the following supplies under normal conditions: Santa Ana River Flows; Incidental Recharge; Replenishment (surplus) supplies from Metropolitan; and Recycled Supplies for replenishment use.

Appropriate Plan(s)

OCWD is not required to prepare an Urban Water Management Plan because it does not fit the

definition of an "urban water supplier":

> "-a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers- WATER CODE SECTION 10617."

Groundwater Management Plan 2015 (GWMP).

For OCWD the applicable plan is the Groundwater Management Plan 2015. According to the GWMP, OCWD plans for the next five years include the Huntington Beach Ocean Desalination Plant in order to increase water supply by up to 56,000 afy.

Table 2-7: Recommendations for 2015-2020

PROJECT	BENEFIT TO BASIN
Huntington Beach Ocean Desalination Plant	Increase water supply by up to 56,000 afy

The need for increasing water supply included: declining Santa Ana River base flow reduces supply of water available to recharge groundwater basin; and limited imported water supply increases demands on groundwater supplies & supply to recharge groundwater basin.

Assumptions Supporting the Need to Increase Water Supply

1. **Declining flows from the Santa Ana River**

> Flows declined from Water Year 1998-99 high of 158,600 acre-feet to Water Year 2013-14 low of 64,900 acre-feet. The average annual recharge between Water Year 2009-10 and 2013-14 included Santa Ana River base flow of 90,000 afy (30% of the total) and storm flow of 42,000 afy (14%).
>
> Both the base flow and the storm flow in the Santa Ana River vary from year to year. Recent trends show a decline in base flow, which may be a result of increased recycling, drought conditions, declining per capita water use, and changing economic conditions in the upper watershed.

> Estimated future discharges of water from wastewater treatment plants to the Santa Ana River are expected to decline due to conservation and increased recycling. This, along with reductions in rising groundwater, means that projected Santa Ana River base flows reaching Prado Dam are significantly lower than what occurred from the early 1990s to 2005.

OCWD developed three Santa Ana River base flow projections: 1. High Base Flow Condition: 101,700 afy; 2. Medium Base Flow Condition: 52,400 afy; 3. Low Base Flow Condition: 36,000 afy. This is 54,000 afy less than the average over the past five years.

2. **Changes in the cost and availability of imported water supplies.**

> OCWD purchases imported water for recharge from the Municipal Water District of Orange County (MWDOC), which is a member agency of MWD. Treated imported water was used extensively for in-lieu recharge from 1977 to 2007. During this time frame, OCWD recharged over 900,000 acre-feet of water using in-lieu recharge purchased from MWD. The MWD discontinued the in-lieu program in 2012.

3. **Increased water demands within District boundaries due to population growth.**

> Demand projections within the District's service area are based on Urban Water Management Plans (UWMP), which each Producer prepares to support their long-term resources planning to ensure that adequate supplies are available to meet existing and future water demands. Future demands are projected to increase over 20 percent (83431 afy) to 525,000 acre-feet by 2035. Key drivers in increased water demands are population growth within OCWD's service area, which is projected to increase from approximately 2.38 million to 2.54 million by 2035 (MWDOC, 2014), and a return to an average level of economic activity.

Conclusion

The assumptions about the need for increased supplies for the OCWD are well documented in the GWMP which is the appropriate plan for OCWD as a regional groundwater management agency. The GWMP explicitly identifies the HBDP as a planned source of 56,000 afy. The GWMP also identifies the need for over 130,000 afy based on a reduction in Santa Ana River flows of 54,000 afy and growth in future demands exceeding 80,000 afy. Even with expansions of the GWRS from 100,000 to 130,000 afy there is still need for the HBDP. Clearly the scale of the water supply provided by the proposed HBDP is consistent with the identified need.

OCWD Long-Term Facility Plan 2014

The OCWD GWMP identifies and references the District's Long-Term Facilities Plan (LTFP). Below are excerpts from that plan:

The cost-effectiveness of each project that provides additional groundwater recharge is evaluated in relationship to the current and projected cost of imported water. In this sense, the cost of imported water provides a benchmark for determination of project cost effectiveness.

The LTFP is a strategic planning tool which identifies potential projects that advance the District's mission. A key purpose in preparing the LTFP is to identify the most important and effective potential projects so that the District can prioritize its efforts to those potential projects that should be further developed for consideration by the Board. This report summarizes current and future water demands, describes the current water supplies available to the District for groundwater recharge, presents a range of potential projects, explains the process for selecting projects for projects for focused study, and provides details of those projects including cost estimates and project benefits where possible.

The LTFP addresses the three key need assumptions found in the OCWD GWMP.
The District expects that present water resources challenges will continue into the future. These trends include:

- Continued decline in Santa Ana River base flow;
- A continuation of cycles of below and above average precipitation with a greater frequency of extreme conditions;
- Need for greater local water supply self-sufficiency as imported water supplies continue to be less reliable; and
- An increase in water produced by the GWRS.

Assumptions Supporting the Need to Increase Water Supply

The LTFP identifies the assumptions that support the need to use 56,000 afy of desalinated seawater as:

In recent years, the supply of Santa Ana River base flow has declined, but at the same time, the supply of recycled water has increased. Santa Ana River base flow is projected to continue to decline as upstream agencies divert these flows for their uses. A key objective of the LFTP is to identify projects that cost-effectively provide additional sources of water including projects that increase storm water capture and increase the production of recycled water. The two main components of flow in the Santa Ana River are base flow and storm flow. A large amount of the base flow, especially in the summer months, is comprised of tertiary-treated wastewater discharged from wastewater treatment facilities upstream of Prado Dam.

Water demands within the OCWD boundaries for water year (WY) 2012-13 totaled 434,535 acre-feet. Future demands are projected to increase over 20 percent to 525,000 acre-feet by 2035. Key drivers in increased water demands are population growth within OCWD's service area, which is projected to increase from approximately 2.38 million to 2.54 million by 2035 (MWDOC, 2014), and a return to an average level of economic activity.

Based on review and analysis of the potential projects, 17 focused study projects were identified including 6 water supply projects. One of those is the Poseidon Resources Huntington Beach Ocean Desalination Plant where the District would partner with Poseidon to utilize purified ocean water supply from Huntington Beach facility.

Table ES-1: List of Projects for Focused Study (page ES-5)

PROJECT	DESCRIPTION
	WATER SUPPLY
Poseidon Resources Huntington Beach Ocean Desalination Plant	Partner with Poseidon to utilize purified ocean water supply from Huntington Beach facility

Other Agencies

Local Retail Agencies

The OCWD is considering different options concerning the distribution of desalinated seawater from the HNTB which includes several local retail agencies including Newport Beach, Huntington Beach, Seal Beach, Fountain Valley, Garden Grove, Golden State Water, and the South County agencies. Each of these agencies has UWMPs adopted in 2010. Since they are local retail water providers they include their own individual planned projects and as demonstrated in the City of Huntington Beach's UWMP they refer to regional planned projects from MWDOC and OCWD. Each of the local UWMPs includes a description of potential seawater desalination projects in the region. In addition, many of the retail agencies that had signed non-binding Letters of Interest (LOI) with Poseidon for the planning of the HBDP identified the quantity of seawater desalinated water that they were considering.

Huntington Beach 2010 UWMP

This plan includes the following information related to the HBDP:

The reliability of the City's water supply is currently dependent on the reliability of both the groundwater managed by OCWD and the imported water supplies managed by Metropolitan and delivered by the Municipal Water District of Orange County (MWDOC). Despite the ongoing regional water supply challenges, the goals and statutory mission of these agencies are to identify and develop projects to meet regional water demands.

4.4.2 Regional Agency Projects

Since the City purchases imported water from the SWP and the Colorado

In Orange County, there are three proposed ocean desalination projects that could serve MWDOC, including one specifically that may benefit the City. On January 20, 2010, the City signed a non-binding LOI for 7.1 MGD (8,000 AFY) of Huntington Beach Seawater Desalination Project supplies.

Municipal Water District of Orange County (MWDOC) Projects

Although MWDOC is not responsible for carrying out specific supply development projects in the region, the MWDOC 2010 Regional Urban Water Management Plan discusses a number of water supply opportunities in Orange County. Additional details on each of these projects or programs can be found in Section 7 of MWDOC's RUWMP.

Huntington Beach Seawater Desalination Project: Poseidon Resources LLC, a private company, is developing the Huntington Beach Seawater Desalination Project to be located adjacent to the AES Power Plant in the City of Huntington Beach along Pacific Coast Highway and Newland Street. The proposed project would produce up to 50 MGD (56,000 AFY) of drinking water and will distribute water to coastal and south Orange County to provide approximately 8% of Orange County's water supply needs.

Newport Beach 2010 UWMP

In Orange County, there are three proposed ocean desalination projects that could serve MWDOC, including one specifically that may benefit the City. On January 20, 2010, the City signed a non-binding LOI for 7.1 MGD (8000 AFY) of Huntington Beach Seawater Desalination Project supplies.

Seal Beach 2010 UWMP

In Orange County, there are three proposed ocean desalination projects that could serve MWDOC, including one specifically that may benefit the City. On May 24, 2010, the City signed a non-binding LOI for 0.8 MGD (850 AFY) of Huntington Beach Seawater Desalination Project supplies.

Fountain Valley UWMP 2010

> In Orange County, there are three proposed ocean desalination projects that could serve MWDOC, including one specifically that may benefit the City. On October 13, 2009, the City signed a non-binding LOI for 2.2 MGD (2,500 AFY) of Huntington Beach Seawater Desalination Project supplies.

Garden Grove 2010 UWMP

> In Orange County, there are three proposed ocean desalination projects that could serve MWDOC, including one specifically that may benefit the City. On January 27, 2009, the City signed a non-binding LOI for 8.9 MGD (10,000 AFY) of Huntington Beach Seawater Desalination Project supplies.

South Orange County (SOC)

2015 Long Range Water Reliability Plan

There was a 2012 Update of the 2004 South Orange County Water Reliability Study completed for the El Toro Water District, Laguna Beach Water District, Moulton Niguel Water District, City of San Clemente, City of San Juan Capistrano, Santa Margarita Water District, South Coast Water District, and the Trabuco Canyon Water District.

This update identified that approximately 97 percent of South Orange County's potable water supply is imported from Northern California and the Colorado River, and that demands in the SOC area are projected by the local agencies to increase from a current demand level of approximately 108,000 AF per year to 130,000 AF per year by 2020 based on anticipated development plans.

A description of the HBDP is included in the report:

> Poseidon Resources, Inc. has been working with MWDOC and about 20 local agencies over the past several years to examine the terms and conditions for developing a 50 mgd ocean desalination project in Huntington Beach (annual production is estimated at 56,000 AF).

Table 5 Potential Participation in the Poseidon Huntington Beach Project by South Orange County Agencies

Letter of Interest Participant	afy
El Toro WD	3,000
Laguna Beach CWD	1,000
Moulton Niguel WD	4,000
Santa Margarita WD	5,000
South Coast WD	3,000
Trabuco Canyon WD	750
Total SOC	16,750

Assumptions supporting the need for increases in water supply were identified as:

- It is apparent that much uncertainty exists in providing cost and reliability estimates for imported water out into future years beyond the near term. This is especially true given the Bay-Delta Conservation Plan (BDCP) implementation issues, such as the Endangered Species Act, with potential climate change and hydrologies outside of the 82 year period of history.

- The South OC area is about 90% dependent on imported water for drinking water supply, and this dependence will continue into the future. The South OC area has between 12 and 31 days of drinking water supply given a complete outage of the imported water system. The reliability varies from agency to agency.

- Local projects that produce new sources of supplies have two benefits. These types of projects include ocean desalination, groundwater desalting, water use efficiency projects and water recycling. These projects provide reliability during outages and a new source of supply.

Regional Agencies

Metropolitan Water District of Orange County (MWDOC) Urban Water Management Plan.

MWDOC is a water wholesaler and regional planning agency serving 26 cities and water districts throughout Orange County, which includes OCWD's service area. MWDOC prepared its 2010 Regional Urban Water Management Plan to provide a comprehensive assessment of the

region's water services, sources and supplies, including imported water, groundwater, surface water, recycled water, and wastewater.

The **MWDOC 2010 UWMP** included:

> Opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply. To accommodate long-term population and economic growth in Southern California, and to protect against uncertainty and more extreme variability in natural water supply, as well as development and depletion of water resources outside of Southern California, continuing regional and local efforts in water resource management and supply development will be necessary. Application of desalination technology is increasingly being recognized as one important supply component to develop new sustainable water supplies and to bolster water system reliability. Overall supply shortage risks from drought, regulatory constraints on existing supplies and emergency outages can be lessened with a diversified and disaggregated water supply portfolio that incorporates appropriate desalination projects.

> In Orange County, there are three proposed ocean desalination projects that could serve MWDOC and its member agencies with additional water supply. These are the Huntington Beach Seawater Desalination Project, the South Orange Coastal Ocean Desalination Project, and the Camp Pendleton Seawater Desalination Project. Poseidon has received non-binding Letters of Intent (LOI) from MWDOC and 17 retail water agencies to purchase a total of approximately 72 MGD (88,000 AFY) of project supplies.

> MWDOC has worked closely with its retail agencies to decrease dependence on imported water and increase supply reliability by expanding local supplies and implementing water use efficiency measures. Development of additional local supplies improves both local and regional reliability as well as system (emergency reliability). Although MWDOC is not responsible for carrying out supply development projects in the region, they are aware of their retail agencies supply opportunities.

The **Final Draft MWDOC UWMP 2015** describes the core water resources that will be used to meet full-service demands at the retail level under all foreseeable hydrologic conditions from 2020 through 2040.

Additional required portions of the draft include discussion of planned projects in which the HBDP is clearly included as well as the discussion of the potential for seawater desalination projects.

A list of potential future projects that could improve water supply and system reliability in Orange County were identified in 2015 during the discussions regarding the OC Water Reliability Study. The projects listed below include potential projects that could be completed by agencies in Orange County to meet future projected demands as well as projects to improve the County's reliability from Metropolitan's supplies. Further detail of these projects should be available in the UWMPs developed by each retail agency and/or Metropolitan. Although some of these projects do not introduce new sources of supply, they increase system reliability (emergency services).

Huntington Beach Seawater Desalination Project - 56,000 AF/yr produced by Poseidon in Huntington Beach with distribution in Orange County by OCWD and MWDOC.

Metropolitan Water District of Southern California 2015 Integrated Water Resource Plan (IRP) Update

The IRP discusses the need to look locally to close the gap between supplies and demands which achieves California's policy to reduce reliance on the Delta to meet future needs. The 2015 update includes the need for 238,000 afy from local reliability projects to meet projected demands to the year by the year 2040.

Setting the 2015 IRP Update Reliability Targets:
The 2015 IRP Update reliability targets identify developments in imported and local water supply and in water conservation that, if successful, would provide a future without water shortages and mandatory restrictions under planned conditions. For imported supplies, Metropolitan looks to make investments in additional partnerships and initiatives to maximize Colorado River Aqueduct deliveries in dry years. On the State Water Project, Metropolitan is looking to make ecologically-sound infrastructure investments so that the water system can capture sufficient supplies to help meet average year demands and to refill Metropolitan's storage network in above-average and wet years. Lowering regional residential demand by 20 percent by the year 2020 (compared to a baseline established in 2009 state legislation), reducing water use from outdoor landscapes and advancing additional local supplies are among the planned actions to keep supplies and demands in balance.

These targets represent a combined total of 723,000 acre-feet of increased conservation savings and supply production by the end of the forecast period; 485,000 acre-feet from the total conservation target and 238,000 acre-feet from the local supply reliability target.

In addition to the local supply target the IRP acknowledges that additional local supply development is needed to address uncertainties in current local supplies.

Additional Supplies to Address Risks and Uncertainties
The 2015 IRP Update reliability targets are based on a wide range of potential future conditions. Beyond that range, the 2015 IRP Update process identified additional foreseeable challenges and risk scenarios. To address these risks, an additional 200,000 acre-feet of water conservation and local supplies would be needed. This additional supply goal should be considered when examining implementation polices and approaches

The role of seawater desalination as a source of the local supply is identified in the IRP.

In the early 2000s, several member agencies began pursuing local seawater desalination projects to diversify their resource portfolios and in 2001, Metropolitan created an incentive program to support these projects. Soon after, the Board of Directors approved Metropolitan's role as a regional facilitator for seawater desalination with the purpose of assisting the member agencies with state and regional development issues. In 2014, Metropolitan included seawater desalination projects in the LRP for the development of additional local supplies.

Other Regional Plans

Integrated Regional Watershed Management Plans (IRWMP) for Orange County

Orange County has three integrated plans that support the need to enhance local water supplies.

North Orange County Integrated Regional Watershed Management Plan (IRWMP)

This IRWMP from 2007 supports the importance of enhancing local water supplies and the potential relationship between ocean water desalination and protecting the groundwater basin:

4.3 Objectives

Enhance Local Water Supplies

- Reduce reliance on imported water by supporting groundwater recharge, groundwater supply and treatment programs, and implementing demand management measures, including development and use of recycled water and water conservation strategies;
- Reduce the vulnerability of water supply systems to droughts, seismic and other related emergencies, and the effects of climate change; and
- Protect groundwater from contamination and seawater intrusion. Evaluate new local water supplies, such as ocean water desalination.

Central Orange County Integrated Regional and Coastal Watershed Management Plan (IRWMP) 2007

The Central Orange County plan was prepared in 2011 by the County of Orange and local stakeholders, including OCWD, to serve as a planning tool to effectively manage the region's water resources. The Central Orange County IRCWM Plan Objectives included the objective of:

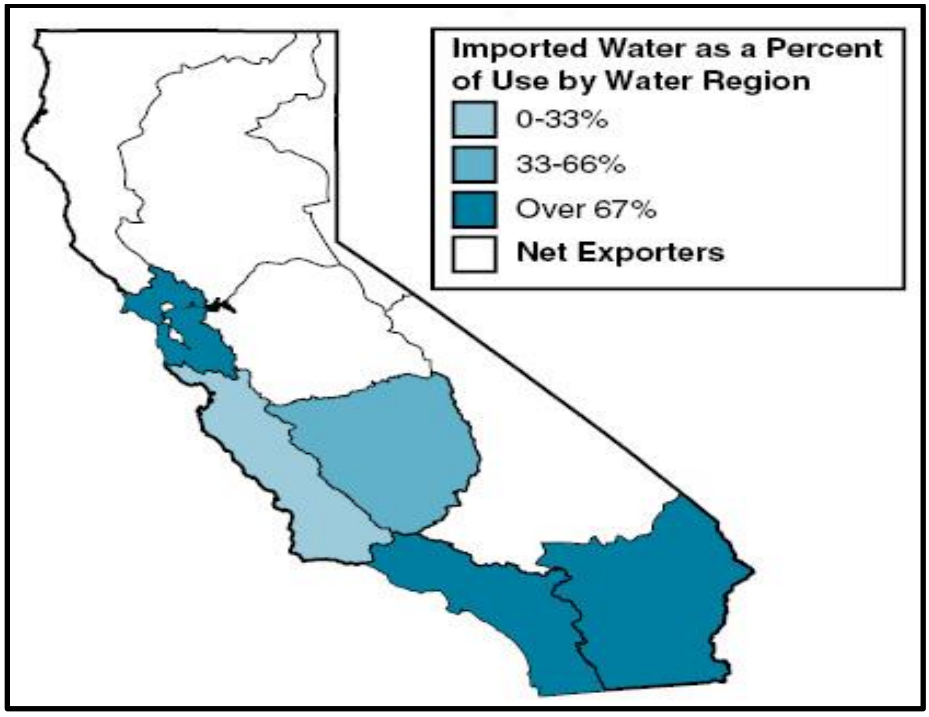
> "Enhance quantity and quality of local water supplies, including groundwater, to reduce reliance on imported water."

SOC WMA IRWMP 2013

This South Orange County IRWMP included:

> 4.2.1 Regional Issues/Challenges In developing the objectives, the stakeholders considered long-term regional planning conflicts and issues including identification of enhanced local water supplies to offset reduction of imported water to meet demands during times of drought.
>
> Goal: Increase Water Supply and Reliability
>
> - Improve planning and awareness of water supply reliability issues related to imported water into So.OC.
> - Develop and manage groundwater supplies in South Orange County 10,800 AF by 2020.
> - Increase efficient use of recycled water from municipal wastewater sources by 20,000 AFY by 2020.
> - Increase capture and utilization of surface runoff for irrigation purposes
> - Produce 15 MGD of ocean water desalination as a new drought proof supply by 2020.
> - Improve System Reliability to protect against out of the region earthquakes and floods as well as earthquakes in Orange County that would cause interruptions of supplies.
> - Manage and improve the supplies available to South Orange County for the collective benefit.

State of California



As shown in this graphic, Orange County is in a part of the State of California that imports over 67% of the water that is used.

In a November 8, 2013 letter (attached) to the California Coastal Commission the Director of the California Department of Water Resources wrote: "Approval of the Coastal Development Permit for the Huntington Beach project would advance State water supply reliability needs." The objectives of increasing local or regional water supplies and reducing dependence on imported water are documented in a number of California policy documents including:

California Water Action Plan

The California Water Action Plan – originally released by the administration of Governor Brown in January 2014 – is a roadmap for the first five years of the state's journey toward sustainable water management.

The Action Plan includes goals and actions that emphasize the importance of local projects like the HBDP:

> Goals: Reliability, Restoration and Resilience
>
> Actions: Increase regional self-reliance and integrated water management across all levels of government.

The plan notes that: "Ensuring water security at the local level includes efforts to conserve and use water more efficiently, to protect or create habitat for local species, to recycle water for

reuse, to capture and treat stormwater for reuse, and to remove salts and contaminants from brackish or contaminated water or from seawater."

It also states that: "The administration will review and propose measures to streamline permitting for local projects that make better use of local water supplies such as recycling, stormwater capture, and desalination of brackish and seawater."

California Water Plan (CWP)

Required by the California Water Code Section 10005(a), the CWP is State government's strategic plan for managing and developing water resources statewide.

Update 2013 builds on and advances a planning transformation that began with the California Water Plan Update 2005 (Update 2005) process. Update 2005 was the first of the CWP updates to explicitly include a strategic planning approach from preparation to presentation.

Guiding Principles from this updated plan include:

Increase regional self-reliance.

- Implement resource management strategies that reduce dependence on long-term imports of water from other hydrologic regions for meeting additional future water demands and during times of limited supply, such as a drought or interrupted supply after a catastrophic event (e.g., an earthquake or fire).
- Reduce reliance on the Sacramento-San Joaquin Delta (Delta) in meeting California's future water demands.
- Increase regional self-reliance for water by investing in water use efficiency, water recycling, advanced water technologies, local and regional water-supply projects, improved regional coordination of local and regional water supplies, and other strategies.

Delta Reform Act

In 2009, the Legislature passed the Delta Reform Act and associated bills. By affirming the equal status of ecosystem health and water supply reliability, the Legislature changed the terms of the conversation. It changed them further with the following pronouncement: "The policy of the State of California is to reduce reliance on the Delta in meeting California's future water supply needs through a statewide strategy of investing in regional supplies, conservation, and water use efficiency." Here was recognition that, for the sake of the water system and the Delta both, a partial weaning of the one from the other will be required.

II. Capacity

The topic of "capacity" appears in the Technology section of the Desal amendment:

> *III.M.2.d. (1) (a)) 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.**

The apparent intent in this section is to ensure that project is not designed to an unnecessary scale based on inflated water needs which is used by itself to declare subsurface intakes* as not feasible.*

The question is whether scale was the determining factor in the intake feasibility analysis for the HBDP?

Technical Feasibility of Subsurface Intakes

In 2014 an Independent Scientific and Technical Advisory Panel (ISTAP) was established by an agreement between the California Coastal Commission and Poseidon Resources to undertake an independent assessment of the technical feasibility of using one or more potential subsurface intake technologies to supply the feed water to the Huntington Beach seawater desalination facility proposed by Poseidon.

The objective of Phase 1 of ISTAP was to examine the "Technical Feasibility" of subsurface intakes at or near the proposed site at Huntington Beach, California. For the Phase 1 Report, the working definition of "Technical Feasibility" was: "Able to be built and operated using currently available methods". The specific question posed to the ISTAP in Phase 1 was: Will any of the currently available subsurface intake designs be technically feasible at the proposed site at Huntington Beach?

The ISTAP also concluded that the definition of "technical feasibility" should be informed by the recent State Water Resources Control Board Draft Desalination Policy published July 3, 2014. The Draft Policy specified 14 factors that should be considered to determine subsurface intake feasibility. The ISTAP determined that the following six factors are technological in nature, namely, (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, and these then comprise the "technological factors" considered in this Phase 1 assessment, consistent with interpretation of the CEQA definition of "feasible".

The first step undertaken by the ISTAP was to identify all possible subsurface intake options that have at least one application of the technology worldwide for the purposes of delivering water from a surface source regardless of economic considerations, or the other factors identified under the CEQA definition. These purposes could include not just intakes for desalination plants, but also any subsurface intake technology used to obtain fresh, brackish or saline water from a surface water body. The ISTAP considered that these technical options would be considered as "currently available methods".

The ISTAP then established a list of criteria and sub factors that address all of the technical factors noted above. Information was then developed, based on technical information available to the ISTAP or using professional judgment, to address all technical factors for each of the selected subsurface intake options. The matrix developed through this process then served as the foundation of the ISTAP's determination as to whether or not any of the options were feasible based on technological factors solely. In simple terms, this means that cost and other factors normally considered under the CEQA definition of feasible were not addressed in Phase 1 of the assessment.

The ISTAP evaluated nine types of subsurface intakes for technical feasibility at the Huntington Beach site. The subsurface feasibility options included: (1) vertical wells completed in the shallow aquifer above the Talbert aquifer, (2) vertical deep wells completed within the Talbert aquifer, (3) vertical wells open to both the shallow and Talbert aquifers, (4) radial collector wells tapping the shallow aquifer, (5) slant wells tapping the Talbert aquifer, (6) seabed infiltration gallery (SIG), (7) beach gallery (surf zone infiltration gallery)5, (8) horizontal directional drilled wells, and (9) a water tunnel.

The ISTAP carefully evaluated fatal flaws of each subsurface intake type considered for application at Huntington Beach. Only the seabed infiltration gallery and the surf zone (beach) gallery survived the fatal flaw analysis, and both were deemed to be technically feasible. Both gallery types would face constructability challenges related to subsea construction. The surf zone gallery was judged to have particularly challenging construction issues (and thus a lesser degree of technical feasibility) related to construction in a high-energy environment**.** The ISTAP did not consider the existing scale of use of any particular subsurface intake compared to the capacity requirement at Huntington Beach to be a fatal flaw for technical feasibility (e.g., the only existing seabed infiltration gallery has a capacity of 27 MGD versus the 100 MGD required at Huntington Beach or no large scale implementation of the beach gallery has been constructed and operated to date).

The Panel interpreted its charge relative to the Terms of Reference to be the evaluation of the technical feasibility of subsurface intake technology linked to a proposal. Consistent with that approach, the Phase 1 Panel considered nine technologies keyed to a potential project in the range 100 to 127 mgd. The Panel did address the broad issue of downward scalability where they saw relevance, but did not attempt to consider a full or parsed range of scale options for all of the technologies.

It was the collective opinion of the ISTAP that:

> Each of the other seven subsurface intake options for the desired capacity range (100-127 MGD) had at least one technical fatal flaw that eliminated it from further technical consideration. The shallow vertical wells would create unacceptable water level drawdowns landward of the shoreline and could impact wetlands and cause movement of potential contaminants seaward. The deep vertical wells would have a significant impact on the Talbert aquifer that would interfere with the management of the salinity barrier and the management of the interior freshwater basin.

The combined shallow and deep-water wells would adversely impact both the shallow aquifer and Talbert aquifer, and in addition, would produce waters with differing inorganic chemistry, which would adversely affect SWRO plant operation. Radial collector wells constructed into the shallow aquifer would have to be located very close to the surf zone which would make them susceptible to damage during storms and would be impacted by the projected sea level rise. Slant wells tapping the Talbert aquifer would interfere with the management of the salinity barrier and the management of the freshwater basin, and further, would likely have geochemical issues with the water produced from the aquifer (e.g., oxidation states of mixing waters). A water tunnel constructed in the unlithified sediment at Huntington Beach would have overwhelming constructability issues.

The ISTAP recommended that consideration be given solely to seabed infiltration galleries (SIG) and beach gallery intake systems in the Phase 2 assessment. As noted, the ISTAP was not asked to evaluate the economic considerations of using a subsurface intake versus a conventional open-ocean intake during Phase 1 of the assessment. The ISTAP recommended in the next phase, the Panel should focus primarily on the constructability of the seabed infiltration and beach gallery intake systems, because this greatly affects the economic viability of their potential use.

Technical Feasibility of Smaller Scale Wells

At the conclusion of Phase 1 of the Independent Scientific Technical Advisory Panel (ISTAP) Process, the Conveners (Tom Luster of the California Coastal Commission, and Stan Williams of Poseidon Water) agreed to form a Well Investigation Team (WIT) to develop additional information about the potential effects of using wells to provide source water for Poseidon's proposed desalination facility in Huntington Beach. The wells would be located along the shoreline and would be intended to draw from the offshore extension of the Talbert Aquifer, which is managed by the Orange County Water District. This WIT review was to be conducted in parallel with Phase 2 of the ISTAP process.

Commission staff specifically requested additional information about the effects of shoreline wells on the Talbert Aquifer in order to evaluate and help complete Poseidon's Coastal Development Permit application. The charge to the WIT was to provide advice to the Conveners on the selection or development of a supplemental model to determine the effects of alternative well intake methods and extraction volumes associated with Poseidon's proposed desalination facility on the Talbert Aquifer and regional groundwater resources.

The WIT noted that, as part of Poseidon's feasibility assessment of Subsurface Seawater Intakes (SSIs) conducted under the auspices of the ISTAP process, geohydrologist Gordon Thrupp of Geosyntec had utilized geotechnical data obtained from that process and developed a groundwater flow model to simulate pumping from a series of slant wells beneath the beach. The WIT invited Dr. Thrupp to present a summary of his work to the WIT participants in February, 2015. At that meeting Dr. Thrupp reported that the slant well SSI groundwater model (Geosyntec, 2013) indicates that for 127 mgd pumping beneath the coastline, approximately 89% (~113 mgd) comes from the ocean and 11% (14 mgd) comes from inland aquifers, which may

interfere with the performance of the Talbert Injection Barrier. After this presentation, the WIT recommended to the Conveners that the most straightforward approach to accomplishing the desired modeling would be to retain Dr. Thrupp to extend and build upon his prior modeling efforts, and develop a supplemental memorandum detailing his findings.

The results of that modeling effort were reported in a Technical Memorandum titled "Revision and Sensitivity Analyses of Slant Well SSI Model, Feasibility Assessment of Shoreline Subsurface Collectors, Huntington Beach Seawater Desalination Project." The original model indicated that approximately 89% of the water pumped from the slant wells would come from the ocean, 1% from inland regional recharge, and 10% from the inland aquifers boundary, which represents the Talbert Injection Barrier. Revision of the model to include fixed sea-level elevation for portions of the coastal wetland and marsh areas resulted in approximately 2% of the 127 mgd coming from recharge from portions of the wetlands with hydraulic connection to ocean.

A sensitivity analysis was conducted using a range of assigned values for hydraulic conductivity for the Talbert Aquifer and the overlying strata, variation in the location of the series of slant wells relative to the coastal margin, and lower pumping rates. The results of the sensitivity runs show the following ranges of contribution of different sources of the water pumped by the series of slant wells under the beach:

Ocean Recharge	62 to 89%
Recharge from Coastal Wetlands with Connection to Ocean	0.5 to 2%
Inland Aerial Recharge	0.8 to 3.2%
Inland Aquifer Boundary Condition (Talbert Injection Barrier)	8 to 36%.

Subsurface Intake Capacity	Percent of Water from Sea	Percent of Water from Inland Boundary Condition (Talbert Injection Barrier
127 mgd	89%	10%
63.5 mgd	85%	12%
31.75 mgd	80%	15%

This analysis demonstrated that reducing the capacity of the slant wells increased the portion of the intake water from the Talbert injection barrier and reduced the portion from the ocean. The Orange County Water District was also a participant in the WIT process, represented by Chief Hydrologist Dr. Roy Herndon. At the conclusion of the process in a letter dated February 12, 2016 he stated the OCWD staff opinion was that a SSI constructed within the Talbert aquifer near the coast would produce an unacceptable amount of inland groundwater that would reduce the yield of the groundwater basin and, likewise, would effectively reduce the net yield of "new" water produced by an ocean desalination project. For these reasons, again, OCWD staff would not be in favor of continued consideration of a SSI option for the Huntington Beach Seawater Desalination Project.

Feasibility of a Seafloor Infiltration Gallery

In the ISTAP first phase, the Panel was to determine whether any of several subsurface intake options were technically feasible at or near the proposed project site – that is, whether they could be built and operated given site conditions. The Phase 1 ISTAP reviewed the technical feasibility of nine subsurface intake technologies and concluded that two of the technologies, namely a seafloor infiltration gallery (SIG) and beach infiltration galleries (BIG), met criteria established by the Phase 1 Panel to define technical feasibility. At the end of Phase 1, the Conveners (Coastal Commission staff and Poseidon) considered the report and agreed to initiate a second phase.

The Conveners established a second panel (Phase 2 ISTAP) to assess the broader feasibility of the two technically feasible options 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. To address these broader issues associated with a feasibility assessment, the composition of the second Panel was expanded to include experts in natural resource economics and environmental and social science to complement experts in engineering, water quality and constructability associated with desalination plants and alternative intake systems.

The Phase 2 ISTAP conducted the following tasks:

- Reviewed the technical feasibility of the two subsurface options selected in Phase 1of the ISTAP, and determined that the beach infiltration gallery would not be feasible.
- Determined key technical assumptions for the two construction methods for the seafloor infiltration gallery (SIG).
- Established the baseline hydraulic capacity (scale) for the Huntington Beach proposed desalination facility, and defined the range of scales to be evaluated in the economic assessment of project alternatives, namely the relative costs of the proposed desalination facility, with and without a SIG at varying scales.
- Completed a technical assessment of the two SIG construction alternatives and established assumptions needed for the environmental and economic analysis.
- Collected necessary data to assess the economic feasibility of the three intake alternatives (open ocean, SIG-Trestle, SIG-Float In).
- Assessed the environmental and social factors qualitatively and identified those factors that can be quantified with respect to mitigation requirements.
- Compiled and analyzed the capital, operations and maintenance (O&M) costs associated with each alterative, including mitigation costs for environmental impacts that can be quantified.
- Conducted a life cycle analysis for costs of each alternative and a sensitivity analysis to provide a justifiable range of life cycle unit costs (i.e. cost per acre foot of produced water).
- Analyzed the impact of varying the scale of the desalination facility on the life cycle costs.
- Completed an assessment of the economic feasibility of each alternative by comparing a range of unit cost estimates (i.e. 2015 dollars/acre foot of produced water) with the range of water costs that a utility may be willing to pay given a

reasonable estimate of the costs of alternative sources and defining a "cost recovery year" in which the willingness to pay matches the likely average unit cost of water production.

- Prepared the final report of the Phase 2 process.

The Phase 2 ISTAP selected the following product capacities in addition to the 50 MGD product capacity option for consideration: 12.5, 25, and 100 MGD product capacities. These capacities reflected their judgment as to the practical ranges of product capacity that would be reasonable to consider. The intake capacities for each of these options would be approximately twice the product capacity. The Panel conducted sensitivity analyses to assess the impact of varying the product capacity (12.5, 25 and 100 MGD compared to the 50 MGD capacity).

The ISTAP Phase found that reducing the product scale of the desalination facility decreases capital and O&M costs, but the unit cost increases as the scale (or product capacity) decreases from 50 MGD to 12.5 MGD. Alternatively, increasing the product capacity to 100 MGD results in a net decrease in unit cost.

Scale Impacts on Unit Costs ($/acre foot)

Scale (MGD-product)	Ocean Open Intake	SIG - Trestle	SIG - Float-in
12.5	1,694	2,497	2,646
25	1,650	2,282	2,410
50	1,517	2,121	2,279
100	1,466	2,011	2,156

Note: 50 year life at a 3% Discount Rate

The Phase 2 ISTAP report further discussed the issue of scale related to a SIG. It noted that seabed filtration is a modular process. Therefore, the number of cells in a SIG can be designed to meet the requirements of virtually any capacity SWRO plant. There is however a cost associated with scale that is likely at about the same ratio as found in the overall cost of SWRO treatment costs in general, with an increase in unit cost as the facilities product capacity is reduced. As in almost any product capacity treatment process, the overall unit cost to operate a facility goes down as the product capacity of the facility increases. For example, the overall unit operating cost of a 10 MGD plant is higher than a 50 MGD plant based on a lower unit construction cost and other operational efficiencies. This unit cost reduction as the scale of a production facility increases has been documented in the chemical process industry and desalination literature.

The conclusions reached by the Phase 2 ISTAP included that:

- The beach infiltration gallery is infeasible at the Huntington Beach location; and
- The SIG option is not economically viable at the Huntington Beach location within a reasonable time frame, due to high capital costs and only modest reduction in annual operating costs compared to the open ocean intake option.

The Panel further explained that the economic viability of the SIG, regardless of construction technique, and for a product capacity of 50 MGD at this off shore location, is highly uncertain and thus the SIG option faces financing risks that pose significant barriers to implementation. They concluded that it is unlikely that the unit price for produced water from a SWRO plant with the SIG intake technology would find a buyer under current and likely future estimates of alterative waters sources through 2033. The very high capital cost adds operating cost in the form of additional interest that overwhelms the savings in pretreatment operating costs provided by the SIG intake.

Conclusion

The Phase 1 ISTAP found that only the seabed infiltration gallery and the surf zone (beach) gallery survived the fatal flaw analysis, and both were deemed technically feasible. Each of the other seven subsurface intake options for the desired capacity range (100-127 MGD) had at least one technical fatal flaw that eliminated it from further technical consideration.

The Wells Investigation Team analysis demonstrated that reducing the capacity of the slant wells increased the portion of the intake water from the Talbert injection barrier and reduced the portion from the ocean. The OCWD staff determined that the wells at any scale produce an unacceptable amount of inland groundwater.

The ISTAP Phase 2 conclusion that the beach infiltration gallery is infeasible and the SIG intake was not economically viable was for a 50 mgd production scale. As shown in the Phase 2 report, smaller production capacity increased the unit cost of water above that calculated for a 50 mgd project decreasing the economic viability.

Based on these findings and the need identified by the OCWD, it is apparent that the HBDP is not proposed at an unnecessary design capacity based on inflated water needs which is used by it to declare subsurface intakes as not feasible. Design capacity was not the determining factor in the intake feasibility analysis for the HBDP.

III. Size

The topic of "size" appears in the Design section of the Desal amendment:

> *III.M.2.c. - Design is 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.*

The question of size for the HBDP was considered by the OCWD. In an August 14, 2015 letter from OCWD to Residents for Responsible Desalination, there was an explanation of the rationale behind the adoption of the term sheet. The letter described the District's 2014 Long-Term Facilities Plan (LTFP) adopted by the OCWD Board of Directors, which evaluated the Project and compared it to other water supply alternatives and determined that the Huntington Beach desalination facility was a priority project. The District's LTFP found that demand today for imported water within the District's service territory is typically over 150,000 acre feet per year.

This response letter identified that the Huntington Beach Project's 56,000 acre feet per year capacity is the single largest source of new, local drinking water supply available to the area. In addition to offsetting imported water demand, water from the Project could provide flexibility in how the District manages the groundwater basin, specifically the desalinated water could be used to augment supplies OCWD injects into the Talbert Seawater Barrier to help prevent seawater intrusion into the groundwater basin.

In response to a question about the size of the project, the letter explained that, because there is a current demand for 150,000 afy of imported water, with a projected increase of an additional 90,000 afy in the future, purchasing any less than 56,000 afy from Poseidon would not have a meaningful impact on reducing demand for imported water. Given the current demand for imported water, the economies of scale a larger plant can achieve to lower the project unit cost, and the huge effort necessary to permit an ocean desalination plant, it was the opinion of the OCWD General Manager that anything less than a 50 mgd plant is not meaningful.

Conclusion

Based on the evaluation of the OCWD the 50 mgd HBDP is appropriately sized to have a meaningful impact on reducing demand for imported water. Under long-term stand-alone operations, the 50 mgd HBDP will be designed for direct intake of seawater at a rate that has been reduced in accordance with the Desalination Amendment to an average annual 106 mgd using the existing seawater intake and discharge facilities once they are retrofitted to meet the technology requirements of the Desalination Amendment. The intake would be retrofitted with 1 millimeter screens with a through-screen velocity of no more than 0.5 feet per second. The existing discharge pipe would be retrofitted with a diffuser.