POSEIDON WATER

August 16, 2016

Ben Neill, P.E
Water Resource Control Engineer
California Regional Water Quality Control Board, San Diego Region
2375 Northside Drive, Suite 100
San Diego, CA 92108-2700

Dear Mr. Neill:

Subject: Addendum to the September 4, 2015 Amended Report of Waste Discharge Renewal of NPDES CA0109223 Carlsbad Desalination Project (CDP)

San Diego Regional Water Quality Control Board (Regional Water Board) Order No. R9-2006-0065 (NPDES CA0109223) establishes requirements for the discharge of reverse osmosis (RO) concentrate and pretreatment backwash flows from the Claude "Bud" Lewis Carlsbad Desalination Project (CDP) into the Pacific Ocean via the Encina Power Station (EPS) effluent channel. In accordance with the requirements of the Order, Poseidon Resources (Channelside) LP (Poseidon) filed a Report of Waste Discharge on March 29, 2011 in application for renewal of NPDES CA0109223, and an Amended Report of Waste Discharge was submitted on September 4, 2015 (Amended ROWD).

The amended application describes measures proposed to: (1) transition the CDP from co-located operation and temporary stand-alone operation with the Encina Power Station (EPS) to permanent stand-alone operation following the retirement of the EPS; (2) allow for a potential increase in potable water production; and (3) comply with the Desalination Amendment to the State Water Resources Control Board's (State Water Board) California Ocean Plan (Desalination Amendment) that requires new or expanded seawater desalination facilities to use the best available site, design, technology, and mitigation measures feasible to minimize the intake and mortality of all forms of marine life pursuant to California Water Code section 13142.5(b).

On April 13, 2016, the San Diego County Water Authority (SDCWA), acting as the lead agency under the California Environmental Quality Act, released for public review and comment, a Draft Supplemental Environmental Impact Report (Draft SEIR) to address the CDP's modifications to the existing intake system (New Screening/Fish-friendly Pumping Structure) and potential increase in potable water production. Because the California Water Code section 13142.5(b) determination will rely in part on the SEIR, the Regional Water Board and the State Water Board provided comments on the Draft SEIR addressing information the Regional Water Board will need to complete the NPDES Tentative Order and the California Water Code section 13142.5(b) determination. The responses to the Regional Water Board's comments on the Draft SEIR, along with responses to additional information the Regional Water Board requested of Poseidon, are hereby submitted to the Regional Water Board as the August 16, 2016 Addendum to the September

4, 2015 Amended Report of Waste Discharge (Addendum). The contents of the Addendum are provided in electronic format and include the following information:

Revised hydrodynamic modeling report. The Regional Water Board requested additional information regarding the dilution of the discharge from the CDP in the Pacific Ocean. Specifically, the Regional Water Board asked Poseidon to provide a series of dilution ratios over a range of distances from the discharge point, including the distance where sufficient dilution has been achieved to meet all receiving water quality objectives. This information will be used to identify the appropriate dilution ratio and to define the brine mixing zone in the Pacific Ocean for compliance determination purposes. The enclosed Addendum includes a revised dilution analysis that is responsive to this request (Appendix BB Revised Hydrodynamic Modeling Report). As noted in Table 1, a brine mixing zone of less than 200 meters would not be able to achieve compliance with the Ocean Plan receiving water salinity limitation of 2.0 ppt above natural background salinity at the edge of brine mixing zone during the worst case month without increasing the quantity of seawater used for flow augmentation, or the Regional Water Board approval of a facility-specific receiving water salinity limitation.

Brine mixing zone. The Regional Water Board requested information supporting the Poseidon's request for an alternative BMZ Poseidon of 200 meters.

The 200-meter brine mixing zone is consistent with the Ocean Plan Amendment as a facility-specific alternative receiving water salinity limitation. Chapter III.M.3.d provides that a facility which has received a conditional Water Code section 13142.5(b) determination and is over 80 percent constructed by the effective date of the Desalination Amendments shall not exceed a daily maximum of 2.0 parts per thousand (ppt) above natural background salinity measured at the edge of the brine mixing zone 200 meters (656 ft.) away from the points of discharge. The owner or operator of such a facility must demonstrate, in accordance with chapter III.M.2.d.(2)(c), that the individual and cumulative effects of a combination of the alternative brine mixing zone and flow augmentation using a surface water intake provide a comparable level of intake and mortality of all forms of marine life as the combination of the standard brine mixing zone and wastewater dilution if wastewater is available, or multiport diffusers if wastewater is unavailable; and in no case may the discharge result in hypoxic conditions outside of the alternative brine mixing zone.

The Regional Water Board conducted and approved a conditional Water Code section 13142.5(b) determination in 2009 (Order R9-2009-0038) and the CDP is constructed and fully operational. The proposed modifications would continue to rely on flow augmentation using a surface water intake. The Amended ROWD includes a request that the Regional Water Board, in consultation with the State Water Board staff, approve of an alternative brine mixing zone not to exceed 200 meters (656 ft.) laterally from the discharge point and throughout the water column. The information provided as Appendix CC of the Addendum demonstrated in accordance with chapter III.M.2.d.(2)(c), that wastewater dilution does not provide an opportunity to eliminate, or reduce the capacity of the proposed intake/discharge modifications, because the Encina Water Pollution Control Facility requires the entire capacity of the outfall to discharge the peak flows during storm events up to two weeks out of the year. Analysis provided as Appendix B and Appendix K of the Addendum demonstrated that the combination of the alternative brine mixing zone and flow augmentation using a surface water intake would result in a lower level of intake and mortality of all forms of marine life as the combination of the standard brine mixing zone with a multiport

diffuser. The analysis provided as Appendix DD of the Addendum demonstrated that the proposed discharge would not result in hypoxic conditions outside of the alternative brine mixing zone.

The proposed brine mixing zone would be contained to 15.5-acre semicircular area extending 200 meters (656 ft.) from the end of the discharge channel. For comparison purposes, the area in which the brine mixing zone for the multiport diffuser considered in the Feasibility Study consisted of four duck-bill diffuser ports located 100 feet apart would eject the brine into the water column at a high velocity to promote rapid diffusion and dispersion. The Brine Mixing Zone would extend 100 meters (328 ft.) out from each of the four discharge points with the combined area inside the brine mixing zone covering 14.4 acres. Therefore, the size of the brine mixing zone associated with the screened intake combined with flow augmentation is slightly larger (7.6%) than the brine mixing zone for a screened intake combined with a multiport diffuser.

As part of the Regional Water Board permitting process, Poseidon prepared a Feasibility Study and Addendum to the Feasibility Study (Appendix B of the Amended ROWD and Appendix II of the Addendum) that assessed the combined effects of each of these technologies on all forms of marine life as required by California Water Code Section 13142.5(b). The conclusion of that assessment was that the screened intake combined with flow augmentation would result in lower mortality to all forms of marine life than the screened intake combined with a multiport diffuser. The total area impacted by these technologies was found to be 99.8 acres for the surface screened intake combined with flow augmentation versus 118.94 acres with the surface screened intake combined with the multiport diffuser.

Based on the results of the revised hydrodynamic discharge modeling study (Appendix BB of the Addendum) described above, a brine mixing zone of less than 200 meters would not be able to achieve compliance with the Ocean Plan receiving water salinity limitation of 2.0 ppt above natural background salinity at the edge of brine mixing zone during the worst case month without increasing the quantity of seawater used for flow augmentation, or allowing a higher receiving water salinity limitation.

Poseidon has requested guidance from the Regional Water Board regarding the applicability of a facility-specific alternative receiving water salinity limitation in accordance with section III.M.3.c. of the Ocean Plan. Poseidon conducted chronic toxicity testing to determine whether a facility-specific alternative receiving water limitation is adequately protective of beneficial uses. The chronic toxicity testing (Chronic Test Results included as Appendix H of the Amended ROWD) found that the lowest observed effect concentration (LOEC) for the most sensitive species, red abalone, is 36.5 ppt. The Regional Water Board is reviewing Poseidon's request and has yet to make a decision about whether a facility-specific receiving water salinity limitation for the CDP is appropriate. Absent a determination by the Regional Water Board that an alternative receiving water salinity limitation for the CDP is appropriate, the SEIR assumes project operations in conformance with a daily maximum salinity requirement of 2.0 ppt above natural background salinity measured at the edge of a brine mixing zone 200 meters (656 ft.) away from the end of the EPS discharge channel.

Analysis of potential for CDP discharge to cause hypoxic conditions. The Regional Water Board requested additional information regarding the discharge's potential to create hypoxic (reduced oxygen) conditions in the Pacific Ocean. The enclosed Addendum includes a technical memorandum describing why the project is not expected to cause hypoxic conditions outside the BMZ (Appendix DD Analysis of Potential for CDP discharge to Cause Hypoxic Conditions).

Fish return system. The Regional Water Board requested additional information regarding the proposed fish return system for small fish and other aquatic organisms collected from the 1 mm modified intake screens with fish protection features (fish lifting buckets on each screen basket, low pressure spraywash, and fish return system). The Addendum includes two technical memoranda regarding the proposed fish return system (Appendix EE Comparison of Fish Return Options, and Appendix FF Fish Return Cleaning Methods). Appendix EE provides an assessment of the feasibility of fish return system options to the Agua Hedionda Lagoon and the existing Encina Power Station (EPS) discharge pond, with a recommendation of the EPS discharge pond as the preferred location for the fish return. Appendix FF is a technical memorandum describing proposed methods for physical cleaning fish return without the use of chemicals.

Investigation of an alternative to discharge a portion of the brine from the CDP to the Encina Ocean Outfall rather than to the Encina Power Station channel. The Regional Water Board requested that Poseidon consult with the Encina Wastewater Authority about the possibility of diverting some of the effluent from the CDP to the Encina Ocean Outfall. Poseidon is assessing the opportunity for co-mingling a portion of the CDP discharge with municipal wastewater in the Encina Ocean Outfall. Appendix CC includes a copy of the Encina Wastewater Authority Response to Request for Information regarding the Encina Ocean Outfall as a Brine Discharge Alternative for the CDP. The Encina Wastewater Authority's response addresses some of the criteria necessary for assessing the feasibility of diverting some of the brine discharge from the CDP to the Encina Ocean Outfall for disposal. Through this assessment, the Encina Wastewater Authority (EWA) confirmed that outfall is not able to accept the CDP discharge during large storm events. Such events significantly increase the quantity of treated wastewater that is processed at the Encina WPCF, leaving no excess capacity in the outfall for the CDP discharge. According to EWA, such events can last up to two weeks. As a result of these limitations, comingling the discharge from the CDP with treated wastewater from the Encina Water Pollution Control Facility and discharging the combined flow to the ocean via the Encina Ocean Outfall does not reduce or eliminate the need for the proposed intake/discharge modifications. The investigation of feasibility of an alternative to discharge a portion of the brine from the CDP to the Encina Ocean Outfall rather than to the Encina Power Station channel is still underway. Poseidon will provide the Regional Water Board updates as the investigation progresses.

Entrapment. The Regional Water Board identified a concern that marine life may be trapped in the intake tunnel by passing through the trash racks, but being unable to swim back out through the trash racks or get through the traveling screens. Appendix HH of the Addendum includes an assessment of the potential for entrapment of fish and organisms in the proposed intake/discharge modifications. The Desalination Amendment does not define or explicitly regulate entrapment, and entrapment was not evaluated in the FEIR. The U.S. Environmental Protection Agency (USEPA 2014a) defines entrapment in the final 316(b) Rule as follows:

> *Entrapment means the condition where impingeable fish and shellfish lack the means to escape the cooling water intake. Entrapment includes but is not limited to: Organisms caught in the bucket of a traveling screen and unable to reach a fish return; organisms*

> *caught in the forebay of a cooling water intake system without any means of being returned to the source waterbody without experiencing mortality; or cooling water intake systems where the velocities in the intake pipes or in any channels leading to the forebay prevent organisms from being able to return to the source waterbody through the intake pipe or channel.*

Based on the federal definition of entrapment, intake systems which provide at least one means of escape for fish are viewed as having eliminated entrapment. The proposed intake/discharge modifications provide two means of escape that will minimize the risk of entrapment that are described in Appendix HH of the Addendum: (i) fish-friendly modified 1-mm traveling water screens with a fish return system; and (ii) reduced velocity in the existing EPS tunnels. An intake system designed with fish-friendly screens and a fish return system provides a means of escape for fish that are unwilling or unable to exit the system through the EPS intake tunnels.

Evaluation of alternative intake/discharge technologies. The Regional Water Board's May 27, 2016 comments on the Draft SEIR requested that the Final SEIR include an evaluation of wedgewire screens, installation of traveling screens on the shore of Agua Hedionda Lagoon, and an offshore intake structure as alternatives to the proposed CDP modifications that may result in fewer impacts on marine life. Appendix B to the September 4, 2015 Amended ROWD provided a feasibility assessment of four intake/discharge alternatives. Appendix II of the Addendum to the Amended ROWD provides an assessment of the wedgewire screen and lagoon front traveling screen intake alternatives requested by the Regional Water Board. Collectively, these appendices assess the feasibility of ten combinations of intake and discharge technologies as well as the Ocean Plan preferred technology requirements in developing an intake and discharge plan that provides the best combination of the best available site, design, technology, and mitigation feasible to minimize the intake and mortality of all forms of marine life.

The evaluation of alternative intake and discharge technologies relied on the definition of "feasible" set forth in the Ocean Plan Amendment:

> *"FEASIBLE for the purposes of chapter 111.M. shall mean "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social and technological factors"*

The intake/discharge technologies evaluated include:

1. Surface Screened Intake with Flow Augmentation
2. Surface Screened Intake with Multiport Diffuser
3. Subsurface Intake with Flow Augmentation
4. Subsurface Intake with Multiport Diffuser
5. Offshore Wedgewire Screen with Flow Augmentation
6. Offshore Wedgewire Screen with Multiport Diffuser
7. Lagoon Wedgewire Screen with Flow Augmentation
8. Lagoon Wedgewire Screen with Diffuser
9. Lagoon Traveling Screen with Flow Augmentation
10. Lagoon Traveling Screen with Diffuser Offshore Wedgewire Screen with Diffuser

The results of the Feasibility Report and Addendum are summarized in Table 2 below (Overall Feasibility Assessment). The Feasibility Report concluded that the surface screened intake with discharge flow augmentation is the only feasible intake/discharge technology for the CDP when it begins long term stand-alone operation. When compared to the other alternative technologies, the proposed modifications were found to result in marginally higher marine life mortality (99.8 acres) than the two lowest ranked alternatives (Table 3 Comparison of Marine Life Mortality Impacts). The alternative using the subsurface intake with flow augmentation was found to have the lowest marine life mortality impacts (87.5 acres). However, the subsurface intake with flow augmentation was found to be infeasible with respect to the other four criteria, (1) economically infeasible (capital cost of $1.04 billion and total annual cost of $159 million); (2) longest implementation period (10.2 years) resulting in $424 million in the loss of fixed capital and fixed operating costs (debt and equity payments, plant maintenance, utility charges) not recovered while the plant is out of service; (3) technically infeasible due to the physical size of the subsurface intake, associated interconnecting piping and pump stations; and (4) socially infeasible due to extensive impacts to the marine resources and recreational in Agua Hedionda Lagoon. The alternative using the lagoon wedgewire screen with flow augmentation was found to have the next lowest marine life mortality impacts (99.6 acres). However, the lagoon wedgewire screen with flow augmentation was found to be infeasible with respect to three criteria; (1) economically infeasible (capital cost of $126 million and total annual cost of $34 million); (2) implementation period (6 years) resulting in $200 million in the loss of fixed capital and fixed operating costs (debt and equity payments, plant maintenance, utility charges) not recovered while the plant is out of service; and (3) technically infeasible due to the lack of sweeping currents in the lagoon which are necessary to prevent fouling of the screen.

When calculated per the requirements set forth in Appendix E of the Ocean Plan, the marine life mortality impact associated with the alternatives ranged from 87.5 acres to 123.1 acres. The proposed modifications would impact 99.8 acres prior to mitigation (lowest impact after elimination of the subsurface intake with flow augmentation and the lagoon wedgewire screen with flow augmentation). In terms of time required for project completion, the alternatives ranged from 2.5 years (proposed modifications) to 10.2 years (subsurface intake with flow augmentation), with the proposed modifications requiring less than half the implementation period of the next closest alternative (Table 4 Comparison of Time Required for Project Completion). The potential delay costs (the fixed capital and fixed operating costs not recovered while the CDP was out of service) associated with the CDP potentially losing access to source water if the timeline for project completion extended beyond 2018, ranged from $0 for the proposed modifications to $424 million for the subsurface intake with flow augmentation.

Lastly, in terms of economic impacts, a detailed analysis of the life-cycle cost for the CDP subsurface intake/discharge alternatives is presented in Appendix OO of the Addendum. The findings of this analysis are included in Table 5 (Economic Analysis of Intake/Discharge Alternatives). The life cycle costs provide a relative comparison of the net incremental cost and savings of each of the alternatives. Costs considered include permitting, design, land acquisition, financing, construction, operations, maintenance, mitigation, equipment replacement, insurance, taxes, management, and energy consumption over the lifetime of the facility and fixed capital and operating costs not recovered while the plant is out of service after 2018. Savings considered

include operational savings due reduced chemical consumption, extended membrane life, and reduced membrane cleaning frequency that is applicable to the subsurface intake alternatives.

The findings of the economic analysis indicate that $94 million would need to be added to the annual operating budget of the CDP to pay for the capital and operating costs associated with SIG with the multiport diffuser alternative and $159 million would need to be added to the annual operating budget of the CDP to pay for the capital and operating costs associated with the SIG with flow augmentation alternative. The primary difference between these figures and the lifecycle costs of these alternatives shown in Appendix B is the inclusion of the fixed capital and operating costs not recovered while the plant is out of service after 2018.

Chapter III.M of the Ocean Plan provides the following guidance for assessing the feasibility of subsurface intakes:

> *Subsurface intakes shall not be determined to be economically infeasible solely because subsurface intakes may be more expensive than surface intakes. Subsurface intakes may be determined to be economically infeasible if the additional costs or lost profitability associated with subsurface intakes, as compared to surface intakes, would render the desalination facility not economically viable.*

Therefore, the Regional Water Board's determination of the economic feasibility of the intake/discharge alternatives turns on the basis of whether the additional costs or lost profitability associated with these alternatives would render the desalination facility not economically viable. One measure of economic viability is whether the anticipated plant revenues would cover cost of one or more of the intake/discharge alternatives.

The annual costs would be approximately $94 million per year for the subsurface intake with a multiport diffuser and approximately $159 million per year for the subsurface intake with flow augmentation. Absent an additional source of revenue, the SIG alternatives are economically infeasible.

The economic analysis summarized in Table 5 indicates that approximately $8 million would need to be added to the annual operating budget of the CDP to pay for the capital and operating costs associated with proposed surface water intake with flow augmentation. The net annual cost of the other intake/discharge alternatives under consideration (WWS and lagoon based intakes with flow augmentations or diffuser) range from $29 million to $76 million, rendering these alternatives economically infeasible.

Interim operations of the CDP following closure of the EPS while the modifications are under construction. The Water Board requested clarification of CDP operations during the period when the EPS is closed and construction of the proposed modifications is underway. The Draft Final SEIR (Appendix KK of the Addendum) includes an analysis of the proposed modifications and the operations of the CDP following closure of the EPS while the modifications are under construction.

The EPS is currently scheduled to suspend operation of the existing generating units in 2017. The intake and discharge modifications will not be operational by this date. The proposed modifications and the operations of the CDP following closure of the EPS while the modifications are under

construction would be consistent with the periodic non-operation of EPS included in the FEIR (temporary stand-alone mode of operation). The EPS would operate the cooling water pumps solely for the benefit of the CDP and Poseidon is working with the owner of the EPS to ensure the EPS cooling water pumps will continue to be available to provide seawater for CDP operations until the intake and discharge modifications are operational. Poseidon is proposing that during this interim period, the CDP would continue to operate in the temporary stand-alone mode of operation as described in Table 6. Once the intake and discharge modifications are complete, the CDP would transition to permanent stand-alone operating conditions. The CDP will comply with the Ocean Plan receiving water limitation (daily maximum of 2.0 parts per thousand (ppt) above natural background salinity measured at the edge of the brine mixing zone 200 meters (656 ft.) away from the points of discharge while operating in both temporary and permanent stand-alone configurations.

CEQA compliance. The Water Authority is scheduled to consider certification of the SEIR on August 25, 2016. The following SEIR documents are included with the Addendum:

Draft Final SEIR. Included in Appendix KK of the Addendum is the draft Final Supplement to the Environmental Impact Report (EIR 03-05) Precise Development Plan and Desalination Plant, which evaluates the potential environmental effects resulting from the project as modified, which includes (1) seawater intake and discharge system improvements required to be constructed due to the decommissioning of the once-through cooling system of the EPS; (2) desalination processing improvements that would increase production capacity of the CDP by approximately an annual average 5 million gallons per day (mgd); and (3) comply with the Desalination Amendment to the State Water Resources Control Board's California Ocean Plan that requires new or expanded seawater desalination facilities to use the best available site, design, technology, and mitigation measures feasible to minimize the intake and mortality of all forms of marine life pursuant to California Water Code section 13142.5(b).

Draft Response to Comments. Included in Appendix LL of the Addendum is the draft Response to Comments for the Final Supplement to the Environmental Impact Report (EIR 03-05) Precise Development Plan and Desalination Plant.

Draft Findings of Fact and Statement of Overriding Considerations. The Findings of Fact and Statement of Overriding Considerations to the Final Supplement to the Environmental Impact Report (EIR 03-05) Precise Development Plan and Desalination Plant (Appendix MM of the Addendum) will be forwarded to the San Diego Regional Water Board following approval by the Water Authority.

Draft Mitigation Monitoring and Reporting Program. Included in Appendix NN of the Addendum is the draft Mitigation Monitoring and Reporting Program for the Final Supplement to the Environmental Impact Report (EIR 03-05) Precise Development Plan and Desalination Plant.

Table 7 provides an updated list of the technical appendices included with the September 4, 2015 Amended Report of Waste Discharge with revisions shown in redline format to note additions and changes to the appendices as a result of this Addendum.

Please contact me at (760) 655-3999 (email: pmacLaggan@poseidonwater.com) if you have any questions.

Sincerely,

Peter M. MacLaggan
Senior Vice President

Cc: David Barker
Brandi Outwin-Beals
Claire Waggoner
Kimberly Tenggardjaja
Philip Isorena
Renan Jauregui
Michael Welch

Table 1
Summary of Minimum Monthly Dilution (Dm) as a Function of Distance from the Point of Discharge in the Pacific Ocean

Distance from Discharge, (m)	Maximum Salinity of Discharge for ΔT = 0° C, (ppt)	Maximum Salinity of Discharge for ΔT = +2° C, (ppt)	Dilution Factor (Dm) for ΔT = 0° C	Dilution Factor (Dm) for ΔT = +2°C
0.00	42.000	42.000	0	0
10.78	40.956	40.956	0.14	0.14
21.07	39.528	39.485	0.41	0.42
50.19	37.435	37.435	1.16	1.16
54.90	37.311	37.294	1.23	1.24
73.17	36.807	36.794	1.57	1.58
100.0	36.381	36.371	1.95	1.96
110.0	36.233	36.232	2.11	2.11
120.0	36.131	36.130	2.23	2.23
130.0	36.060	36.059	2.32	2.32
140.0	35.956	35.949	2.46	2.47
150.0	35.901	35.894	2.54	2.55
160.0	35.760	35.754	2.76	2.77
170.0	35.685	35.679	2.89	2.90
180.0	35.614	35.609	3.02	3.03
190.0	35.543	35.538	3.16	3.17
196.0	35.502	35.495	3.25	3.26
200.0	35.472	35.467	3.31	3.32
264.0	35.100	35.097	4.31	4.32
328.0	34.900	34.898	5.07	5.08
600.0	34.420	34.419	8.23	8.24
1000.0	34.174	34.164	11.6	11.8
1300	34.011	33.994	16.0	16.2
1600	33.830	33.828	24.7	24.9
1800	33.700	33.698	41.4	41.9
1851	33.660	33.651	52.1	55.0
2000	33.621	33.618	69.8	71

Table 2 Overall Feasibility Assessment Intake and Discharge Alternatives						
	Project Capable of Being Accomplished in a Reasonable Period of Time?	Is Project Economically Feasible?	Marine Life Mortality Ranking	Socially Feasible	Technically Feasible	Overall Feasibility
Alternatives	Yes/No	Yes/No	Ranked Lowest to Highest Impact	Yes/No	Yes/No	Yes/No
Surface Screened Intake with Flow Augmentation	Yes	Yes	3	Yes	Yes	Yes
Surface Screened Intake with Multiport Diffuser	No	No	7	Yes	Yes	No
Subsurface Intake with Flow Augmentation	No	No	1	No	No	No
Subsurface Intake with Multiport Diffuser	No	No	6	No	Yes	No
Offshore Wedgewire Screen with Flow Augmentation	No	No	5	Yes	Yes	No
Offshore Wedgewire Screen with Diffuser	No	No	10	Yes	Yes	No
Lagoon Wedgewire Screen with Flow Augmentation	No	No	2	Yes	No	No
Lagoon Wedgewire Screen with Diffuser	No	No	8	No	Yes	No
Lagoon Traveling Screen with Flow Augmentation	No	No	4	Yes	Yes	No
Lagoon Traveling Screen with Diffuser	No	No	9	Yes	Yes	No

Table 3
Comparison of Marine Life Mortality Impacts at Maximum Production of 60 mgd
Feasibility Assessment Intake and Discharge Alternatives

Impacts	Intake Water Potentially Exposed to 100% Mortality	Flow Augmentation Water Potentially Exposed to 100% Mortality	Diffuser Water Potentially Exposed to 100% Mortality	Total Water Potentially Exposed to 100% Mortality	Area of Production Foregone	Brine Mixing Zone @ 35.5 ppt	Permanent Construction Impacts to Marine Environment	Total Area Impacted	Marine Life Mortality Ranking
Alternatives	MGD	MGD	MGD	MGD	Acres	Acres	Acres	Acres	Ranked Lowest to Highest
Surface Screened Intake with Flow Augmentation	128	171	0	299	84.3	15.5	0	99.8	3
Surface Screened Intake with Multiport Diffuser	128	0	217	345	103.3	14.4	1.5	118.9	7
Subsurface Intake with Flow Augmentation	0	0	0	0	0	15.5	72	87.5	1
Subsurface Intake with Multiport Diffuser	0	0	217	217	67	14.4	33	114.4	6
Offshore Wedgewire Screen with Flow Augmentation	127	171	0	298	92	15.5	2.0	109.5	5
Offshore Wedgewire Screen with Diffuser	127	0	217	344	106.2	14.4	2.5	123.1	10
Lagoon Wedgewire Screen with Flow Augmentation	127	171	0	298	84	15.5	0.1	99.6	2
Lagoon Wedgewire Screen with Diffuser	127	0	217	344	103	14.4	1.6	119.0	8
Lagoon Traveling Screen with Flow Augmentation	128	171	0	299	84.3	15.5	0.1	99.9	4
Lagoon Traveling Screen with Diffuser	128	0	217	345	103.3	14.4	1.6	119.3	9

Table 4 Comparison of Time Required for Project Completion Feasibility Assessment Intake and Discharge Alternatives						
	Permitting and Property Acquisition	Construction, Commissioning and Startup	Total Time Required for Project Completion	Potential Duration CDP Is Without Source Water After 2018	Fixed Capital and Operating Costs Not Recovered While Plant is Out of Service After 2018	Project Capable of Being Accomplished in a Reasonable Period of Time?
Alternatives	Years	Years	Years	Years	$	Yes/No
Surface Screened Intake with Flow Augmentation	1	1.5	2.5	0	$0	Yes
Surface Screened Intake with Multiport Diffuser	3	3	6	3.5	$199,925,313	No
Subsurface Intake with Flow Augmentation	3	7.2	10.2	7.7	$423,770,193	No
Subsurface Intake with Multiport Diffuser	3	3.8	6.8	4.3	$242,696,411	No
Offshore Wedgewire Screen with Flow Augmentation	3	3	6	3.5	$199,925,313	No
Offshore Wedgewire Screen with Diffuser	3	3	6	3.5	$199,925,313	No
Lagoon Wedgewire Screen with Flow Augmentation	3	3	6	3.5	199,925,313	No
Lagoon Wedgewire Screen with Diffuser	3	3	6	3.5	$199,925,313	No
Lagoon Traveling Screen with Flow Augmentation	3	3	6	3.5	$199,925,313	No
Lagoon Traveling Screen with Diffuser	3	3	6	3.5	$199,925,313	No

Table 5
Economic Analysis
Feasibility Assessment Intake and Discharge Alternatives

	Total Project Cost	Fixed Costs Not Recovered While Plant is Out of Service After 2018	Financing Period	Capital Charge	Out of Service Charge	O&M and Other Annual Costs	Total Annual Cost	Is Project Economically Feasible?
Alternatives	$	$	Years	$/Year	$/Year	$/Year	$/Year	Yes/No
Surface Screened Intake with Flow Augmentation	$49,061,041	$0	27.5	$4,077,205	$0	$4,455,035	$8,532,239	Yes
Surface Screened Intake with Multiport Diffuser	$428,639,220	$199,925,313	24	$37,464,471	$17,481,175	$6,790,828	$61,736,474	No
Subsurface Intake with Flow Augmentation	$1,037,702,060	$423,770,193	19.8	$100,112,270	$37,988,099	$20,965,196	$159,065,565	No
Subsurface Intake with Multiport Diffuser	$676,862,341	$242,696,411	23.2	$59,971,724	$21,509,330	$12,903,385	$94,384,439	No
Offshore Wedgewire Screen with Flow Augmentation	$285,490,487	$199,925,313	24	$24,952,799	$17,481,175	$6,566,746	$49,000,720	No
Offshore Wedgewire Screen with Diffuser	$576,823,886	$199,925,313	24	$50,416,311	$17,481,175	$8,211,320	$76,108,807	No
Lagoon Wedgewire Screen with Flow Augmentation	$126,904,462	$199,925,313	24	$11,100,609	$17,481,175	$5,246,746	$33,828,529	No
Lagoon Wedgewire Screen with Diffuser	$416,573,734	$199,925,313	24	$36,409,907	$17,481,175	$6,781,320	$60,672,403	No
Lagoon Traveling Screen with Flow Augmentation	$80,783,075	$199,925,313	24	$7,060,814	$17,481,175	$4,960,539	$29,502,528	No
Lagoon Traveling Screen with Diffuser	$405,778,290	$199,925,313	24	$35,466,357	$17,481,175	$6,719,356	$59,666,888	No

Table 6
Summary of CDP Intake, Production and Discharge Flows
Temporary and Permanent Stand-Alone Operating Conditions

Parameter		Temporary Stand-Alone Operating Conditions (to be continued until the intake and discharge modifications are complete)		Permanent Stand-Alone Operating Conditions (Following completion of intake and discharge modifications)	
		Average Daily Flow	Maximum Daily Flow	Annual Average Flow	Maximum Daily Flow
Potable water production capacity		50 mgd	54 mgd	55 mgd	Up to 60 mgd
Intake Flows	Intake from EPS Lagoon Intake Structure	304	324	NA	NA
	Intake from CDP Lagoon Intake Structure	NA	NA	Up to 299 mgd	299 mgd
Discharge Flows	Granular Media Filtration Backwash	4 mgd	6 mgd	Up to 7 mgd	Up to 7 mgd
	RO concentrate	50 mgd	54 mgd	Up to 60 mgd	Up to 60 mgd
	Screen wash/fish return from CDP Intake	NA	NA	1 mgd	1 mgd
	CDP flow augmentation	NA	NA	Up to 198 mgd	Up to 198 mgd
	EPS minimum dilution flow	200 mgd	210 mgd	NA	NA
	Total Discharge	254 mgd	270 mgd	Up to 244 mgd	Up to 244 mgd

Table 7
Summary of Amended Report of Waste Discharge Technical Appendices

Appendix	Study	Key Conclusions/Findings
Appendix A	Compliance with Ocean Plan Amendments	Proposed CDP operations are in compliance with all applicable provisions of the 2015 Ocean Plan, including requirements governing receiving water salinity; use of best available site, design, technology and mitigation; and consideration of preferred technologies. Subsurface intake alternatives were determined to be infeasible. The multiport diffuser is not the best technology measure feasible to minimize the intake and mortality of all forms of marine life. See Appendix JJ for errata to this Appendix A. 1
Appendix B	Intake Discharge Feasibility Report	~~Poseidon has considered the f~~Feasibility of four combinations of~~all~~ intake and discharge technologies as well as the Ocean Plan preferred technology requirements in developing an intake and discharge plan that provides the best combination of the best available site, design, technology, and mitigation feasible to minimize the intake and mortality of all forms of marine life. See Appendix II for the feasibility assessment of six additional combinations of intake and discharge technologies.
Appendix C	Hydrodynamic Discharge Study	The existing discharge structure provides for significant additional dilution through a range of hydrodynamic conditions. Actual initial dilutions are projected to be in excess of the dilution credits assigned within Order No. R9-2006-0065. The hydrodynamic discharge modeling report contained in this Appendix C has been revised in response to comments received from the Regional Water Board. See Appendix BB for the revised hydrodynamic discharge modeling report.
Appendix D	Coastal Process Effects of Reduced Intake	Reduced intake flows under permanent stand-alone operations will not create any significant adverse impacts on either the lagoon environment or local beaches, and will result in environmental benefits resulting from the reduced frequency of required lagoon maintenance dredging.
Appendix E	NPDES Order No. R9-2011-0028	The Order approves selection of the Otay River Floodplain wetlands restoration site for mitigating entrainment and impingement effects that may be caused by operation of the CDP.
Appendix F	Water Circulation in Agua Hedionda Lagoon	The location of the fish return system takes into account lagoon mixing that occurs as a result of tidal actions and other hydrodynamic drivers.
Appendix G	Acute Toxicity Study	The proposed salinity discharge standard of 42 ppt within the effluent pond will ensure that the CDP discharge will comply with Ocean Plan acute toxicity standards.
Appendix H	Chronic Toxicity Study	The proposed salinity discharge standard of 42 ppt within the effluent pond will ensure that the CDP discharge will comply with Ocean Plan chronic toxicity standards.
Appendix I	Brine Dilution Salinity Tolerance	The proposed salinity discharge standard of 42 ppt within the effluent pond is consistent with Ocean Plan requirements to minimize osmotic shock and consistent with ensuring protection of marine species.
Appendix J	Fish-Friendly Pumping	The proposed fish-friendly flow augmentation pumps are consistent with the Ocean Plan requirements to minimize turbulence and shear stress on marine organisms.
Appendix K	Intake/Discharge Entrainment Analysis	Entrainment effect associated with the proposed CDP flow augmentation system are less than impacts that result from a multiport diffuser discharge.
Appendix L	CFD Modeling of Flow Augmentation System	Computational fluid dynamics (CFD) modeling using particle tracking was utilized to estimate exposure times of marine organisms in the CDP intake flow under permanent stand-alone conditions.

1 Underline text represents additions to the originally submitted Report of Waste Discharge.

Table 7
Summary of Amended Report of Waste Discharge Technical Appendices

Appendix	Study	Key Conclusions/Findings
Appendix M	Antidegradation Analysis	Proposed CDP production rates, discharge flows, and effluent pond salinities are in keeping with Tier I antidegradation requirements for the protection of beneficial uses and maintenance of existing high quality receiving water.
Appendix N	Life Cycle Cost Analysis	Life cycle costs for CDP facilities demonstrate the economic superiority of surface intake with flow augmentation and surface discharge as the preferred intake/discharge alternative. The life-cycle cost analysis contained in this Appendix N has been revised in response to comments received from the Regional Water Board. See Appendix NN for the life-cycle cost analysis.
Appendix O	NPDES Order No. R9-2009-0038	Order No. R9-2009-0038 makes certain findings pursuant to Water Code Section 13142.5(b), approves the March 27, 2009 Minimization Plan submitted by Poseidon, and modifies NPDES CA0109223 to acknowledge Minimization Plan approval and to establish performance standards for Minimization Plan implementation.
Appendix P	Flow, Entrainment, Impingement Minimization Plan	The Minimization Plan implements Water Code 13142.5(b) requirements and establishes the best available site, design, technology, and mitigation feasible to minimize CDP intake effects associated operations under co-located and temporary stand-alone conditions.
Appendix Q	Final EIR	CDP facilities and operations under co-located and temporary stand-alone conditions are in compliance with requirements of the California Environmental Quality Act (CEQA).
Appendix R	California Coastal Commission Approval of Marine Life Mitigation Plan	California Coastal Commission findings and habitat restoration requirements for mitigating against potential CDP entrainment and impingement effects.
Appendix S	Hydrogeologic Investigation SDG&E Encina Power Plant, Carlsbad, CA	Prior hydrogeologic assessment of EPS site has identified opportunities and limitations associated with developing onsite groundwater supplies.
Appendix T	Drought Proofing Through Desalting the SDG&E Approach	Prior SDG&E assessment has identified opportunities and limitations at the EPS site for developing power plant water supplies through desalination of pumped groundwater.
Appendix U	Huntington Beach Desalination Project, ISTAP Phase I & II Reports	An Independent Scientific Technical Advisory Panel evaluated alternatives for subsurface intakes for the Huntington Beach Desalination Project.
Appendix V	U.S. Fish and Wildlife Service MOU	The Memorandum of Understanding establishes responsibilities for Poseidon and U.S. Fish and Wild Life Service in restoring and enhancing habitat in the San Diego Bay National Wildlife Refuge.
Appendix W	SDCWA 2010 Urban Water Management Plan and 2013 Facilities Master Plan Update	The San Diego County Water Authority (SDCWA) plans identify the importance of seawater desalination in meeting projected regional water supply demands and enhancing regional water supply reliability.
Appendix X	Construction Cost Estimates for Intake/ Discharge Alternatives	Construction cost estimates for intake/discharge alternatives considered in developing a recommended intake and discharge plan that provides the best combination of best available site, design, technology, and mitigation feasible to minimize the intake and mortality of all forms of marine life.
Appendix Y	Implementation Schedules for	Permitting and construction schedules for intake/discharge alternatives considered in developing a recommended intake and discharge plan that

Table 7
Summary of Amended Report of Waste Discharge Technical Appendices

Appendix	Study	Key Conclusions/Findings
	Intake/Discharge Alternatives	provides the best combination of the best available site, design, technology, and mitigation feasible to minimize the intake and mortality of all forms of marine life.
Appendix Z	Proposed Monitoring and Reporting Plan	The proposed CDP monitoring and reporting plan incorporates enhanced receiving water sediment, benthic, and water column monitoring in order to comply with monitoring provisions established within Section III.M.4 of the 2015 Ocean Plan amendments.
Appendix AA	California Coastal Commission Approval of CDP	California Coastal Commission revised findings to conditionally approve Carlsbad Desalination Project CDP #E-06-013, August 5, 2008.
Appendix BB	Revised Hydrodynamic Discharge Modeling Report	The hydrodynamic discharge modeling report contained in Appendix C was revised in response to comments received from the Regional Water Board. The mixing conditions modeled in the study were modified to conform to the definition of Initial Dilution in the Ocean Plan. The existing discharge structure continues to provide for significant additional dilution through a range of hydrodynamic conditions. Actual initial dilutions are projected to be in excess of the dilution credits assigned within Order No. R9-2006-0065.
Appendix CC	Encina Wastewater Authority Response to Request for Information regarding the Encina Ocean Outfall as a Brine Discharge Alternative for the Carlsbad Desalination Plant	The San Diego Regional Water Board Staff requested that Poseidon consult the Encina Wastewater Authority about the possibility of diverting some of the effluent from the CDP to the Encina Ocean Outfall. The Encina Wastewater Authority's response addresses some of the criteria necessary for assessing the feasibility of diverting some of the brine discharge from the CDP to the Encina Ocean Outfall for disposal.
Appendix DD	Analysis of Potential for CDP Discharge to Cause Hypoxic Conditions	Technical memorandum describing why the project is not expected to cause hypoxic conditions outside the BMZ.
Appendix EE	Comparison of Fish Return Options	Technical memorandum assessing the feasibility of fish return system options in Agua Hedionda Lagoon and the existing discharge pond.
Appendix FF	Fish Return System Cleaning Methods	Technical memorandum describing proposed fish return cleaning methods.
Appendix GG	Larval Fish Residence Time in Agua Hedionda Lagoon	Technical memorandum assessing the residence time of larval fish in Agua Hedionda Lagoon.
Appendix HH	Entrapment Evaluation	Technical memorandum assessing the potential for entrapment of fish and organisms in the proposed intake/discharge modifications.
Appendix II	Addendum to Intake Discharge Feasibility Report	Addendum to Appendix B. Collectively, these appendices assess the feasibility of 10 combinations of intake and discharge technologies as well as the Ocean Plan preferred technology requirements in developing an intake and discharge plan that provides the best combination of the best available site, design, technology, and mitigation feasible to minimize the intake and mortality of all forms of marine life. This Appendix II includes the for all ten combinations of intake and discharge alternatives considered along with the detailed analysis of alternatives 5-10. See Appendix B for the detailed analysis of intake and discharge technologies 1-4.
Appendix JJ	Appendix A Errata	Corrections to errors contained in Appendix A.

Table 7
Summary of Amended Report of Waste Discharge Technical Appendices

Appendix	Study	Key Conclusions/Findings
Appendix KK	Draft Final SEIR	Final Supplement to the Precise Development Plan and Desalination Plant Project Final Environmental Impact Report (EIR 03-05) evaluating the potential environmental effects resulting from the project as modified, which includes (1) seawater intake and discharge system improvements required to be constructed due to the decommissioning of the once-through cooling system of the EPS; and (2) desalination processing improvements that would increase production capacity of the CDP by approximately an annual average 5 million gallons per day (mgd).
Appendix LL	Draft Response to Comments	Response to Comments Supplement to the Precise Development Plan and Desalination Plant Project Final Environmental Impact Report (EIR 03-05).
Appendix MM	Draft Findings of Fact	Findings of Fact Supplement to the Precise Development Plan and Desalination Plant Project Final Environmental Impact Report (EIR 03-05)
Appendix NN	Draft Mitigation Monitoring and Reporting Program	Mitigation Monitoring and Reporting Program Supplement to the Precise Development Plan and Desalination Plant Project Final Environmental Impact Report (EIR 03-05)
Appendix OO	Revised Life Cycle Cost Analysis	Life cycle cost analysis for all ten combinations of intake and discharge alternatives considered for the CDP transition to stand-alone operations and Ocean Plan Compliance.
Appendix PP	Intake/Discharge Design Modifications	Summarizes the changes made to the design of the New Screening/Fish-friendly Pumping Structure since the September 4, 2015 submittal of the Amended ROWD.