POSEIDON WATER

Appendix HH
Entrapment Evaluation

Renewal of NPDES CA0109223
Carlsbad Desalination Project

August 10, 2016

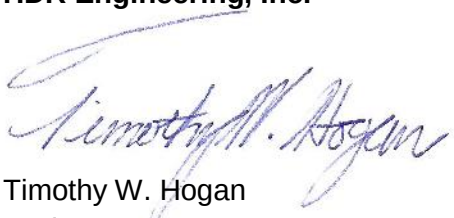
Josie McKinley
Poseidon Water
17011 Beach Boulevard, Suite 900
Carlsbad, CA 92008

Re: **Technical Memorandum: Entrapment at the Carlsbad Desalination Plant Intake**

Dear Josie,

I am pleased to submit HDR's final technical memorandum which evaluates the potential for fish to be entrapped by the intake at the Carlsbad Desalination Plant. I look forward to discussing our findings with you at your earliest convenience.

Sincerely,
HDR Engineering, Inc.



Timothy W. Hogan
Project Manager

Final Technical Memo: Entrapment at the Carlsbad Desalination Plant Intake

Introduction

Poseidon Water (Poseidon) has developed a conceptual design for the New Screening/Fish-friendly Pumping Structure that will be implemented when the Carlsbad Desalination Plant (CDP) enters long-term, stand-alone operation after the Encina Power Station's (EPS) once-through cooling system goes offline. At that point, the CDP will become subject to the provisions of Chapter III.M of the Water Quality Control Plan, Ocean Waters of California (Desalination Amendment). The long-term, stand-alone CDP's New Screening/Fish-friendly Pumping Structure will use 1-mm modified (referring to the presence of fish protection features) traveling water screens located between the existing EPS intake tunnels and the CDP's existing Intake Pump Station (IPS) (Figure 1).

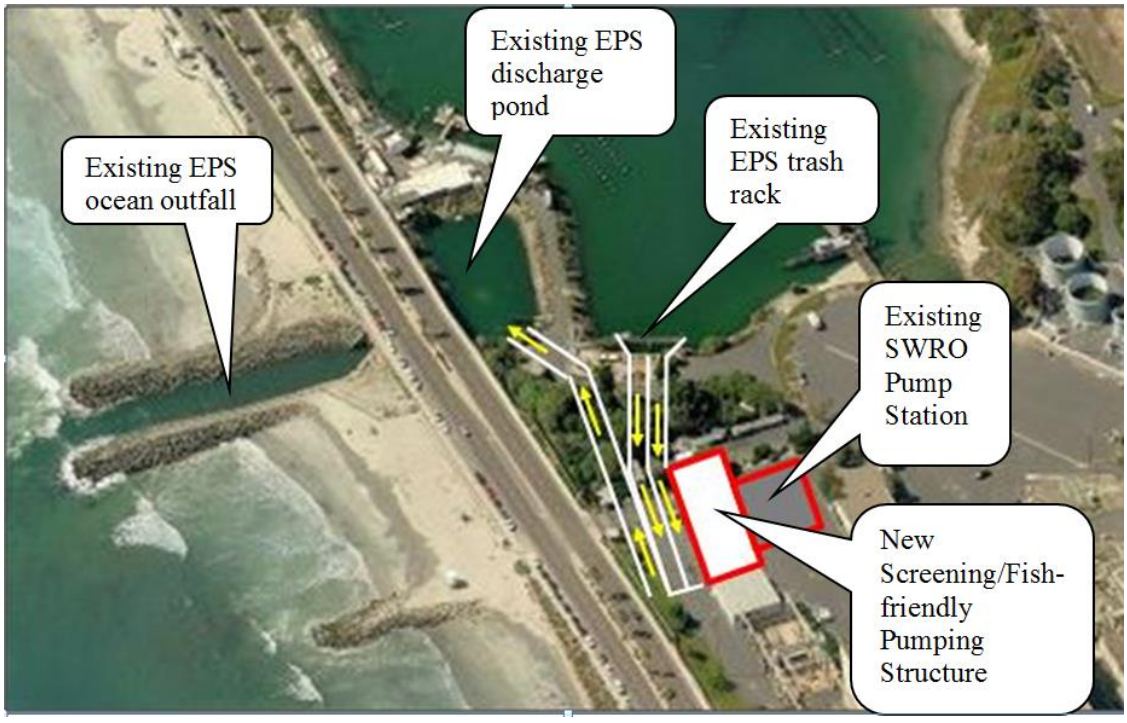


Figure 1. General layout of the CDP and location of the New Screening/Fish-friendly Pumping Structure.

The San Diego County Water Authority received comments from the State Water Resources Control and Regional Water Quality Control Boards (Boards) on the draft Supplement to the Precise Development Plan and Desalination Plant Project Final Environmental Impact Report which was submitted in April 2016. Relative to the design and configuration of the intake system, the Boards stated that "*Entrapment of marine life may occur in the intake tunnel, if organisms pass through the trash racks at the onset of the tunnel but cannot swim back through*

them". Therefore, the objective of this technical memorandum (memo) is to discuss the issue of entrapment relative to the design of the CDP intake system.

Entrapment Definition

Entrapment is not explicitly defined in the Desalination Amendment nor in the Substitute Environmental Documentation (SED). 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 [emphasis added]; 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.*

Design Features Which Preclude Entrapment at the CDP

Based on the design of the long-term, stand-alone New Screening/Fish-friendly Pumping Structure, entrapment, as defined above, is very unlikely. The New Screening/Fish-friendly Pumping Structure will minimize this risk by including modified traveling water screens with a fish return system and by keeping the velocity in the existing EPS tunnels low. The sections below provide additional detail on each design feature.

Modified Traveling Water Screens and Fish Return System

The New Screening/Fish-friendly Pumping Structure will utilize state-of-the-art, 1-mm modified traveling water screens. The screens specified will have all of the features known to minimize injury and mortality of fishes (i.e., mesh with a smooth surface to minimize the risk of scale loss during collection, fish lifting buckets on the screen baskets which keep collected organisms submerged in water, continuous screen rotation to minimize handling time, low pressure spraywash system to stimulate the movement of fish into a fish return system, and a fish return system to transport collected fish to the discharge point).

An intake system designed with fish-friendly components provides a means of egress for fish that are unwilling or unable to exit the system through the EPS intake tunnels. The CDP, therefore, does not entrap fish if a means has been provided to "*escape the cooling water intake"*. Figure 2 illustrates the top of a screen where collected fish are transferred to the fish trough. From the fish trough, collected fish would be conveyed through the fish/debris return system back to Agua Hedionda Lagoon or the Pacific Ocean via the discharge pond.

Tunnel Velocities

The EPS intake tunnels were designed for a facility drawing full cooling water flows. At design capacity, the EPS is permitted to withdraw 857 million gallons per day (MGD) of cooling water through the intake tunnels (Tenera 2005). Based on the dimensions of the tunnels, the mean velocity at the maximum design flow would be approximately 7.5 ft/sec. When the EPS goes

offline and the CDP enters long-term, stand-alone operation, the total intake flow will decrease to 299 MGD. This represents a 65 percent reduction in flow and, therefore, a 65 percent reduction in velocity. The mean tunnel velocity will be approximately 2.6 ft/sec under long-term, stand-alone operation. At this velocity, the potential for fish to escape the intake flow will improve relative to the EPS operation. In addition, the maximum distance a fish would need to travel to exit the intake tunnels would be approximately 200 ft.

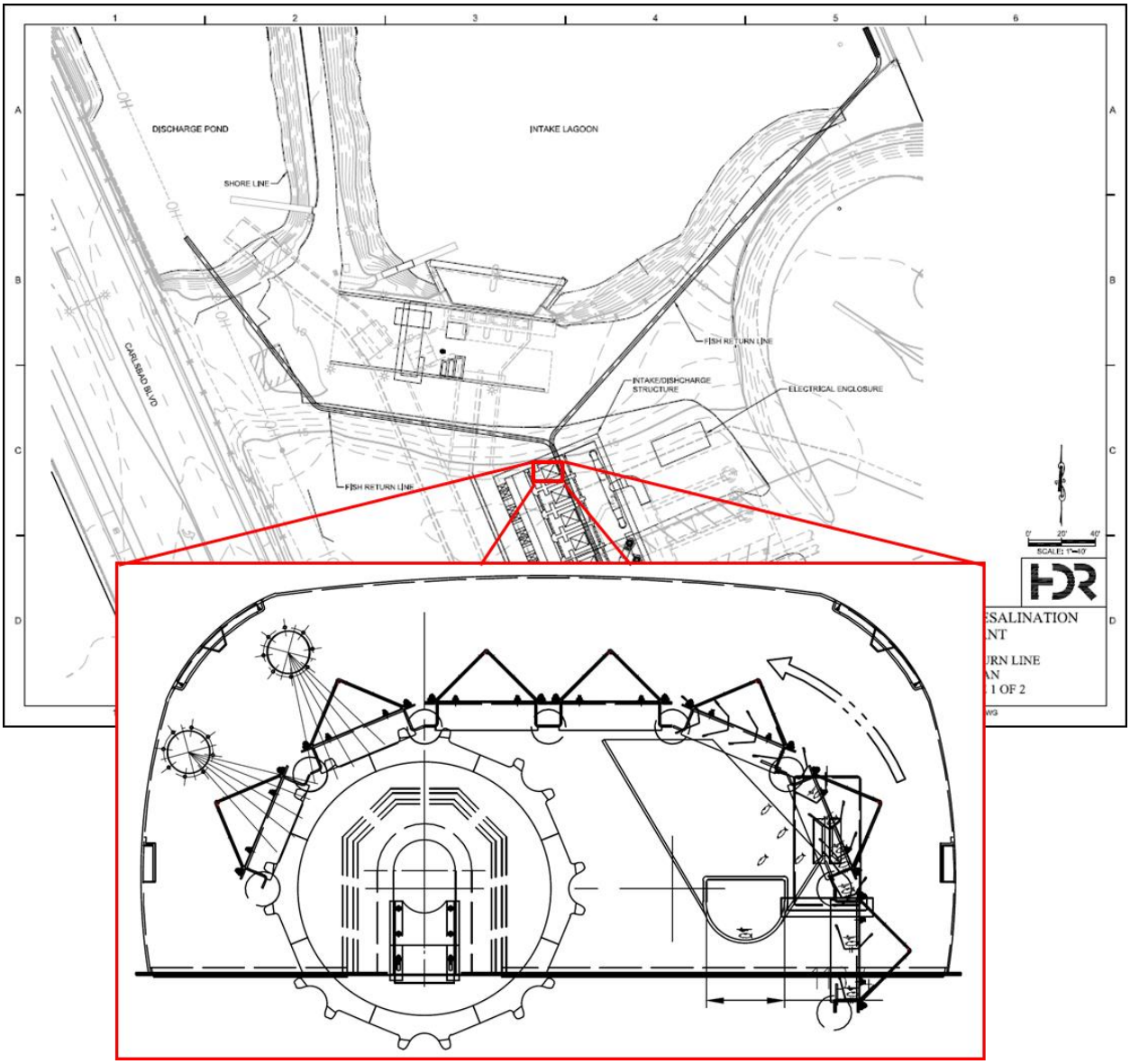


Figure 2. Enlarged view of the fish collection and transfer system of the Bilfinger Water Technologies center-flow modified traveling water screen. Towards the right of the inset, fish are shown being transferred from the fish lifting buckets to the fish trough. From the trough, fish are conveyed through the fish/debris return system back to Agua Hedionda Lagoon or to the Pacific Ocean via the discharge pond (both return lines shown).

Conclusion

Entrapment of marine life at the long-term, stand-alone CDP is extremely unlikely. The use of 1-mm modified traveling water screens that are designed to collect and return organisms precludes entrapment. In addition, the intake tunnel velocity will be reduced by approximately 65 percent when the CDP enters long-term, stand-alone operation increasing the potential for fish to escape through the intake structure to the Lagoon. Lastly, the maximum distance a fish would need to travel to exit the intake tunnels would be approximately 200 ft.

References

Tenera Environmental (Tenera). 2005. Carlsbad Desalination Facility Intake Effects Assessment Draft March 3, 2005. Prepared for Poseidon Resources Corporation.

United States Environmental Protection Agency (USEPA). 2014a. National pollutant discharge elimination system—Final regulations to establish requirements for cooling water intake structures at existing facilities and amend requirements at phase I facilities; Final Rule. Federal Register 79 (158), Aug. 15, 2014.

USEPA. 2014b. Technical development document for the final section 316(b) existing facilities rule. EPA-821-R-14-002, May 2014.