Agenda

Annual Public Workshop

San Onofre Nuclear Generating Station Artificial Reef Mitigation Project
Ocean Institute, Dana Point, CA
April 9, 2019

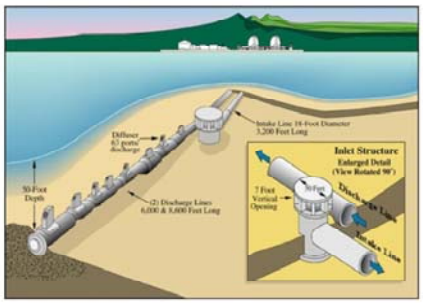
1:30 – 1:45	Introduction to SONGS reef mitigation - *Dan Reed, UCSB*
1:45 – 2:15	Results from the 2018 performance monitoring of the Wheeler North Reef - *Steve Schroeter, UCSB*
2:15 - 2:30	Questions and comments on monitoring results
2:30 – 2:45	Expansion of Wheeler North Reef to increase fish stocks and giant kelp acreage - *Kate Huckelbridge, CCC*
2:45 – 3:00	Questions and comments on reef expansion
3:00 – 3:15	General Discussion

For more information go to: http://marinemitigation.msi.ucsb.edu/

SONGS generators cooled by a single pass seawater system

(San Onofre Nuclear Generating Station = SONGS)

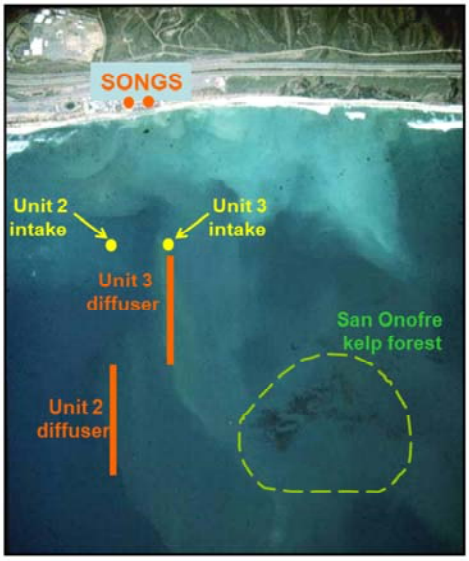
The nuclear reactors of SONGS units 2 and 3 were cooled by seawater that is taken in by large intake pipes and discharged back to the ocean via two diffuser lines



- SONGS located in north San Diego County
- The nuclear reactors of Units 2 and 3 are cooled by sea water that is taken in through large intake pipes located in about 30 feet of water offshore of the power plant
- When operational the water was elevated 19^{o} F above ambient as it's circulated through the plant and then discharged back to the ocean through an extensive diffuser system designed to dissipate the heat in the surrounding seawater

Reef mitigation linked to the adverse effects of the SONGS cooling water discharge

Results from studies conducted from 1976-1987 by the Marine Review Committee determined that a turbidity plume associated with SONGS diffusers was the cause of a substantial reduction in size of the San Onofre kelp forest

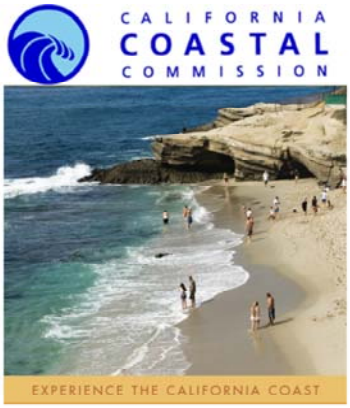


The SONGS artificial reef mitigation project is linked to the adverse effects of the SONGS single pass seawater cooling system on the San Onofre kelp forest, which is located directly offshore of the power plant

- Mixing of the discharged cooling water with the surrounding seawater was found to result in the formation of a turbid plume in the vicinity of the San Onofre kelp forest which is located adjacent to the two diffuser lines
- Studies conducted from 1976-1987 by the Marine Review Committee determined that the turbid plume was the cause of a substantial reduction in area of the San Onofre kelp forest

The California Coastal Act Requires Mitigation of Marine Impacts

The California Coastal Commission (CCC) is responsible for implementing the Coastal Act



As mitigation for the impacts to the San Onofre kelp forest caused by SONGS the CCC required SCE to:

1. **Construct an artificial reef large enough to support at least 28 tons of fish and 150 acres of kelp forest habitat to compensate for losses of kelp and kelp bed fish, invertebrates, and algae.**
2. **Provide funding for scientific oversight and monitoring of the mitigation project that is *independent* of SCE.**

- The California Coastal Act requires mitigation for impacts to the marine environment such as those caused by SONGS
- Implementation of the Coastal Act resides with the California Coastal Commission (CCC)
- The CCC is responsible for ensuring that the adverse impacts to the marine environment caused by SONGS are adequately mitigated
- As mitigation for the impacts to the San Onofre kelp forest caused by SONGS the CCC required SCE to: (1) Construct of an artificial reef that is large enough to support 28 tons of reef fish and 150 acres of kelp forest habitat to compensate for losses of kelp and kelp bed fish and invertebrates, and (2) Provide funding for scientific oversight and monitoring of mitigation projects that is *independent* of SCE
- Independent monitoring is done by marine scientists at UCSB who report directly to the CCC

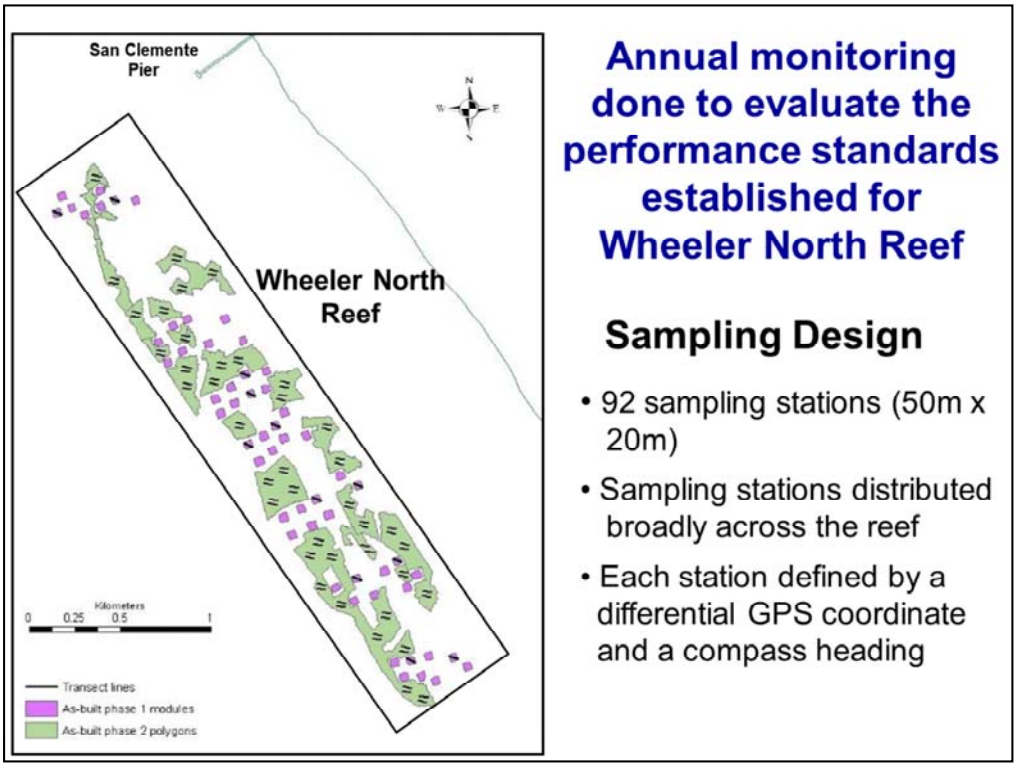
Project Objective

Replace the marine resources in the San Onfre kelp forest that were damaged or lost by the operations of SONGS Units 2 & 3

Approach

1. **Build an artificial reef in sandy habitat that is:**
   - **Low-relief with a topography and depth similar to the San Onofre kelp forest**
   - **Located near SONGS, but outside the influence of its discharge**
2. **Build the artificial reef in two phases :**
   - **a small (22 acre) short-term (5 y) experimental phase to test different reef materials and designs**
   - **A large (> 150 acres) long-term (>30 y) mitigation phase to replace the kelp forest resources lost at San Onofre**
3. **Measure the success of the artificial reef using performance standards developed to ensure the that project objective is met**
4. **Impose corrective measures to remediate the artificial reef if it fails to meet the performance standards**
5. **End project oversight after mitigation requirement is met**

- This map provides a general overview of the project site and shows the locations of the artificial reef
- Wheeler North Reef was constructed in 2 phases
- Construction of Phase 1 was completed in October 1999 and consisted of 56 modules that tested different bottom coverages of quarry rock and rubble concrete
- Information obtained from the 5 year Phase 1 period was used to guide the design of the Phase 2
- Phase 2 was completed in September 2008 and consisted of 18 polygons of low relief quarry rock which totaled 152 acres
- The Phase 1 and Phase 2 reefs combined constitute the 176-acre Wheeler North Reef
- Data were collected during annual monitoring surveys to judge the performance of the Wheeler North Reef in meeting its mitigation objective, which is to compensate for kelp forest resources lost due to the operation of SONGS



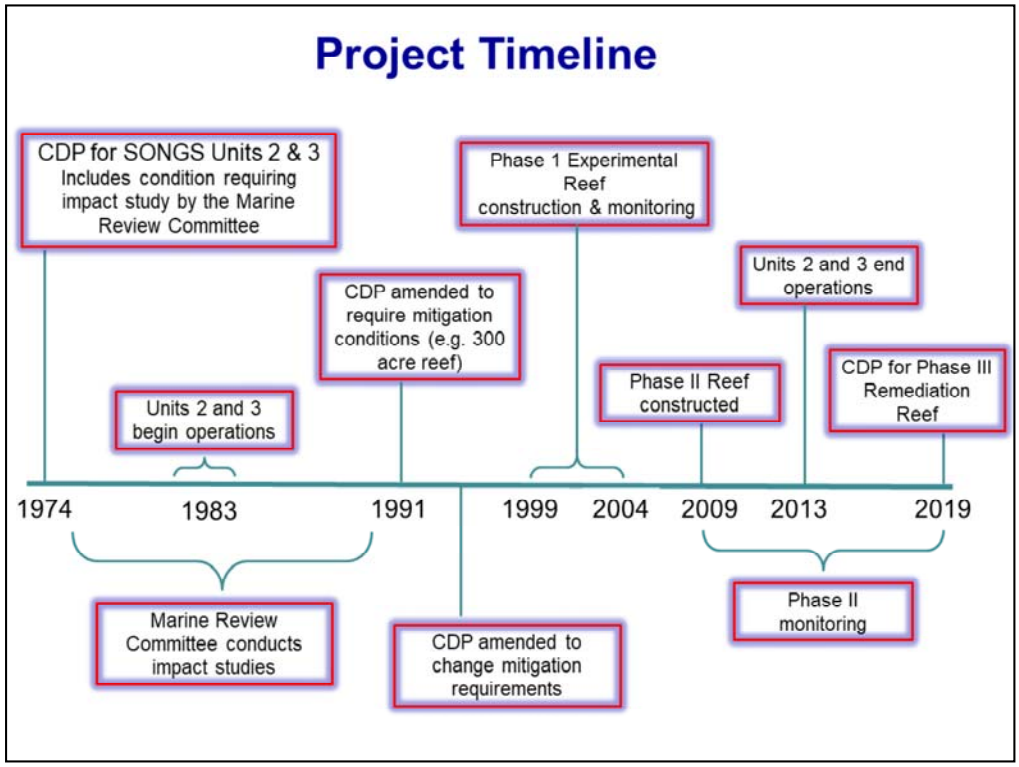
- This diagram summarizes the sampling design for the monitoring that is being done to evaluate the performance of the Wheeler North Reef
- The experimental Phase 1 modules constructed in 1999 are shown in purple; the new Phase 2 polygons constructed in 2008 are shown in green
- The 92 sampling stations are shown as black lines. The sampling stations are arranged in 40 pairs spaced 25 m apart on the Phase 2 polygons and as single stations on 12 of the Phase 1 modules

SONGS Reef Mitigation Compliance

Goal: ***Replace kelp forest resources lost by SONGS' operations***

- **One year of mitigation credit is given for each year that Wheeler North Reef meets the performance standards**
- **Fulfillment of the SONGS reef mitigation requirement occurs when the number of years of mitigation credit accrued by the Wheeler North Reef equals the total years of operation of SONGS Units 2 & 3, including the decommissioning period to the extent that there are continuing discharges**

- The goal of the SONGS reef mitigation project is to replace the kelp forest resources that were lost due to the operations of SONGS Units 2 & 3
- One year of mitigation credit is given for each year that Wheeler North Reef meets the performance standards
- Wheeler North Reef is required to provide compensation for damages to kelp forest resources for a period of time equal to the lifetime operation of SONGS Units 2 & 3
- Thus, fulfillment of the SONGS reef mitigation requirement occurs when the number of years of mitigation credit accrued by the Wheeler North Reef equals the total years of operation of SONGS Units 2 & 3, including the decommissioning period to the extent that there is continuing discharge of cooling water


Project Timeline
CDP for SONGS Units 2 & 3
Includes condition requiring impact study by the Marine Review Committee
Phase 1 Experimental Reef construction & monitoring
Units 2 and 3 end operations
CDP amended to require mitigation conditions (e.g. 300 acre reef)
Phase II Reef constructed
CDP for Phase III Remediation Reef
Units 2 and 3 begin operations
1974
1983
1991
1999
2004
2009
2013
2019
Marine Review Committee conducts impact studies
CDP amended to change mitigation requirements
Phase II monitoring