Agenda

Annual Public Workshop

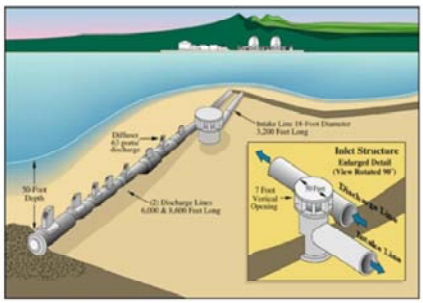
San Onofre Nuclear Generating Station Artificial Reef Mitigation Project
Ocean Institute, Dana Point, CA
April 9, 2018

1:30 – 1:45	Introduction to SONGS reef mitigation - *Dan Reed, UCSB*
1:45 – 2:15	Results from the 2017 performance monitoring of the Wheeler North Reef - *Steve Schroeter, UCSB*
2:15 – 2:30	Assessing the current and future performance of giant kelp at Wheeler North Reef - *Dan Reed, UCSB*
2:30 – 2:40	Update on Wheeler North Reef Remediation - *Kate Huckelbridge, CCC*
2:40 – 3:00	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)

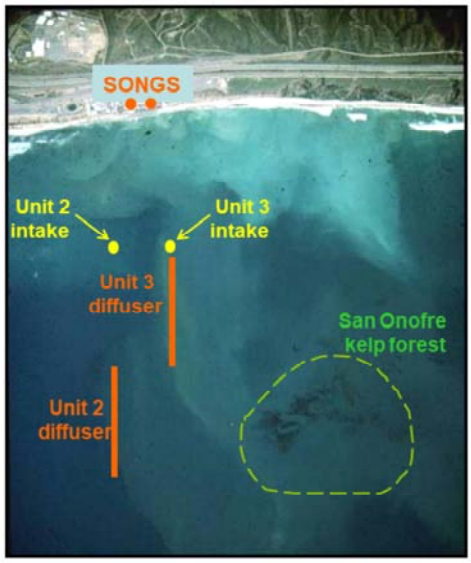


The nuclear reactors of SONGS units 2 and 3 were cooled by seawater that is taken in by large intake pipes and discharged back to the ocean via two diffuser lines

- 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

A turbidy plume associated with SONGS diffusers has been implicated as the cause of a substantial reduction in size of the San Onofre kelp forest



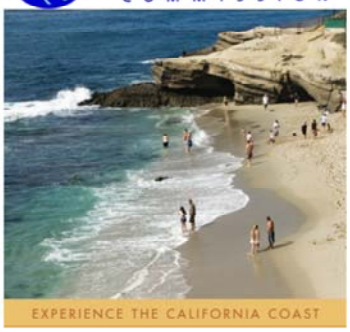
The SONGS artificial reef mitigation project is linked to the adverse effects of the SONGS single pass seawater cooling system on the San Onofre kelp forest, which is located directly offshore of the power plant

- 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
- The turbid plume was implicated as 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

CALIFORNIA COASTAL COMMISSION

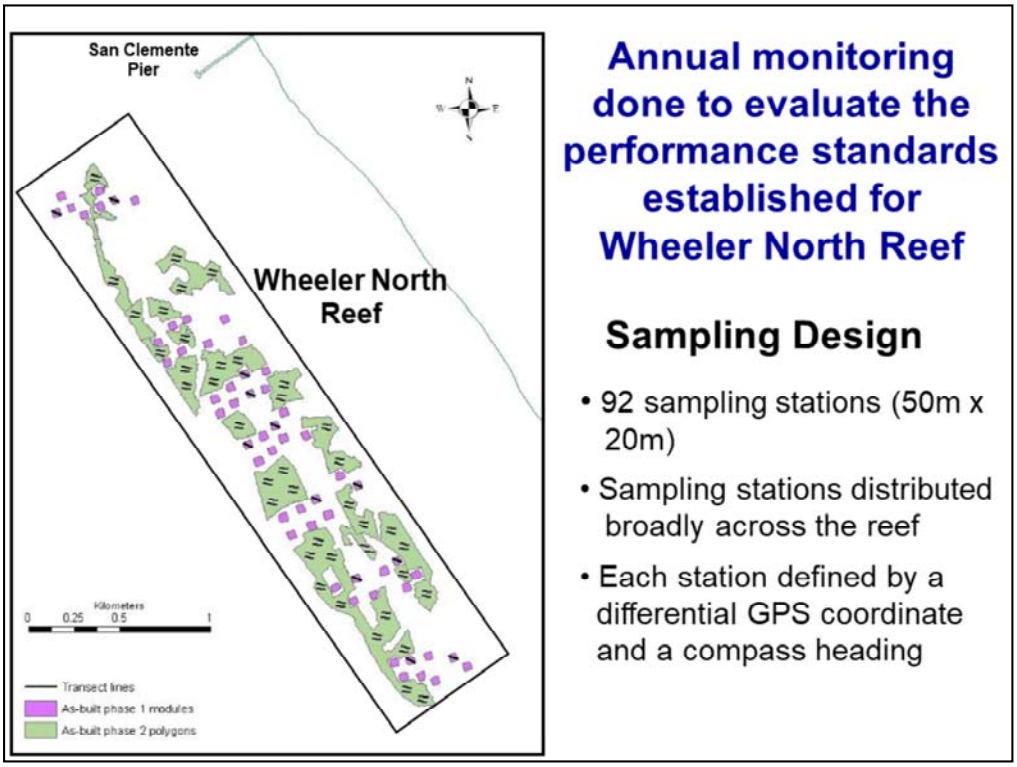


As mitigation for the impacts to the San Onofre kelp forest caused by SONGS the CCC required SCE to:

1. **Construct an artificial reef that creates a minimum of 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 creates a minimum of 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

- 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

- These underwater images taken from the Wheeler North Reef show the types of organisms that have colonized the reef, including::
- High densities of economically important species such as spiny lobster, and
- Ecologically protected species such as the giant sea bass

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

SONGS Units 2 & 3 Operating History

1983: Unit 2 operations begin
1984: Unit 3 operations begin
2012: Units 2 and 3 operations suspended
2013: Units 2 and 3 operations permanently ceased
Transfer of fuel to spent fuel pool
Operating license modified
- **No operation of reactors**
- **No fuel in reactors**
- **"Possession Only" license**

www.songscommunity.com

- Operations of SONGS Units 2 and 3 began in 1983 and 1984, respectively
- Operations of SONGS Units 2 and 3 were suspended in January 2012 due to premature wear of replacement steam generators
- SCE decided to permanently shut down the plant in June 2013
- SCE's operating license has been modified to "possession only" and they are no longer authorized to operate the reactors

SONGS Units 2 & 3 Intake Flows

Full Operational Flow (1983 -2012)

- 1,287 Million Gallons per Day (MPD) per unit = 2,574 MGD total
- Represents total allowable flows

Offline Flow (2012 – present)

- 42 to 49 MGD per unit = 84 to 98 MGD total

- Under normal operation conditions the flow rate of the cooling water systems of each Unit was about 1200 million gallons per day
- This amounted to 2.4 billion gallons a day for both units which is equivalent to a volume of water that is a 1 square mile 12 feet deep
- Since the shutdown, the flow in each unit has been reduced to about 42 million gallons a day or roughly 3% of the normal operating flow

Questions?