Annual Review Workshop for SONGS Kelp Reef Mitigation

April 19, 2010

SONGS Mitigation Monitoring Project
Marine Science Institute, University of California Santa Barbara

Welcome to the annual review workshop for the SONGS kelp reef mitigation

Agenda

Annual Public Workshop
San Onofre Nuclear Generating Station Artificial Reef Mitigation Project
Ocean Institute, Dana Point, CA

6:00 Introduction – *Dan Reed*

6:15 Experimental Reef: Ten Years After - *Steve Schroeter*

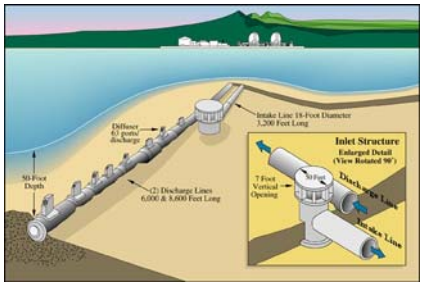
6:40 Status of the Wheeler North Reef - Year 1 (2009) monitoring results - *Steve Schroeter*

7:15 Conclusions and Future Monitoring Plans - *Dan Reed*

7:30 Discussion

Coastal Mitigation Linked to the Effects of the SONGS Cooling Water System

(San Onofre Nuclear Generating Station = SONGS)



First some background on the project is important for understanding the purpose and rationale for the SONGS artificial reef mitigation project.

•The SONGS reactors are cooled by a single pass seawater system which each day takes in a volume of water that is equal to about a square mile 14 ft deep

•The water is elevated 10.5 deg C above ambient in the plant and then discharged through an extensive diffuser system designed to dissipate the heat which relies on entraining 10X the volume of water that is taken in.

•The two discharge lines are located adjacent to the San Onofre kelp forest

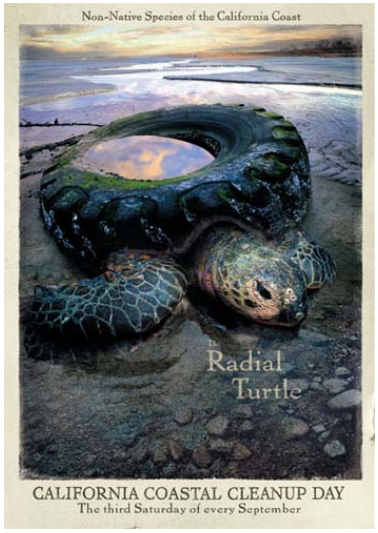
•SONGS impacts to living marine resources result from both the intakes and the discharge

Adverse Effects Attributed to SONGS Cooling Water System Include:

- **Losses of immature fish in the cooling water intake system is projected to cause substantial reductions in populations of adult fish in the S. California Bight**
- **In-plant losses of juvenile and adult fish led to reductions in the local abundance of mid-water fish populations in near vicinity of SONGS**
- **The discharge plume caused a substantial reduction in size of the kelp forest community at San Onofre that resulted in losses of kelp, fish, & invertebrates**

After lengthy detailed studies the CCC concluded that SONGS cooling water system had major adverse impacts to the coastal environment

Adverse Impacts caused by SONGS is in violation of the California Coastal Act



California Coastal Act

- **Includes policies that address many coastal issues including "marine habitat protection"**
- **Enforcement resides with the California Coastal Commission (CCC)**
- **CCC is responsible for ensuring that the adverse impacts to the marine environment caused by SONGS are adequately mitigated**

Adverse impacts caused by SONGS is in violation of the coastal act and thus requires mitigation

Mitigation required by the CCC for the impacts caused by SONGS cooling water system includes four conditions:

Condition A: Wetland Mitigation

Out-of-kind mitigation to compensate for in-plant losses of immature fish.

Condition B: Behavioral Barriers Mitigation

In-kind mitigation to reduce in-plant losses of juvenile & adult fish.

Condition C: Kelp Reef Mitigation

In-kind mitigation to compensate for losses of kelp and kelp bed fish and invertebrates.

Condition D: Administrative Structure

Provides for scientific oversight and monitoring of mitigation projects that is independent of SCE.

CCC determined that the adverse marine impacts caused by SONGS operations could be adequately compensated for by a mitigation package that included 4 conditions

Condition D requires an annual public workshop be held to:

1) **Review the status of the mitigation projects.**

2) **Identify outstanding issues and make recommendations for addressing them.**

3) **Review next year's program.**

The focus of today's workshop is on Condition C: Kelp Reef Mitigation

An annual public workshop is but one element of the mitigation requirement for SONGS

Condition C: Kelp Reef Mitigation

Duties and Requirements

- **SCE to construct artificial reef that creates a minimum of 150 acres of kelp forest habitat**
- **CCC to provide scientific oversight and monitoring of the artificial reef project that is independent of SCE**

SCE and the CCC have clear distinct roles in the kelp reef mitigation

Key Elements of the SONGS Artificial Reef Mitigation Project

Goal

In-kind compensation for the loss of kelp forest habitat and associated biota caused by the operation of SONGS Units 2 & 3.

Performance Criteria

Physical and biological standards established by which the performance of the artificial reef is judged.

Evaluation

Data from independent long-term monitoring used to determine:
(1) whether the performance standards are met
(2) the causes for any failures to meet the standards
(3) the most appropriate methods for remediation

It was decided that the goal of in-kind compensation for the lost resources will most likely be met if:

1. Artificial reef is built in the near vicinity of SONGS but outside its influence to insure local compensation
2. Artificial reef is configured to look like the natural reef at San Onofre which is a low relief boulder field

Determining whether the project goal is met will be based on whether the WNR meets certain well defined Performance Criteria

- 13 Performance standards

Evaluation

Remediation required if standards are not met.

Kelp Forest Mitigation in Two Phases

Phase 1: Experimental Reef

Short-term, small scale to test different reef designs

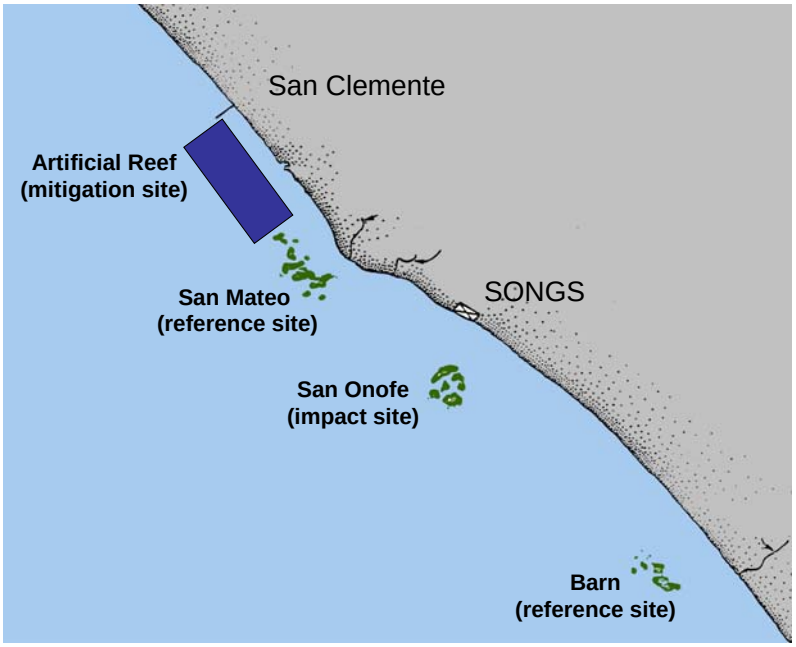
Phase 2: Mitigation Reef

Long-term, large scale to compensate for resources lost due to SONGS operations

Information gained from the Experimental Reef used to design the Mitigation Reef (since re-named the Wheeler North Reef)

Mitigation for SONGS impacts to the San Onofre kelp forest is being done in two phases

Project site and reference reefs



• this slide provides a general overview of the project site – the artificial reef – and the nearby natural kelp beds

• San Onofre kelp is the bed where the impacts occurred

• The San Mateo and Barn are the two natural kelp beds being used at reference sites to judge the performance of certain performance standards of the Artificial reef

Design of Experimental Reef

Constructed in summer 1999

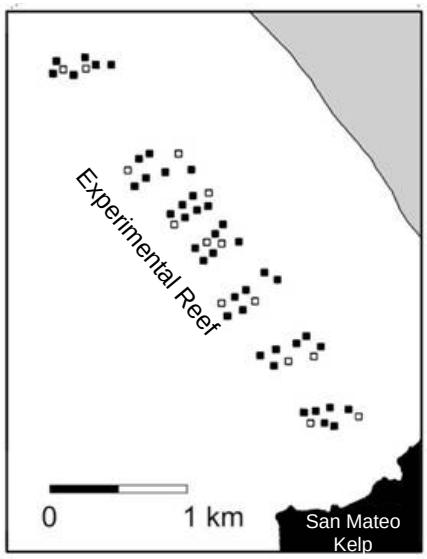
22.4 acres
- *56 uniformly sized modules*

Two types of material
- *quarry rock boulders*
- *recycled concrete rubble*

Three bottom coverages
- *low (~40%)*
- *medium (~60%)*
- *high (~80%)*

Stratified block design
- *7 replicate blocks of 8 reef designs*
- *Module size = 40 m x 40 m*

Duration of Experiment
- *5 years*



The experimental phase of the kelp reef mitigation began in 1999 and lasted for 5 years

Conclusions from Experimental Reef

All reef designs tested showed a near equally high tendency to meet the performance standards established for the mitigation reef

Final Report on the Findings and Recommendations of the Experimental Phase of the SONGS Artificial Reef Mitigation Project

PREPARED FOR THE CALIFORNIA COASTAL COMMISSION
AUGUST 1, 2005

Dan Reed, Steve Schroeter, and David Huang
Marine Science Institute
University of California, Santa Barbara

Recommendations for the Mitigation Reef

Reef Location
- **Near San Clemente, CA**

Reef topogragphy
- **Low relief, < 1 m high**

Substrate Type
- **Quarry rock or rubble concrete boulders**

Substrate Coverage
- **At least 42%, but no more than 86%**

Design of Wheeler North Reef

Constructed in Summer 2008

153 acres

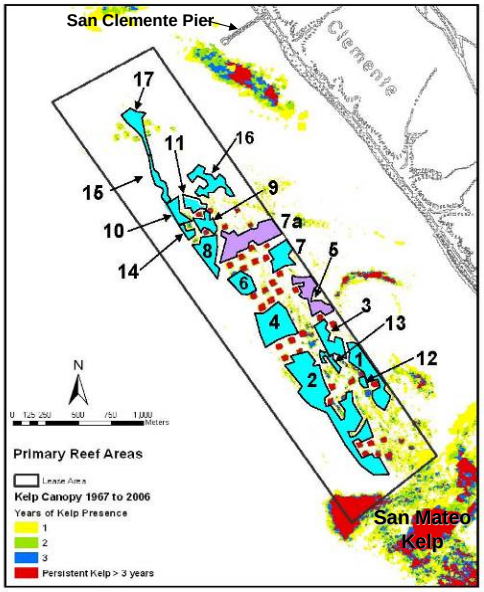
- ***18 polygons of variable size***
- ***Covers 3.5 km of coast***
- ***Avoided Experimental modules***
- ***Avoided natural hard bottom***

One type of material

- ***quarry rock boulders***
- ***126,000 tons of rock***

One bottom coverage

- ***~42%***
- ***low relief < 1 tall***



•The second phase of the mitigation is the construction and monitoring of the full mitigation build-out reef, which was completed in October 2008

• Together, the Experimental reef and the full mitigation build-out comprise the Wheeler North Reef

Monitoring Period

- **No less than the full operating life of SONGS plus years monitored without the project attaining compliance with permit standards.**
- **The level of sampling can be reduced to annual site inspections after 10 years if the performance standards have been met for the preceding 3 years.**
- **The reef mitigation requirement will be fulfilled when the performance standards are met for a period equal to the total years of operation of SONGS Units 2 & 3, including decommissioning period to the extent that there is continuing discharge of cooling water.**