UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF FEDERAL AND STATE MATERIALS AND ENVIRONMENTAL MANAGEMENT PROGRAMS RELATED TO AMENDMENT NO. 165 TO FACILITY OPERATING LICENSE NO. DPR-13

SOUTHERN CALIFORNIA EDISON COMPANY

SAN DIEGO CAS AND ELECTRIC COMPANY

SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 1

DOCKET NO. 50-206

1.0 INTRODUCTION

By letter dated December 19, 2007 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML080580468), Southern California Edison (SCE or the licensee) submitted a request to amend Facility Operating License No. DPR-13 for the San Onofre Nuclear Generating Station, Unit 1 (SONGS-1 or the facility). In accordance with the requirements of Section 50.83, "Release of part of a power reactor facility or site for unrestricted use," of Title 10 of the *Code of Federal Regulations* (10 CFR), the licensee requested to release a portion of the site, namely the offshore cooling pipes, for unrestricted use. The proposed amendment would release a parcel of the ocean bottom that SCE has leased from the California State Lands Commission (CSLC), as well as the offshore portion of the SONGS-1 Circulating Water System (CWS) that is beneath that parcel of seabed floor. The structures comprising this portion of the CWS have been isolated from the remainder of the plant. Following approval of this amendment, SCE will abandon these structures in place.

The lease agreement between the State of California, CSLC, SCE, and the San Diego Gas and Electric Company defines the affected area as approximately 7.5 acres of submerged land, the rights to which were acquired from the State of California by a grant of easement and lease made by the CSLC. This parcel contains buried pipes previously used to convey ocean water to and from SONGS-1 for cooling purposes and to discharge liquid radioactive effluents. The lease agreement, which was enacted on September 24, 1964, identified as No. 3193.1 in the [California] Public Resources Code Series, describes a piece of tidal and submerged land about 100 feet wide and 3310 feet long extending from the western boundary of the SCE site across the ocean floor in a southwesterly direction. This agreement expires on September 24, 2013.

Because the SONGS-1 CWS contained radiologically contaminated water, the licensee defines the system and the surrounding seabed as potentially contaminated (impacted) areas. As part of the license termination process, licensees submit a License Termination Plan (LTP) that includes provisions for planned residual radiological concentrations that have a calculated dose at or below the regulatory limits and As Low as Reasonably Achievable (ALARA). SCE does not plan to submit an LTP for SONGS-1 until after the other operating units on the site reach the

end of licensed operation. Therefore, the licensee did not develop site-specific criteria for release of the SONGS-1 CWS. Instead, the licensee conducted radiological sampling and surveying of the system and seabed to demonstrate compliance with the radiological criteria for unrestricted use as specified in 10 CFR 20.1402, "Radiological criteria for unrestricted use." As part of its review process, the NRC verified the licensee's radiological sampling results by reviewing the procedures and independently evaluating split samples.

2.0 BACKGROUND

The SONGS facility is located approximately 4 miles south of San Clemente, California on the Pacific Ocean coast, immediately south of the San Diego/Orange County border. SONGS-1, Docket No. 50-206, was a Westinghouse 456 megawatt electric (MWe) pressurized water reactor that was jointly owned by SCE and the San Diego Gas and Electric Company. SONGS-1 was granted Facility Operating License No. DPR-13 on January 1, 1968 (ADAMS Accession No. ML13309A138), and ceased operation on November 30, 1992 (ADAMS Accession No. ML13319B040). The licensee completed defueling on March 6, 1993 (ADAMS Accession No. ML13319B055), and maintained the unit in SAFSTOR (i.e., deferred dismantlement) with the intent of decommissioning the entire site when SONGS, Units 2 and 3 ceased operation. On December 28, 1993 (ADAMS Accession No. ML13319B059), the NRC approved the Permanently Defueled Technical Specifications for SONGS-1.

SCE submitted the proposed Decommissioning Plan for SONGS-1 on November 3, 1994 (ADAMS Accession No. ML13319B073). As a result of the 1996 revision to the regulations in 10 CFR 50.82, the NRC replaced the requirement for a decommissioning plan with a requirement for a Post Shutdown Decommissioning Activities Report (PSDAR). On August 28, 1996, the SONGS-1 Decommissioning Plan became the SONGS-1 PSDAR (61 FR 67079; December 19, 1996). On December 15, 1998 (ADAMS Accession No. ML13184A353), SCE submitted an update to the PSDAR to the NRC, as required by 10 CFR 50.82(a)(7), in order to begin planning for the dismantlement and decommissioning of SONGS, Unit 1.

In June 1999, SCE initiated the prompt decommissioning of SONGS-1 (i.e., DECON) (ADAMS Accession No. ML13319B111). At that time, the onshore activities for dismantlement of the CWS at SONGS-1 were already underway. Since initiating DECON, SCE has moved the SONGS-1 fuel to an onsite Independent Spent Fuel Storage Installation (ISFSI), removed and disposed of the components comprising SONGS-1, and demolished the facility. Only the reactor vessel and the below-grade portions of some buildings remain onsite.

3.0 REGULATORY REQUIREMENTS

The regulations for release of impacted areas contained in 10 CFR 50.83(d) require the licensee to submit an application for amendment of its license for the release before license termination of any impacted areas on its property. Such an application must include:

An evaluation of the effect of releasing the property to ensure that:

(i) The dose to individual members of the public does not exceed the limits and standards of Subpart D, "Radiation Dose Limits for Individual Members of the Public," of 10 CFR Part 20, "Standards for Protection Against Radiation;"

(ii) There is no reduction in the effectiveness of emergency planning or physical security;

(iii) Effluent releases remain within license conditions;

(iv) The environmental monitoring program and offsite dose calculation manual are revised to account for the changes;

(v) The siting criteria of 10 CFR Part 100, "Reactor Cite Criteria," continue to be met; and

(vi) All other applicable statutory and regulatory requirements continue to be met.

An application to release an impacted area before approval of the LTP must also include a historical site assessment (HSA) of the part of the facility or site to be released, including a description of the site and a schedule for its planned release. The application must further identify the methods used for, and results obtained from, the radiation surveys that were performed to demonstrate compliance with the radiological criteria for unrestricted use specified in 10 CFR 20.1402. The licensee must also supplement its environmental report, under 10 CFR 51.53, "Postconstruction environmental reports," to describe any new information or significant environmental changes associated with the proposed release of the impacted area.

4.0 TECHNICAL EVALUATION

SCE submitted its partial site release request on December 19, 2007, in accordance with the requirements of 10 CFR 50.83(d). The request describes SCE's approach for demonstrating compliance with the radiological criteria for unrestricted use for the proposed release of the offshore portion of the CWS from the SONGS-1 license.

4.1 Circulating Water System Description

The SONGS-1 CWS supplied seawater to condense the exhaust steam from the low-pressure turbines. In addition, the discharge conduit received wastewater from the following systems:

- onsite sewage treatment plant
- radioactive liquid waste processing system
- steam generator blowdown system
- turbine plant oily waste / water separator and the condenser overboard (drawdown)
- saltwater return from the Turbine Plant Cooling Water (TPCW) and Component Cooling Water (CCW) heat exchangers
- storm drain water via the yard drain sump

During normal plant operation, seawater was drawn into the system at the intake terminal structure, pumped through the main condensers and other heat exchangers and returned to the discharge terminal structure. The CWS could also be configured to draw seawater in through

the discharge conduit and discharge the heated water back through the intake conduit. This "reverse tunnel" evolution was performed periodically to minimize fouling of the intake conduit from the growth of marine organisms. The components of the SONGS-1 CWS that SCE will abandon in place are within the parcel of land described below, and include:

1. The intake terminal structure, 3200 feet southwest of the seawall.

2. The intake conduit running from the intake terminal structure to the southwestern edge of a concrete plug installed in the intake stop gate structure within the SONGS-1 area.

3. The discharge conduit running from the southwest edge of the concrete plug installed in the intake stop gate structure within the SONGS-1 area to the discharge terminal structure.

4. The discharge terminal structure, 2600 feet southwest of the seawall.

The intake and discharge conduits are reinforced concrete pipes 12 feet (3.7 meters) in diameter. At the point where they connect to the stop gate structures, the top of each conduit is 12 feet (3.7 meters) below Mean Lower Low Water (MLLW) – the 19-year average of the lower of the two daily tidal low water levels. The intake conduit extends out 3200 feet (975 meters) to the intake terminal structure where the top of the conduit is approximately 32 feet (9.75 meters) below MLLW. The discharge conduit extends out 2600 feet (792 meters) to the discharge terminal structure where the top of the conduit is approximately 28 feet (8.5 meters) below MLLW. The conduits are below the ocean floor and when constructed were covered by nominally 4 feet (1.2 meters) of sand. The intake and discharge conduits are within the boundaries defined by California Public Resources Code Series Lease No. 3193.1, which is a 100-foot wide parcel extending southwest from the mean high water level southwest of the SONGS-1 site to approximately 3,300 feet offshore.

4.2 Current Condition of the Circulating Water System

The main CWS pumps at SONGS-1 were secured shortly after permanent plant shutdown in 1992. Smaller, auxiliary saltwater cooling system pumps circulated water through the offshore conduits to support spent fuel pool cooling requirements until all spent fuel was removed from the SONGS-1 Spent Fuel Pool to the onsite ISFSI, which was complete as of June 30, 2005.

The auxiliary saltwater cooling pumps were maintained in operation to support other SONGS-1 decommissioning activities, including providing dilution water for permitted releases of liquid radioactive waste. At the completion of all radioactive liquid waste processing, a new system was constructed and placed in service to divert the storm drain system from SONGS-1 to the SONGS, Units 2 and 3 CWS. Radioactive releases via the SONGS-1 CWS were completed and all pumps circulating water through the SONGS-1 CWS were secured in November 2006.

4.3 Circulating Water System Surveys

The structures and conduits comprising the offshore portion of the CWS at SONGS-1 and the associated parcel of the ocean floor are the subject of this partial site release. Based on site operating history and the HSA, the offshore portion of the discharge conduit and the discharge terminal structure of the SONGS-1 CWS are classified as Class 1 impacted areas. The entire

length of the offshore portion of the discharge conduit and the discharge terminal structure are included in a single survey unit. Based on site operating history and HSA, the licensee also classified the offshore portion of the intake conduit and the intake terminal structure of the SONGS-1 CWS as Class 1 impacted areas. The entire length of the offshore portion of the intake conduit and the intake terminal structure are included in a single survey unit. SCE did not remediate the intake or discharge structures prior to conducting sampling. There was no need for remediation of these structures as a result of the characterization and final status surveys.

The CWS intake and discharge structures cannot be isolated from the Pacific Ocean. Therefore, all characterization and final status surveys were performed underwater. In order to minimize the risk to underwater sampling personnel, separate characterization and final status surveys were not conducted. Instead, divers collected a single set of samples to provide data for both the characterization and final status surveys.

SCE conducted radiological surveys at the onshore end of both the intake and discharge conduits in December 2006 and January 2007. At the completion of these surveys, SCE permanently blocked the onshore ends of the conduits with concrete. The results of these radiological surveys demonstrate that the calculated dose rates are less than five percent (5%) of the limiting NRC criteria for release for unrestricted use. The details of these surveys and their results are discussed in Chapter 6 of SCE's submittal.

SCE conducted radiological surveys at the offshore end of both the intake and discharge conduits, as well as the local area surrounding the discharge terminal structure, in May 2007. The results of these radiological surveys demonstrate that the calculated dose rates are less than five percent (5%) of the limiting NRC criteria for release for unrestricted use. The details of these surveys and their results are also discussed in Chapter 6 of SCE's submittal.

SCE conducted its sampling campaign in accordance with procedures established under the SONGS Radiological Environmental Monitoring Program (REMP), including the Offsite Dose Calculation Manual (ODCM), as stated in Defueled Technical Specification (DTS) 6.8.4b and DTS 6.9.1.3. Quality assurance (QA) and quality control (QC) measures for the radiological surveys included requirements for ensuring compliance with the REMP.

SCE also conducted a thorough review of the historical results of ocean bottom sediment sampling performed under the SONGS REMP. No historical REMP sediment sample results were above the State or NRC reporting criteria. This data is not sufficient, in and of itself, to conclude that the leased tract of ocean floor meets the NRC acceptance criteria for unrestricted use. However, this data does support a conclusion that any contaminants that might be present would be detectable at very low levels, or would be at levels below the minimum detectable activity (MDA) of the analysis process.

In addition, because the survey methods defined in NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," Revision 1 (ADAMS Accession Nos. ML003761445 and ML003761454), do not apply to underwater areas, SCE consulted with the NRC staff to define an acceptable method for demonstrating compliance. Therefore, in lieu of using Derived Concentration Guideline Limits (DCGLs) to demonstrate compliance with the NRC dose limit of 25 millirem per year (mrem / yr) for unrestricted use, SCE developed site-specific models for direct (external) and indirect (ingestion) dose. SCE developed its direct dose model to calculate hypothetical annual exposure based on the actual measured

concentrations of licensed radiological material in samples collected during the conduct of the CWS surveys. SCE's indirect dose model follows applicable portions of the ingestion dose model outlined in Regulatory Guide (RG) 1.109, "Calculation of Annual Doses to Man From Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I" (ADAMS Accession No. ML003740384).

4.4 Circulating Water System Survey Results

4.4.1 *Exposure Scenario*

The critical group for the SONGS-1 CWS exposure scenario to develop the site-specific acceptance criteria is a recreational lobster diver who enters the offshore CWS structures in the pursuit of lobster. SCE assumed the exposure time is a series of 30-minute dives into six of the eleven available openings into the intake and discharge conduits each day for the entire 173-day length of the lobster season. This hypothetical individual also ingests lobster and shellfish from within these structures at the average rate defined in RG 1.109.

4.4.2 *Dose Calculations*

SCE developed site-specific dose models for both direct exposure and indirect exposure through ingestion, and then used these models to derive site-specific acceptance criteria to meet the NRC criteria for release for unrestricted use. The isotopes of interest considered for the dose calculations included all isotopes identified in the evaluations conducted to comply with the requirements of 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste." All gamma-emitting isotopes from the 10 CFR Part 61 analyses were considered in the direct exposure dose calculations. The direct exposure dose models considered the radioactive material in sediment, imbedded in the concrete conduits, and materials both loosely and tightly adhered to the internal surface of the conduits. A sensitivity analysis demonstrated that, in all cases, the residual radioactive material present in sediment dominated the dose rate.

Hypothetical radiation exposure from the residual licensed radioactive material inside these structures, under the conditions proposed in the application, would result from two pathways: external exposure to a diver who might enter these structures, and internal exposure by the ingestion of edible marine species containing residual licensed radioactive material. Site-specific underwater exposure rates were calculated using the Grove Engineering MicroShield® Software, Version 5.03a, and site-specific dose conversion models for these pathways were developed to demonstrate compliance with the NRC's dose criteria for unrestricted release. Samples were collected from the subject structures, analyzed, and the actual measured concentrations applied to the site-specific dose models. The resulting hypothetical dose was then compared against the NRC's radiological criteria for unrestricted use of 25 mrem / yr.

The parcel of the ocean floor that SCE proposes to remove from licensee control does not meet the assumptions in the dose models used to develop the soil acceptance criteria in MARSSIM. Therefore, site-specific occupancy factors for the ocean floor were not developed.

4.4.2.1 <u>Internal Doses</u>

A representative sample of lobsters was collected from the intake terminal structure and the southwestern end of the intake conduit. The edible portion of each lobster was removed and

mixed into a composite sample. Analysis of this composite sample identified tritium at 5.92E-5 ± 4.73E-5 microCuries per gram (µCi/g) and Strontium-90 at 4.02E-7 ± 3.31E-7 µCi/g. A representative sample of scallops was collected from the intake structure. The edible portion of each scallop was mixed into a composite sample. Analysis of this composite sample identified Calcium-45 and Actinium-227 at levels below the MDA, but neither of these is attributable to plant operations so they are not used as part of the dose calculations. A representative sample of mussels was collected from the intake terminal structure. The edible portion of each mussel was mixed into a composite sample. Analysis of this composite sample identified Lead-210 that is a decay product of naturally occurring Uranium-238. Therefore, the dose due to Lead-210 resulting from ingestion of mussels is not included in this evaluation.

A representative sample of lobsters was collected from the discharge terminal structure and the southwestern end of the discharge conduit. The edible portion of each lobster was removed and mixed into a composite sample. Analysis of this composite sample identified tritium at 4.0E-5 ± 4.51E-5 µCi/g. Calcium-45 and Uranium-234 were also identified at levels below the MDA, but neither of these is attributable to plant operations so they are not used as part of the dose calculations. A representative sample of scallops was collected from the discharge structure. The edible portion of each scallop was mixed into a composite sample. Analysis of this composite sample identified tritium at 8.87E-5 ± 5.77E-5 µCi/g and Europium-154 at 6.03E-7 ± 2.78E-7 µCi/g. A representative sample of mussels was collected from the discharge terminal structure. The edible portion of each mussel was mixed into a composite sample. Analysis of this composite sample identified tritium at 7.26E-5 ± 4.72E-5 µCi/g.

Applying the dose conversion factors from Federal Guidance Report No. 11 (FGR-11), “Limiting Values Of Radionuclide Intake And Air Concentration And Dose Conversion Factors For Inhalation, Submersion, And Ingestion,” and the ingestion rates from RG 1.109 for average consumption to the measured concentrations described above for the SONGS-1 CWS yields a maximum credible dose due to the ingestion of lobster, scallops, and mussels from reactor related isotopes of 7.96E-2 mrem / yr. The calculated ingestion dose results are summarized in Table 6-1 of SCE’s submittal, which is provided below.

Table 6-1
Calculated Ingestion Dose

0Species	Source	Isotope	Annual Dose mrem/yr
Lobster	Intake Conduit	Tritium Strontium-90	3.8E-3 5.7E-2
Lobster	Discharge Terminal Structure	Tritium	2.6E-3
Scallops	Discharge Terminal Structure	Tritium Europium-154	5.7E-3 5.8E-3
Mussels	Discharge Terminal Structure	Tritium	4.7E-3
Total			7.96E-2

4.4.2.2 External Doses

External dose models were developed for each gamma-emitting isotope identified in the SONGS-1 CWS, and the actual geometry of the intake and discharge conduits proposed to be abandoned below the ocean floor was modeled using the Grove Engineering MicroShield® software. Specific models were also developed to evaluate dose from radioactive material deposited on the walls and top of the structures, as well as radioactive material deposited in sediment on the bottom of the structure.

Divers from a marine biology company collected samples of sediment, wall scrapings, and concrete from the surface of the intake and discharge conduits using industry standard collection methods. For diver safety reasons, access was limited to the first 100 feet into the onshore and offshore ends of each conduit. The concentration of residual radioactivity expected to be present at the access points that will be opened during preparation for abandonment along the length of the intake and discharge conduits is interpolated based on the results from the sampled locations. The average dose rate at each end of each conduit is used as the endpoints for the interpolation, with the distance used for endpoints in the interpolation set as the midpoint of the sample area at each end (i.e., 50 feet from the actual endpoints).

Using this method, the dose rate at several intermediate points along the intake and discharge conduits was calculated by linear interpolation and summarized in Table 6-9 and Table 6-10 of SCE's submittal, which are provided below.

Table 6-9
Calculated Dose Rates in Intake Conduit

Distance	50 ft	700 ft	1200 ft	1700 ft	2200 ft	2700 ft	3150 ft
Dose Rate mrem/hr	3.00E-06	2.65E-06	2.39E-06	2.12E-06	1.85E-06	1.58E-06	1.34E-06

Table 6-10
Calculated Dose Rates in Discharge Conduit

Distance	50 ft	700 ft	1200 ft	1700 ft	2200 ft	2550 ft
Dose Rate mrem/hr	4.06E-03	3.14E-03	2.42E-03	1.71E-03	9.96E-04	4.97E-04

The calculation for the annual Deep Dose Equivalent (DDE) to the hypothetical diver in the critical group exposure scenario assumes entering six of the eleven openings into the two conduits (six intermediate points and the terminal structure for the intake conduit, and five intermediate points and the terminal structure for the discharge conduit). Assuming the diver stays for 30 minutes on each dive, for each day of the 173 days of the lobster season, the DDE can be calculated using the average dose rate at these eleven points. The 50 foot dose rate points are not included in the DDE calculation because the onshore access to each conduit is plugged with concrete and is 650 feet from the nearest opening, which is too far for a lobster diver to go on a standard dive. An average dose rate is used because there is no reason for one location to be more attractive than another for lobster habitability.

Given the above assumptions, the equation for the calculation of the annual DDE becomes:

$$mrem\ /\ year\ =\ \frac{7.98E\ -\ 4\ mr}{hr}\ X\ \frac{0.5\ hr}{dive}\ X\ \frac{6\ dives}{day}\ X\ \frac{173\ days}{year}$$

The result of this calculation is an annual DDE to the hypothetical diver of 4.14 E-1 mrem / yr.

4.4.2.3 Total Doses

The calculation for the Total Effective Dose Equivalent (TEDE) to the hypothetical diver in the critical group exposure scenario is calculated as the sum of internal and external exposure for all licensed isotopes identified by sample analysis using the following formula:

$$TEDE\ =\ U_a \sum_i C_i D_i\ +\ EDE$$

Where:

- TEDE is the annual Total Effective Dose Equivalent in millirem per year
- U_a is the usage factor; i.e., the average annual consumption rate of fish and seafood in kilograms per year from Table E-4, "Recommended Values for U_{ap} to be Used for the Average Individual In Lieu of Site-Specific Data," in RG 1.109
- C_i is the specific activity of each isotope in the seafood in picoCuries per kilogram
- D_i is the dose conversion factor from Table 2.2, "Exposure-to-Dose Conversion Factors for Ingestion," of FGR-11 for isotope i
- EDE is the calculated external annual exposure in millirem per year

As summarized above, the maximum Committed Effective Dose Equivalent (CEDE) for internal exposure from the ingestion of lobster, scallops, and mussels taken from inside the SONGS-1 CWS conduits is 7.96 E-2 mrem / yr. The calculated annual DDE to the hypothetical diver is 4.14 E-1 mrem / yr. The TEDE is the sum of the DDE and the CEDE, and is therefore equal to 4.94 E-1 mrem / yr from all pathways. This calculated TEDE of approximately 0.5 mrem / yr is far below the NRC's limit of 25 mrem / yr for release for unrestricted use, as stated in 10 CFR 20.1402. The calculated TEDE dose results are summarized in Table 6-11 of SCE's submittal, which is provided below.

Table 6-11
Calculated TEDE

Total Effective Dose Equivalent mrem/year	=	Deep Dose Equivalent mrem/year	+	Committed Effective Dose Equivalent mrem/year
4.94E-1	=	4.14E-1	+	7.96E-2

4.5 NRC Evaluation of the Circulating Water System Surveys

The licensee conducted a series of sample analyses using various media to represent the distribution of radionuclide contaminants, and their decay-corrected distribution, over the area planned for release. The isotopes of interest considered for dose calculations included all isotopes identified in the evaluations conducted to comply with the requirements of 10 CFR Part 61. All gamma-emitting isotopes from the 10 CFR Part 61 analyses were considered in the direct exposure dose calculations. The direct exposure dose models considered the radioactive material in sediment, imbedded in the concrete conduits, and materials both loosely and tightly adhered to the internal surface of the conduits. A sensitivity analysis demonstrated that, in all cases, the residual radioactive material present in sediment dominated the dose rate.

The NRC staff evaluated the licensee's analyses to verify compliance with 10 CFR 20.1402 using the guidance for evaluation of dose modeling found in Draft NUREG-1836, "Standard Review Plan for Releasing Part of a Reactor Facility or Site for Unrestricted Use Before Approval of the License Termination Plan" (ADAMS Accession No. ML063170151) and Volume 2, "Characterization, Survey, and Determination of Radiological Criteria," of NUREG-1757, "Consolidated Decommissioning Guidance" (ADAMS Accession No. ML063000252). In lieu of using DCGLs that demonstrate compliance with the criteria for unrestricted release in 10 CFR 20.1402, the licensee developed site-specific dose models for external and internal exposures to the average member of a critical group. Per NUREG-1757, the NRC staff reviewed the following information provided by the licensee: (1) source term(s); (2) exposure scenario(s); (3) conceptual and mathematical model(s); (4) uncertainty; and (5) ALARA.

As described previously, the licensee used divers to collect samples from the intake and discharge conduit structures. The samples were collected, in part, to demonstrate that the areas were sufficiently free of radioactive material to move forward with a partial site release for unrestricted use. The samples collected included concrete, sediment, wall scrapings, and biological material from inside the intake and discharge conduit structures. The primary radionuclides of concern were Cobalt-60 and Cesium-137.

During a routine inspection in March 2007 (NRC Inspection Report 050-00206/07-007; ADAMS Accession No. ML070940069), the NRC conducted a confirmatory survey of the intake and outfall structures of the onshore portion of the SONGS-1 CWS in order to independently measure the radiological condition of the structures. In addition, the inspectors split nine concrete, sediment, and biological samples previously collected by the licensee in the offshore portions of the SONGS-1 CWS. Both the licensee's contract laboratory and the Oak Ridge Institute for Science and Education (ORISE) analyzed the samples on behalf of the NRC. Two sets of samples were analyzed for gamma-emitting radionuclides. Selected samples were also analyzed for tritium concentrations.

The results of the NRC's and licensee's split sample analyses are presented in the table from the NRC Inspection Report, which is also provided below. The sample results indicate agreement between ORISE and the licensee's laboratories. Accordingly, the licensee's laboratory was determined to be technically capable of accurately detecting and quantifying radioactive material present in site samples.

Table: Inspection Report 050-00206/07-007 Split Sampling Results

Sample Description	NRC's Results (pCi/g)		Licensee's Results (pCi/g)	
Intake-CL-09 Sediment	Cesium-137	0.16 ± 0.04	Cesium-137	0.133 ± 0.026
	Cobalt-60	0.02 ± 0.03	Cobalt-60	0.015 ± 0.013
	Tritium	-1.5 ± 2.8	Tritium	-0.5 ± 1.0
Discharge-CC-06 Concrete	Cesium-137	0.07 ± 0.04	Cesium-137	0.056 ± 0.015
	Cobalt-60	0.05 ± 0.03	Cobalt-60	0.086 ± 0.012
	Tritium	-1.5 ± 2.7	Tritium	not measured
Discharge-BIO-5 Biological	Cesium-137	0.00 ± 0.03	Cesium-137	0.036 ± 0.038
	Cobalt-60	0.05 ± 0.03	Cobalt-60	0.012 ± 0.033
	Tritium	2 ± 19	Tritium	not measured

The licensee reports that it has analyzed samples of sediment, wall scrapings, and concrete from both the internal and external intake and discharge conduits, as well as the terminal structures. The licensee's analyses indicate that only Cobalt-60, Cesium-134, Cesium-137, Europium-152, Europium-154, Manganese-54, Iridium-192, Sodium-22, and Niobium-94 are present at levels greater than the lower limit of detection and distinguishable from naturally occurring background or medical isotope concentrations.

In addition, the licensee reports that it has analyzed samples of marine crustaceans and vertebrate fish collected within approximately the first 30 meters (100 feet) of conduit at both the onshore and offshore ends of the circulating water structures. SCE used this data to estimate the concentration of activity in these organisms that could result in internal ingestion exposures to the average member of the critical group. The licensee's analyses indicate that only tritium, Strontium-90, and Europium-154 are present at levels greater than the lower limit of detection and distinguishable from naturally occurring background or medical isotope concentrations. The NRC staff review of the licensee's sample characterization data indicated that Cesium-137 is also reported to be present in mussel samples collected in the onshore portion of the discharge conduit. The licensee did not provide a clear rationale for exclusion of this isotope from the source term. However, NRC staff does not expect the inclusion of Cesium-137 in ingestion exposure calculations to have a significant impact on the demonstration of compliance with the criteria specified in 10 CFR 20.1402.

The NRC staff calculation of the external dose using all reported residual radioactivity samples (i.e., sediment, scrapings, and concrete) collected from the conduits results in a dose of only 0.520 mrem / yr. As such, the NRC staff concludes that SCE is using a reasonable approach as concentrations would be expected to decrease exponentially due to removal processes (e.g., sorption to sediments or concrete) along the length of the conduits, resulting in lower average concentrations along the length of the conduits than those linearly interpolated by the licensee. The NRC staff also considered an alternative analysis of the potential effect of re-suspended sediments within the conduits from potential diver disturbance. The alternative NRC staff analyses used MicroShield©, Version 5.05, to estimate external dose rates for approximately 3 cm to 15 cm (1 in. to 6 in.) of re-suspended sediments. The resultant dose rates are less than or approximately equal to the sediment dose rates calculated by the licensee. Therefore, the NRC staff considers the licensee's parameters and models for external exposures reasonable.

The NRC staff notes that the seafood ingestion rates reported by RG 1.109 are based on U.S. Department of Agriculture Agricultural Economic Report 138, which estimated national per capita food consumption rates. The licensee did not provide a justification for the applicability of a nationally averaged seafood ingestion rate to the proposed lobster diver critical group. The licensee evaluated, though does not report, the effect of increased seafood ingestion rates on the estimated internal dose using a maximum exposed individual seafood ingestion rate from Table E-5, "Recommended Values for U_{ap} to be Used for the Maximum Exposed Individual In Lieu of Site-Specific Data," in RG 1.109. Based on these assessments, the licensee estimated internal doses of approximately 0.415 mrem / yr. The NRC staff does not expect larger consumption rates of contaminated seafood by the proposed critical group to have a significant impact on demonstration of compliance with the criteria specified in 10 CFR 20.1402. The NRC staff considers SCE's parameters, models, and calculations for internal exposures reasonable.

In Chapter 5 of SCE's submittal, the licensee reports the results of its analysis that residual radioactivity has been reduced to levels that are ALARA. The NRC staff considers the licensee's ALARA analysis reasonable.

Given the above discussion, the types of surveys and sampling methods described for SCE's survey efforts are acceptable. Based on its analyses, the NRC staff considers that the licensee has provided reasonable assurance that the proposed action is protective of the public health and safety. Therefore, the staff finds that the proposal to abandon in place the offshore subsurface structures of the San Onofre Nuclear Generating Station, Unit 1 Circulating Water System, and release for unrestricted use the leased parcel of the ocean bottom, will comply with the radiological criteria specified in 10 CFR 20.1402 and necessary for site release.

5.0 ENVIRONMENTAL CONSIDERATION

The NRC regulations require licensees to provide a supplement to the environmental report describing any new information or significant environmental changes associated with the licensee's proposed license termination activities. Chapter 7 of SCE's submittal updates the "Environmental Report – Post Operating License Stage, San Onofre Nuclear Generating Station, Unit 1, Facility License DPR-13" dated September 18, 2002. Therefore, Chapter 8 of SCE's submittal constitutes a supplement to the SONGS-1 Environmental Report, as required by 10 CFR 51.53(d) and 10 CFR 50.82(a)(9)(ii)(G).

Based on the information in Chapter 8, the licensee concluded that the environmental impacts associated with changes to the SONGS-1 decommissioning activities remain bounded by the previously issued NUREG-0856, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities." Under the provisions of 10 CFR 51.21, the NRC staff prepared an environmental assessment (EA) (74 FR 62605; November 30, 2009, at ADAMS Accession No. ML093010071) to determine the impacts of the proposed action on the environment. In the EA, the staff found that approval of the partial site release request would not cause any significant impacts to the human environment and is protective of human health. Therefore, the staff concluded a Finding of No Significant Impact.

The NRC staff also reviewed the information in SCE's request for SONGS-1, according to Section B.8 of NUREG-1700, "Standard Review Plan for Evaluating Nuclear Power Reactor License Termination Plans." Based on this review and the EA prepared by the NRC staff, the staff concludes that the licensee met the regulatory requirements.

6.0 STATE CONSULTATION

In accordance with the NRC regulations, the NRC staff notified the CSLC of the proposed issuance of the partial site release amendment. The CSLC submitted comments to the associated EA on October 26, 2009. The CSLC provided several editorial recommendations to clarify its requirements. The NRC staff incorporated the CSLC's comments in the revised EA.

7.0 CONCLUSION

The NRC staff has concluded, based on the considerations discussed above, that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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