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June 27, 2016

10 CFR 50.71

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Subject: **Docket No. 50-206**
Defueled Safety Analysis Report
San Onofre Nuclear Generating Station Unit 1

Reference: Letter from T.J. Palmisano (SCE) to U. S. Nuclear Regulatory Commission (Document Control Desk) dated July 1, 2014, Subject: Docket No. 50-206, Defueled Safety Analysis Report, San Onofre Nuclear Generating Station, Unit 1

Dear Sir or Madam:

In accordance with the requirements of 10 CFR 50.71(e), Southern California Edison (SCE) hereby submits the amended Defueled Safety Analysis Report (DSAR) for San Onofre Nuclear Generating Station Unit 1 (SONGS 1).

An entire DSAR update is being provided within 24 months following the last update (Reference). To denote the changes from the previous revision of each chapter a vertical change bar is located in the page margin adjacent to the revised information.

The entire submittal is publicly available, containing no proprietary, personal or safeguards information.

There are no commitments contained in this letter or its enclosures.

Should you have any questions or require additional information, please contact Mr. James A. Kay at (949) 368-7481.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 6/27/16

Sincerely,

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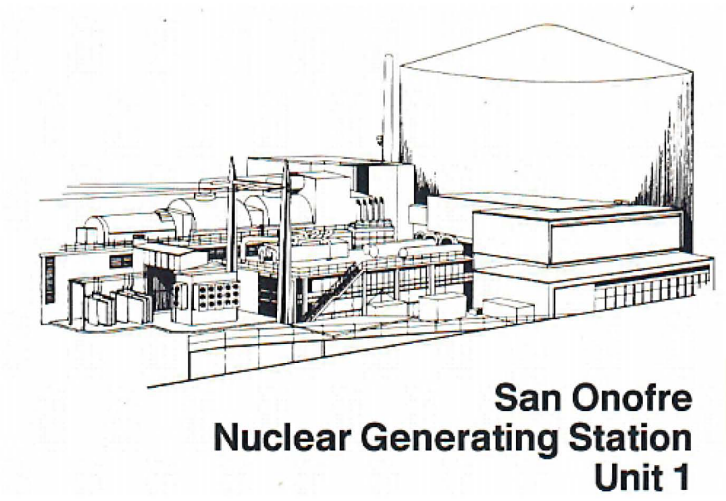
Enclosure: Defueled Safety Analysis Report SONGS 1

cc: M. Dapas, Regional Administrator, NRC Region IV
M. G. Vaaler, NRC Project Manager, SONGS 1

Defueled Safety Analysis Report

San Onofre Nuclear Generating Station
Unit 1

Amended June 2016



Defueled Safety Analysis Report

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1.0 INTRODUCTION

1.1 EXECUTIVE SUMMARY

The San Onofre Nuclear Generating Station (SONGS) was licensed for three units:

San Onofre Unit 1 (SONGS 1) commercially generated power from January 1, 1968 until November 30, 1992. SONGS 1 was permanently defueled on March 6, 1993 and was maintained in SAFSTOR until the Decommissioning Program was initiated in June, 1999.

San Onofre Unit 2 (SONGS 2) last operated on January 9, 2012, and San Onofre Unit 3 (SONGS 3) last operated on January 31, 2012. The permanent shutdown of SONGS Units 2 and 3 was announced in June of 2013. Currently these two units are undergoing decommissioning as described in the Units 2 and 3 Post-Shutdown Decommissioning Activities Report (PSDAR), dated September 23, 2014 (refer to dockets 50-361 and 50-362).

The SONGS 1 Defueled Safety Analysis Report (DSAR) updates the Current Licensing Basis (CLB) for the existing site configuration and is a reference available for reviewing decommissioning actions and plans affecting the SONGS 1 area of the site. The SONGS 1 DSAR is updated every 24 months as required by 10 CFR 50.71(e)(4) under “Maintenance of Records, Making of Reports,” as referenced to 10 CFR 50.82(a)(1) under “Termination of License.”

The NRC provided guidance in Regulatory Guide 1.184, “Decommissioning of Nuclear Power Reactors,” for updating the Final Safety Analysis Report (FSAR) of a permanently shutdown facility. Section 8.2, "Maintenance of the Final Safety Analysis Report" identifies those sections which should continue to be updated periodically. Those sections were used in the preparation of the DSAR. The information provided in the specific sections of the DSAR was taken from various design and licensing basis documents including the Unit 1 UFSAR, Unit 1 Updated Fire Hazard Analysis (UFHA), Unit 1 PSDAR, and the Unit 1 Permanently Defueled Technical Specifications (PDTS).

Current Plant Status:

- All of the above ground structures associated with the SONGS 1 operating plant have been demolished and removed.
- SONGS 1 spent fuel assemblies previously stored under water in the Spent Fuel Pools (SFP) have been transferred to dry cask storage in the Independent Spent Fuel Storage Installation (ISFSI) located on the site of the former Unit 1 operating plant.
- The ISFSI is being expanded to store the remaining spent fuel from SONGS Units 2 & 3.

1.1.1 ORGANIZATION OF THE DEFUELED SAFETY ANALYSIS REPORT

The SONGS 1 DSAR is organized into the following main sections:

- INTRODUCTION
- SITE CHARACTERISTICS
- FACILITY DESCRIPTION
    - Facility Description
    - Fuel Storage Facility
    - Sphere
    - Reactor Auxiliary Building
    - Intake Structure
    - Turbine Building
    - Electrical System
    - Monitoring and Communications
    - Fire Protection
- LICENSEE ORGANIZATION AND CONDUCT OF OPERATIONS
- RADIOACTIVE WASTE MANAGEMENT
- RADIATION PROTECTION
- ACCIDENT ANALYSIS

1.1.2 BACKGROUND

The area formerly occupied by the SONGS Unit 1 operating plant has been designated as the North Industrial Area (NIA). The NIA contains the ISFSI and is undergoing an expansion to store additional spent fuel assemblies from Units 2 and 3. Demolition of the above ground structures and decommissioning within the NIA was completed in 2008. In addition to the ISFSI, the NIA contains the Unit 1 Reactor Vessel Storage Module, site utilities (electrical power distribution panel and water), a water storage tank (MT-351), and portable fire pump (MP-1065).

The SONGS 1 Updated Final Safety Analysis Report (UFSAR) was prepared for the operating plant license and was written to comply with the regulatory requirements applicable at that time. The UFSAR was organized around the performance of the fuel, the reactor, the reactor coolant system, and the associated support and safety systems.

The DSAR, which replaces the UFSAR, was created to describe the plant and to maintain the licensing basis current with the decommissioning status. Many of the topics and analyses discussed in the UFSAR, particularly those concerned with the adequacy for power operation, do not apply to decommissioning. The process of eliminating inapplicable information began with the original DSAR and has been carried forth by the subsequent revisions. The information that remains provides the basis for the 50.59 evaluation process during future dismantlement and demolition activities within the Unit 1 NIA.

1.2 SITE DESCRIPTION

San Onofre Nuclear Generating Station, Unit 1 (SONGS 1) is part of a three unit facility located on the coast of Southern California, in San Diego County. The site is located entirely within the Camp Pendleton Marine Corps Base under an easement granted by the United States Government. Unit 1 is northwest of, and adjacent to, Units 2 and 3. Figure 1-1 shows the general location of the station.

SONGS 1 is jointly owned by Southern California Edison Company (SCE) and San Diego Gas and Electric Company (SDG&E). SCE is the primary owner and operator of the facility. The use of the property on which the three SONGS units are built was granted to SCE and SDG&E until May 12, 2024. Unit 1 went critical on June 14, 1967 and entered commercial operation on January 1, 1968. As a result of an agreement with the California Public Utilities Commission (CPUC), operation of SONGS 1 was permanently discontinued on November 30, 1992, at the end of Fuel Cycle No. 11. The reactor was defueled and SONGS 1 remained in SAFSTOR until decommissioning was started in June of 1999. Spent fuel assemblies previously stored in the Unit 1 spent fuel pool were transferred to the ISFSI as of August 31, 2004, and the remaining Unit 1 spent fuel assemblies stored in the Units 2 and 3 spent fuel pools were transferred to the ISFSI as of June 28, 2005. During the period from 1972 to 1980, 270 SONGS 1 spent fuel assemblies were transported to the GE – Hitachi facility in Morris, Illinois. The SONGS 1 operating plant has been dismantled and demolished in accordance with the Decommissioning Program requirements.

The station site is located in a sparsely populated area. It is surrounded principally by unused land and the natural exclusion provided by the Marine Corps reservation. The topography surrounding the site consists of a gently sloping coastal plain, terminated abruptly at the shoreline by high sea cliffs. Excavation of the bluff at the shoreline provided a foundation for the station of extremely dense sand. From seismic, geologic, and foundation considerations, this formation is adequate to support the structural loads. The site enjoys favorable meteorological conditions, except for relatively few occasions, with daily land and sea breezes. Investigations in meteorology, oceanography, and environmental monitoring have been conducted to verify the environmental characteristics of the site.

1.3 FACILITY DESCRIPTION

Three nuclear generating units and supporting facilities are located on the SONGS site. Figure 2-1 shows the original layout of the SONGS Site Plan. SONGS 1 was comprised of a Westinghouse three-loop, 450 MWe Nuclear Steam Supply System (NSSS) and turbine-generator.

The major structures on the SONGS 1 portion of the site were the Containment Sphere, Turbine Building, Fuel Storage Facility, Reactor Auxiliary Building, and the Intake and Discharge Structure. These structures and their foundations have been removed or abandoned as described in Facility Description section. The North Industrial Area of Unit 1 may be used for the temporary staging of large equipment from Units 2 and 3 as it is decontaminated or prepared for shipment to an off-site facility for treatment and/or disposal. The NIA also has on-going construction work for the ISFSI. The decommissioned general arrangement is shown on drawing 40028.

1.4 REGULATORY HISTORY AND MAJOR PROJECTS

SONGS 1 operation was authorized by a Provisional Operating License issued on March 27, 1967, by the NRC's predecessor, the Atomic Energy Commission (AEC). Initial criticality was achieved on June 14, 1967, and SONGS 1 began commercial operation on January 1, 1968. The Environmental Report and the Final Environmental Statement (FES) were issued in accordance with applicable regulations implementing the requirements of the National Environmental Policy Act of 1969.

On July 28, 1970, following two extensions to the Provisional Operating License, SCE submitted an application to convert the Provisional Operating License to a Full-Term Operating License (FTOL or simply the "Operating License"). In connection with this application, SCE provided, in February, 1986, and August, 1991, updated information relevant to the findings and conclusions contained in the FES. Based on the updated information, the NRC issued an Environmental Assessment in September, 1991, which updated the FES. This was followed by issuance of the Facility Operating License (OL) on September 26, 1991. The license authorized SONGS 1 operation until March 2, 2004, 40 years after the date of issuance of the Construction Permit.

The long delay (from July, 1970, to September, 1991) in issuing the OL was caused by the NRC (and AEC) re-evaluation of the SONGS 1 design in light of industry operating experience and the updated design standards which were established after the plant was constructed. SONGS 1 operated under a Provisional Operating License since March 27, 1967, as authorized by 10 CFR 2.109, until the OL was issued.

As a result of an agreement with the California Public Utilities Commission (CPUC), SONGS 1 was permanently shut down on November 30, 1992, at the end of Fuel Cycle No. 11. On April 2, 1992, SCE submitted an application to the NRC to modify the OL to an Operating (Possession Only) License (POL). The NRC issued the license amendment on October 23, 1992. The POL became effective on March 9, 1993, after SCE provided certification that operation of the reactor had been permanently terminated and all fuel from the SONGS 1 core was stored in the plant's spent fuel pool.

The SONGS 1 Post-Shutdown Decommissioning Activities Report (PSDAR), dated September 11, 1998, outlined the plan to place SONGS 1 in SAFSTOR. SCE originally intended to decommission SONGS 1 along with Units 2 and 3, after the operating licenses for Units 2 and 3 had expired in 2013. The NRC was subsequently advised in the PSDAR, dated December 15, 1998, that SCE intended to start decommissioning in June, 1999, a significantly earlier date than previously indicated.

1.5 DECOMMISSIONING STATUS

As described in the PSDAR, SONGS 1 is undergoing decommissioning to return the site to a condition suitable for general use. All systems, structures and components and their foundations have been removed or abandoned as described in Section 3. Soil remediation, compaction, and grading of the NIA site has been completed and the ISFSI expansion is currently in progress.

1.6 DSAR BASIS AND DESCRIPTION

The SONGS 1 DSAR provides an updated Licensing Basis for the remaining decommissioning activities.

The SONGS 1 facility is administered under the Permanently Defueled Technical Specifications (PDTS), issued by Amendment No. 155 dated December 28, 1993, and modified by subsequent amendments. The SONGS Operations Division currently has the responsibility for oversight of the North Industrial Area and components previously associated with SONGS Unit 1. The remaining decommissioning activities, such as conducting radiological surveys, are performed under applicable site-wide programs.

The DSAR format was chosen to simplify the preparation of 50.59 reviews and evaluations for dismantlement of the facility and the completion of the decommissioning process. The dismantlement of SONGS 1 proceeded by removing systems and components in an order determined by their location rather than by system function and operation. Therefore, the descriptions of plant equipment and decommissioning activities in the DSAR were organized by their location within the facility, rather than by system.

Many of the topics and analyses discussed in the UFSAR, particularly those that demonstrated the technical adequacy for power operation, do not apply to decommissioning. The Facility Description sections were revised to retain information that would be useful for preparing dismantlement 50.59 evaluations under the 50.59 process, while eliminating obsolete information.

With all of the SONGS 1 above ground structures and components having been removed, many of the detailed Facility Description sections have been deleted. The initial DSAR Facility Description sections contained a description of the major systems and components that were in service for SAFSTOR, physical descriptions of major abandoned components, and design evaluations addressing the interactions between the plant components and decommissioning activities. The descriptions provided for components which were no longer important to safety were intended to aid in understanding the past use of the components and for identifying possible safety hazards during dismantlement. Historical facility descriptions may be obtained from previous revisions of the SONGS 1 DSAR and UFSAR.

1.6.1 DELETED

1.6.2 DELETED

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1.8 IDENTIFICATION OF AGENTS AND CONTRACTORS

1.8.1 OWNERS OF THE FACILITY AND HOLDERS OF THE OPERATING LICENSE

Sole owners of the facility and holders of the Possession Only License (POL) are:

Southern California Edison Company (SCE), and
San Diego Gas and Electric Company (SDG&E).

1.8.2 PROJECT MANAGER

SCE is the manager for the Decommissioning Project and is responsible for the technical adequacy of the design, modification, operation, and demolition activities at Unit 1.

1.8.3 DELETED

1.9 REFERENCES

1. Letter, J. O. Bradfute, U. S. Nuclear Regulatory Commission, to H. B. Ray, SCE, "Issuance of Amendment for the San Onofre Nuclear Generating Station, Unit No. 1 (TAC NO. M83123)," dated October 23, 1992

2. Letter, H. B. Ray, SCE, to Document Control Desk, U.S. Nuclear Regulatory Commission, "Amendment Application No. 211, Permanently Defueled Technical Specifications, San Onofre Nuclear Generating Station, SONGS 1," dated May 12, 1993

3. Letter, H. B. Ray, SCE, to Document Control Desk, U.S. Nuclear Regulatory Commission, "Amendment Application No. 203, San Onofre Nuclear Generating Station, SONGS 1," dated April 2, 1992

4. Letter, R. M. Rosenblum, SCE, to Document Control Desk, U.S. Nuclear Regulatory Commission, "Operation and Surveillance Requirements for Permanently Defueled Condition for San Onofre Nuclear Generating Station, SONGS 1," dated September 21, 1992

5. Letter, W. C. Marsh, SCE, to Document Control Desk, U.S. Nuclear Regulatory Commission, "Implementation Schedule for Operation and Surveillance Requirements for the Permanently Defueled Condition, San Onofre Nuclear Generating Station, SONGS 1," dated March 3, 1993

6. Letter, W. C. Marsh, SCE, to Document Control Desk, U.S. Nuclear Regulatory Commission, "Preliminary Decommissioning Plan, San Onofre Nuclear Generating Station, SONGS 1," dated December 1, 1992

7. Letter, Michael K. Webb (NRC), to Harold B. Ray (SCE), "Issuance of Amendment No. 155 to Facility Operating License No. DPR-13, San Onofre Nuclear Generating Station Unit, No. 1, Permanently Defueled Technical Specifications (TAC No. M86377)," December 28, 1993

8. Physical Security Plan, San Onofre Nuclear Generating Station Units 1, 2, and 3, Southern California Edison (Safeguards Information Withheld from Public Disclosure in Accordance with 10CFR73.21)

9. Post-Shutdown Decommissioning Activities Report (PSDAR) for SONGS 1, December 15, 1998

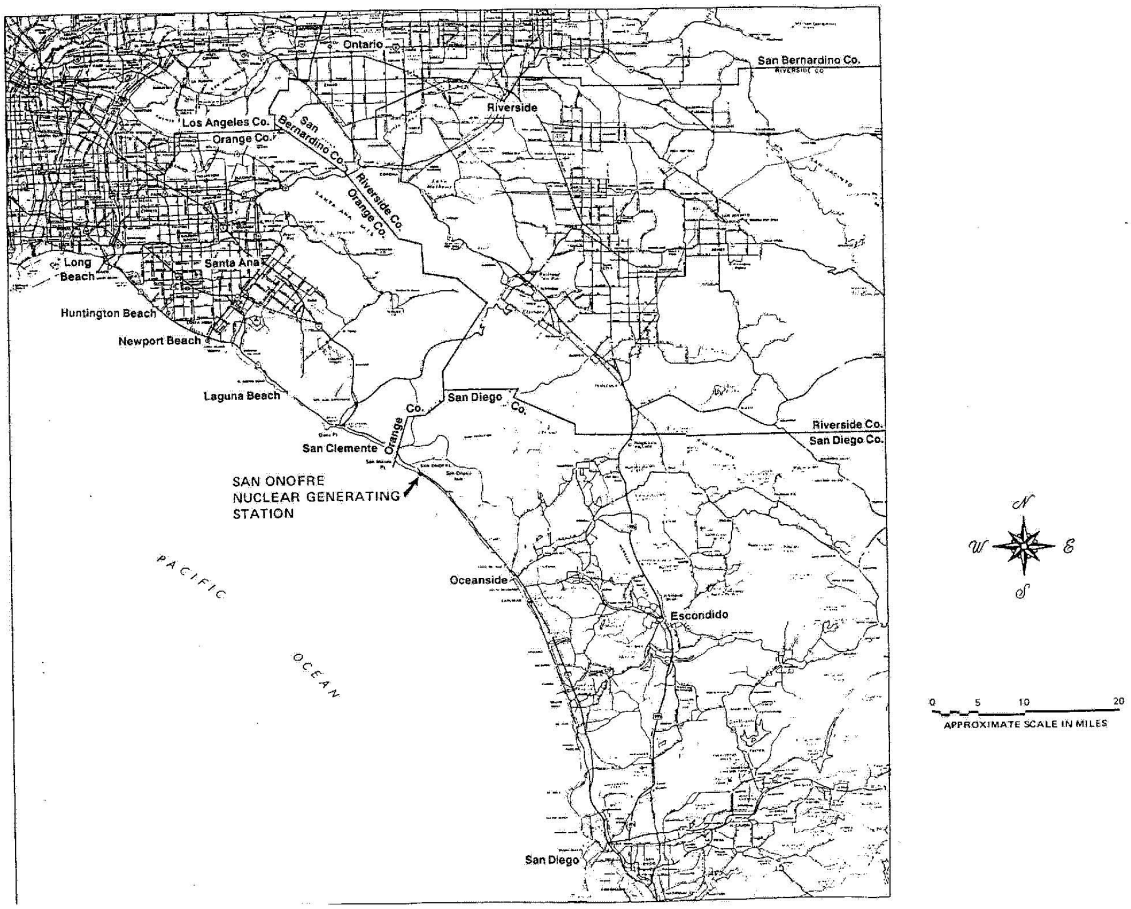
10. "San Onofre Generating Station Unit 1, Updated Final Safety and Analysis Report," Docket 50-206

11. Regulatory Guide 1.184, “Decommissioning of Nuclear Power Reactors,” dated June 1997

12. Letter, Drew Holland (U.S. Nuclear Regulatory Commission) to H. B. Ray (SCE), “Spent Fuel Pool Plant Conditions During Decommissioning, San Onofre Nuclear Generating Station, SONGS 1, (TAC No. MB0405, Amendment Application No. 217),” dated October 30, 2001 (NRC Amendment No. 160)

13. “Permanently Defueled Technical Specifications,” Amendment No. 155 to License No. DPR-13, Issued December 28, 1993

14. “Permanently Defueled Technical Specifications,” Amendment No. 163 to License No. DPR-13, Issued September 22, 2004



SAN ONOFRE NUCLEAR GENERATING STATION Unit 1 Defueled Safety Analysis Report
General Site Area
Figure 1-1

SONGS Unit 1 DSAR

Figure 1-2

North Industrial Area
General Arrangement

See Drawing 40028

2.0 SITE CHARACTERISTICS

This section describes the San Onofre site, and the location of the SONGS 1 facility. Descriptions are provided of the site characteristics, geography and demographics, the exclusion area, low population zone, and development of the atmospheric dispersion factors.

Hydrological, meteorological and some population data have been moved to Appendix A, Historical Information. This information and its impact to the facility design is not expected to change during Decommissioning (through license termination).

Changes to the Site Characteristics section are no longer required.

2.1 GEOGRAPHY AND DEMOGRAPHY

2.1.1 SITE LOCATION AND DESCRIPTION

2.1.1.1 Specification of Location

The SONGS site is located on the coast of Southern California in San Diego County, approximately 62 miles southeast of Los Angeles and 51 miles northwest of San Diego. The site is located entirely within the boundaries of the United States Marine Corps Base, Camp Pendleton, California, near the northeast end of its 18-mile shoreline.

The coordinates for SONGS 1 are latitude 33°22'10" N and longitude 117°33'30"W.

2.1.1.2 Site Area Map

The plant property line, which is also the site boundary, and the location of the original major structures of the facilities, is delineated in Figure 2-1. The site, comprising 83.63 acres, is about 4500 feet long and 800 feet wide. The SONGS 1 power block was located northwest of Units 2 and 3, occupies 11.7 acres. The SONGS 2 and 3 power block occupies 19.5 acres. A spur of the Burlington Northern and Santa Fe Railway line extends into the site area.

The SONGS site exclusion area is a common area for SONGS 1, 2, and 3 and is roughly formed by two semicircles with radii of 1967.5 feet each, centered on the SONGS 2 containment and a point 134 feet southwest of the SONGS 3 containment. The minimum exclusion area distance for SONGS 1 is 996 feet (282 meters) measured from the center of Unit 1 containment northwestward to the nearest point on the exclusion area boundary. The exclusion area boundary is delineated in Figure 2-2. At the northwest and southeast site boundaries, the exclusion area is tangential to, but does not exceed, the site boundary. There are no industrial, commercial, institutional, or residential structures within the exclusion area boundary.

The Pacific Ocean is located immediately west of the site and traverses the seaward side of the exclusion area. The San Onofre State Beach includes sections of the coast on both sides of the site. Access to open beach areas up and down the coast from the exclusion area is provided by a walkway (the beach passageway) adjacent to the SONGS 1, 2, and 3 seawall. The passageway extends the 2200-foot length of the seawall and is bounded on the seaward side by a concrete wall extending approximately three (3) feet above the passageway surface.

A typical cross-section through the beach passageway is shown in Figure 2-3. The passageway is 15 feet in total width with a hard surface which can accommodate pedestrian traffic only. Two removable vehicle barriers are installed along the beach passageway (one at the northwest corner of Unit 2 boundary and another at the southwest corner of Unit 3 boundary) as part of SONGS security enhancements following NRC's order issued on April 29, 2003 to upgrade the plant's security. A 3-foot wide, 20-foot long removable pedestrian bridge is also installed along the passageway at the intake structure area of Units 2 and 3 to permit pedestrian access when the saltwater cooling system of Units 2 and 3 is discharging to the beach, during which the passageway will be flooded. The seaward side of the walkway is formed by a concrete retaining wall which is protected by riprap in the event of infrequent beach erosion caused by wave action.

Old Highway 101 is immediately adjacent to the east boundary line of the site. The highway is currently being used for access the south end of the State Beach. The Burlington Northern and Santa Fe Railway right of way is east of Highway 101. Interstate Highway 5 is adjacent to the railroad right of way.

2.1.1.3 Boundaries for Establishing Effluent Release Limits

The site-restricted area defined for the purpose of establishing effluent release limits coincides with the exclusion area boundary as shown in Figure 2-2. The procedures for control of individual access and a description of the boundary are presented in Section 2.1.2. The Offsite Dose Calculation Manual (SO123-ODCM) describes the administrative controls and calculation methodology applied to maintain effluent releases within regulatory limits.

2.1.2 EXCLUSION AREA AUTHORITY AND CONTROL

2.1.2.1 Authority

The applicant's authority to control all activities within the exclusion area was acquired by grant of easement from the United States of America made by the Secretary of the Navy pursuant to the authority of Public Law 88-82. This easement is recorded in the official records of the Recorder of San Diego County, California, on page 85887, Series 5, Book 1964. In order to remove any ambiguities contained in the original grant of easement with respect to the applicant's authority to control activities in the exclusion area, an amendment to the grant of easement was executed on September 18, 1975, and is reproduced below, in part:

> "In order to protect the public health and safety, and in accordance with the rules, regulations and requirements of the United States Nuclear Regulatory Commission, successor to the United States Atomic Energy Commission, applicable to the Nuclear Station, the Grantees may determine all activities including exclusion or removal of personnel and property from such exclusion area as is established from time to time by or with the approval of the United States Nuclear Regulatory Commission and is located within the lands described in Exhibit B. Subject to the foregoing, such exclusion area may be used by the Government, its successor or assigns, for military operations (provided same do not endanger operation of the Nuclear Station), agricultural, recreational and such other uses as may be compatible with operation of the Nuclear Station, provided that any and all uses of the exclusion area shall be in accordance with and subject to the rules, regulations and requirements of the United States Nuclear Regulatory Commission applicable to the Nuclear Station, and further provided that no significant hazards to the public health and safety shall result from any such uses."

This amendment to the grant of easement expires on May 12, 2024.

All mineral rights in the land portion of the exclusion area are held by the United States Government.

The Pacific Ocean, Interstate Highway 5 (San Diego Freeway), old U.S. Highway 101, the Burlington Northern and Santa Fe Railway right-of-way, and the beach passageway constitute traverses of the site exclusion area as allowed by 10 CFR 100.3(a).

2.1.2.2 Control of Activities Unrelated to Plant Operation

Recreational activities, such as sunbathing or picnicking, are not permitted within the landward portion of the exclusion area (the area landward of the contour of mean high tide). The seaward portion of the exclusion area (the area seaward of the contour of mean high tide) may be occupied by small numbers of people for passageway transit between the public beach areas upcoast and downcoast from the plant. Additional small numbers of people may be anticipated to occasionally be in the water.

Transient access to an approximately 5-acre area at the southwest corner of the site for the purposes of viewing the scenic bluffs and barrancas is on an unimproved path.

Physical features and administrative controls, limit activities in the landward portion of the exclusion area. These features and controls minimize use of the seaward portion, limiting it to predominately passageway use.

The following enforcement measures ensure that use of the beach exclusion area, not related to operation of the facility, is minimized:

A. Beach areas within the exclusion area are subject to periodic surveillance by direct means.

B. If use of beach areas within the exclusion area is observed to be other than for transient use, an announcement may be made over the public address system, or other means, to request the movement of persons out of the exclusion area.

C. Should actions described above prove to be unsuccessful, plant security personnel may request the assistance of the California State Park Rangers or Camp Pendleton Military Police.

2.1.2.3 Arrangements for Traffic Control

The environs of the Site are the Pacific Ocean and the beach passageway on the west, the San Diego Freeway (Interstate 5), old U.S. Highway 101, and the Burlington Northern and Santa Fe railroad on the southeast and north.

In the event of an emergency, all traffic within the roadways and waterways is subject to control by agencies of state and local governments. Surveillance measures discussed in paragraph 2.1.2.2 will control the use of the beach passageway.

As documented in the SONGS Permanently Defueled Emergency Plan (PDEP), it is no longer possible for the radiological consequences of design basis accidents or other credible events at SONGS to exceed or approach the limits of the EPA Protective Action Guide beyond the site boundary or require offsite protective actions. Offsite agencies maintain the ability, under their emergency management plans, to implement offsite protective measures, if needed, in the unlikely event of a release due to a beyond design-basis event.

2.1.2.4 Abandonment or Relocation of Roads

There are no public roads that were subject to abandonment or relocation as a result of construction of SONGS 1, 2, and 3.

2.1.3 LOW POPULATION ZONE

The Low Population Zone (LPZ) was the area contained within 1.95 miles of the plant site. This distance was established to ensure that the guidelines of 10 CFR 100 were met with respect to the LPZ and the population center. As documented in the SONGS PDEP, with SONGS Unit 2 and 3 defueled, there are no longer any credible events for SONGS which would require an LPZ. The historical LPZ is shown in Figure 2-4 along with transportation routes that may be used by Marine Corps personnel for evacuation purposes.

Population estimates are included in Appendix A, Historical Information.

2.1.4 REFERENCES

1. Southern California Edison Company, “San Onofre Generating Station (SONGS) Permanently Defueled Emergency Plan,” Revision 1, Docket 50-361

2. Southern California Edison Company, Emergency Plan for San Onofre Nuclear Generation Station Units 1, 2, and 3

3. "San Onofre Generating Station Unit 1, Updated Final Safety and Analysis Report," Docket 50-206

2.2 HYDROLOGY AND METEOROLOGY

With the removal of the SONGS Unit 1 above ground structures, the details of the hydrology and atmospheric diffusion estimates are considered of historical interest and have been deleted from the DSAR. The hydrological and meteorological data and information developed and verified for the SONGS site are included in Appendix A, Historical Information. A general review has determined that this information, its basis, and its impact to the facility design will not change during Decommissioning (through license termination).

2.3 DELETED

TABLE 2-1

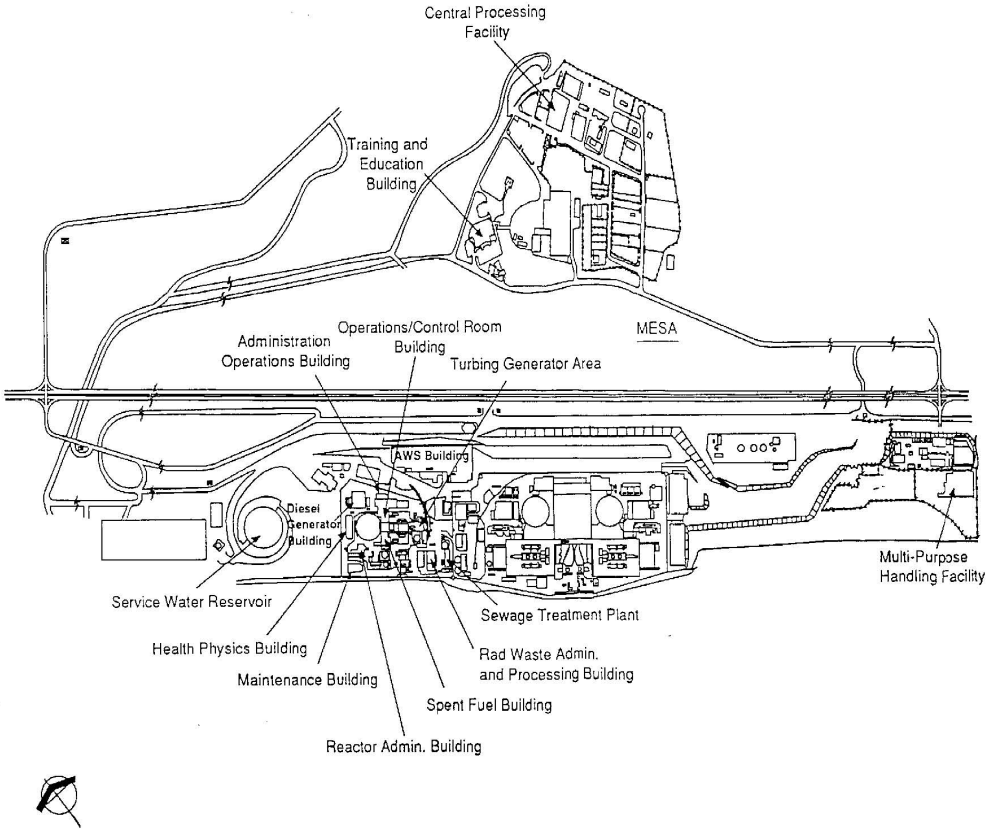
2.4 BIBLIOGRAPHY

1. Updated Final Safety Analysis Report, San Onofre Nuclear Generating Station, Unit 2 & 3, Southern California Edison Company, Dockets 50-361, 50-362.

2. U.S. Nuclear Regulatory Commission: Safety Evaluation Supporting Amendment No. 25 to Preliminary/Operating License No. DPR-13, Final Evaluation of Atmospheric Transport and Diffusion Characteristics for Accident Analysis - San Onofre (SEP Topic II-2.C), November 18, 1981.

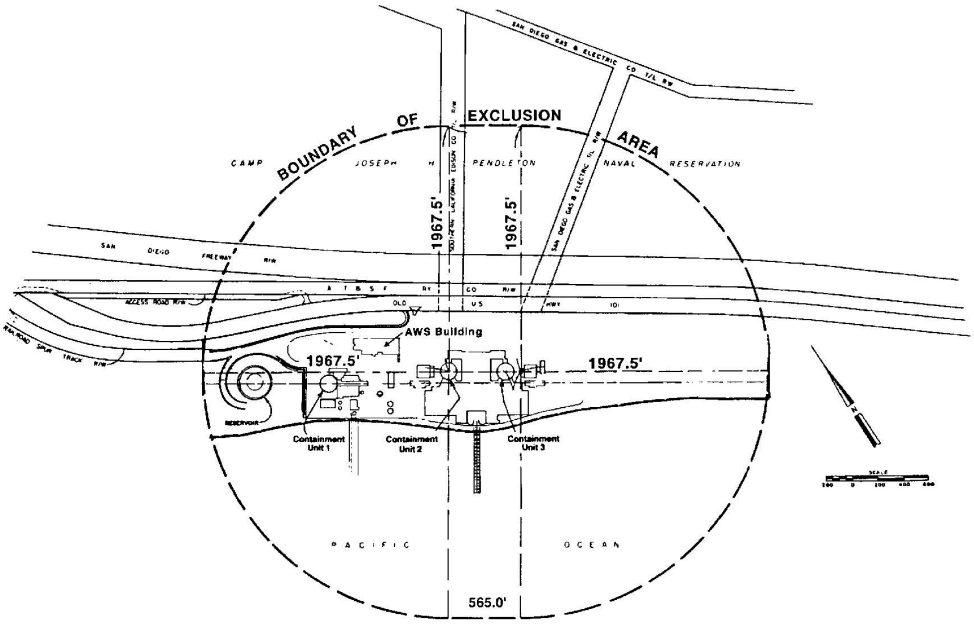
3. J.I.P. Jones and F. Pasquill, "An Experimental System for Directly Recording Statistics of the Intensity of Atmospheric Turbulence," Quarterly Journal Royal Meteorology Society, 85, 365, pp. 225-236, (1959).

4. M. Septoff, A. E. Mitchell, and L. H. Teuscher, Final Report of the Onshore Tracer Tests Conducted December 1976 Through March 1977 at the San Onofre Nuclear Generating Station. NUS-1927, NUS Corporation, Rockville, Maryland, (1977).

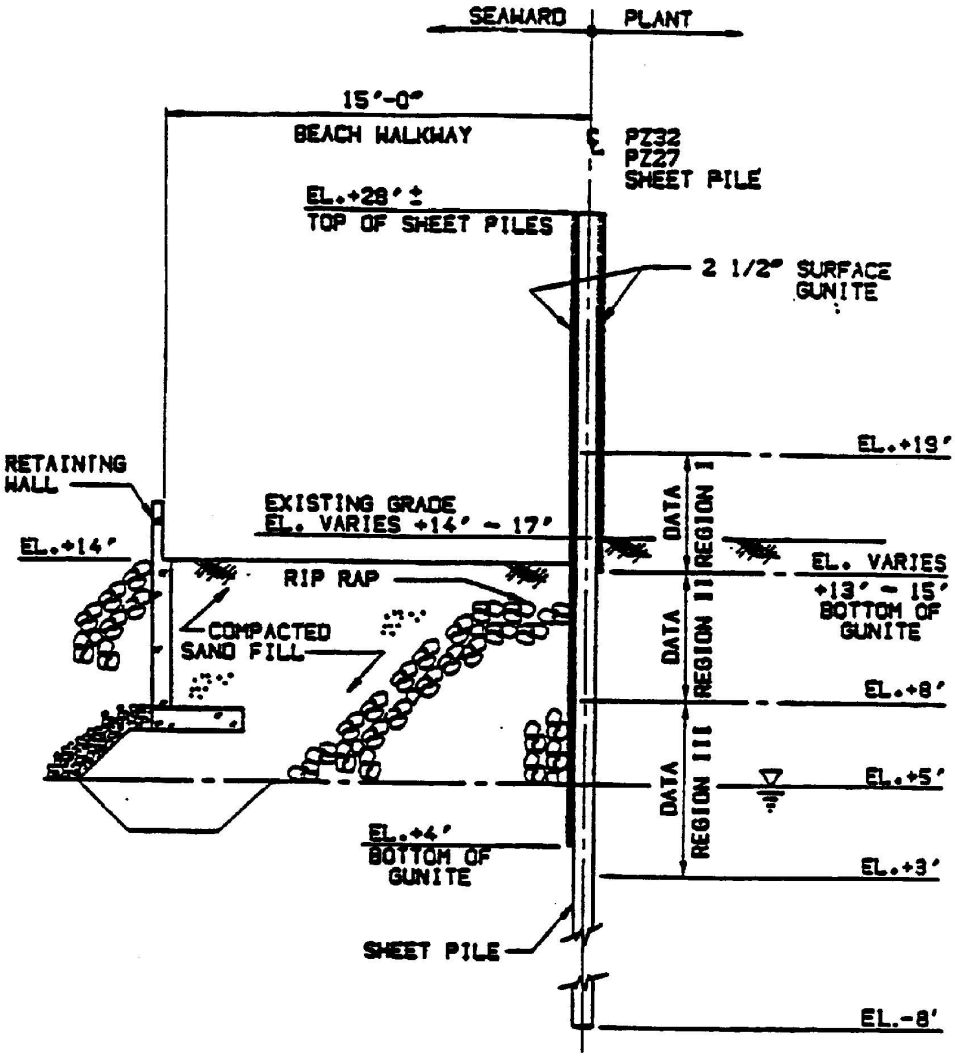


NOTE: The Site Plan for the operating plant is shown for reference and does not include changes made for Decommissioning.

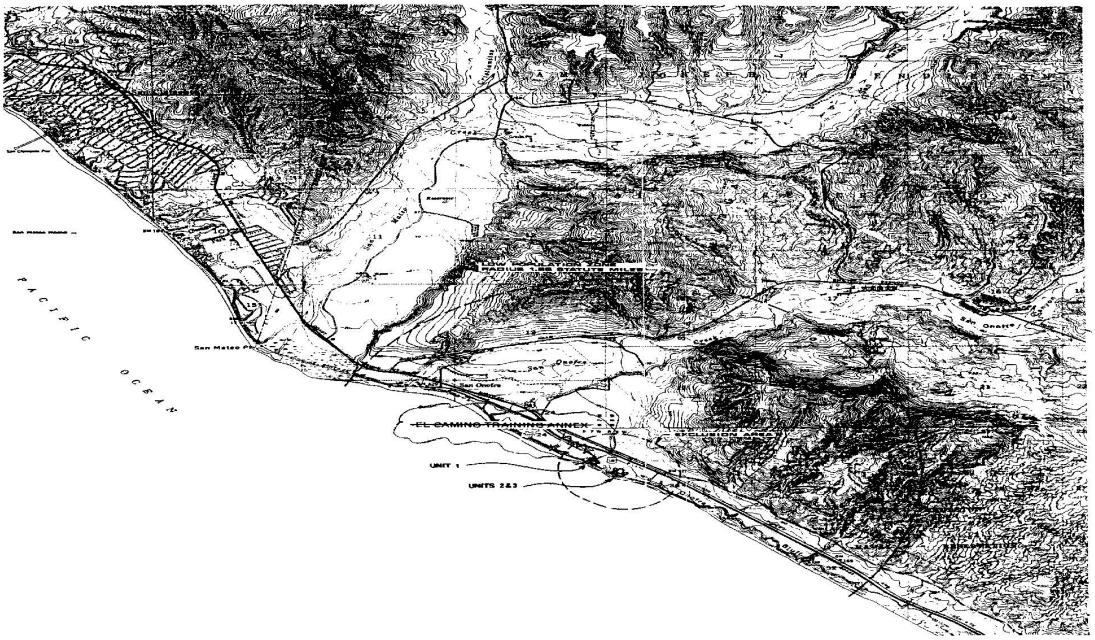
SAN ONOFRE NUCLEAR GENERATING STATION Unit 1 Defueled Safety Analysis Report
Site Plan (Operating Plant)
Figure 2-1



SAN ONOFRE NUCLEAR GENERATING STATION Unit 1 Defueled Safety Analysis Report
Exclusion Area Boundary
Figure 2-2



SAN ONOFRE NUCLEAR GENERATING STATION Unit 1 Defueled Safety Analysis Report
Beach Passageway and Seawall Section
Figure 2-3



SAN ONOFRE NUCLEAR GENERATING STATION Unit 1 Defueled Safety Analysis Report
Low Population Zone
Figure 2-4

3.0 FACILITY DESCRIPTION

3.1 FACILITY DESCRIPTION

3.1.1 INTRODUCTION

The above ground structures of the SONGS 1 facility have been removed, and the spent fuel is stored within the ISFSI located on the SONGS 1 site. The SONGS 1 site, currently renamed the North Industrial Area (NIA), is entering a period of construction to expand the ISFSI to accept additional Units 2 and 3 spent fuel assemblies. Open areas of the NIA site are available for equipment staging and as a work area supporting site decommissioning. The remaining decommissioning activities, such as conducting radiological surveys, are performed under applicable site-wide programs.

In the Facility Description section, the term "Unit 1 Facility" refers to the systems, structures, and components associated with the former operating plant. Descriptions referring to the ISFSI are included for clarity, as the ISFSI is located within the NIA and contains the Unit 1 spent fuel and Greater than Class C (GTCC) high level waste. The ISFSI facility was licensed under 10 CFR 72, consequently, specific details are not described in the SONGS 1 DSAR for the 10 CFR 50 operating plant. Refer to docket 72-41 for additional details of the ISFSI. Some of the ISFSI associated components and the remaining Unit 1 associated NIA utilities, such as fire protection piping, water and electrical supplies, have quality classifications currently assigned under the SONGS 1 Quality Classifications (Q-List) as described in Section 3.1.6.

The NIA yard sump collects groundwater runoff, tritium dewatering outflows, and the overflow from the site sewage treatment plant located in the NIA. The NIA yard sump, consisting of two pumps (P1056, P1060) and a radiation effluent monitor (2/3RT2101), is associated with Units 2/3 components as it directs effluents to the Unit 2 outfall. Additional details are available in the Units 2/3 UFSAR Section 11.5.2.1.4.14 "North Industrial Area Yard Sump Monitor 2/3RT2101," (docket 50-361).

The Facility Description sections summarize the former operating plant structures and locations for guiding and planning future decommissioning activities. The Facility Description section consists of five sections dedicated to specific buildings and three sections for plant-wide topics: Electrical Systems, Monitoring and Communications, and Fire Protection.

The Unit 1 NIA continues to transform as the ISFSI is expanded. The utilities within in the NIA are under the control of the Operations Division, the construction activities are directed by the Decommissioning Project Division, and the environmental and radiological monitoring requirements are under the oversight of the Radiation Protection, Chemistry, and Environmental Division. These divisions are responsible for maintaining the configuration and status of the NIA.

3.1.2 OPERATING STATUS

The Operations Division is responsible for maintaining the Unit 1, Units 2 and 3 facilities, and manages the fire brigade. The Decommissioning P&IDs, which are distinguished from the original P&IDS by a “DE” suffix, depict the current configuration of the North Industrial Area. The Decommissioning P&IDs are updated as required in accordance with site programs and procedures. Structures, systems and components that are Required to be Operational (RO) are identified on the Unit 1 Q-List (drawing. M-37560).

3.1.3 RADIOLOGICAL STATUS

The Radiation Protection, Chemistry, and Environmental Division incorporated the formerly separate Health Physics (HP) Division, and monitors and controls the radiological status of the Unit 1 NIA and decommissioning activities. The NIA no longer contains a restricted access Radiological Control Area (RCA) and is open to the site for general use.

3.1.4 EQUIPMENT REMOVAL STATUS

All systems, structures and components and their foundations have been removed or abandoned as described in sections 3.2 through 3.9. Soil remediation, compaction, and grading have been completed to prepare the NIA for general use and expansion of the ISFSI.

3.1.5 PLANT CONFIGURATION AT THE START OF DECOMMISSIONING

The physical layout of Unit 1 that existed prior to any dismantlement is shown in the following general arrangement drawings:

Drawing	Title
568700	General Arrangement - Plan of Elevation 35 ft - 6 in.
568701	General Arrangement - Plan of Elevation 14 ft - 0 in.
568702	General Arrangement Sections - Sheet 1.
568703	General Arrangement - Reactor Auxiliary Building and Intake Structure
568704	General Arrangement Sections - Sheet 2.

All of these historical drawings are listed for information reference only to aid in understanding the plant configuration prior to decommissioning and are available at the site.

3.1.6 QUALITY CLASSIFICATION OF STRUCTURES, SYSTEMS AND COMPONENTS

3.1.6.1 Quality Class Basis

The Structures, Systems and Components (SSC) in the SONGS 1 operating plant required for accident mitigation and safety, had a Quality Classification (QC) designation of Safety Related (SR), based on 10 CFR 100 “Reactor Site Criteria.” Other SSCs were assigned lesser quality classifications depending on their relative importance to the safety of the reactor. These included Non Safety Related--Fire Protection (NSRFP), Non Safety Related—Anticipated Transients Without Scram (NSR-ATWS), and Non Safety Related (NSR).

After SONGS 1 was defueled, the quality classifications were changed to designate SSCs needed to protect the spent fuel as Required to be Operational (RO), based on 10 CFR 20 “Standards for Protection Against Radiation.” Quality classifications for the RO structures, systems and components were assigned consistent with their relative importance to safety of the spent fuel. These include SR, NSRFP, and a new classification of Non Safety Related--Augmented Quality (NSRAQ).

Accidents affecting the spent fuel are no longer possible with the fuel assemblies removed and transferred to the ISFSI. ISFSI components associated with the Unit 1 fuel assemblies and fuel transport are currently classified in accordance with the Unit 1 Quality Assurance Classification program.

3.1.6.2 Required to be Operational (RO) SSC

The SONGS 1 spent fuel assemblies, ISFSI, and associated components are currently classified with these designations:

Safety Related (SR): Safety Related SSCs include components that prevent the consequences of postulated accidents that could cause undue risk to the health and safety of the public.

Non Safety Related Fire Protection (NSRFP): Fire protection components which protect RO equipment are designated NSRFP and are covered by the QA program for Fire Protection.

Non Safety Related Augmented Quality (NSRAQ): RO items requiring augmented quality, are covered by the QA program.

3.1.6.3 Not Required to be Operational (NRO) SSC

Structures, systems, and components which are not important to protect the health and safety of the public are designated as Not Required to be Operational (NRO). NRO structures, systems and components are exempt from Quality Assurance program requirements. All NRO structures, systems and components have been assigned a quality classification of NSR.

3.1.7 SEISMIC CLASSIFICATION OF SSC

The seismic design of SONGS 1 was originally intended to ensure the most adverse conditions of stress and deflection resulting from the combined influence of normal and earthquake loads would not impair safe operation or orderly shutdown of the plant. The original seismic analysis and procedures are very conservative for the permanently defueled condition. The seismic classification system has not been changed for decommissioning; the same categories are applied as in the plant design:

Category A: SSCs that are important to the nuclear safety of the plant;

Category B: SSCs that are important to the continuity of power generation or whose contained activity is such that release would not constitute a hazard;

Category C: All remaining SSCs not required for safety and not directly associated with power generation.

In addition, a separate category includes those portions of SSCs whose continued function is not required, but whose failure could reduce the functioning of any SSC important to safety to an unacceptable level and those portions of SSCs which form interfaces between Seismic Category A and Non-seismic Category A features. This category is in accordance with Regulatory Guide 1.29, Positions C.2 and C.3.

The Q-list retains the original seismic category designations which were applicable during power operation for historical interest to identify the construction design specifications for the structures.

3.1.8 QUALITY ASSURANCE CLASSIFICATION PROGRAM

The requirements of the quality assurance program apply to the design, fabrication, construction, modification, testing, operation, and maintenance of structures, systems, and components (SSC) that prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public as given in 10 CFR 50, Appendix B.

For decommissioning the designations RO and NRO are used to determine Quality Assurance program applicability. SSC are classified using both the RO (or NRO) designations and the quality class, as SR/RO, NSRFP/RO, NSRAQ/RO, or NSR/NRO. Normal plant quality assurance documentation is maintained for SSC designated as RO. For SSC designated as NRO, only the Q-List is maintained; other documentation does not require updating.

3.1.8.1 Q-List

The Q-List defines the quality classifications of each SSC in Unit 1. The Q-List (SCE Document Number M-37560) is maintained as a controlled document under the SCE Quality Assurance Program.

3.1.8.2 Quality Groups

Components containing water, steam, or radioactive material are assigned a Quality Group (A, B, C or D) in accordance with NRC Regulatory Guide 1.26, Rev. 2. These quality groups are part of a Quality Assurance program dedicated to assuring:

1) the integrity of the reactor coolant pressure boundary,

2) the capability to shut down the reactor and maintain it in a safe shutdown condition, or

3) the capability to prevent or mitigate the consequences of accidents which could cause undue risk to the health and safety of the public.

The current Q-list includes the R.G. 1.26 Quality Group classification for each component. Since the first two objectives do not apply to a defueled plant, Quality Groups A and B are no longer relevant for SONGS 1 plant components, however these were retained for the Spent Fuel Dry Cask Storage components. The quality groups are:

Quality Group A

Group A quality standards are given in 10 CFR 50.55a and are applied to the design, fabrication, erection, and testing of reactor coolant pressure boundary components.

Quality Group B

Group B quality standards are given in Regulatory Guide 1.26 and are applied to the water-and-steam-containing components identified in regulatory position C.1 of Regulatory Guide 1.26.

Quality Group C

Group C quality standards are given in Regulatory Guide 1.26 and are applied to the water-, steam-, and radioactive-waste-containing components identified in regulatory position C.2 of Regulatory Guide 1.26.

Quality Group D

Group D quality standards are given in Regulatory Guide 1.26 and are applied to water and steam-containing components not part of the reactor coolant pressure boundary nor included in Groups B and C but that are part of systems or portions of systems that contain or may contain radioactive material.

3.1.9 DESIGN CRITERIA FOR EVALUATIONS AND MODIFICATIONS OF EXISTING SSC

SONGS 1 was designed and constructed before the General Design Criteria (GDC) current criteria were established for the analysis, design, and construction of nuclear power plants. The NRC's Systematic Evaluation Program (SEP) compared the existing configurations of the SONGS 1 structures, systems, and components with criteria that had evolved since the original design was developed.

3.1.9.1 Design Codes and Standards

The original design codes and standards used to construct the operating plant are of historical interest and are presented in Reference 1. Limitations and exceptions to these codes and standards are identified in work package design criteria. Work performed on RO components is within the requirements of the Quality Assurance Program. Work that is not directly related to RO components is performed in accordance with sound engineering practice and may use commercial standards and materials.

3.1.9.2 Electrical Engineering Design Criteria

During Decommissioning, electrical work is generally performed under commercial grade standards.

3.1.9.3 Design Controls and Work Process

The engineering design process and work activities at SONGS 1 are controlled under site-wide administrative controls. Design activities are planned, performed and documented in accordance with written procedures and instructions to assure control through all phases of design development, review and approval. Determination of 10 CFR 50 Appendix B requirements for design activities at SONGS 1 is currently based on the guidance of the Decommissioning Quality Assurance Program (DQAP) and is implemented through controlled engineering procedures (SONGS Procedures Section XXIV).

The requirements of 10 CFR 50.59 are implemented in accordance with the recommendations and guidelines contained in NEI 96-07, Revision 1, “Guidelines for 10 CFR 50.59 Implementation.” A screening process is used to determine when a specific evaluation is required. Evaluations are performed by personnel with pertinent technical expertise in the DSAR and Technical Specifications. The 50.59 process applied to SONGS 1 has been augmented to include a determination that proposed work is within the limits of 50.82(a)(6).

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3.1.10 REFERENCES

1. “San Onofre Generating Station Unit 1, Updated Final Safety Analysis Report,” Docket 50-206

3.2 FUEL STORAGE FACILITY

3.2.1 INTRODUCTION

The Fuel Storage Building was an independent and separate Seismic Category A structure which housed the spent fuel pool, an underwater cask transfer area, an underwater fuel transfer area, a cask decontamination area, a storage room, and an abandoned 480V switchgear room. The Fuel Storage Building was located southwest of the containment sphere.

3.2.2 FUEL STORAGE FACILITY STATUS

All structures, systems and components associated with the Fuel Storage Facility have been removed or demolished. Spent fuel assemblies in the Unit 1 spent fuel pool, as well as Unit 1 spent fuel assemblies in the Unit 2 and Unit 3 spent fuel pools, were loaded into a specially designed cask and transferred to the Independent Spent Fuel Storage Installation (ISFSI). Segmented Greater than Class C (GTCC) waste from the reactor vessel internals was placed in GTCC waste container, and was similarly transferred to the ISFSI.

3.2.3 PLANNED DECOMMISSIONING ACTIVITIES

The Fuel Storage Facility has been demolished.

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3.2.7 REFERENCES

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3.3 SPHERE AND ENCLOSURE BUILDING

3.3.1 INTRODUCTION

A spherical steel containment enclosed the reactor and its related equipment. The 140-foot diameter sphere was one-inch thick and extended 40 feet below grade. The sphere was continuously supported by a concrete cradle between the steel sheet and the undisturbed soil. A concrete foundation provided support and shielding for equipment inside the sphere. The concrete Sphere Enclosure Building surrounded the steel containment sphere. The building had three-foot thick cylindrical walls and a conical roof. It was designed to reduce the offsite dose during a design basis accident.

3.3.2 SPHERE AND ENCLOSURE BUILDING STATUS

All structures, systems and components internal to the Containment Sphere have been completely removed. The reactor vessel internal (RVI) components were cut up. Highly activated pieces that were Greater than Class C (GTCC) waste were segmented, placed in a GTCC waste container and transferred to the Independent Spent Fuel Storage Installation (ISFSI). The remaining pieces were returned to the reactor vessel and stabilized by grouting. The reactor vessel was packaged for shipment and is stored in the Unit 1 North Industrial Area.

The Sphere Enclosure Building and foundation have been completely demolished. The steel sphere has been removed. The lower portion of the concrete cradle foundation located below grade still remains. The bowl was filled with Elastozell and one foot of concrete up to elevation 8 ½ feet.

3.3.3 PLANNED DECOMMISSIONING ACTIVITIES

The Sphere and Enclosure Building has been demolished.

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3.3.4 DESIGN EVALUATION

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3.3.5 BUILDING DESCRIPTIONS

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3.3.7 REFERENCES

1. "Permanently Defueled Technical Specifications," Amendment No. 155 to License No. DPR-13, Issued December 28, 1993

2. "Permanently Defueled Technical Specifications," Amendment No. 163 to License No. DPR-13, Issued September 22, 2004

Table 3.3-1
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3.4 REACTOR AUXILIARY BUILDING

3.4.1 INTRODUCTION

The Reactor Auxiliary Building contained the liquid and gaseous radwaste processing equipment and associated holdup tanks. A pipe tunnel connected the Reactor Auxiliary Building to the sphere piping penetration room (dog house). The Reactor Auxiliary building was a single story, partially embedded, reinforced concrete structure rising to about 6 feet above ground level. The northeast corner included a second story that was constructed of masonry walls, conventionally reinforced concrete walls and slabs, and structural steel floor framing.

The overall dimensions of the Reactor Auxiliary Building were approximately 134 feet by 60 feet. The northeast corner, which comprised an additional story, was approximately 32 feet by 41 feet.

The Reactor Auxiliary Building foundation was a reinforced mat, 2 feet 4 inches thick, 134 feet 4 inches long and 60 feet 2 inches wide, bearing directly on the San Mateo formation. The lowest elevation of the basemat was at (-) 4 feet 4 inches.

The area surrounding the Reactor Auxiliary Building was known as the "backyard." The backyard area included equipment which supported the reactor primary systems. The area was paved and fenced forming the controlled boundary of the former Radiological Control Area (RCA). The backyard provided access to the PASS lab, high rad storage vault, pipe tunnel, sphere penetration room, cryogenic building, ventilation building, and ion exchanger vault shield plugs. The Unit 1 RCA has been cleared for general use and no longer exists.

3.4.2 REACTOR AUXILIARY BUILDING PLANT STATUS

All structures, systems and components associated with the Reactor Auxiliary Building have been completely removed.

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3.4.3 PLANNED DECOMMISSIONING ACTIVITIES

The Reactor Auxiliary Building has been demolished.

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3.5 INTAKE STRUCTURE

3.5.1 INTRODUCTION

The Pacific Ocean provided cooling water for SONGS 1 cooling systems and dilution water for liquid releases. Water was drawn from an offshore intake structure which rests on a foundation located 33 feet beneath the ocean bottom and rises vertically to a point about 10 feet above the ocean floor. The inside horizontal dimensions of the offshore intake structure are 16 by 21 feet. Two 12-foot inside diameter reinforced concrete pipes, extending about 3,200 feet and 2600 feet into the ocean, provided for the intake and discharge of seawater. These pipes are buried beneath the ocean bottom, with a minimum of 4 feet of sand cover over the top and 4 feet of rock cover surrounding the intake structure.

The intake pipe conveyed water to and from a concrete intake structure located on-shore. The intake structure was a Seismic Category A buried reinforced concrete structure that housed: (1) the components of the circulating water system, (2) the salt water cooling pumps which supported the component cooling water system and, (3) the tsunami pit. The intake structure foundation was a reinforced concrete slab, 3 feet 4 inches thick, 136 feet 3-1/2 inches long with a varying width, bearing directly on the San Mateo formation. The intake structure provided the structural transition from the pipes used to collect and discharge seawater for salt water cooling and to the ocean.

The intake tunnel consists of a 14-foot, 2-inch outside diameter intake pipe leading to a 12-foot square box culvert to two pump chambers, with a maximum open cross section of 12 feet high by 23 feet wide. The pump well, where the salt water pumps were installed, had a 23-foot high peripheral retaining wall, and the pump chamber top slab formed the base of the pump well.

The discharge tunnel was 10 feet, 8 inches by 12 feet cross-section and it led to the 14-foot, 2-inch diameter outfall tunnel.

The sea wall is a cantilevered sheetpile wall which runs along the western boundary of the site. It is protected with a 2-1/2 inch gunite coating which extends down to elevation 4 feet on the seaward face and down to 1 foot below finished grade on the landward face. The top and bottom elevations of the wall are 28.0 feet and (-) 8.0 feet respectively. The finished grade adjacent to the wall varies from elevation 14.5 feet to elevation 17.0 feet. The stone revetment on the seaward face extends from approximately elevation 5.0 feet to elevation 13.0 feet and is placed at an approximate 1.5:1 slope. The seawall is laterally supported by San Mateo sand.

The Domestic Water System consists of a header supplied with potable water which provides drinking water and other domestic water system needs. To eliminate any potential for contaminating the domestic water system, backflow preventer are installed upstream of all use points.

3.5.2 INTAKE STRUCTURE

All structures, systems and components associated with the Intake Structure, including the Circulating Water System and Salt Water System, have been removed from the site. The yard sump and overflow berm have been removed.

Except for the east wall of the intake structure circulation water pit, the entire structure was removed down to elevation 8 foot 6 inches. The east wall of the circulation water pit was removed down to grade which is approximately 13 foot 4 inches. The offshore circulating water conduits were sealed off in the Intake/Discharge Gate Structures by placing stop gates in the gate slots and slurry filling the structure up to 8 foot 6 inches. The remaining portions of the intake structure were filled up to elevation 8 foot 6 inches with 70 pcf minimum Elastizell. The Turbine Plant Cooling Water line was breached between the Concrete Junction Box and Anchor Block 2 and the Discharge Structure Gate structure, filling with slurry. The off-shore intake structure and tunnels were abandoned in place.

The seawall remains as the western security boundary of the North Industrial Area; it has no other design function.

The Domestic Water System remains in service throughout the site, however, it no longer interfaces with any SSC associated with Unit 1.

3.5.3 PLANNED DECOMMISSIONING ACTIVITIES

The Intake Structure and all associated equipment has been demolished or abandoned, and decommissioning is complete. On February 24, 2010 the NRC approved Amendment No.165 to the SONGS 1 Facility Operating License No. DPR-13. Under the provisions of 10 CFR 20.1402 “Radiological Criteria for Unrestricted Use,” and 10 CFR 83 “Release of part of a Power Reactor Facility or Site for Unrestricted Use,” the amendment released for unrestricted use approximately 7.5 acres of ocean bottom leased from the California State Lands Commission containing the abandoned SONGS 1 circulating water system submerged inlet and outlet conduits.

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3.5.8 REFERENCES

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3.6 TURBINE BUILDING

3.6.1 INTRODUCTION

The Turbine Building consisted of four individual structural systems which surrounded the turbine pedestal. These four structural systems were the turbine building north and south extensions and east and west heater platforms. The Turbine Building area contained the main steam system, the turbine-generator unit, the electrical distribution system, compressed air system, and several other support systems related to power production.

The turbine building north extension was a one-story structural steel frame building with a mezzanine. It had approximate plan dimensions of 40 feet by 50 feet with an 8-1/2 inch thick prestressed concrete slab at elevation 42 feet, 0 inches, and a steel grating platform at elevation 30 feet, 0 inches. The west side of the turbine building north extension was adjacent to the fuel storage building. Doors in the east wall of the fuel storage building provided personnel access to the spent fuel pool area from the turbine building north extension, elevation 42 feet, 0 inches. Expansion joints were provided at the junctures between the turbine building north extension and other buildings, including the fuel storage building.

The turbine building foundation consisted of column spread and combined footings, bearing directly on the San Mateo formation. Footing width varies from 3 feet to 5 feet, while footing thickness varied from 2 feet, 6 inches, to 5 feet. Elevation of top of the footing varied from elevation 6 feet to elevation 17 feet, 7 inches.

3.6.2 TURBINE BUILDING STATUS

The Turbine Pedestal Bottom mat, Anchor Blocks 1 and 2, intake culverts and discharge culverts have been abandoned. The anchor blocks, and the intake and discharge culverts have been filled with a 100 psi minimum slurry. The turbine pedestal foundation floor drains and the reheater pit sump and its drain line were filled with 100 psi slurry.

All other structures, systems and components associated with the Turbine Building have been removed from the site.

3.6.3 PLANNED DECOMMISSIONING ACTIVITIES

The Turbine Building has been demolished.

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3.7 ELECTRICAL SYSTEMS

3.7.1 INTRODUCTION

The electric system that served SONGS 1 was electrically independent of SONGS 2 and 3. Electrical isolation of most of the original electrical equipment was accomplished by the Cold and Dark modification. Under Cold and Dark, the station electrical system provided power to the facility from the SDG&E 12 kV system located at the Mesa. Substation “Gary” fed the North Construction load Center B34 and “Fran” fed Switchboard CD-5. Three motor control centers (CD1, CD2, CD3), fed from CD-5 were installed by Cold and Dark. Two 120-208 VAC distribution panels CD1-DP1 and CD3-DP2 were powered from MCC-CD1 and MCC-CD3.

3.7.2 ELECTRICAL SYSTEM STATUS

The electrical system that served SONGS 1 has been dismantled, demolished or abandoned. The SDG&E 12 kV system, 480V system, and the 120 VAC systems have all been removed.

A new electrical distribution system has been installed to support the North Industrial Area. The system consists of 480VAC load center 2/3B57 fed from SDG&E 12kV line “Gary” which provides electrical power for the North Security Processing Facility and North Industrial Area Yard Drain Sump Switchboard 2/3B58. A separate 480V substation is fed from SDG&E 12kV line “Fran.” This substation consists of Transformer X69A, Switchboard CD-5A, MCC-CD3A and 120-208VAC Distribution Panel CD3A-DP1. This substation supplies decommissioning loads and power to the Motor Operated gate MOG-1.

3.7.3 PLANNED DECOMMISSIONING ACTIVITIES

There are no AC power systems remaining in service for the SONGS 1 power plant. The AC power supply system installed and currently serving the North Industrial Area does not interface with any SSC associated with the Unit 1 facility.

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3.8 MONITORING AND COMMUNICATIONS

3.8.1 INTRODUCTION

A new Control Room was located in the HP/Operations Building (A52) for SAFSTOR and subsequent decommissioning. Plant conditions were monitored from the Control Room via a personal computer (PC). There were no control functions. Equipment was controlled locally by plant operators or, in a few cases, was automatically controlled.

3.8.2 MONITORING AND COMMUNICATIONS STATUS

After all Unit 1 spent fuel was transferred to the ISFSI, the control room was no longer required. Equipment control responsibility for the NIA was taken over by Operations.

3.8.3 PLANNED DECOMMISSIONING ACTIVITIES

Decommissioning activities related to plant monitoring and communications have been completed.

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3.9 FIRE PROTECTION

3.9.1 INTRODUCTION

The fire protection program protected safety related equipment that was required to be operable for the safe shutdown of the operating plant. The Unit 1 fire protection capability included permanent detection and suppression equipment, mobile fire apparatus, and portable fire extinguishers. Additional fire protection features were in place to satisfy Nuclear Electric Insurance Limited (NEIL) Property and Loss prevention requirements and to provide defense-in-depth fire protection features for the surrounding structures. Administrative measures controlled the transient combustible materials and ignition sources.

3.9.2 FIRE PROTECTION STATUS

All safety related equipment and buildings have been removed. Fire protection features were systematically abandoned and removed as fire hazards were eliminated and buildings were demolished. The fire protection system has been reduced to manual suppression capabilities throughout the Unit 1 North Industrial Area.

Fire protection requirements are established by SO123-FP-1, Fire Protection Program, which covers Units 1, 2 & 3. The reduced fire protection program requirements for the Unit 1 North Industrial Area include control of combustibles, control of ignition sources, and manual suppression capabilities, including firewater supply and fire brigade staffing. The fire protection system includes sprinkler systems in occupied structures, fire extinguishers, hydrants and hose valves. The water supply and pumping equipment are from Unit 2/3.

Additional details of the fire protection system are available in the historical Updated Fire Hazards Analysis (UFHA) Section 6. The fire zones and fire protection features are shown on drawing 83321. This drawing is provided for reference information only.

3.9.3 PLANNED DECOMMISSIONING ACTIVITIES

The modification and/or removal of fire protection features will continue as conditions change during decommissioning. Significant decommissioning activities are reviewed by Fire Protection Engineering staff, who may require temporary or permanent fire protection features be established based on conditions at the time.

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3.9.8 REFERENCES

1. Deleted

2. Letter, Huffman (NRC) to Ray (SCE), Subject, "San Onofre Nuclear Generating Station - Unit 1- Issuance of Amendment Upon Transfer of All Spent Fuel Storage From The Spent Fuel Pool Into Dry Cast Storage (TAC No L52616)", dated September 22, 2004. Amendment No. 163 to Facility Operating License No DPR-13 for SONGS Unit 1.

3. Letter, McConnell (NRC) to Ridenoure (SCE), Subject, "San Onofre Nuclear Generating Station, Unit 1, Issuance of Amendment to Release the Off-Shore Portions of the Circulating Water System from the License," dated February 24, 2010. Amendment No. 165 to Facility Operating License No DPR-13 for SONGS Unit 1.

List of Figures Deleted from the SONGS Unit 1 DSAR

Figure 3.1-1
Figure 3.1-2
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Figure 3.1-4
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Figure 3.1-6
Figure 3.2-1
Figure 3.2-2
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Figure 3.2-8
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Figure 3.2-16
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Figure 3.2-18
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Figure 3.3-1
Figure 3.3-2
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Figure 3.6-1

Unit 1 Fire Area Boundaries and Fire Protection Features

Refer to the (Historical) UFHA Section 6 Docket 50-206

4.0 LICENSEE ORGANIZATION AND CONDUCT OF OPERATIONS

4.1 CORPORATE ORGANIZATION

This section provides information on the corporate organization, its functions and responsibilities, and the qualification of personnel participating in the facility design, design review, design approval, testing, maintenance, operation, modification and decommissioning of SONGS.

4.1.1 CORPORATE ORGANIZATION FUNCTIONS, RESPONSIBILITIES, AND AUTHORITIES

Southern California Edison (SCE) is the Operator of the San Onofre Nuclear Generating Station (SONGS). SCE is a subsidiary of Edison International (EIX). The ultimate responsibility for operating, maintaining, repairing, inspecting, testing, and modifying SONGS rests with the Chief Executive Officer (CEO) of EIX. The President of EIX reports to the CEO of EIX and has the general responsibility for SCE, as directed though the CEO of SCE. The Vice President, Decommissioning and Chief Nuclear Officer (CNO), is directly responsible for the Nuclear Organization. The CNO reports through the President of SCE to the CEO of SCE. The Nuclear Site Management Organization chart is provided as Appendix A to the SONGS Decommissioning Quality Assurance Program (DQAP).

4.1.2 VICE PRESIDENT OF DECOMMISSIONING AND CHIEF NUCLEAR OFFICER

The Vice President Decommissioning and Chief Nuclear Officer (CNO) is responsible for the overall plant management of SONGS Units 1, 2, and 3, and the Independent Spent Fuel Storage Installation (ISFSI). The CNO is responsible for the safe and reliable operation, maintenance, decommissioning, testing, and training conducted at the SONGS facility. The CNO may delegate responsibilities to one or more qualified individuals to facilitate management of the station and plant operations as well as other areas not specifically discussed in the DSAR.

The Vice President Decommissioning and Chief Nuclear Officer is responsible for the following along with other matrixed organizations:

- Plant Manager
- Nuclear Oversight, Nuclear Regulatory Affairs, and Nuclear Safety Concerns
- Site Engineering
- Strategic Planning
- Decommissioning Projects
- Decommissioning Consultant
- Communications
- Project Oversight

4.2 SONGS NUCLEAR ORGANIZATION AND MANAGEMENT

4.2.1 SONGS DECOMMISSIONING PROJECT

The Decommissioning Project Manager reports to the CNO and is responsible for the decommissioning of the SONGS site and the ISFSI expansion. The Decommissioning Project Manager is responsible for overall strategy and long-term business planning of decommissioning activities, establishing and ensuring achievement of objectives and initiatives associated with decommissioning activities, and, safely and efficiently decommissioning SONGS in accordance with applicable regulations and project cost and schedule. The Decommissioning Project Manager is responsible for directing and overseeing staff in accomplishing the physical activities to prepare the plant for decommissioning, and in performing dismantlement, disassembly, removal, decontamination and packaging of structures, systems and components that constitute decommissioning. The Decommissioning Project Manager procures and manages contractors, provides field oversight, and secures and coordinates Radiation Protection and Low Level Radwaste (LLRW) support. The Decommissioning Project is supported by Engineering and other SONGS and contract organizations.

With the completion of the removal of the SONGS 1 facility structures, the Decommissioning Project is focused on the decommissioning of Units 2 and 3. Additional details of the SONGS 2 and 3 decommissioning process are available on the Units 2 and 3 dockets (50-361, 50-352).

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4.2.2 NUCLEAR OVERSIGHT, NUCLEAR SAFETY CONCERNS, AND NUCLEAR REGULATORY AFFAIRS DIVISIONS

The Director, Nuclear Oversight Division (NOD), Nuclear Regulatory Affairs (NRA), and Nuclear Safety Concerns (NSC) reports to the CNO.

4.2.2.1 Nuclear Oversight Division (NOD)

The Nuclear Oversight Division reports to the Director (NOD, NRA, NSC) and is responsible for the establishment and execution of the Quality Assurance Program in compliance with 10 CFR 50, Appendix B. The Quality Assurance Program is described in the SONGS Decommissioning Quality Assurance Program (DQAP), common to all three units. The DQAP satisfies the requirements of 10 CFR Appendix B, and provides control over activities affecting quality to an extent consistent with their importance to ensure safety and compliance.

NOD is responsible for establishing quality assurance policies, goals, and objectives, ensuring that these policies are followed, and that the goals and objectives are achieved. NOD is also responsible for the development, maintenance, and surveillance of the DQAP, surveillance of safety-related activities, and has the authority to stop work.

Nuclear Oversight management and personnel are located at the site. However, NOD retains the necessary independence from the other organizations reporting to the CNO.

Nuclear Oversight has the following responsibilities:

- Management of day-to-day oversight of implementation of the DQAP
- Authority and obligation to raise any conditions adverse to quality to the CNO
- Assuring quality activities at SONGS are performed in accordance with procedures
- Managing the performance of audits, assessments, and inspections in order to verify that important to safety activities have been correctly performed
- Reporting on oversight activities to the CNO
- Authority to stop work when quality is adversely affected

4.2.2.2 Nuclear Regulatory Affairs (NRA)

The NRA Division Manager reports to the Director NOD, NRA, and NSC and is delegated the overall responsibility for licensing and nuclear regulatory compliance functions. NRA is responsible for maintaining licensing documents, submitting routine regulatory agency reports, and developing strategies for addressing U.S. Nuclear Regulatory Commission issues.

4.2.2.3. Nuclear Safety Concerns (NSC)

Nuclear Safety Concerns are investigated by personnel reporting to the Director (NOD, NRA, NSC). The Nuclear Safety Concerns Program supports the Safety Conscious Work Environment (SCWE) in which workers feel free to raise concerns both to SCE and the Nuclear Regulatory Commission (NRC) without fear of retaliation. SCE's policy addresses two specific concepts: 1) A SONGS Nuclear Safety Culture, which is this organization's values and behaviors modeled by its leaders and internalized by its members that serves to make nuclear safety the overriding focus, 2) To build and maintain a strong nuclear safety culture, a key component is the establishment and maintenance of effective lines of communication for safety concerns such that workers are encouraged to raise concerns and that such concerns are promptly reviewed, properly prioritized, and resolved with timely feedback to workers.

4.2.3 SITE ENGINEERING

The Manager of Site Engineering reports to the CNO and has responsibility for the Nuclear Fuel Program (including the Unit 1 spent fuel stored in the ISFSI) and providing engineering support for the site. The engineering groups provide engineering change package preparation and engineering analysis. The engineering staff requests and coordinates support from other departments in the company, or from outside consultants and engineering firms, as needed.

4.2.4 SONGS PLANT MANAGER

The SONGS Plant Manager has the responsibility for the safe operation of the San Onofre Nuclear facility. The Plant Manager is responsible for:

- Operations & Training
- Maintenance and Work Control
- Radiation Protection, Chemistry & Environmental
- Emergency Preparedness Planning
- Security

4.2.4.1 RADIATION PROTECTION, CHEMISTRY, AND ENVIROMENTAL

The Manager, Radiation Protection, Chemistry, and Environmental (RPCE), reports to the Plant Manager and is responsible for providing strategic direction for the development of long-term business plans and initiatives in these areas.

4.2.4.1.1 Radiation Protection and ALARA Program

The ALARA Program and Radiation Protection Manager (RPM) reports to the Manager, Radiation Protection, Chemistry and Environmental, and is responsible for developing, implementing, and managing the ALARA program and RP programs for normal and emergency conditions for the site in accordance with ALARA and applicable standards and regulations.

The RPM is responsible for providing station radiation protection support for operational and maintenance and decommissioning activities. In addition, the RPM is responsible for the shipment and disposal of radioactive waste, personnel radiation monitoring measurements, a comprehensive respiratory protection program, self-assessments and corrective actions for the radiation protection program, and the ALARA Program. The RPM ensures that adequate protective clothing is available at all times. The RPM is also responsible for properly maintaining all required radiation exposure records for station personnel and visitors.

The Radiation Protection (RP) Supervisors report to the RPM and are responsible for ensuring Radiation Protection support is provided to operations and maintenance personnel for facility operations and emergency conditions, and for controlling access to radiologically controlled areas. The RP supervisors are also responsible for ensuring that all personnel radiation doses are properly monitored and recorded. In addition, the supervisors oversee operation of a comprehensive respiratory protection program and ensure radioactive waste shipments meet all applicable transportation and packaging requirements for transfer to authorized facilities.

Portable and fixed radiation instrumentation required by the RP program is maintained by the RP Supervisors. The RP Supervisors are responsible for the control, inventory and periodic leak testing of all radioactive sources used on site for the calibration of RP and plant equipment.

An RP specialist reports to the RP Manager and is responsible for providing technical support for all aspects of the Radiation Protection program. The RP Specialist is responsible for interpreting and applying regulations across the RP program, for developing and controlling program procedures, self-assessment and for coordinating software development and maintenance with the appropriate organizations.

4.2.4.1.2 Environmental

The Environmental Manager reports to the RPCE Manager and oversees compliance with the National Pollutant Discharge Elimination System (NPDES) permit, the San Diego County Air Pollution Control District, and other federal and state environmental regulations and rules. The Environmental Manager also ensures the required permits are obtained for portable equipment used for decommissioning activities, monitoring of endangered or protected species on the SONGS site, and preparing notifications to state agencies of deviations from the regulations. The Environmental Manger oversees the Radiological Effluents, Radiological Environmental and Groundwater Programs, and prepares the required annual reports.

4.2.4.1.3 Chemistry

The Chemistry Manager reports to the RPCE Manager and has responsibility for chemistry control at Units 2 and 3, ISFSI, and obtaining chemical and radiological samples for effluent controls. The Chemistry Manager is also responsible for the Hazardous Materials (Hazmat) Response Team that serves to protect the public, site personnel, and the environment from an unplanned loss or release of hazardous material on the site.

4.2.4.2 MANAGER, MAINTENANCE AND WORK CONTROL

The Manager of Maintenance and Work Control reports to the Plant Manager and is responsible for overall management of site maintenance and associated planning. The manager cooperates closely with Operations and other staff managers and supervisors in the scheduling and performance of work. This includes development and supervision of programs for routine and emergency maintenance of all units.

4.2.4.3 MANAGER, OPERATIONS

The Operations Manager reports directly to the Plant Manager and has the responsibility for operating the SONGS facility. The Operations Manager also has responsibility for Fire Protection (Fire Brigade), Operations Work Control, Training, Procedures and Records Management. The former Unit 1 operations division has been incorporated into the site operations division. The site operating staff oversees operation of the yard sump, water storage tank, portable fire pump, and utilities remaining within the Unit 1 North Industrial Area (NIA). The operating staff also performs surveillance of the ISFSI and monitors the associated alarms. Work within the NIA is coordinated with Operations Work Control, when the associated equipment may be impacted.

4.3 QUALIFICATION OF NUCLEAR PLANT PERSONNEL

The key management supervisory and technical positions in the plant organizations are filled by persons who have been actively engaged in the nuclear power field.

Members of the Site Engineering, NOD, NSC, NRA, and Emergency Preparedness (EP) Planning staff based at the site and available for the technical support of SONGS, have the education, experience, and skills, commensurate with their level of responsibility. The qualifications provide reasonable assurance that decisions and actions during the decommissioning of SONGS will not constitute a hazard to the health and safety of the public.

The recommendations of ANSI N18.1-1971, Standard for Selection and Training of Personnel for Nuclear Power Plants, for comparable positions, except the Radiation Protection Chemistry and Environmental Manager who shall meet or exceed the qualifications of Regulatory Guide 1.8, are currently used as the basis for establishing minimum qualifications for all management, supervisory, and professional-technical personnel in the plant organization.

The education, training, and experience requirements for operators, technicians, and repairmen meet the qualifications for these positions stated in ANSI N18.1-1971. Established company training programs include documented academic and on-the-job training.

4.4 TRAINING PROGRAM

SCE maintains training programs during the decommissioning period that comply with the Permanently Defueled Technical Specifications (PDTS). The training programs, in concert with other managerial systems, ensure that qualified individuals are available to support decommissioning activities and protect the health and safety of plant personnel and the public.

The SONGS 1 North Industrial Area (NIA) is maintained by a common SONGS 1, 2 and 3 workforce. The existing training programs will remain in effect and be utilized to the appropriate degree for personnel requiring access to or involved in maintaining SONGS 1, 2 and 3. The following are examples of existing training programs:

- General Employee Training (GET)
- Radiation Protection Training
- Chemistry Technician Training
- Engineering Training
- Operator Training
- Maintenance Training
- Emergency Plan Training
- Environmental Training
- Security Training
- Safety Training

4.4.1 SCOPE OF TRAINING

The training given to site personnel provides individuals with the necessary knowledge and skills to perform their job functions. SCE will continue to provide specialized training applicable to specific activities, tasks, and conditions, as needed.

4.4.1.1 General Employee Training

SCE maintains the general employee training and access requirements for SONGS site employees and contractor/visitors. Access for radiation and non-radiation workers is controlled as necessary during the decommissioning activities. The SONGS 1 NIA has been separated from the Units 2/3 Protected Area. Access to the NIA does not require additional specialized training.

4.4.1.2 Radiation Protection/Chemistry Technician Training

SCE uses a Radiation Protection/Chemistry Technician workforce that is common to all three units.

4.4.1.3 Operator Training

The Unit 1 spent fuel has been stored in the ISFSI. The operator certification program for Unit 1 is no longer conducted as there is no need to maintain a separate Unit 1 staff. The current site training program for operators is addressed in dockets 50-361 (Unit 2) and 50-362 (Unit 3).

4.4.1.4 (Deleted)

4.4.1.5 (Deleted)

4.4.1.6 Maintenance Training

SCE uses a Maintenance work force that is common to all three units.

4.4.1.7 Trainer Qualifications

Specific training for SONGS Unit 1 is no longer conducted and there is no Unit 1 training staff.

4.4.1.8 Training Records

SCE documents and maintains records of required training in accordance with appropriate procedures.

4.5 REVIEW AND AUDIT

Operations affecting nuclear safety are independently reviewed and audited by site organizations other than those directly responsible for the activity. The review and audit program ensures that proper review and evaluation is conducted for proposed facility and procedure changes, tests, experiments, and unplanned events. This program complies with the associated requirements in 10 CFR 50.59 and is conducted in accordance with the recommendations of the Decommissioning Quality Assurance Program (DQAP).

SCE establishes measures for a system of planned and documented audits in order to verify compliance with all aspects of the DQAP, and to determine the effective implementation of programs covered by the DQAP. QA internal and supplier audits are planned and performed by Nuclear Oversight personnel trained in SONGS audit techniques utilizing SONGS approved written procedures and/or checklists. External audits by licensees / utilities, contractors, or consultants acting for SCE to satisfy SCE audit requirements, have the results evaluated by SCE to ensure acceptability.

Results of audits are reviewed with the management of the organization audited during exit interviews and are documented in formal audit reports to SONGS management. The Plant Manager has ultimate onsite responsibility for the safety of SONGS and is kept abreast of plant operating conditions by onsite managers and supervisors who are knowledgeable and experienced in their areas of job responsibility.

4.5.1 ONSITE REVIEW

The Onsite Review Committee has overall responsibility for the review of nuclear safety aspects of station administration, maintenance, and operational activities. The methods used to exercise this responsibility will ensure that before they are approved, items of this nature are reviewed for adequacy by qualified personnel at the appropriate technical and managerial level(s). Control over proper implementation will be maintained under the authority of the committee in a manner consistent with SCE corporate policy, approved procedures, and regulatory and licensing requirements. A detailed description of the Onsite Review Committee and its responsibilities and authority is provided in DQAP Appendix G.

4.5.2 NUCLEAR OVERSIGHT BOARD

The Nuclear Oversight Board serves the Chief Nuclear Officer (CNO) with an independent overview of selected SONGS decommissioning activities, placing particular emphasis on those activities which affect the safe decommissioning of the facility and changes to the SONGS ISFSI, including the protection of the public and the environment. Members of the Nuclear Oversight Board typically have experience as senior managers in the nuclear industry. Additional details of the program are provided in the site implementing procedures.

4.5.3 AUDIT PROGRAM

A comprehensive system of planned and documented audits is carried out to verify compliance with all aspects of administrative controls and the quality assurance program.

The Nuclear Oversight organization performs audits as outlined in the Decommissioning Quality Assurance Program (DQAP) Section titled “Audits,” under the cognizance of Director of Nuclear Oversight (Nuclear Safety Concerns and Nuclear Regulatory Affairs). These audits are performed with a frequency commensurate with their safety significance.

4.6 PLANT PROCEDURES

This section describes administrative and operating procedures used by the operating organization to ensure that routine operating, off-normal, and emergency activities are conducted in a safe manner. Procedures are provided as applicable under Regulatory Guide 1.33, “Quality Assurance Program Requirements (Operation).” All of the Unit 1 operating plant above ground structures have been demolished and there are no safety related operations planned requiring a Unit 1 operating group. ISFSI related surveillances and operations are administered as site wide procedures consistent with Units 2 & 3 administrative controls.

4.6.1 ADMINISTRATIVE PROCEDURES

4.6.1.1 (deleted)

4.6.1.2 Preparation of Procedures

Site managers are responsible for initiating, preparing, and controlling plant procedures consistent with their responsibilities and ensuring that work is performed in accordance with applicable documents.

4.6.1.3 Procedures

Administrative procedures remaining for SONGS 1 include maintaining the ground survey record, and inspecting utilities and fire protection systems.

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4.6.1.3.3 (Deleted)
4.6.1.3.4 (Deleted)
4.6.1.3.5 (Deleted)
4.6.1.3.6 (Deleted)

4.6.2 OPERATING AND MAINTENANCE PROCEDURES

4.6.2.1 Operating Procedures

All remaining Unit 1 equipment and processes requiring operating or maintenance procedures have been incorporated into Units 2/3 procedures and programs.

4.6.2.2 Other Procedures

Other procedures are provided for health physics, emergency, instrument calibration and test, chemical and radiochemical control, radioactive waste management, maintenance, material control, plant security, and fire protection.

4.6.2.2.1 Radiation Protection

Radiation Protection procedures are designed to limit and control radiation exposures and the spread of contamination as well as to meet the requirements of 10 CFR 20 and ALARA philosophy.

Procedures in this area include:

- Control and use of radioactive material,
- Respiratory protection,
- ALARA,
- Personnel monitoring,
- Internal dosimetry and bioassay,
- Instrument calibration and control,
- Radiation, contamination, and airborne surveys, and
- Solid radwaste.

4.6.2.2.2 Emergency Preparedness

Emergency preparedness procedures are provided to implement the provisions of the emergency plan. They provide for the assignment of responsibilities, instructions to employees, procedures for coping with emergency, and mobilization of offsite assistance where necessary.

4.6.2.2.3 (Deleted)
4.6.2.2.4 (Deleted)

4.6.2.2.5 Radioactive Waste Management

Radioactive waste management procedures are included in the plant radiation protection procedures.

4.6.2.2.6 Maintenance

Maintenance procedures provide detailed instructions for important maintenance functions performed by maintenance and technical personnel. Procedures in this area include:

(1) Maintenance station orders which present policies and responsibilities for maintenance programs,

(2) Maintenance administrative procedures which describe implementing details for maintenance program policies,

(3) Maintenance surveillance procedures which present performance details for inspections and tests assigned to the maintenance department,

(4) (Deleted)

(5) Preventive maintenance procedures which present performance details for routine electrical and mechanical scheduled activities required to maintain safety-related and certain nonsafety-related equipment, components, and structures operable at the quality level necessary for them to perform their intended functions, and

(6) Corrective maintenance procedures which describe performance details for non-routine electrical and mechanical equipment overhauls with replacements of life-limiting wear items. These may be scheduled based upon historical data, calendar time, operating hours, etc., or nonscheduled based upon failure or predicted failure.

4.6.2.2.7 (Deleted)

4.6.2.2.8 Plant Security

Plant security procedures provide instructions for implementing the security plan.

4.6.2.2.9 Fire Protection

Fire protection procedures provide instructions for implementing the fire protection plan.

4.7 REFERENCES

1. (Deleted)

2. "Permanently Defueled Technical Specifications," Amendment No. 155 to License No. DPR-13, Issued December 28, 1993

3. "San Onofre Generating Station Unit 1, Updated Final Safety and Analysis Report," Docket 50-206

4. "Post Shutdown Decommissioning Activities Report (PSDAR)," dated December 15, 1998

5. NRC Regulatory Issue Summary 2005-18, “Guidance for Establishing and Maintaining a Safety Conscious Work Environment, United States Nuclear Regulatory Commission,” August 25, 2005

6. “Decommissioning Quality Assurance Program (DQAP)”

5.0 RADIOACTIVE WASTE MANAGEMENT

5.1 CURRENT RADIOLOGICAL STATUS

The Radiation Protection (RP), Chemistry, and Environmental Organization monitors and controls the radiological status of the Unit 1 North Industrial Area (NIA) and decommissioning activities. The RP organization maintains current information on radiation and contamination levels within the Unit 1 NIA.

The SONGS Unit 1 NIA no longer contains an active Radiological Controlled Area (RCA). Radioactive waste handling and packaging activities are not currently being conducted in the NIA. Following completion of the ISFSI expansion, under construction in the NIA, limited areas within the NIA may become available for future use in conjunction with the decommissioning of SONGS Units 2 and 3.

With all of the SONGS Unit 1 operating systems and above ground structures having been demolished and removed, there are no significant sources of radioactive waste or effluents emanating from the site of the former Unit 1 operating plant, nor have any significant emissions been detected from the ISFSI. As reported in the “Annual Effluent Release Report for the Independent Spent Fuel Storage Installation (ISFSI) – 2015,” dated February 10, 2016, there were no releases of liquid or gaseous effluents to the environment from the SONGS ISFSI in 2015.

Although radioactive waste is not being processed currently at SONGS Unit 1, the processes described herein are commonly utilized at the SONGS site and may be conducted in the future within the SONGS NIA.

5.2 RADIOLOGICAL HISTORY

The radioactive waste management and disposal systems at SONGS 1 were designed to provide controlled handling and release or disposal of liquid, gaseous, and solid wastes generated. Plant personnel and the general public were protected from significant exposure to radiation from wastes.

Any releases of radioactive nuclides in either liquid or gaseous wastes discharged from the plant during decommissioning activities are a very small fraction of the quantity permitted under 10 CFR 20. Additionally, the objective is to meet the numerical guidelines outlined in 10 CFR 50, Appendix I, regarding "as low as is reasonably achievable."

Liquids were collected and processed by filtration prior to discharge to the ocean. The gas treatment systems were no longer required during decommissioning, as there were no significant sources of fission product gases. The radiation monitoring system for airborne discharges at SONGS Unit 1 was removed during demolition. Solid wastes were stored, packaged, and shipped offsite for either (1) direct disposal at licensed burial facilities or (2) volume reduction licensed waste processor(s).

Fuel cladding leakage occurred during several fuel cycles at SONGS 1. Monitoring programs such as primary chemistry, effluent chemistry and health physics detected fission product

contamination and characterized the typical constituents of fission products and corrosion products. Activity of these isotopes could be found throughout systems that handled liquids and gases during normal operation.

The unit had a history of steam generator tube leakage. For this reason, secondary systems were considered suspect and were treated as such under the administrative programs. Similarly, liquid systems interfacing with known contaminated systems through heat exchangers were also considered suspect due to the possibility of tube leakage during operation. All plant sumps and drains were considered suspect, or were known to be contaminated, and were regarded as potentially contaminated.

In 2007, the Nuclear Energy Institute (NEI) established the NEI 07-07 “NEI Groundwater Protection Initiative” standard for monitoring and reporting radioactive isotopes in groundwater. There is no drinking water pathway for groundwater underneath the site, however SONGS implemented the groundwater protection industry standard. Initial ground water sample data indicated the presence of low but detectable levels of tritium in shallow ground water between the former Unit 1 sphere and fuel handling building, extending towards the seawall. The concentrations of tritium were well below all regulatory limits. The groundwater at that location was extracted through a dewatering process and discharged through the monitored Unit 2/3 release point. Groundwater monitoring has continued under the NEI 07-07 initiative.

With the cessation of operation in 1992, and the ensuing period of inactivity, the inventories and normal releases of radioactivity at SONGS 1 were greatly reduced from those which existed shortly after plant shutdown. The potential consequences of an accident or uncontrolled release of radioactive material from the site of the Unit 1 facility resulting from decommissioning, remain well below the regulatory limits applicable to the operating plant. Decommissioning activities are very conservatively bounded by the conditions that existed shortly after the operating plant was shutdown. These bounding values for activities, inventories and releases of radioactive products are included in Section 5.1 of Appendix A, “Historical Information,” as a point of reference.

5.2.1 SPENT FUEL POOL

All spent fuel assemblies and hardware have been transferred to the Independent Spent Fuel Storage Facility (ISFSI), and the Unit 1 Spent Fuel Pool has been demolished.

An activation analysis of the reactor vessel and its internals was performed to generate radioactivity levels in these components (Reference 2). The results expressed in units of curies were used to segment the waste into low level radioactive waste shipments for near surface disposal and Greater than Class C (GTCC) waste to be stored in the ISFSI. The total activity calculated for the vessel and non-GTCC internals as of 04/01/2002 was less than 5.0E+04 Curies. The total GTCC activity level calculated was less than 3.5 E+05 as of 04/01/2002. GTCC waste has been transferred to the ISFSI. The reactor vessel remains stored on site.

5.2.2 DELETED

5.2.3 AIRBORNE RELEASES

Any airborne releases are well below the requirements of 10 CFR 20.106(b); 10 CFR 20 Appendix B Table II; and 10 CFR 50 Appendix I, as there Is no remaining significant source of fission product gases.

All building structures that previously contained, handled, and or processed radioactive liquids and gases have been demolished. There are no more sources of noble gases or iodine. Local engineering controls are implemented to control the production of particulate airborne material for any potentially contaminated work and are assessed by local air sampling.

5.2.4 ESTIMATED DOSES FOR AIRBORNE RELEASES

Experience since plant shutdown has indicated that airborne radioactive releases are only a very small fraction of the allowable limits given in 10 CFR 20 Appendix B Table II.

5.2.5 LIQUID RELEASES

All Unit 1 plant liquid discharge systems have been demolished. Any liquid radwaste that would be created through future decommissioning activities is dispositioned per the site procedure SO123-XV-29. Precipitation runoff from the NIA, tritium dewatering outflows, and sewage plant overflows, is collected by the NIA Yard Sump, monitored, and directed to the Unit 2 outfall for release.

5.2.6 ESTIMATED DOSES FOR LIQUID RELEASES

The calculated dose or dose commitment to a member of the public from radioactive materials in liquid effluents released to unrestricted areas, is limited during any calendar quarter to ≤1.5 mrem to the total body and to ≤5 mrem to any organ and during any calendar year to ≤3 mrem to the total body and to ≤10 mrem to any organ. These dose allowances are in compliance with 10 CFR 50 Appendix I and 10 CFR 20.

5.2.7 DELETED

5.2.8 REFERENCES

1. San Onofre Nuclear Generating Station Radioactive Annual Effluent Release Report, June 1996.

2. SO1-207-1-M106, San Onofre Nuclear Generating Station Unit 1 Reactor Vessel and Internals Characterization, Report WMG-20004-9088.

3. “Annual Radioactive Effluent Release Report for Independent Spent Fuel Storage Installation – 2015, San Onofre Nuclear Generating Station Units 1,2 and 3,” dated February 10, 2016, Dockets 50-206, 50-362, 72-41.

5.3 DELETED

5.3.1 (DELETED)

5.3.2 (DELETED)

5.3.3 (DELETED)

5.3.4 DELETED

5.4 DELETED

5.5 SOLID WASTE

The handling of solid radwaste generated during all phases of Decommissioning is described in the following subsections.

The major source of dry active waste was debris generated by building demolition and material removed from the plant as a part of Decommissioning. Controlled dismantlement methods were used to minimize the radioactive waste volume produced and to prevent the spread of contamination.

5.5.1 DESIGN OBJECTIVES

The solid radwaste is packaged and stored until it is shipped offsite for permanent disposal at a licensed burial facility. The solid wastes are generated by dismantling and demolition activities.

The design objectives may be stated as follows:

(1) To provide a means for collecting and processing the plant's radioactive waste streams in accordance with both regulatory and burial site criteria;

(2) To maintain any potential radiation exposure to plant personnel and the environment, as a result of the packaging, within the dose limits of 10 CFR 20 and 10 CFR 50; and

(3) To package the plant's solid radioactive wastes in conformance with the requirements of 10 CFR 61 and 10 CFR 71.

5.5.2 DELETED

5.5.3 SOLID RADWASTE EQUIPMENT AND PROCESSES

5.5.3.1 (Deleted)

5.5.3.2 (Deleted)

5.5.3.3 Dry Active Waste Collection and Processing

The radioactive trash collected from the plant radioactive work areas may contain compactible dry active waste, noncompactible dry active waste, wet waste, and protective clothing. These items are segregated and collected in their respective receptacles at the exit point of the contaminated work area. The trash is collected from these receptacles and is packaged according to its classification.

The collection containers (plastic bags) of dry active waste are inspected for other classes of waste such as noncompactible waste or "wet trash" before the dry active waste is loaded into a container. Compactible dry active waste is generally packaged and shipped offsite to a vendor who performs volume reduction.

The noncompactible waste is packaged in strong tight containers. After placing the maximum capacity of metallic objects in each box, the voids may be further filled by sifting sand/dirt or rubble into the box. The box is sealed and staged for shipment.

The wet trash is segregated and packaged into appropriate containers using appropriate operating procedures and controls to keep exposure ALARA.

The protective clothing collected from receptacles is packaged and transported offsite to a licensed facility for cleaning. If the protective clothing is determined to be not reusable, it is packaged according to directions for the disposition and burial offsite of compactible dry active waste or wet waste.

5.5.3.4 (DELETED)

5.5.3.5 Solidification Program for Wet Wastes

At present, the solidification of SONGS solid radwaste is not accomplished at the site. To ensure that the packaged waste would meet the burial site and regulatory requirements for packaging and shipping, the qualified service contractors must supply detailed information to SCE about the solidification process, the sampling program, verification for free standing water, and exothermic process considerations. The information is evaluated before the service contract is awarded. After the award of contract, any special procedures required for this operation, such as sampling to ensure solidification and verification of the free standing water, are reviewed and may be accepted or rejected.

5.5.3.5.1 (Deleted)

5.5.3.6 (Deleted)

5.5.4 PACKAGING

Before packaging, the solid radioactive waste is evaluated and classified in accordance with the requirements of 10 CFR 61. This classification determines the manner in which the solid radioactive waste is handled, packaged, labeled, and prepared for shipment in order to comply with all applicable regulations.

Several sizes of containers are used for packaging the radioactive solid waste. The dry active waste may be compressed into 55-gallon drums or, when noncompactible, packaged in strong tight containers of different dimensions. The wet solid waste materials are rendered dry prior to packaging and/or disposal.

The packaging containers conform to the applicable regulatory requirements of 10 CFR and 49 CFR and the criteria specified in the burial site licenses for receiving and burying solid radioactive waste.

5.5.5 DISMANTLEMENT, DECONTAMINATION, AND DISPOSAL

During Decommissioning SCE may decontaminate and dismantle the contaminated structures, systems and components (SSC) by decontamination in place, dismantlement and decontamination, dismantlement and disposal, or a combination of these methods. Buildings will be dismantled and prepared for disposal. Appropriate methods will be selected for particular situations with the objectives of safely and efficiently removing the SSC while reducing contamination levels and worker exposure.

5.5.5.1 Decontamination Methods

Contaminated systems and components are removed and sent to a processing facility or to a LLRW disposal facility. Onsite decontamination is generally limited to activities needed to maintain personnel exposure as low as reasonably achievable (ALARA), to expedite equipment removal, and to minimize the spread of contamination. Decontamination may also be conducted as part of volume reduction or as a step in the process to free release an item.

Fixation or removal of loose surface contamination is accomplished primarily by application of coatings and wiping. Airborne contamination control and waste processing systems are used, as necessary, to control and monitor such contamination if other methods are used, e.g., grit blasting or high pressure water. Openings in components are covered and sealed to minimize the spread of contamination as components are moved to packaging areas.

5.5.5.2 Dismantlement

Controlled dismantlement methods are used to remove SSCs. Two basic types of dismantlement are mechanical and thermal.

Mechanical methods, those which machine the surfaces of the material being cut, typically do not generate significant amounts of contamination. This attribute makes these methods attractive for cutting contaminated piping and components. The outside diameter machining method is best suited for large bore piping. Smaller bore piping and supports can be cut using any of the mechanical methods, e.g., saws, reciprocating saws and hydraulic shears.

Thermal methods melt or vaporize the surfaces of the material being cut. The cutting debris is transported from the cut region with a gas jet or water spray. Although thermal methods are significantly quicker than mechanical methods, they generate airborne contamination. Contamination control and effluent control measures are implemented, as appropriate, to minimize worker exposure and the potential for an unmonitored effluent release. HP&E Position Paper “Airborne Effluent Controls During Decommissioning,” dated September 27, 2000, provided additional guidance on effluent control measures to minimize airborne effluents.

5.5.5.3 Processing Building Debris and Dismantled Equipment

LLRW is processed in accordance with plant procedures and shipped to an offsite processing facility or LLRW disposal facility. No incineration will occur onsite.

Concrete which cannot be decontaminated is packaged and shipped to a LLRW disposal facility. Contaminated structural steel components may be removed to an onsite processing area for decontamination, volume reduction, and packaging for shipment to an appropriate facility.

5.5.5.4 Soil Remediation

Soils and asphalt pavement is surveyed and characterized in accordance with the Site characterization program. As necessary, soil and pavement is removed, processed, and disposed of at a licensed LLRW processing or disposal facility if determined to contain contamination levels above those required for compliance with 10 CFR 20, Subpart E.

5.5.6 STAGING, PROCESSING AND STORAGE FACILITIES

Several areas may be used for the processes of decontamination, segregation, storage and packaging radioactive waste. Section 6.1 describes the South Yard Facility (SYF), and the Units 2&3 Truck Bay. The description of the Multipurpose Handling Facility (MPHF), follows.

The MPHF is an in-process staging area for the accumulation of solid radwaste until it is released for shipment. The MPHF consists of an office building, a staging building, and an equipment pad. The facility is surrounded by a gated chain link fence. The MPHF is located at the southern edge of the SONGS owner-controlled area. The location of the facility with respect to SONGS 1 is presented in Figure 2.1.

The following subsections present a general overview of each area.

5.5.6.1 Office Building and Equipment Pad

The office building houses the office, control room, equipment room, and locker rooms, and also serves as the main personnel access to the MPHF. The equipment pad is on the east side and adjacent to the office building. Located on the equipment pad are the air handling units ductwork and effluent monitoring equipment for the staging building.

5.5.6.2 Truck Bay

The truck bay is 67 feet long and 12 feet wide and is surrounded by the loading dock and walkway areas, which are 4 feet above the floor level of the truck bay. The roll-up door opening is 14 feet high by 11 feet 6 inches wide.

Above the east walkway is a leaded glass view port that allows containers in the sample vault to be inspected. Also located in the truck bay is the sump discharge station, a personnel decontamination shower, and a frisking station. A ladder with a locking hatch cover leads from the walkway to the maintenance area. In the northwest corner of the truck bay is an emergency exit leading directly to the outside ground level.

5.5.6.3 Maintenance Area

The maintenance area is located east of the truck bay and serves as a work area and a shielding labyrinth. Housed there is the pump, the hydrogen purge station, the container decontamination spray system, and the swiper arm. A floor plug covers the sump drain valves and also serves as the sump lid.

Personnel access to the maintenance area is by way of a ladder extending from the truck by a walkway area. Access for containers is through an opening in the labyrinth west wall, 10 feet wide and covered with a sliding safety gate.

5.5.6.4 North Staging Area

The north staging area for the high specific activity containers of solid radwaste consists of the sample vaults, the main vault, and the floor staging area surrounding the vaults. Each sample vault is a separate cubicle with an individual lid. Access for containers is through an opening 11 feet wide in the labyrinth east wall Personnel access to this area requires installation of a temporary ladder.

5.5.6.5 South Staging Area

In the south staging area, roll-up door 8 feet wide by 11 feet 11 inches high opens into 3200 square feet of floor space designed to accommodate pallets of drums and LSA boxes of dry active waste (low specific activity). An emergency exit is located at the east wall. Outside the roll-up door is an equipment storage room and the forklift charging station. The south staging area is section lined to provide a method of accountability and location for the packaged solid radwaste awaiting shipment.

5.5.7 SHIPMENT

Shipping casks and radwaste packages are used to transport the waste from the site to the burial ground. A contract trucking firm is hired to transport the shipping cask and radwaste packages to the burial site. Shipping casks waiting to be loaded are stored near the MPHF.

Depending on the activity level and waste classification, some of the dry active waste may be transported in a covered van or on a flatbed trailer without requiring placement in a shipping cask.

Intermodal containers and gondolas are used for shipping large components and bulk materials by rail.

5.5.8 DELETED

5.6 DELETED

5.6.1 DELETED

5.6.2 DELETED

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5.6.4 DELETED

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6.0 RADIATION PROTECTION

6.0 RADIATION PROTECTION PROGRAM

This section contains information on the administration of the Radiation Protection (RP) Program for SONGS 1 decommissioning. The Radiation Protection Program is a site wide program for all three units at SONGS. Following these sections is a brief description of the Radiological Environmental Monitoring Program.

The Radiation Protection Program ensures that personnel radiation exposure and, especially during emergencies, offsite doses are kept As Low As Reasonably Achievable (ALARA) and within permissible limits.

The objectives of the Radiation Protection Program are:

(1) To provide administrative control of persons on the site to ensure that personnel exposure to radiation and radioactive materials is within the guidelines of 10 CFR 20 and that such exposure is kept ALARA,

(2) To provide administrative control over station effluent releases to ensure that these releases are below 10 CFR 20 concentration values and that they do not exceed the dose values given in the ODCM, and

(3) To provide technical support during plant emergencies to limit any radiological consequences of those emergencies.

The site Radiation Protection program encompasses and controls radiological activities in the Unit 1 North Industrial Area (NIA). The program is implemented by procedures to ensure compliance with all requirements and is reviewed and maintained under the administrative controls required by the SONGS 10 CFR 50, Appendix B, Quality Assurance Program. Administrative controls include procedures for work planning, work control, access control, and waste shipment and disposal.

The radiation protection program ensures:

- Personnel receive appropriate radiation protection training.
- Appropriate control techniques and protective clothing are used to limit external contamination.
- Respiratory protection equipment is used to limit internal exposure and assure the Total Effective Dose Equivalent (TEDE) is maintained as low as reasonably achievable (ALARA).
- Radiation, airborne radioactivity, radioactive material, and contaminated areas are segregated and appropriately posted to control access and limit exposure.
- RP instruments and equipment used for quantitative radiation measurements are properly calibrated and maintained so that accurate radiological surveys can be performed.

- Appropriate personnel monitoring devices are provided to personnel requiring external monitoring and exposure records maintained.

- Internal dose assessment programs passive monitoring, whole body count and bioassay are conducted and exposure records maintained.

- Incoming and outgoing shipments of radioactive materials are properly handled and classified.

- Necessary measures are employed to keep exposures within the guidelines of 10 CFR 20 and to keep them ALARA.

- Radioactive material is controlled to minimize release to unrestricted areas.

6.1.1 RADIATION PROTECTION DIVISION FUNCTIONS

6.1.1.1 Technical support typically:

- Interprets regulations and develops conforming procedures/programs.

- Provides technical support for RP.

- Reviews the analysis of the station radionuclide mix performed to comply with radioactive waste burial site requirements. Determines if changes in radionuclide mix warrant a corresponding change to (1) factors used to estimate airborne radioactivity concentrations based on gross counting of air samples (effective DAC) or (2) factors used to estimate internal dose (effective HALI and GALI).

- Provides technical support to Nuclear Regulatory Affairs with respect to new or revised radiation safety regulations, and NRC inspection of radiation safety programs.

- Maintains licenses and permits related to RP functions including radioactive material transportation permits, low level radioactive waste burial permits.

- Reviews or drafts reports related to occupational and public radiation safety including the Annual Radiological Environmental Operating Report, Annual Radiological Effluent Release Report, Annual Report of Individual Monitoring and Annual Report of Low Level Radioactive Waste.

- Represents the station on national committees, task forces, and working groups related to radiation safety including the Nuclear Energy Institute and the Electric Power Research Institute.

6.1.1.2 Operational and Dosimetry support typically:

- Receives radioactive material on site.

- Stores and controls radioactive material (excluding Special Nuclear Material) on site.

- Handles, packages and ships radioactive material off-site.
- Implements the process control program.
- Provides decontamination services.
- Supplies protective clothing, portable ventilation and breathing air equipment.
- Performs surveys to evaluate radiological conditions.
- Posts and barricades radiological areas.
- Evaluates radiological hazards associated with working in radiological areas and implements controls sufficient to maintain exposures ALARA and control radioactive material.
- Provides monitoring for external and internal occupational radiation exposure during normal and emergency conditions.
- Maintains 1 RP Technician on-shift at all times trained on their responsibilities and duties in the event of an emergency.
- Has an individual qualified in Radiation Protection procedures onsite during fuel handling operations or movement of loads over storage racks containing fuel.
- Determines prior occupational dose and maintains Administrative Dose Controls for occupationally exposed individuals.
- Maintains occupational exposure records and provides occupational exposure reports.
- Maintains whole body count equipment and performs whole body counts.
- Provides the radiological respiratory protection services including fit testing, issue, and maintenance of respirators for normal and emergency conditions.
- Performs radioisotopic analysis when Chemistry personnel are not available.

6.1.1.3 Instrumentation typical functions:

- Maintains and calibrates RP instruments including survey instruments, contamination monitors, air samplers, continuous air monitors, and electronic dosimeters for normal and emergency conditions.

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- Maintains radiological standards used in RP instrument calibration.
- Maintains custody and performs leak tests of sealed radioactive sources used by RP, Chemistry and Maintenance and Work Control.
- Evaluates and selects RP instruments used by the RP Program and Emergency Plan.

6.1.1.4 ALARA Program:

- Facilitates ALARA Committee work and meetings.
- Tracks and reports radiation exposure status vs goals.
- Performs ALARA design reviews.
- Administers temporary shielding program.
- Reviews and evaluates work plans, dose reduction techniques and equipment.
- Prescribes site ALARA training.
- Recognizes and celebrates good individual and organizational ALARA performance.

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6.1.2 RESPONSIBILITIES OF KEY PERSONNEL

Refer to Section 4.2.4.1 “Radiation Protection, Chemistry, and Environmental,” for the Radiation Protection personnel responsibilities.

6.1.3 RADIATION PROTECTION TRAINING

Each member of the permanent operating organization whose duties entail entering radiologically controlled areas or directing the activities of others who enter radiologically controlled areas, is instructed in the fundamentals of radiation protection, and must pass an examination before performing those functions. These same individuals are also required to attend a retraining program in radiation protection held at least annually.

The radiation protection training program includes instructions in applicable provisions of the NRC regulations for the protection of personnel from radiation and radioactive material (10 CFR 20) and instructions concerning prenatal radiation exposure (NRC Regulatory Guide 8.13).

Radiation Protection technicians also receive training in such areas as radiation and contamination surveys, air sampling techniques, use of portable and laboratory instrumentation, release limits, and safe handling of sources that apply to their specific job functions.

Other radiation training and retraining requirements are identified by Radiation Protection supervisory personnel to the Operations Division which develops and implements this training.

6.1.4 DELETED

6.1.5 PERSONNEL MONITORING DEVICES

Station employees, contractors, support personnel, and visitors are generally required to wear personnel monitoring devices at all times while within the Radiologically Controlled Areas (RCA). Neutron badges are issued to those individuals subject to significant neutron exposure. When issued, personal electronic dosimeters are read and recorded by automated computer controlled systems. In the event of a computer outage they are read and recorded by Radiation Protection personnel. Optically Stimulated Luminescence (OSL) badges are processed at an offsite lab on an annual basis or more frequently if necessary. Dosimeter and OSL badge readings are recorded by Radiation Protection personnel.

Whole body counting and bioassay are available to detect radioactivity within the body and to determine internal exposure levels. Measurements are taken whenever ingestion or inhalation of radioactive materials is suspected to have occurred. Normally, each worker exiting the RCA is “passively” monitored for internal deposition when the worker uses the whole body frisking equipment (IPM8D or similar). When possible, a final whole body count is taken when the worker terminates radiation work at the site.

6.1.6 ACCESS TO RADIOLOGICALLY CONTROLLED AREAS

Radiation Exposure Permits (REPs) are a key administrative tool that informs workers of the radiological conditions in the work area and the requirements for protective clothing, respiratory protective equipment, dosimetry, and engineering controls. The REP is also used as an exposure tracking device to ensure that exposures are maintained ALARA.

Most entries into, and work performed in, radiologically controlled areas require an REP. The radiologically controlled areas onsite are divided into areas of progressively more stringent access control, according to radiation and contamination levels. Controlling access to contaminated and radiation areas is accomplished by appropriate contamination and/or radiation caution signs, barricades, locked doors and gates, and may include audible and visual alarm signals.

SCE provides protective clothing, as necessary, to protect individuals against contact with radioactive contamination. Radiological respiratory equipment is available and its use is required when necessary, to protect individuals against airborne radioactive contamination. Individuals are trained in the use of respiratory protection equipment. The use and maintenance of protective clothing and radiological respiratory protective equipment is managed by the Radiation Protection Division.

Entry to radiologically controlled areas is normally through an access control point. Additional personnel monitoring devices, protective clothing, and respiratory equipment may also be issued here, if required. Radiation and high radiation areas are segregated within the radiologically controlled areas and identified and controlled in accordance with 10 CFR 20.1601. Positive control over high radiation areas having dose rates in excess of 1000 mrem/h is exercised by locked barriers. When it is not reasonable to construct a barrier, the area is roped off and either a Radiation Protection technician is in attendance or a flashing warning light is activated. Access to other high radiation areas (less than 1000 mrem/h) administratively requires the individual to use a dose rate instrument or an alarming dosimeter, or be accompanied by a Radiation Protection technician who performs dose rate surveys and who exercises positive control over the activities within the area. Control over entries into Radiation Areas, Posted Contaminated Areas and Airborne Radioactive Areas are provided by using radiation exposure permits.

6.1.7 RECORD KEEPING

The Radiation Protection Division maintains an exposure record system which includes the exposure history and current exposure for individuals who enter radiologically controlled areas. This system contains all the information required to maintain NRC Form 4, Occupational Exposure History, and NRC Form 5, Individual Monitoring Results. The system produces Annual radiation exposure letters for individuals receiving 100mrem or greater. The system also tracks daily exposures and provides radiological controlled area access control.

Proposed shipments of radioactive materials are reviewed to ensure conformance with 10 CFR 71, 61, and 49 CFR. The Radiation Protection Division maintains records of all shipments and stored wastes and submits reports to the NRC, as required.

6.1.8 RADIATION INSTRUMENTATION

A variety of instruments are used to cover the range of radiation measurements at SONGS. These include portable instruments as well as fixed systems. Portable instruments include low and high range beta-gamma survey meters, neutron survey meters, alpha survey instruments, and samplers for airborne gaseous and particulate radionuclides. Fixed systems include portal monitors and permanently installed area and process radiation monitoring systems.

Personnel contamination monitoring instruments are located at RCA exits. These instruments aid in preventing contamination from being spread into other areas. Appropriate monitoring instruments are available within the controlled areas. A portal monitor checks individuals as they leave the radiologically controlled area and again at the protected area exit.

Portable radiation survey and monitoring instruments for routine use are the responsibility of the Radiation Protection Division. Calibration sources are available to allow for instrument calibration, response checks, maintenance, and repair.

6.1.9 RADIATION SURVEYS

Routine surveys are performed in accordance with the Radiation Protection program to ensure that licensed material is surveyed and inventoried in accordance with Federal regulations and the Technical Specifications. These surveys will include radiation and contamination surveys for radiation protection, updating posted areas, leak testing sources, and free release of plant equipment and surfaces. The frequency and extent of the surveys is in accordance with approved procedures and Federal regulations.

6.1.10 CONTAMINATION CONTROL

Surveys are performed routinely to determine surface contamination levels. Additional surveys may be performed during and after maintenance work or after an operation that may have increased contamination levels. Any area found contaminated is roped off or otherwise delineated with a physical barrier, posted with appropriate signs, and decontaminated when practical. In areas where it is impractical to decontaminate the area to clean controlled area limits, a step off pad is used to prevent the spread of contamination.

Tools and equipment used in contaminated areas are monitored or bagged or both (or wrapped in polyethylene sheeting) before they are removed from the jobsite to prevent the spread of contamination. All tools and equipment being removed from the restricted area are monitored for contamination by Radiation Protection personnel (or other qualified personnel as specified in the station procedures) to ensure that they meet unrestricted area limits. If the tools or equipment do not meet the limits, they are decontaminated, disposed of as radioactive waste, or maintained for use within radiologically controlled areas only.

Control of personnel contamination (external and internal) is provided using protective clothing, engineering controls, and respiratory equipment. Each individual is responsible for monitoring himself and his clothing when he crosses a local control point or the main access control point. If contamination is found, the individual is decontaminated, under the direction of Radiation Protection personnel.

Special coatings are applied to walls and floors of areas containing radioactive fluids. In addition, equipment vents and drains are piped directly to sumps (or other collection devices) where practicable to prevent radioactive fluids from flowing across the floor to the drains.

6.1.11 AIRBORNE ACTIVITY CONTROL

Airborne contamination is minimized by keeping loose contamination levels low.

If personnel entry is required into areas where the source of airborne radioactivity cannot be removed or controlled, either occupancy is restricted and/or respiratory protection equipment is provided to maintain exposures within 10 CFR 20 limits. When required, an area is posted as an airborne radioactivity area and access is controlled. Entry into these areas requires the entrant to be on a radiation exposure permit. The use of a radiation exposure permit provides radiation exposure control by controlling and recording conditions under which work in airborne radioactivity areas is performed. Air sampling results are used to ensure that appropriate respiratory protective equipment is specified on the radiation exposure permit. The respiratory protection program is organized to conform with 10 CFR 20 requirements, Regulatory Guide 8.15, and NUREG-0041 recommendations.

The major portion of the respiratory equipment is available at the access control point(s).

Whole-body counting, bioassay analysis, nasal smears, or face-piece interior smears may be performed to evaluate the protection afforded by respiratory protective equipment. To ensure an adequate program for respiratory protection, the program includes the following controls:

(1) Each respirator user is advised that he/she may leave a high airborne-radioactivity area for psychological or physical relief from respirator use. Each user must leave the area in the case of respirator malfunction or any other condition that might cause reduction in the protection afforded the user.

(2) Sufficient air samples are taken and surveys conducted to identify the hazard, evaluate individual exposures, and permit proper selection of respiratory protective equipment.

(3) Written procedures are established to ensure respiratory equipment is properly selected and personnel using the equipment are supervised and trained.

(4) Written procedures are established to ensure that respirators are individually and adequately fitted, and the respiratory protective equipment is individually tested for operability immediately before each use.

(5) Written procedures are established to ensure that respiratory protective equipment is fully effective including procedures for cleaning and disinfection, decontamination, inspection, repair, and storage.

(6) Written operational and administrative procedures are established for control, issuance, proper use, and return of respiratory protective equipment, including provisions for planned limitations or duration of respirator use for any individual, as necessitated by operational conditions.

(7) Bioassays and other surveys are performed, as appropriate, to evaluate individual exposures and to assess the protection actually provided.

(8) Records are maintained sufficient to permit periodic evaluation of the adequacy of the respiratory protection program.

(9) Before any individual is assigned to tasks requiring the use of respirators, it is determined that such an individual is medically and physically able to perform the work and use the respiratory protective equipment. A physician determines what health and physical conditions are pertinent. The medical status of each radiological respirator user is reviewed annually.

6.1.12 RADIATION PROTECTION FACILITIES

Radiation Protection facilities include assess control locations, decontamination areas, radiation protection offices, locker rooms with shower facilities and toilets, and storage areas for protective clothing, respiratory protection equipment, and instrumentation for air sampling equipment, radiation detection, and personnel monitoring. Personnel monitor(s) and/or frisker(s) are normally located at the exit from the radiologically controlled areas.

6.1.12.1 South Yard Facility

Equipment is staged in the South Yard Facility (SYF) for reuse on the site. In addition, this area is used to stage equipment expected to be free of contamination that is destined for unconditional release, until it can be surveyed and be proven free of licensed radioactive material contamination.

The facility consists of a fenced area and access to the area is strictly from the Owner Controlled Area. The SYF is controlled as a restricted area as defined in 10 CFR 20. The REMS Storage Area, the Multi-Purpose Handling Facility (MPHF), and the Hazardous Material (HazMat) Staging Areas are included within this restricted area. The SYF has facilities for decontamination of tools and equipment.

Stored items known to be contaminated with licensed radioactive material are tracked under the Radioactive Equipment and Materials System (REMS). These items are typically staged in containers or are covered, or staged inside buildings to protect them from the weather. Radiological health and safety measures are instituted by the Radiation Protection Division to ensure protection against a release of licensed radioactive material.

6.1.12.2 Deleted

6.1.12.3 Multi-purpose Handling Facility (MPHF)

The Multi-purpose Handling Facility is located within the SYF yard area. The MPHF provides a staging facility for waste that has been processed and packaged and is awaiting shipment for disposal. Specific areas are set aside for segregation of waste based on the radioactivity content and the waste classification. A more detailed description of the MPHF can be found in DSAR Section 5.5.6.

6.1.12.4 Unit 1 North Industrial Area (NIA)

Temporary radiologically controlled areas may be established, as needed, for work activities involving radioactive materials within the NIA. Work activities may include refurbishment of equipment, or segregation, decontamination, and/or packaging of materials, equipment, or solid

waste. Calculation N-0320.007, “Airborne Source Term for South Yard Shops Facility and Outdoor Activities,” Revision A, April 16, 1995, evaluated the work activities and established allowable contamination levels to ensure that the effluent limits of 10 CFR 20, Appendix B, will not be exceeded. Contamination control and effluent control measures are also implemented, as appropriate, to minimize worker exposure and the potential for an unmonitored effluent release. HP&E Position Paper “Airborne Effluent Controls During Decommissioning,” dated September 27, 2000, provided additional guidance on effluent control measures to minimize airborne effluents.

6.1.12.5 Units 2&3 Truck Bay

Areas in the Units 2&3 Protected Area adjacent to the Truck Bay access to the Units 2&3 Auxiliary Building are used as outdoor staging areas for potentially contaminated equipment and for waste segregation and packaging activities. A fenced area immediately adjacent to the Truck Bay access provides a designated area for these activities.

6.2 AS LOW AS REASONABLY ACHIEVABLE (ALARA) PROGRAM

During SONGS Decommissioning, the site ALARA program in place during plant operation will continue to be maintained.

The ALARA methods, techniques, and practices implemented during Decommissioning will be the same as those used during plant operation. The existing ALARA program meets or exceeds the requirements of 10 CFR 20; Regulatory Guide 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable;" and Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Is Reasonably Achievable." The program ensures radiation exposure to workers and the public are maintained ALARA. SCE's commitment is stated in various station directives and implementing procedures. This is underscored by high level management oversight.

The Radiation Protection Program is the focal point of the ALARA program. Key elements of the ALARA program include dose reduction goal setting, in-depth radiation work review and job planning, industry experience review and implementation of beneficial technology and lessons learned from other nuclear sites.

6.2.1 GOALS

Annual ALARA exposure goals are developed (by individual department) for the site. ALARA exposure estimates for work are tracked and evaluated as the work progresses. For work that requires ALARA job planning, a job specific file is compiled. Performance indicators are tracked and evaluated, including the ALARA exposure goals. The exposure is tracked and reported to management and the site work force, on a routine basis. Performance is measured against the goals. When the task is completed, the lessons learned are documented and reviewed with appropriate personnel. This review is included in the file for future reference.

6.2.2 TRAINING

General Employee Training reinforces the ALARA program goals by providing methods for employees to keep their radiation exposure ALARA.

Practical factors in ALARA technique are examined during training. Mock-up training is performed for high dose jobs as a technique for reducing exposure.

6.2.3 ENGINEERING CONTROLS

Engineering controls to reduce radiation exposures are considered during the ALARA planning effort. Engineering controls are used when beneficial in reducing exposures in a cost effective manner. Engineering controls are also evaluated during the project planning process.

Work enclosures and HEPA ventilation are available for use in controlling potential or actual areas of airborne radioactivity.

SCE evaluates and revises the ALARA program as appropriate. The program will continue to be implemented site wide. Enhancements to the program will occur as industry experience grows and work techniques are developed or improved.

6.2.4 EFFLUENTS

The Station Radiation Protection, Chemistry, and Environmental division has the responsibility to monitor gaseous and liquid effluent pathways. Monitoring of effluent pathways is specified the ODCM. The station policy is to maintain all effluent releases ALARA.

The effluent releases are compiled and reported in the Annual Effluent Release Report. This is in accordance with 10 CFR 20 and the reporting format of Regulatory Guide 1.21.

6.2.5 REFERENCES

1. SO123-VII-20, “Radiation Protection Program”

6.3 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

The REMP is designed to quantify ambient radiation levels in the environs of SONGS 1 and to identify and quantify concentrations of radioactivity, which have a potential exposure pathway to man, in various environmental media in the vicinity of SONGS 1. Sampled environmental media selection is based on the objectives stated below. Each sample is analyzed for both naturally occurring and SONGS-related radionuclides.

The objectives of the operational REMP are:

(1) To fulfill the obligation for radiological surveillance required by Offsite Dose Calculation Manual specifications,

(2) To determine whether there is any significant increase in the concentration of radionuclides in critical dose pathways,

(3) To detect any significant change in ambient gamma radiation levels, and

(4) To determine whether the operation of SONGS 1 has any measurable effects on the health and safety of the public or the environment.

The REMP is conducted in accordance with 6.8.4.b of the Permanently Defueled Technical Specifications and Section 5 of the ODCM.

SONGS also conducts a Groundwater Monitoring Program to sample groundwater wells placed at selected locations around the SONGS site. The program is administered under procedural guidance in accordance with NEI 07-07, “Industry Ground Water Protection Initiative - Final Guidance Document,” August 2007 (see section 5.2 Radiological History).

6.3.1 EXPECTED BACKGROUND

Results of the preoperational REMP are presented in Section I of Table 11.6-1 (see Rev. 3 of SONGS 1 UFSAR). The measurements were taken during the period from 1964 through 1967 to provide a baseline for future comparison. Because the number and type of samples collected during that time was limited, results of an expanded operational REMP from 1968 through 1987 for SONGS 1 have been included in Section II of Table 11.6-1 for general information.

6.3.1.1 Critical Pathways

6.3.1.1.1 Land Environment

The only significant route of transfer of material from the plant to the land surrounding San Onofre was via stack releases. Under routine operating conditions, small quantities of noble gases, airborne tritium, particulate matter, and iodines were released through the plant vent stack. With all spent fuel transferred to the ISFSI, the source of noble gas and iodine from Unit 1 has been removed.

The predominant effect of the noble gases on a person derives from the external radiation exposure they may contribute since, as inert gases, they cannot be concentrated in environmental media in the human food chain.

Since these gases constituted the major contribution of the plant to the environment, one facet of the REMP is intended to detect changes in environmental radiation levels attributed to this

source. Because very low levels of radiation exposure were expected, the only detector of suitable reliability and sensitivity is one that integrates exposure over a long period of time. Consequently, Thermoluminescent Dosimeters (TLDs) or OSLs are being used at appropriate locations in the vicinity of SONGS 1. In order to provide adequate detection sensitivity, the TLDs are collected quarterly and annually from established REMP locations.

Internal exposure to radiation occurs from the ingestion or inhalation of radioactive materials. Samples are still collected in the environment surrounding SONGS 1 and are subsequently analyzed for both naturally-occurring and station-related activity. For landward sectors, sampled environmental media include the following: air, local crops, and drinking water. Soil is also collected in order to detect any potential build-up of radionuclides in the land near SONGS 1. Figures 5-1 through 5-4 of the ODCM show the sampling locations. Sample analyses include one or more of the following: gross alpha activity determination, gross beta activity determination, tritium activity determination, and radiostrontium activity determination, as well as the determination of the activities of various gamma emitters.

6.3.1.1.2 Marine Environment

During normal operation of the plant, controlled quantities of radioactive liquids are released to the marine environment via the circulating water discharge. These discharges have been terminated from Unit 1.

As in the land environment, it is the intent of the monitoring program to use marine organisms as indicators of any accumulation processes occurring in the marine environment. For seaward sectors, sampled environmental media include the following: beach sand, ocean water, nonmigratory marine species, kelp, and ocean bottom sediment. Figures 5-1 through 5-4 of the ODCM show the sampling locations. Sample analyses are similar to those used in the analysis of terrestrial samples.

6.3.1.1.3 Exposure Estimates

Offsite doses due to radioactive liquid and gaseous effluent are calculated as required by the SONGS 1 PDTS. The methodology and parameters to be used in those calculations are described in the Offsite Dose Calculations Manual (ODCM). These evaluations are performed independently of the REMP.

6.3.1.2 <u>Sampling Media, Location and Frequency</u>

Possible exposure to man could result from direct radiation, atmospheric immersion, inhalation, consumption of radionuclides deposited as particulates from the plant gaseous effluents, and consumption of radionuclides deposited in the marine environment by plant radioactive liquid effluents. In order to monitor the above pathways, various types of terrestrial and marine samples are collected and analyzed. Table 5-1 of the ODCM lists the required types of samples to be collected, the minimum number of locations, the frequency, and the type of analysis to be performed. Table 5-4 of the ODCM gives the sample collection points. These locations were selected to provide data from all landward sectors surrounding the plant, from major population centers, and to represent various food products that are produced in the area. In addition, several locations are selected in areas that would not be affected by plant operations to serve as control stations.

Direct radiation measurements are made at pre-determined selected locations using TLDs or OSLs. Other sample types collected include air, soil, ocean water, drinking water, beach sand, local crops, marine animals, kelp, and ocean sediment. The selection of sample types is based on established critical pathways for the transfer of radionuclides through the environment to man, experience gained during the preoperational phase, and the evaluation of data during the operational phase.

Sampling locations were determined with consideration given to site meteorology, local demographics, and land uses.

A land-use census is conducted annually and identifies the location of the nearest milk animal, the nearest residence, and the nearest garden of greater than 500 square feet producing fresh leafy vegetables in each of the 16 meteorological sectors within a distance of 5 miles of SONGS 1.

The land-use census is provided to ensure that the changes in the use of unrestricted areas are identified and that modifications to the monitoring program are made if required by the results of this census. Restricting the census to gardens of greater than 500 square feet provides assurance that significant exposure pathways via leafy vegetables will be identified and sampled since a garden of this size is the minimum required to produce the quantity (25 kg/year) of leafy vegetables assumed in Regulatory Guide 1.109 for consumption by a child. To determine this minimum garden size, it was assumed that: (1) 20% of the garden was used for growing broad leaf vegetation (i.e., similar to lettuce and cabbage), and (2) the vegetation yield was 2 kg/m^2

6.3.1.3 Analytical Sensitivity

The types of radiological analysis performed on each sample are presented in the Offsite Dose Calculation Manual (ODCM) Table 5-1. The REMP emphasizes analysis for naturally occurring radionuclides, and for those radionuclides that may be attributable to the effluents from the facility and those that may be primary contributors to exposure of the public. In addition to gamma spectrometry, gross beta, gross alpha, radiostrontium, and tritium analyses are also performed on selected media as appropriate.

Maximum acceptable values for the lower limit of detection (LLD) for the various isotopes expected to be present in plant effluents are defined in the ODCM Table 5-3.

An interlaboratory comparison program is also required by SONGS 1 PDTS. Participation in this program ensures that independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices can be made. This is done as part of the quality assurance program for environmental monitoring to demonstrate that the results are reasonably valid. Analyses are performed on radioactive materials supplied as part of an interlaboratory comparison program.

6.3.1.4 Data Analysis and Presentation

Information acquired from the environmental monitoring program fall into the following categories:

(1) Radioactivity distributions in various environmental media at San Onofre,

(2) Direct radiation measurements in the vicinity of San Onofre, and

(3) Concentrations of radionuclides in crops and marine life that may result in a dose to a member of the public.

In examining the distribution of radionuclides in the environment, comparisons are made of the preoperational data to determine if there are any biological or physical compartments in nature that are accumulating radioactivity.

Similarly, external radioactivity measurements for the operating plant are compared with the mean and range of data obtained in the preoperational program. Data from control locations that are considered to be outside of the area radiological impact of the plant are also compared with data collected near the plant.

For radionuclides found in foodstuffs, estimates of radiation dose are made that utilize the best estimates of food consumption. These dose calculations may then be compared with those based on plant emission data with the appropriate meteorological and aquatic dispersion models as discussed in the ODCM.

The data from the REMP are reported annually. The Annual Radiological Environmental Operating Report (AREOR) includes:

(1) Summarized and tabulated results in the format of Regulatory Guide 4.8, December 1975 of all radiological environmental samples taken during the report period,

(2) A summary description of the radiological environmental monitoring program,

(3) A map of all sampling locations, keyed to a table giving distances and direction from a site reference point,

(4) The results of licensee participation in the interlaboratory comparison program,

(5) Raw data and statistical summaries, interpretations, and analyses of trends of the results of the radiological environmental surveillance activities for the report period,

(6) A comparison with preoperational studies, operational controls, and previous environmental surveillance reports,

(7) An assessment of the observed impacts of the plant operation on the environment,

(8) The results of the land-use census,

(9) A description of the reasons for not conducting the REMP as required, and the plans for preventing recurrence,

(10) A description of any exceedances of reporting levels listed in the ODCM Table 5-2,

(11) When analyses were not performed as required by the interlaboratory comparison program, a description of the corrective actions taken to prevent recurrence,

(12) And, if harmful effects or evidence of irreversible damage are detected by the REMP, the report also provides an analysis of the problem and a planned course of action to alleviate the problem.

(13) Graphs to trend radioactivity concentration in different environmental media and its variation as a function of time.

6.3.1.5 Program Statistical Sensitivity

The activity in environmental samples is expected to be low after radionuclides released by the power plant are diluted and dispersed. For many isotopes, the radioactivity is below the lower limits of detection (LLD) that are listed in the ODCM Table 5-3. Doses calculated from environmental measurements at the LLD demonstrate exposures below 5 mrem/yr. With exposures estimated from effluent data, much lower exposure levels can be demonstrated even though large errors may be introduced in the dispersion modeling. Thus, exposures evaluated using effluent data provide a more detailed definition of the dose increments due to the operation of SONGS 1 than exposure calculated from the environmental measurements.

Counting errors for effluent data and errors associated with the calculational models are used to determine the overall sensitivity of dose evaluation. Where dose calculations are based on environmental data, errors in the environmental sample analysis are included in the overall program sensitivity analysis.

6.3.2 REFERENCES

1. “Permanently Defueled Technical Specifications,” Amendment No. 155 to License No. DPR-13, Issued December 28, 1993.

2. “San Onofre Generating Station Unit 1, Updated Final Safety and Analysis Report,” Docket 50-206.

3. SONGS Offsite Dose Calculation Manual (ODCM), SO-123-ODCM.

7.0 SITE CHARACTERIZATION

SECTION 7 HAS BEEN DELETED IN ITS ENTIRETY

8.0 ACCIDENT ANALYSIS

8.1 INTRODUCTION

Unit 1 was licensed to operate in consideration of a spectrum of postulated accidents with offsite dose consequences. Decommissioning activities are permitted by this same license and are predicated on the objective of posing no greater risk to the public than that which existed when the reactor was operating. The guidelines selected by Southern California Edison to evaluate risk during Decommissioning are based on the conservative assessment that postulated accidents from Decommissioning activities are moderately frequent events, as described in Regulatory Guide 1.70, “Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants (LWR Edition).” The risk associated with an activity is acceptable if the potential accident dose consequences are a small fraction of the values established in 10 CFR Part 100, i.e., less than approximately 2.5 rem (whole body) and 30 rem (thyroid) for two-hour doses at the exclusion area boundary (EAB). (It should be noted that, due to the decay of fission product gases, the possibility of a significant thyroid dose no longer exists.)

All spent fuel assemblies have been removed from the spent fuel pools and transferred to the Independent Spent Fuel Storage Installation (ISFSI). The analysis approved for the operating plant license is considered as bounding for any associated decommissioning activities conducted at the Unit 1 site.

8.2 DELETED

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8.3 LICENSING BASIS ACCIDENTS

8.3.1 REQUIREMENT FOR DECOMMISSIONING

With all of the SONGS 1 operating plant above ground structures having been demolished and removed, and the spent fuel stored contained within the ISFSI, there are no significant design basis accidents remaining to be addressed under the operating plant license. Decommissioning activities conducted within the Unit 1 North Industrial Area are very unlikely to incur any significant dose risk to the public and are well bounded by the analysis accepted for the operating plant.

The moderately frequent event is considered an appropriate and conservative guideline for evaluating Decommissioning accidents because:

1. Decommissioning activities which have the potential to initiate an accident are carefully performed and controlled under existing site procedures and programs.

2. Decommissioning activities are comparable to previously accepted activities which were part of the operating plant licensing basis, e.g., processing radioactively contaminated ion exchange resins, managing the risk of radioactive exposure with an ALARA program.

3. The probabilities for specific accidents are low because the activities are performed infrequently.

8.3.2 EVALUATION OF ACCIDENTS DUE TO DECOMMISSIONING ACTIVITIES

Decommissioning activities, including dismantlement, demolition and waste handling, are reviewed to determine if the potential exists for an accident that might result in an unplanned release of radioactive material. Where the possibility of a release does exist, the accident is evaluated to ensure that the estimated dose consequences are a small fraction of 10 CFR Part 100. Decommissioning activities readily meet the above criteria.

Descriptions of potential accidents and results of the accident analyses are documented in the 10 CFR 50.59 evaluations for the subject activities. The assumptions and limitations presented in the evaluations are part of the SONGS 1 licensing basis for Decommissioning. The analyses of specific Decommissioning accidents with dose consequences within the moderate frequency guidelines will not be added to the DSAR.

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8.3.3.1 DELETED

8.3.3.2 DELETED

8.3.3.3 DELETED

8.3.4 ACCIDENTS THAT ARE NO LONGER RELEVANT

8.3.4.1 Loss of Offsite Power (Loss of Spent Fuel Pool Cooling)

The Loss of Offsite Power (LOP) is no longer safety significant to the fuel storage facility since all fuel assemblies have been transferred to the ISFSI and the fuel storage facility has been demolished. Loss of offsite power cannot affect radiological releases and need not be analyzed for consequences in accordance with the criteria of Regulatory Guide 1.70, Revision 3.

8.3.4.1.1 DELETED

8.3.4.1.2 DELETED

8.3.4.2 Operating Basis Accidents

Most of the accidents previously evaluated in UFSAR Chapter 15 for the operating plant were events that were directly related to power operation or the integrity of the reactor coolant system (RCS), such as turbine trip, loss of normal feedwater, rod ejection, fuel handling accident and steam generator tube rupture. Since the plant is permanently defueled and the RCS is demolished, such accidents are no longer applicable to Unit 1.

8.3.4.3 Fuel Handling Accident

A Fuel Handling Accident (FHA) is no longer credible since the spent fuel assemblies have been transferred to the ISFSI.

8.4 SUPPORTING CALCULATIONS AND STUDIES

The following evaluations were performed:

DC-3779 Removal of CREATS from the Unit 1 Permanently Defueled Technical Specifications

This evaluation determined the impact of not crediting the Control Room Emergency Air Treatment System (CREATS) with Unit 1 permanently defueled. Fuel Handling and SFP Loss of Cooling accidents (Unit 1), and the limiting Unit 2 radiological accident requiring site evacuation (LOCA), were considered. The results are no longer applicable as all spent fuel is stored in the ISFSI and the operational-period control room has been dismantled.

8.5 OTHER APPLICABLE EVENTS, NATURAL PHENOMENA, FIRES

Other events, natural phenomena, and fires that were relevant during power operation are not significant for Decommissioning and dismantlement. Natural phenomena (earthquakes, floods, tornadoes, tornado missiles), and fires were considered under the operating license requirements and bound any activity under Decommissioning.

The probability and consequences of these events are either reduced during Decommissioning or remain unchanged from those that applied when the reactor was licensed to operate.

Equipment brought on site for dismantlement activities, such as cranes, hoists, or other heavy vehicles will be located and/or secured when required by procedures, or other evaluations, such that they cannot become missiles during a tornado event. Fire protection for dismantlement activities will be under the same administrative procedures and controls employed throughout the site for construction activities.

In summary, the safety significance of natural phenomena (earthquakes, floods, tornadoes, tornado missiles) and fires is either reduced during Decommissioning or remains unchanged from that which applied when the reactor was licensed to operate.

8.6 REFERENCES

1. Letter, Michael K. Webb (NRC) to Harold B. Ray (SCE), "Issuance of Amendment No. 155 to Facility Operating License No. DPR-13, San Onofre Nuclear Generating Station, Unit No. 1, Permanently Defueled Technical Specifications (TAC No. M86377)," December 28, 1993.

2. Letter, Harold B. Ray (SCE) to NRC Document Control Desk, "Docket No. 50-206, Amendment Application No. 211, Permanently Defueled Technical Specifications, San Onofre Nuclear Generating Station, SONGS 1," May 12, 1993.

3. Letter, W. C. Marsh (SCE) to NRC Document Control Desk, "Docket No. 50-206, Amendment Application No. 211, Supplement 1, Fuel Storage Facility Thermal and Structural Analyses, Permanently Defueled Technical Specifications, San Onofre Nuclear Generating Station, SONGS 1," June 30, 1993.

4. Letter, W. C. Marsh (SCE) to NRC Document Control Desk, "Docket No. 50-206, Amendment Application No 211, Supplement 2, San Onofre Nuclear Generating Station, Unit 1", November 23, 1993.

5. Letter, D. L. Zeiman (NRC) to R. Dietch (SCE) "Systematic Evaluation Program Topic XV-20, Radiological Consequences of Fuel Damaging Accidents Inside and Outside Containment," January 17, 1980.

Table 8-1
(Deleted)

Table 8-2
(Deleted)

APPENDIX A

HISTORICAL INFORMATION

APPENDIX A
HISTORICAL INFORMATION

The following information, which previously appeared in the main body of the DSAR, is designated as "historical" and is included in this appendix for the reader's convenience. Originally provided as part of the licensing basis for the SONGS 1 operating plant, this appendix includes:

- Information that is not expected to change
- Reference information which is a bounding (initial) condition for Decommissioning, and for which no updated values will be provided.

The paragraph numbers used previously in the main body of the Revision 1 of the DSAR have been preserved, with the addition of the prefix "A", in this appendix.

Section A2.0

A2.1.2.2 Control of Activities Unrelated to Plant Operation

...
The number and distribution of persons expected to be within the exclusion area as a result of the nearby beaches have been estimated by the consulting firm of Wilbur Smith and Associates, Inc. (Table A2-1). These estimates were developed by:

(1) Determination of the nature, size, and location of facilities planned in the development of the San Onofre State Beach;

(2) Application of the standard rates of persons per camp site and persons per parking space as used by the Department of Parks and Recreation; and

(3) Distribution of persons from access points to the beach based upon a Poisson probability distribution function.

A2.1.3.1.1 Population

The LPZ is contained entirely within the boundaries of Camp Pendleton. The residential population is in the NW and NNW sectors and was estimated in 1976 to number approximately 1127[4,6] increasing to 1201 by 1980 and remaining at that level.[6] An elementary school for the residents of this military housing development is also located within the LPZ.

REFERENCES:

4. San Diego Association of Governments, "Final Series V Population Projections," San Diego, California.

6. Joint Public Affairs Office, U.S. Marine Corps Base, Camp Pendleton, California.

A2.1.3.1.2 Population in the Vicinity of the LPZ

Beyond the LPZ there are three Marine base camps within a distance of 5 miles from the plant site. Camp San Onofre has a population of 4,804 and is located 2.5 miles from the site in the northeast sector, Camp San Mateo has a population of 2,564 and is located 3.5 miles from the plant site in the north sector, and Camp Horno has a population of 2,426 and is located 4.5 miles from the plant in the east sector.[6]

Within the LPZ the transient population generators within the LPZ are San Onofre State Beach and Interstate 5. Camp Pendleton is not considered a transient population generator within the LPZ inasmuch as the main centers of activity on the base are between 10 and 20 miles from the plant.

The peak seasonal transient population is projected to increase from 1,813,000 in 1980 to 3,123,700 in 2020. The peak daily population is estimated to expand from 95,100 in 1980 to 164,600 in 2020.

REFERENCE:

6. Joint Public Affairs Office, U.S. Marine Corps Base, Camp Pendleton, California.

A2.2 HYDROLOGY

Notable hydrologic influences on the site are the Pacific Ocean and a small area of foothills which drain toward the site. The streams and drainage-ways nearest SONGS are intermittent, carrying water primarily in the wetter months. The largest nearby streams are San Mateo Creek, two miles to the northwest, and San Onofre Creek, about one mile to the northwest.

San Onofre Creek has a drainage area of approximately 43 square miles. The drainage basin is approximately 9.7 miles long and 4.7 miles wide. The origin of the basin is in the Santa Margarita Mountains to the northeast of the site. The maximum elevation in the basin is 3187 feet above sea level, mean lower low water (mllw), with the minimum at sea level. The San Mateo Creek drains an area of approximately 132 square miles. There are two U. S. Geological Survey stream-gauge stations on San Mateo Creek and two on San Onofre Creek. Measurable flows occur only four or five months of the year, usually from December through April. Surface runoff on the San Onofre Creek basin is used by the Camp Pendleton Marine Corps Base to recharge the base well system.

There are no other surface water users in the watershed. Groundwater contours of the San Onofre Creek basin indicate that groundwater movement is to the west and southwest toward the ocean. Little groundwater movement has been identified to occur between the San Onofre Creek and the San Mateo Creek groundwater basins.

Before SONGS was constructed, about 120 acres of the foothill area east of the plant drained through the plant site. Runoff from this watershed is now intercepted by a drainage system along the northeast side of the San Diego Freeway and carried northwest away from the plant to be discharged into the ocean near Basilone Road. The earthen channel on the northeast side of the San Diego Freeway has a capacity of 1850 cubic feet per second. A pair of concrete culverts that lead under the freeway are maintained by the California State Department of Transportation. The culverts are 42 and 72 inches in diameter with flow capacities of 180 and 520 cubic feet per second, respectively.

San Diego Bay is the site of the tidal reference station nearest to the SONGS plant. The differing locations of the tidal reference station and the SONGS plant (on a bay and the open coast, respectively) necessitate application of an amplitude ratio of 0.92 to the San Diego data. The highest tide observed at the reference station occurred on December 20, 1968, and the lowest on December 17, 1933. The water levels of these tidal extremes, adjusted to San Onofre, are +7.18 feet and -2.66 feet mllw, respectively.

The prevailing regional ocean current, called the California current, is about 600 miles wide and meanders slowly southward along the coast. From late October or early November until February or March, it is replaced by the northwest flowing Davidson current. The two currents determine the physical and chemical properties of the water near the SONGS shore. Frequently, a meander or eddy from one of the two regional currents induces a current at the San Onofre site, which may dominate tides and wind currents for up to two weeks.

A2.3 METEOROLOGY

This section presents the meteorological description of the site and its environs. Those meteorological factors which bear upon plant design, operation, and safety are presented and discussed.

Meteorology and Climatology

Due to its coastal location, the site climate can be characterized as marine, subject to daily land and sea breezes on which an annual monsoon oscillation is superimposed. During most of the year, daytime heating of the land surface makes the land warm relative to the Pacific Ocean. This thermal difference produces an onshore wind (sea breeze) that normally begins shortly after sunrise and lasts until after sunset. At night, the land cools, reversing the thermal gradient, and an offshore wind (land breeze) develops. This diurnal reversal is most apparent during the spring and fall months.

Winds at the site exhibit an onshore component somewhat more than half the time. The most frequent wind is the WSW-WNW sea breeze, which averages about 6 to 7 miles/hour. Winds associated with frontal passages are generally out of the southwest and relatively stronger, frequently over 10 miles/hour. The strongest winds blow out of the northeast, occasionally exceeding 30 to 50 miles/hour, and are associated with Santa Ana conditions. The warm dry Santa Ana winds result from a relatively strong offshore pressure gradient produced by the Great Basin high pressure cell in winter months between storm passages.

The Pacific Ocean has a moderating influence over the temperatures in the site region. The daily temperature ranges are usually less than 15 F in the spring and summer, and about 20 F during the fall and winter. Temperatures below 40 F are rare. Temperatures above 85 F occur occasionally throughout most of the year when air from the interior reaches the coast.

The average relative humidity ranges from about 60% during the day to about 75% at night. Occasionally, however, during Santa Ana conditions, the influx of the dry desert air can drop humidities in the area to less than 10%.

The normal annual precipitation for San Diego and Los Angeles is 9.45 inches and 11.59 inches, respectively. Laguna Beach, 17 miles north of the site, with a surrounding topography similar to San Onofre, has a normal annual precipitation of 11.75 inches. About 85% of the precipitation falls in the winter months of November through March during the passage of migratory storm systems, with measurable rain falling on an average of one day in four. Occasionally, a wet month occurs, such as during one February when 11 inches of rain fell in Los Angeles. A maximum rainfall of 6.19 inches of rain in 24 hours was recorded in Los Angeles. Measurable snow has not been recorded at a coastal location in Southern California.

A2.3.1 General Meteorological Conditions for Design and Operating Bases

A2.3.1.1 Temperature

The average annual temperature for the Camp Pendleton Marine Corps surf and weather station nearby is about 60 F, average maximum in July 72 F, average minimum in February 42 F. The highest recorded was 97 F, the lowest 25 F (see Table A2-2). With respect to the absolute maximum it is likely that in a longer record the value would be considerably exceeded; one might expect that occasionally the temperature at the site will reach 100 F or more in extreme Santa Ana conditions. But these very hot days (and also the cool days with temperatures in the twenties) are quite unusual, and the normal daily temperatures ranging from a low of about 40 F to a high of about 60 F in winter and from 60 F to 72 F in summer will be deviated from only slightly on most days.

A2.3.1.2 Precipitation

The precipitation, about 12 inches a year, occurs mostly in winter: the total for the months of May through September averages less than one-half inch. The rainiest month is January, with an average of more than 3 inches; the driest is July, with an average of 0.04 inch. The total number of days per year with measurable precipitation averages only about 40.

A2.3.1.3 Wind and Stability at the Plant Site

The data and information contained in this section and as referenced were developed and verified for the SONGS site original design and licensing. A general review has determined that this information, its basis, and its impact to the facility design have not changed since the plant was licensed.

Meteorological data currently in use for dispersion factors for SONGS 1 was obtained from 1979 -1983 and is incorporated in Table A2-7. This table shows the annual, joint frequency, wind speed-direction summaries, stratified by Pasquill stability categories. The strong dependence of stability categories to onshore and offshore wind flow is indicated in Table A2-3. The unstable categories A, B, and C occur principally with onshore flow. The stable categories F and G are associated principally with offshore flow.

The average wind speeds for the categories A through E for both onshore and offshore flow are nearly equal, i.e., 3 m/s. However, for the stable categories F and G, there is an increasing tendency for the offshore flow to be stronger than onshore flow by 1 to 2 m/s.

Long-term (10 years) annual joint frequency wind speed-direction summaries stratified by Pasquill stability are presented in Table A2-4 for San Diego (Lindbergh Field) and for Los Angeles (Los Angeles International Airport). The stability categories were determined by the NWS STAR program and were obtained from the Environmental Data Service of the National Oceanic and Atmospheric Administration. The long-term tables from the STAR program are based on 24 observations a day, while the short-term STAR tables are based on eight observations a day. The short-term tables concur with the first 2 years of the SONGS data.

A comparison of the frequency distribution of stability categories between the SONGS meteorological tower measurements and those obtained by the STAR model for Los Angeles and San Diego is shown in Table A2-5. The unstable category (A + B + C) frequencies from the tower are about 10% higher and the stable category frequencies (F + G) about 10% lower than those obtained from the STAR model. The neutral (D + E) category frequencies, however, are in closer agreement.

These differences in the unstable category frequencies stem from two factors. The first is related to the fact that the STAR model tends to underestimate the frequency of unstable hours and overestimate the neutral and stable hours. The second factor is the passage of air over progressively warmer water as it moves toward the coast. During the summer months the water surface temperature gradient, over which the air moves, reaches a maximum of about 40°C per 180 kilometers (112 miles). Because frictional stresses over the water are a minimum, very little mechanical turbulence occurs. This permits the lapse rates in the lower levels to become superadiabatic (< -9.8 C per kilometer) by the time the air reaches the coastline. The STAR model does not consider this type of phenomenon and consequently will underestimate the instability frequencies as well as the magnitude of the instability. Smith,[14] in a comparison of STAR model results with tower measurements at New Orleans, Louisiana; and Wilmington, Delaware, and vicinity, showed the results given in Table A2-6.

Section A5.0

A5.1 SOURCE TERMS

The source term information provided in previous revisions of the FSAR in this section was based on operational conditions. Since the RCS has been drained and fuel has been removed, these source terms are extremely conservative. With the cessation of operations the source for generation of fission product gasses, such as krypton and xenon has been removed. Sufficient time has passed to eliminate these nuclides as a concern.

With the majority of systems drained, the current source term is almost exclusively located within the spent fuel pool.

A5.1.1 SPENT FUEL ACTIVITY

The estimates of fission product volatile activity and noble gas inventory due to a gap release are extremely conservative. The spent fuel in the pool has been out of the reactor vessel since March 1993. The estimates represent a conservative maximum condition, and therefore have not been recalculated for the present time. These estimates bound the current conditions and are were well within the regulatory limits.

The potential for the release of fission product volatile activity, contained in the pellet-cladding gap region for an irradiated fuel assembly, is calculated from FIPCO-2 results for fuel which has undergone the maximum design burnup. It was assumed that a decay period of 90 hours elapsed in the process of shutting down the reactor, removing the head, and transferring the first fuel assembly to the spent fuel building.

The gap inventory of noble gas isotopes is listed in Table A5-1 on a per-megawatt basis. The potential release, in the event of a fuel cladding failure, would have been obtained by multiplying the table value by the thermal power rating of the involved fuel elements. Nongaseous isotopes were excluded because of their essentially complete retention by the fuel and cladding at the low temperatures of the spent fuel pit and the scrubbing effect of the fuel pool water should a release occur.

A5.1.2 CORROSION PRODUCT ACTIVITIES AND DEPOSITED CORROSION PRODUCTS

Corrosion product activities during power operation were calculated by the digital code CORA. This code computes the concentration of active nuclides formed by neutron irradiation and subsequent exchange of core-deposited crud with that in suspension. Removal by purification, deposition, and decay are taken into account.

Tables A5-2 and A5-3 give the maximum concentrations and total system inventories of the significant fission and corrosion products, expressed in terms of isotopic quantities and as photon energy groups for direct gamma source application. The tables are based on a maximum power rating of 1,347 MWt, and a fuel element cladding reference defect of 1% for the fission products. The current source term is far reduced from these estimates, however theses tables are included as a “worst case” basis.

A5.1.3 AUXILIARY SYSTEMS ACTIVITY

The auxiliary systems that connected with the primary plant systems have, for the most part, been drained and vented under SAFSTOR. The waste gas decay tanks have been vented and purged. The only significant sources of activity remaining are the fuel assemblies which are stored in the spent fuel building.

A5.1.4 TRITIUM ACTIVITY IN THE REACTOR COOLANT

The reactor coolant system has been drained and there is no longer any tritium produced by the SONGS 1 core. The analysis below was performed for power operation and explains why SONGS 1 continues to release small amounts of tritium in the liquid effluent stream. The record of actual releases is contained in the Semi-Annual (or Annual) Radioactive Effluent Release Report.

One tritium atom is formed as a ternary fission product for each 12,500 fissions (fission yield = 0.008%). For a reactor of the size of SONGS 1, this represented a tritium inventory of slightly less than 5,000 curies a year. Indications are that about one-half of this tritium can diffuse through the fuel and through the stainless cladding into the reactor coolant. There is no economically practical way to remove this activity once it gets into the reactor coolant water. The problem has been examined for SONGS 1 and the consequences of tritium release do not appear to constitute a hazard.

The effect of tritium on the maximum ground concentration of gaseous activity released at the vent stack was examined first. The conservative assumption was made that the entire 5,000 curies of tritium would appear with the waste gases. Calculation shows that yearly average vent stack gas activity due to tritium will be only 9.5×10^{-5} Ci/s, and maximum ground concentration of tritium with a vent stack dilution factor of 1.3×10^{-5} s/m^3 will be only 2.1×10^{-9} µCi/cm^3 air. Maximum permissible concentration in air for tritium is 2.0×10^{-7} µCi/cm^3 of air in unrestricted areas (see Appendix B of 10 CFR 20).

Alternately, it was conservatively assumed that 100% of the total tritium would be in liquid wastes and would be discharged with the plant liquid effluent. Calculations show that this will raise the activity of the 350,000 gal/min effluent by 7.3×10^{-6} µCi/ml. Unrestricted maximum permissible concentration in water for tritium is 3.0×10^{-3} µCi/ml (see Appendix B of 10 CFR 20).

Thus, it can be seen that whether the tritium goes into the liquid effluent or into the vent stack discharge, the maximum concentration of tritium in the unrestricted environment is several orders of magnitude below the allowable concentrations set forth in 10 CFR 20. The quantities of tritium discharged from the SONGS 1 facility are presented in the semiannual effluent reports.[4]

REFERENCE

4. San Onofre Nuclear Generating Station Radioactive Annual Effluent Release Report, June 1996.

A5.1.8 OPERATIONAL EXPERIENCE

Releases of radioactive nuclides in either liquid or gaseous wastes discharged from the plant have been a small fraction of the quantity permitted under 10 CFR 20. Table A5-4 presents a summary of the liquid and gaseous waste discharges from the plant from 1968 through 1996.[5] These quantities indicate that the actual radioactivity of the reactor coolant during plant operation was less than the predicted quantities for which the waste management system was designed. Fuel cladding leakage and steam generator tube leakage occasionally resulted in higher than normal discharges from the plant; however discharges remained well below the limits specified in 10 CFR 20. The quantities of radioactive nuclides discharged from the SONGS 1 facility are presented in the Annual Radioactive Effluent Release Reports.[4]

The historical information presented in Table A5-4 is a conservative boundary estimate of the radioactive inventory in the reactor coolant system, since the RCS has been drained for SAFSTOR. Since the plant ceased commercial operation, the activity in the spent fuel pool has remained relatively constant, changing only in response to being placed on recirculation through an ion exchanger. Typical isotopic activity as determined by analysis is provided in Table A5-5.

Airborne releases to the environment are due to passive venting of containment and diffusion of small quantities of noble gases from the spent fuel rods. Once the plant was retired, discharges of noble gases, iodine, and particulate decreased dramatically; releases of tritium originate in the fuel handling building and occasionally are detected at the level of sensitivity for the analytical technique.

REFERENCES

4. San Onofre Nuclear Generating Station Radioactive Annual Effluent Release Report, June 1996.

5. San Onofre Monthly Operating Reports, December 1969, January 1970, January-March 1971, June-September 1971, November 1971.

A5.2.4 Estimated (Liquid) Releases

Estimated volumes of radioactive waste processed during plant operation and the assumptions on which these estimates are based are listed for SONGS 1 as an operating plant in Table A5-6. These estimates are very conservative as the volume of releases during SAFSTOR is substantially less.

TABLE A2-1

ESTIMATES OF THE NUMBER OF PERSONS PRESENT IN THE BEACH ZONE OF THE EXCLUSION AREA*

	Maximum Use		Average Use
Exclusion Area	Full Development of Facilities	Current Facilities	Current Facilities
Walkway and barranca area	25	9	2
Beach (below mhw line) and adjacent water	75	26	5
TOTAL	100	35	7

*Excludes traverses of highway, rail, and waterway.

TABLE A2-2

MONTHLY TEMPERATURES AND PRECIPITATION AT CAMP PENDLETON SURF AND WEATHER STATION

Month	Temperatures, °F					Precipitation
	Average	Max.	Avg. Max.	Avg. Min.	Min.	inches
January	52.8	97	60	44	25	3.14
February	53.5	88	62	40	31	2.20
March	56.5	77	60	44	36	2.00
April	57.9	75	63	51	38	0.87
May	59.8	89	65	52	40	0.14
June	63.9	93	67	57	44	0.09
July	67.5	78	72	62	52	0.04
August	67.5	86	72	61	52	0.09
September	65.6	92	72	58	44	0.10
October	62.0	97	68	54	40	0.47
November	58.7	87	68	48	35	1.06
December	54.6	88	63	43	25	1.93

TABLE A2-3

ANNUAL WIND CHARACTERISTICS AND PASQUILL STABILITY CATEGORIES
(January 25, 1973-January 24, 1976)

Stability Category	Percent Frequency	Onshore Wind Frequency (%)	Onshore Wind Average Speed (m/s)	Offshore Wind Average Frequency (%)	Offshore Wind Speed (m/s)
LOWER LEVEL (10 meters)					
A	26.75	91.5	3.5	8.5	4.0
B	3.10	78.7	3.0	21.3	2.8
C	3.96	74.0	3.0	26.0	2.9
D	21.73	67.1	3.3	32.9	2.7
E	17.76	47.5	3.2	52.5	2.8
F	8.41	20.6	2.3	79.4	2.7
G	18.28	9.1	1.8	90.9	3.7
UPPER LEVEL (36.6m and 40m Combined)					
A	29.28	94.3	3.6	5.7	3.9
B	3.26	81.0	3.1	19.0	3.2
C	4.36	76.4	3.1	23.6	3.2
D	22.91	66.4	3.3	33.6	2.8
E	15.56	48.3	3.5	51.7	2.8
F	8.07	26.4	1.9	73.6	2.5
G	16.57	14.7	1.7	85.3	2.7

TABLE A2-4

ANNUAL LONG-TERM (10 YEARS) AND SHORT-TERM (2 YEARS) DISTRIBUTION OF PASQUILL STABILITY CATEGORY (STAR) AND AVERAGE WIND SPEED

Stability Category	January 1955-December 1964 Percent Frequency	January 1955-December 1964 Average Wind Speed (m/s)	January 1973-December 1974 Percent Frequency	January 1973-December 1974 Average Wind Speed (m/s)
		Los Angeles, California		
A	0.34	0.8	0.07	2.0
B	6.51	2.7	6.42	2.8
C	14.43	4.2	13.66	4.3
D	21.63	4.8	22.48	4.4
E	22.00	3.4	23.82	3.3
F	11.04	3.5	9.93	3.4
G	24.05	1.6	23.61	1.8
		San Diego, California		
A	0.26	2.2	0.17	1.4
B	9.06	2.9	6.32	3.1

TABLE A2-5

COMPARISON OF DISTRIBUTION OF STAR STABILITY CLASSIFICATIONS AT LOS ANGELES AND SAN DIEGO WITH SAN ONOFRE TOWER STABILITY MEASUREMENTS

(Percent Frequency of Occurrence)

	Los Angeles	San Diego	San Onofre	
(A + B + C) Unstable				
January 1955-December 1964	21.3	25.8	---	---
January 1973-December 1974	20.2	19.9	---	---
Jan, 25, 1973-Jan. 24, 1976	--	--	Lower* 33.8	Upper* 36.9
(D + E) Neutral				
January 1955-December 1964	43.6	39.8	---	---
January 1973-December 1974	46.3	49.3	---	---
Jan. 25, 1973-Jan. 24, 1976	--	--	Lower* 39.5	Upper* 38.5
(F + G) Stable				
January 1955-December 1964	35.1	34.4	---	---
January 1973-December 1974	33.5	30.9	---	---
Jan. 25, 1973-Jan. 24, 1976	---	---	Lower* 26.7	Upper* 24.6

* Based on stability joint frequency wind speed-wind direction summaries. Lower wind level 10m, upper wind level 36.6m and 40m combined.

TABLE A2-6

STABILITY MEASUREMENTS
(Percent Frequency of Occurrence)

Location	Model/Tower	Measurements		
		Unstable	Neutral	Stable
New Orleans, Louisiana	STAR	25	36	39
	Tower	82	6	12
Wilmington, Delaware and Vicinity	STAR	16	51	33
	Tower (Delaware City, DE)	68	5	27
	Tower (Salem, NJ)	65	13	22

Table A2-7-1

USNRC COMPUTER CODE - XOQDOQ, VERSION 2.0 RUN DATE: 01/07/91

SAN ONOFRE UNIT 1 79-83 METI CONT. RELEASE; SITE-SPECIFIC TERR. RECIRC.

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS A

UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0	0.0	0.0	0.000
0.45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.005	0.0	0.0	0.0	0.005
0.89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.005	0.002	0.0	0.0	0.0	0.0	0.007
1.34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.024	0.049	0.049	0.019	0.019	0.007	0.0	0.0	0.167
1.79	0.0	0.0	0.0	0.0	0.0	0.0	0.002	0.007	0.080	0.277	0.336	0.270	0.106	0.026	0.002	0.002	1.109
2.24	0.0	0.005	0.0	0.0	0.0	0.0	0.002	0.033	0.270	0.393	0.691	0.745	0.508	0.096	0.009	0.012	2.764
2.68	0.002	0.002	0.0	0.002	0.0	0.005	0.009	0.075	0.289	0.583	0.837	0.905	1.394	0.190	0.007	0.0	4.301
3.13	0.007	0.002	0.0	0.0	0.0	0.0	0.012	0.080	0.400	0.538	0.759	1.267	1.763	0.496	0.007	0.0	5.331
3.58	0.0	0.005	0.0	0.0	0.002	0.002	0.033	0.162	0.348	0.465	0.510	0.877	1.615	0.639	0.014	0.0	4.673
4.02	0.005	0.007	0.0	0.0	0.0	0.005	0.031	0.143	0.294	0.334	0.289	0.538	1.236	0.550	0.009	0.0	3.441
4.47	0.007	0.009	0.0	0.002	0.0	0.002	0.035	0.136	0.308	0.212	0.110	0.244	0.663	0.414	0.021	0.0	2.165
4.92	0.002	0.0	0.002	0.0	0.0	0.002	0.012	0.125	0.172	0.087	0.054	0.080	0.249	0.256	0.016	0.002	1.060
7.16	0.005	0.028	0.009	0.005	0.002	0.014	0.041	0.247	0.200	0.068	0.052	0.080	0.244	0.463	0.038	0.002	1.518
TOTAL	0.03	0.06	0.01	0.01	0.00	0.03	0.20	1.01	2.38	3.01	3.69	5.03	7.80	3.14	0.12	0.02	26.54

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS B

UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.34	0.0	0.0	0.0	0.0	0.0	0.0	0.002	0.0	0.0	0.009	0.035	0.009	0.005	0.0	0.002	0.002	0.066
1.79	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.007	0.040	0.016	0.042	0.054	0.056	0.016	0.0	0.002	0.235
2.24	0.005	0.002	0.0	0.0	0.0	0.0	0.0	0.014	0.040	0.028	0.035	0.063	0.085	0.026	0.012	0.0	0.310
2.68	0.0	0.005	0.0	0.0	0.0	0.0	0.0	0.028	0.007	0.016	0.028	0.035	0.035	0.056	0.002	0.005	0.219
3.13	0.0	0.002	0.0	0.0	0.0	0.0	0.014	0.042	0.035	0.014	0.012	0.016	0.019	0.071	0.005	0.0	0.230
3.58	0.0	0.005	0.0	0.002	0.0	0.0	0.019	0.035	0.024	0.012	0.012	0.014	0.026	0.019	0.005	0.0	0.172
4.02	0.005	0.002	0.0	0.0	0.0	0.0	0.012	0.040	0.019	0.009	0.002	0.007	0.007	0.021	0.002	0.0	0.127
4.47	0.0	0.0	0.0	0.005	0.0	0.005	0.016	0.021	0.009	0.007	0.005	0.009	0.0	0.009	0.0	0.0	0.087
4.92	0.0	0.002	0.002	0.0	0.0	0.002	0.005	0.021	0.002	0.007	0.005	0.005	0.005	0.007	0.005	0.0	0.068
7.15	0.0	0.005	0.002	0.0	0.005	0.009	0.028	0.061	0.014	0.007	0.016	0.005	0.019	0.026	0.007	0.0	0.204
TOTAL	0.01	0.02	0.00	0.01	0.00	0.02	0.10	0.27	0.19	0.13	0.19	0.22	0.26	0.25	0.04	0.01	1.72

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS C

UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.002	0.0	0.007	0.002	0.0	0.0	0.0	0.012
1.34	0.009	0.005	0.0	0.0	0.0	0.0	0.002	0.012	0.031	0.035	0.024	0.040	0.019	0.014	0.0	0.002	0.193
1.79	0.005	0.005	0.005	0.0	0.0	0.002	0.005	0.028	0.056	0.059	0.078	0.073	0.066	0.064	0.016	0.005	0.468
2.24	0.007	0.014	0.002	0.0	0.002	0.002	0.009	0.045	0.059	0.045	0.042	0.080	0.108	0.099	0.019	0.014	0.548
2.68	0.009	0.005	0.0	0.002	0.0	0.002	0.031	0.071	0.073	0.045	0.028	0.080	0.089	0.085	0.016	0.0	0.536
3.13	0.002	0.012	0.007	0.0	0.002	0.002	0.021	0.063	0.061	0.042	0.042	0.028	0.040	0.125	0.021	0.002	0.472
3.58	0.002	0.005	0.005	0.0	0.0	0.002	0.014	0.073	0.033	0.042	0.031	0.033	0.024	0.047	0.026	0.0	0.336
4.02	0.002	0.005	0.0	0.002	0.0	0.0	0.033	0.073	0.035	0.019	0.007	0.042	0.016	0.038	0.026	0.0	0.299
4.47	0.0	0.002	0.002	0.005	0.0	0.002	0.019	0.047	0.031	0.012	0.009	0.014	0.005	0.019	0.031	0.005	0.202
4.92	0.002	0.002	0.002	0.002	0.0	0.0	0.012	0.059	0.016	0.009	0.009	0.007	0.002	0.021	0.016	0.002	0.165
7.15	0.009	0.009	0.012	0.005	0.002	0.033	0.052	0.132	0.042	0.016	0.035	0.035	0.049	0.052	0.024	0.007	0.515
TOTAL	0.05	0.06	0.04	0.02	0.01	0.05	0.20	0.60	0.44	0.33	0.31	0.44	0.42	0.56	0.20	0.04	3.74

Table A2-7-2

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS D

UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.22	0.002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0	0.0	0.0	0.000	0.0	0.0	0.002
0.45	0.009	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.002	0.0	0.0	0.0	0.002	0.0	0.0	0.014
0.89	0.038	0.035	0.014	0.005	0.002	0.012	0.012	0.019	0.047	0.042	0.042	0.049	0.049	0.045	0.049	0.038	0.498
1.34	0.233	0.165	0.049	0.052	0.042	0.052	0.101	0.160	0.240	0.197	0.230	0.214	0.263	0.174	0.197	0.176	2.545
1.79	0.360	0.263	0.092	0.066	0.068	0.127	0.251	0.484	0.402	0.324	0.249	0.336	0.371	0.421	0.353	0.270	4.438
2.24	0.235	0.362	0.129	0.068	0.122	0.233	0.526	0.517	0.407	0.219	0.190	0.197	0.249	0.357	0.306	0.193	4.313
2.68	0.150	0.355	0.096	0.045	0.143	0.254	0.486	0.552	0.322	0.181	0.120	0.141	0.221	0.301	0.350	0.143	4.061
3.13	0.071	0.212	0.031	0.007	0.118	0.230	0.489	0.468	0.244	0.181	0.089	0.132	0.108	0.219	0.277	0.075	3.150
3.58	0.028	0.108	0.012	0.007	0.052	0.143	0.515	0.397	0.193	0.110	0.056	0.094	0.085	0.125	0.216	0.089	2.231
4.02	0.005	0.049	0.007	0.005	0.009	0.078	0.418	0.263	0.157	0.063	0.045	0.071	0.052	0.118	0.179	0.014	1.532
4.47	0.012	0.031	0.007	0.005	0.009	0.061	0.336	0.207	0.089	0.061	0.035	0.051	0.047	0.089	0.115	0.026	1.161
4.92	0.007	0.014	0.002	0.012	0.005	0.026	0.183	0.186	0.073	0.040	0.047	0.042	0.028	0.054	0.099	0.009	0.827
7.15	0.016	0.038	0.040	0.020	0.068	0.141	0.447	0.639	0.362	0.251	0.183	0.223	0.322	0.204	0.200	0.021	3.185
TOTAL	1.17	1.63	0.48	0.30	0.64	1.36	4.16	3.89	2.54	1.67	1.29	1.53	1.80	2.11	2.34	1.06	27.96

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS E

UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.000
0.45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.002	0.002	0.002	0.0	0.0	0.0	0.0	0.0	0.0	0.007
0.89	0.061	0.096	0.068	0.056	0.033	0.012	0.047	0.040	0.024	0.031	0.026	0.016	0.014	0.009	0.038	0.014	0.585
1.34	0.244	0.566	0.172	0.127	0.134	0.132	0.141	0.143	0.118	0.035	0.061	0.052	0.078	0.061	0.056	0.054	2.174
1.79	0.368	0.926	0.293	0.183	0.179	0.153	0.315	0.146	0.085	0.042	0.063	0.071	0.054	0.096	0.080	0.087	3.032
2.24	0.310	0.738	0.153	0.103	0.134	0.174	0.212	0.122	0.049	0.016	0.031	0.042	0.080	0.094	0.085	0.127	2.470
2.68	0.273	0.501	0.054	0.068	0.082	0.115	0.228	0.071	0.012	0.005	0.005	0.012	0.061	0.110	0.108	0.101	1.805
3.13	0.195	0.404	0.009	0.014	0.049	0.047	0.167	0.063	0.014	0.012	0.012	0.009	0.033	0.141	0.099	0.106	1.375
3.58	0.113	0.226	0.014	0.012	0.021	0.026	0.085	0.047	0.002	0.002	0.007	0.012	0.035	0.087	0.059	0.021	0.769
4.02	0.049	0.108	0.021	0.007	0.012	0.012	0.075	0.021	0.007	0.005	0.009	0.007	0.021	0.059	0.059	0.026	0.496
4.47	0.031	0.035	0.021	0.007	0.005	0.007	0.056	0.026	0.007	0.002	0.012	0.007	0.005	0.061	0.045	0.016	0.343
4.92	0.024	0.035	0.014	0.007	0.005	0.002	0.024	0.007	0.007	0.002	0.002	0.0	0.014	0.024	0.028	0.014	0.209
7.15	0.019	0.078	0.122	0.056	0.014	0.019	0.190	0.132	0.071	0.071	0.045	0.014	0.120	0.132	0.059	0.019	1.159
TOTAL	1.68	3.71	0.84	0.64	0.67	0.70	1.54	0.82	0.40	0.23	0.27	0.24	0.51	0.87	0.71	0.59	14.42

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS F

UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.89	0.007	0.033	0.045	0.040	0.019	0.007	0.012	0.012	0.002	0.0	0.007	0.007	0.002	0.009	0.002	0.007	0.212
1.34	0.073	0.294	0.233	0.101	0.085	0.035	0.045	0.059	0.016	0.009	0.014	0.016	0.024	0.019	0.019	0.021	1.062
1.79	0.106	0.832	0.336	0.103	0.059	0.049	0.052	0.049	0.047	0.009	0.028	0.002	0.033	0.028	0.012	0.024	1.770
2.24	0.143	1.328	0.251	0.068	0.042	0.026	0.089	0.035	0.016	0.014	0.002	0.005	0.052	0.047	0.026	0.028	2.174
2.68	0.139	1.634	0.110	0.028	0.038	0.009	0.068	0.026	0.021	0.009	0.0	0.0	0.031	0.042	0.026	0.028	2.209
3.13	0.125	1.126	0.042	0.012	0.012	0.005	0.049	0.024	0.0	0.005	0.005	0.0	0.012	0.026	0.019	0.031	1.492
3.58	0.141	0.581	0.026	0.005	0.0	0.0	0.014	0.005	0.0	0.005	0.005	0.0	0.005	0.040	0.016	0.016	0.858
4.02	0.106	0.289	0.024	0.005	0.0	0.0	0.005	0.016	0.002	0.005	0.007	0.0	0.0	0.016	0.019	0.024	0.517
4.47	0.026	0.193	0.009	0.0	0.002	0.0	0.012	0.002	0.0	0.0	0.0	0.002	0.002	0.016	0.014	0.009	0.289
4.92	0.028	0.087	0.021	0.005	0.0	0.0	0.007	0.0	0.0	0.0	0.0	0.0	0.002	0.002	0.002	0.0	0.155
7.15	0.016	0.103	0.047	0.007	0.0	0.0	0.0	0.005	0.0	0.0	0.0	0.002	0.0	0.002	0.005	0.002	0.190
TOTAL	0.91	6.50	1.14	0.37	0.26	0.13	0.35	0.23	0.11	0.06	0.07	0.04	0.16	0.25	0.16	0.19	10.93

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS G

Table A2-7-3

UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.45	0.0	0.0	0.002	0.0	0.0	0.0	0.005	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.007
0.89	0.002	0.007	0.009	0.009	0.005	0.014	0.0	0.012	0.002	0.002	0.002	0.002	0.007	0.009	0.0	0.0	0.085
1.34	0.009	0.052	0.031	0.042	0.019	0.040	0.026	0.028	0.024	0.009	0.007	0.012	0.007	0.007	0.005	0.005	0.322
1.79	0.019	0.148	0.122	0.038	0.035	0.016	0.012	0.028	0.014	0.012	0.012	0.002	0.038	0.016	0.012	0.0	0.524
2.24	0.040	0.308	0.099	0.012	0.009	0.007	0.021	0.014	0.005	0.005	0.002	0.021	0.031	0.026	0.012	0.016	0.628
2.68	0.061	0.769	0.110	0.031	0.007	0.007	0.019	0.009	0.0	0.005	0.0	0.0	0.016	0.035	0.026	0.012	1.107
3.13	0.113	1.596	0.073	0.002	0.0	0.007	0.092	0.005	0.012	0.005	0.002	0.0	0.009	0.026	0.019	0.026	1.986
3.58	0.160	1.972	0.040	0.002	0.0	0.0	0.087	0.019	0.0	0.024	0.0	0.0	0.012	0.019	0.019	0.026	2.379
4.02	0.127	2.122	0.038	0.002	0.0	0.0	0.073	0.014	0.024	0.014	0.0	0.0	0.0	0.019	0.002	0.012	2.447
4.47	0.134	1.932	0.035	0.0	0.0	0.0	0.024	0.024	0.0	0.033	0.0	0.0	0.0	0.0	0.016	0.0	2.198
4.92	0.042	1.356	0.002	0.0	0.002	0.0	0.005	0.005	0.009	0.028	0.0	0.0	0.0	0.0	0.0	0.0	1.450
7.15	0.085	1.406	0.019	0.002	0.0	0.0	0.009	0.009	0.005	0.0	0.0	0.0	0.0	0.0	0.002	0.0	1.537
TOTAL	0.79	11.67	0.58	0.14	0.08	0.09	0.37	0.17	0.09	0.14	0.03	0.04	0.12	0.16	0.11	0.10	14.67

TOTAL HOURS CONSIDERED ARE 42546

WIND MEASURED AT 10.0 METERS.

OVERALL WIND DIRECTION FREQUENCY

WIND DIRECTION:	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
FREQUENCY:	4.6	23.7	3.1	1.5	1.7	2.4	6.9	7.0	6.1	5.6	5.8	7.5	11.1	7.3	3.7	2.0	100.0

OVERALL WIND SPEED FREQUENCY

MAX WIND SPEED (M/S):	0.224	0.447	0.894	1.341	1.788	2.235	2.682	3.129	3.576	4.023	4.470	4.917	7.153
AVE WIND SPEED (M/S):	0.112	0.335	0.671	1.118	1.565	2.012	2.459	2.906	3.353	3.800	4.247	4.694	6.035
WIND SPEED FREQUENCY:	0.00	0.03	1.40	6.53	11.58	13.20	14.24	14.04	11.42	8.86	6.44	3.93	8.31

THE CONVERSION FACTOR APPLIED TO THE WIND SPEED CLASSESS IS 0.447

DISTANCES AND TERRAIN HEIGHTS IN METERS AS FUNCTIONS OF DIRECTION FROM THE SITE:

DIRECTION =	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE
DISTANCE	0.	0.	0.	0.	74.	69.	69.	76.	154.	129.	129.	153.	211.	332.	547.	0.
ELEVATION	-6.	-6.	-6.	-6.	24.	24.	24.	24.	24.	24.	24.	24.	24.	24.	24.	-6.

DISTANCES AND SITE-SPECIFIC CORRECTION FACTORS AS FUNCTIONS OF DIRECTION FROM THE SITE:

DIRECTION =	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE
DISTANCE	593.	481.	398.	345.	320.	317.	319.	342.	391.	472.	581.	703.	885.	1023.	954.	765.
FACTOR	1.00	1.52	1.11	1.33	1.63	1.39	1.27	1.00	1.03	1.23	1.27	1.04	1.23	1.05	1.19	1.51

Table A2-7-4

SAN RE U1 79MET;T. RSE; -SPEC TERECI

UNIT 1; SITE SPEC. OPEN TERR. RECIRC.; CONT. RELEASE
CORRECTED USING SITE-SPECIFIC FACTORS
SPECIFIC POINTS OF INTEREST

RELEASE ID	TYPE OF LOCATION	DIRECTION FROM SITE	DISTANCE (MILES)	DISTANCE (METERS)	X/Q (SEC/CUB.METER) NO DECAY UNDEPLETED	X/Q (SEC/CUB.METER) 2.260 DAY DECAY UNDEPLETED	X/Q (SEC/CUB.METER) 8.000 DAY DECAY DEPLETED	D/Q (PER SQ.METER)
S	EAB SECTORS N-B	W	0.20	320.	6.8E-06	6.8E-06	6.5E-06	2.2E-08
S	EAB SECTORS N-B	WNW	0.20	317.	6.6E-06	6.6E-06	6.3E-06	2.7E-08
S	EAB SECTORS N-B	NW	0.20	319.	1.3E-05	1.3E-05	1.3E-05	7.2E-08
S	EAB SECTORS N-B	NNW	0.21	342.	8.2E-06	8.2E-06	7.8E-06	5.2E-08
S	EAB SECTORS N-B	N	0.24	391.	5.1E-06	5.1E-06	4.8E-06	3.8E-08
S	EAB SECTORS N-B	NNE	0.29	472.	3.4E-06	3.4E-06	3.2E-06	3.1E-08
S	EAB SECTORS C-J	NE	0.36	581.	2.3E-06	2.3E-06	2.2E-06	2.4E-08
S	EAB SECTORS C-J	ENE	0.44	703.	1.5E-06	1.5E-06	1.4E-06	1.9E-08
S	EAB SECTORS C-J	E	0.55	885.	1.6E-06	1.6E-06	1.5E-06	2.3E-08
S	EAB SECTORS C-J	ESE	0.64	1023.	1.2E-06	1.2E-06	1.1E-06	1.0E-08
S	EAB SECTORS C-J	SE	0.59	954.	1.3E-06	1.3E-06	1.2E-06	6.5E-09
S	EAB SECTORS C-J	SSE	0.48	765.	1.6E-06	1.6E-06	1.5E-06	6.4E-09
S	EAB SECTORS C-J	S	0.37	593.	4.1E-06	4.1E-06	3.8E-06	1.5E-08
S	EAB SECTORS K-M	SSW	0.30	481.	4.6E-05	4.6E-05	4.4E-05	1.6E-07
S	EAB SECTORS K-M	SW	0.25	398.	7.7E-06	7.7E-06	7.3E-06	2.0E-08
S	EAB SECTORS K-M	WSW	0.21	345.	5.7E-06	5.6E-06	5.4E-06	1.4E-08

VENT AND BUILDING PARAMETERS:

RELEASE HEIGHT	(METERS)	36.60	REP. WIND HEIGHT	(METERS)	10.0
DIAMETER	(METERS)	0.0	BUILDING HEIGHT	(METERS)	41.0
EXIT VELOCITY	(METERS)	0.0	BLDG.MIN.CRS.SEC.AREA	(SQ.METERS)	1440.0
			HEAT EMISSION RATE	(CAL/SEC)	0.0

ALL GROUND LEVEL RELEASES.

TABLE A5-1

DIRECT GAMMA SOURCES AND ISOTOPIC INVENTORY FOR THE SPENT FUEL GAP ACTIVITY 90 HOURS FOLLOWING SHUTDOWN

	Energy Group	Noble Gas Activity (Gamma/s) (14 Fuel Rods)*
I.	E <= 0.4 MeV	4.26×10^{13}
II	0.4 MeV < E <= 0.8 MeV	8.0×10^{7}
IIII	0.8 MeV < E <= 1.7 MeV	Negligible
IV	E > 1.7 MeV	Negligible

Isotope	Inventory, Ci/MWt
Kr-85	1.8×10^{2}
Kr-85m	1.2×10^{-4}
Kr-87	10^{-10}
Kr-88	10^{-10}
Xe-133m	10.4
Xe-133	1.5×10^{3}
Xe-135	5.8×10^{-3}

* One side of the 14 x 14 array fuel assembly (14 fuel rods) is assumed to be involved in the spent fuel handling accident and ruptured so as to release radioactive nuclides into the spent fuel pool.

TABLE A5-2

MAXIMUM FISSION AND CORROSION PRODUCT ISOTOPIC INVENTORIES OF REACTOR COOLANT FOR REFERENCE ONE PERCENT CLADDING DEFECT CASE (BASED UPON 570°F COOLANT)

Sheet 1 of 2

Isotope	Specific Activity µCi/cc	Coolant Inventory, Ci
Br-84	0.16	31
Kr-85	4.2	800
Kr-85 (m)	1.3	250
Kr-87	0.73	140
Kr-88	2.1	400
Rb-88	2.1	400
Rb-89	5.0×10^{-2}	10
Sr-89	2.0×10^{-3}	0.4
Sr-90	1.0×10^{-4}	0.02
Y-90	1.9×10^{-4}	0.04
Sr-91	1.0×10^{-3}	0.2
Y-91	2.8×10^{-2}	5.3
Mo-99	2.5	477
Te-129	1.6×10^{-2}	3
I-129	2.4×10^{-8}	0.5×10^{-5}
I-131	1.4	267
Te-132	0.13	25
I-132	0.50	95
I-133	1.9	363
Xe-133	158	30.200
Te-134	1.4×10^{-2}	2.7
I-134	0.26	50
Cs-134	0.68	130
I-135	0.99	189
Xe-135	4.4	840
Cs-136	7.0×10^{-2}	13
Cs-137	15.7	3000
Xe-138	0.32	61
Cs-138	0.52	100
Ba-140	2.1×10^{-3}	0.4
La-140	7.1×10^{-4}	0.1
Co-60	1.5×10^{-3}	0.29
Fe-59	1.9×10^{-3}	0.36

TABLE A5-2

Sheet 2 of 2

Isotope	Specific Activity µCi/cc	Coolant Inventory, Ci
Co-58	8.5×10^{-3}	1.6
Mn	2.3×10^{-2}	4.4
Mn-54	4.4×10^{-3}	0.84

TABLE A5-3

MAXIMUM FISSION AND CORROSION PRODUCT GAMMA SOURCES OF REACTOR COOLANT (1% CLADDING DEFECTS)

	Time After Shutdown						
	0	1 h	2 h	8 h	1 day	1 wk	1 mo
Source and Energy Group, MeV	Radiation Sources Released, MeV/s						
0.4	1.0×10^{14}	1.0×10^{14}	9.9×10^{13}	9.4×10^{13}	8.0×10^{13}	3.6×10^{13}	1.9×10^{12}
0.8	9.2×10^{13}	8.0×10^{13}	7.8×10^{13}	7.6×10^{13}	7.4×10^{13}	6.9×10^{13}	6.9×10^{13}
1.7	1.5×10^{13}	9.7×10^{12}	6.5×10^{12}	5.2×10^{12}	2.9×10^{11}	2.9×10^{10}	1.9×10^{10}
2.5	4.8×10^{13}	3.1×10^{13}	2.3×10^{13}	2.9×10^{12}	9.0×10^{11}	-	-
Isotope	Iodine Activities, Ci						
I-131	267.0	267.0	267.0	260.0	244.0	147.0	20.0
I-132	88.0	66.0	50.0	8.6	0.086	neg	neg
I-133	363.0	351.0	340.0	279.0	163.0	13.8	neg
I-134	50.2	22.5	9.6	0.096	neg	neg	neg
I-135	189.0	172.0	154.0	82.3	15.7	neg	neg

UNIT 1 RADIOACTIVE RELEASES 1968-1996
Table A5-4

	AIRBORNE				LIQUIDS		
	FISSION/ ACTIVATION GASES	IODINE	PARTICULATE	TRITIUM	FISSION/ ACTIVATION PRODUCTS	DISSOLVED & ENTRAINED GASES	TRITIUM
1968	4.83E+00				1.64E+00		
1969	2.56E+02			2.48E+00	8.00E+00		3.53E+03
1970	1.61E+03			1.08E+01	3.76E+00		4.77E+03
1971	5.99E+03			5.36E+01	9.51E-01		4.57E+03
1972	1.91E+04			2.81E+02	3.03E+01		3.48E+03
1973	1.07E+04	6.51E-01	1.18E+00	2.69E+02	1.60E+01	5.36E+01	4.07E+03
1974	1.78E+03	2.31E-04	8.74E-05	9.14E+01	5.03E+00	3.37E+00	3.85E+03
1975	1.79E+03	2.46E-01	3.58E-02	3.43E+01	1.22E+00	4.74E+00	4.00E+03
1976	4.17E+02	4.48E-03	1.11E+00	4.72E+01	7.39E+00	1.25E+01	3.39E+03
1977	1.67E+02	1.81E-04	4.83E-06	7.57E+01	5.10E+00	4.53E+00	1.79E+03
1978	2.20E+03	2.76E-04	2.49E-03	5.75E+01	1.22E+01	1.82E+00	4.21E+03
1979	7.99E+02	2.44E-04	3.68E-05	4.27E+01	1.20E+01	2.73E+01	3.35E+03
1980	1.05E+03	2.53E-04	8.41E-01	3.69E+01	1.12E+01	2.90E+00	1.03E+03
1981	4.22E+02	8.68E-03	3.12E-02	1.40E+01	4.16E+00	4.94E-01	2.97E+02
1982	8.61E+01	<LLD	4.66E-07	5.63E+01	2.15E+00	<LLD	5.45E+02
1983	1.06E+01	2.92E-06	2.52E-06	3.93E+00	1.22E+00	<LLD	1.57E+01
1984	8.62E+01	6.78E-06	2.71E-06	<LLD	2.74E+00	2.30E-01	3.39E+01
1985	3.83E+03	1.14E-03	2.49E-05	2.89E+01	7.79E+00	3.12E+01	2.38E+03
1986	4.11E+02	1.99E-04	9.34E-06	1.70E+00	8.51E-01	9.80E-01	4.53E+02
1987	9.81E+02	4.10E-04	7.11E-06	1.51E+01	8.42E-01	1.89E+00	2.27E+03
1988	2.99E+03	1.03E-02	5.07E-04	2.05E+01	7.11E-01	1.46E+01	1.53E+03
1989	1.12E+03	2.09E-03	1.37E-04	3.37E+01	6.66E-01	8.03E+00	9.62E+02
1990	1.80E+03	7.22E-03	2.76E-05	9.13E+01	4.00E-01	5.47E+00	1.42E+03
1991	2.49E+03	1.51E-03	9.90E-04	1.68E+01	4.20E-01	3.04E+00	1.25E+03
1992	4.12E+03	1.57E-02	1.12E-05	5.19E+01	3.42E-01	3.12E+00	3.05E+03
1993	4.20E+02	2.94E-04	6.86E-06	1.19E+01	1.14E+00	7.75E-02	4.45E+02
1994	<LLD	<LLD	<LLD	3.47E+00	2.32E-03	<LLD	1.53E-02
1995	<LLD	<LLD	<LLD	3.18E+00	6.99E-02	<LLD	8.64E+00
1996	<LLD	<LLD	<LLD	3.75E+00	4.53E-02	<LLD	3.08E+00

TABLE A5-5

AVERAGE REACTOR COOLANT ACTIVITY WITH
0.1 PERCENT DEFECTIVE FUEL CLADDING

Isotope	(µCi/gm)	Isotope	(µCi/gm
H-3	3.40×10^{0}	Cs-137	2.16×10^{0}
Kr-85	3.36×10^{-1}	I-131	1.92×10^{-1}
Kr-85m	1.28×10^{-1}	I-132	6.80×10^{-2}
Kr-87	1.00×10^{-1}	I-133	2.60×10^{-1}
Kr-88	2.88×10^{-1}	I-134	3.60×10^{-2}
Xe-133	2.16×10^{-1}	I-135	1.36×10^{-1}
Xe-135	6.02×10^{-1}	Mn-54	6.0×10^{-3}
Xe-138	4.40×10^{-2}	Mn-56	3.2×10^{-2}
Mo-99	3.24×10^{-1}	Co-58	1.2×10^{-2}
Cs-134	9.40×10^{-2}	Fe-59	2.6×10^{-3}
		Co-60	2.1×10^{-3}

TABLE A5-6

ESTIMATED ANNUAL RADIOACTIVE WASTE QUANTITIES PROCESSED DURING NORMAL OPERATION

Sheet 1 of 2

Source	Quantity, gal	Assumptions and Comments
LIQUID WASTES		
Input of coolant radwaste		
Boron dilution for fuel depletion	200,000	
One refueling shutdown and startup	59,700	
Four hot shutdowns and startups	164,000	One each at 100, 200, and 300 cycle days plus one at 100 ppm boron
Two cold shutdowns and startups	106,000	One at 50 hrs core life and 300 cycle days
Inputs to decontamination drain tank		
Miscellaneous reactor coolant leakage	9,050	20 gal/day into auxiliary buidling. 40 lb/day leakage to containment atsmosphere
Floor drains	50,000	
Resin sluice water	935	2 ft^3 water/ft^3 resin for total of 125 ft^3
Decontamination showers	9,000	5 showers/day at 30 gal/shower for 30 days/year

TABLE A5-6

Sheet 2 of 2

Source	Quantity, gal	Assumptions and Comments
LIQUID WASTES		
Inputs to radioactive chemical lab drain tank		
Sampling and lab drains	3,900	5 samples/week at 15 gal/sample, including purge
Floor drains	30,000	
Steam generator blowdown (non-routine operation)	13,900,000	Nonroutine operation with steam generator tube leak. 30 gal/min blowdown for 322 days/year

APPENDIX B

Fire Protection Design Basis Table

San Onofre Nuclear Generating Station Unit 1

This section provided a comparison of the SONGS Unit 1 commitments to the requirements of Branch Technical Position 9.5-1, Appendix A. The information contained in this Appendix provided background information regarding statements made in the original Unit's 2 and 3 Fire Hazards Analysis, Unit 1 Fire Protection Program Review, and other selected Unit 1 Licensing Documents.

Unit 1 is no longer operating, there is no longer a need to comply with the requirements of 10CFR50, Appendix R, Sections III.G, III.J, III.L and III.O.

All safety related equipment and buildings have been removed. Fire protection features were systematically abandoned and removed as fire hazards were eliminated and buildings were demolished. The fire protection system has been reduced to manual suppression capabilities throughout the Unit 1 Industrial Area. All areas subject to the Branch Technical Position 9.5-1, Appendix A, have been decommissioned.