

10 CFR 50.36(a)

April 15, 2026

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

Subject: **Annual Radioactive Effluent Release Report – 2025**
San Onofre Nuclear Generating Station (SONGS), Units 1, 2 and 3
Docket Nos. 50-206, 50-361 and 50-362

Dear Sir or Madam:

In accordance with 10 CFR 50.36(a), Southern California Edison (SCE) is submitting the Annual Radioactive Effluent Release Report - 2025 (ARERR) for the San Onofre Nuclear Generating Station (SONGS), Units 1, 2, and 3. The period of the report is January 1, 2025 through December 31, 2025. A separate ARERR was submitted for the SONGS Independent Spent Fuel Storage Installation (ISFSI) on February 24, 2026 which had no effluent releases.

The net result from the analysis of these effluent releases indicates that SONGS has met all the requirements of the applicable regulations that ensure adequate protection of the health of members of the public.

SONGS Licensee Controlled Specification 5.5.2.1.1.c requires changes to the Offsite Dose Calculation Manual (ODCM) to be submitted with the ARERR. There were no revisions made to the SONGS ODCM during this reporting period and so a copy of the ODCM is not included in this submittal.

There are no commitments in this letter or the enclosure.

If you have any questions, please contact me at (949) 368-6274.

Sincerely,

A handwritten signature in black ink, appearing to read "M. Mung", with a long horizontal flourish extending to the right.

Enclosure:

San Onofre Nuclear Generation Station, Annual Radioactive Effluent Release
Report – 2025

cc: J. Monninger, Regional Administrator, NRC Region IV
O.E. Font, NRC Project Manager, SONGS Units 1, 2 and 3
J. Fassel, California Department of Public Health

Enclosure

San Onofre Nuclear Generating Station
Annual Radioactive Effluent Release Report
2025
January - December

San Onofre Nuclear Generating Station



2025 Annual Radioactive Effluent Release Report

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1.0 LIST OF ACRONYMS AND DEFINITIONS

1. Alpha Particle (α): A charged particle emitted from the nucleus of an atom having a mass and charge equal in magnitude of a helium nucleus.
2. AREOR: Annual Radiological Environmental Operating Report
3. ARERR: Annual Radioactive Effluent Release Report
4. BWR: Boiling Water Reactor
5. Composite Sample: A series of single collected portions (aliquots) analyzed as one sample. The aliquots making up the sample are collected at time intervals that are very short compared to the composite period.
6. Control: A sampling station in a location not likely to be affected by plant effluents due to its distance and/or direction from the Plant.
7. Counting Error: An estimate of the two-sigma uncertainty associated with the sample results based on total counts accumulated.
8. Curie (Ci): A measure of radioactivity; equal to 3.7×10^{10} disintegrations per second, or 2.22×10^{12} disintegrations per minute.
9. Direct Radiation Monitoring: The measurement of radiation dose at various distances from the plant is assessed using thermoluminescent dosimeters (TLDs), optically stimulated luminescent dosimeters (OSLDs), and/or pressurized ionization chambers.
10. Grab Sample: A single discrete sample drawn at one point in time.
11. Indicator: A sampling location that is potentially affected by plant effluents due to its proximity and/or direction from the plant.
12. Ingestion Pathway: The ingestion pathway includes milk, fish, drinking water and garden produce. Also sampled (under special circumstances) are other media such as vegetation or animal products when additional information about particular radionuclides is needed.
13. ISFSI: Independent Spent Fuel Storage Installation
14. LLD: Lower Limit of Detection. An *a priori* measure of the detection capability of a radiochemistry measurement based on instrument setup, calibration, background, decay time, and sample volume. An LLD is expressed as an activity concentration. The MDA is used for reporting results. LLD are specified by a regulator, such as the NRC and are typically listed in the ODCM.
15. MDA: Minimum Detectable Activity. For radiochemistry instruments, the MDA is the *a posteriori* minimum concentration that a counting system detects. The smallest concentration or activity of radioactive material in a sample that will yield a net count above instrument background and that is detected with 95% probability, with only 5% probability of falsely concluding that a blank observation represents a true signal.

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16. MDC: Minimum Detectable Concentration. Essentially synonymous with MDA for the purposes of radiological monitoring.
17. Mean: The sum of all of the values in a distribution divided by the number of values in the distribution, synonymous with average.
18. microcurie (μCi): 3.7×10^4 disintegrations per second, or 2.22×10^6 disintegrations per minute.
19. millirem (mrem): 1/1000 rem; a unit of radiation dose equivalent in tissue.
20. milliroentgen (mR): 1/1000 Roentgen; a unit of exposure to X- or gamma radiation.
21. N/A: Not Applicable
22. NEI: Nuclear Energy Institute
23. NRC: Nuclear Regulatory Commission
24. ODCM: Offsite Dose Calculation Manual
25. OSLD: Optically Stimulated Luminescence Dosimeter
26. Protected Area: A 10 CFR 73 security term, the Protected Area is an area encompassed by physical barriers and to which access is controlled for security purposes. The fenced area immediately surrounding the plant and around ISFSI are commonly classified by the licensee as "Protected areas." Access to the protected area requires a security badge or escort.
27. PWR: Pressurized Water Reactor
28. REC: Radiological Effluent Control
29. REMP: Radiological Environmental Monitoring Program
30. Restricted Area: A 10 CFR 20 defined term, a Restricted Area is an area where access is limited by the licensee for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials.
31. TEDE: Total Effective Dose Equivalent (TEDE) means the sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).
32. TLD: Thermoluminescent Dosimeter
33. Unrestricted Area: An area, access to which is neither limited nor controlled by the licensee.

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2.0 EXECUTIVE SUMMARY

San Onofre Nuclear Generating Station (SONGS) Radiological Effluent Control (REC) Program was established to limit the quantities of radioactive material that may be released based on calculated radiation doses or dose rates. Dose to Members of the Public due to radioactive materials released from the plant is limited by Licensee Controlled Specifications, by 10 CFR 20, and by 40 CFR 190. Operational doses to the public during 2025 were calculated to be within the limits required by regulation and compared to other sources of radiation dose and pose no health hazard. These doses are summarized and compared to the regulatory limits in Section 2.1 Comparison to Regulatory Limits.

The Annual Radioactive Effluent Release Report (ARERR) is published per Offsite Dose Calculation Manual (ODCM) requirements and provides data related to plant operation, including: quantities of radioactive materials released in liquid and gaseous effluents; radiation doses to members of the public; solid radioactive waste shipped offsite for processing or direct disposal; and other information as required by site licensing documents.

In 2025, the gaseous effluent dose assessments for locations from the Land Use Census showed that the critical receptor for San Onofre Nuclear Generating Station, is a person of any age group, due to Inhalation and Ground Plane pathways, located 1.1 mi NW of SONGS, based on previous year's releases. The maximum hypothetical Annual Organ Dose calculated for this receptor was 0.0 mrem, because there were no gaseous particulate releases attributable to SONGS during 2025.

The maximum hypothetical dose calculated to any organ due to radioactive liquid effluents was 0.0032 mrem, for the gastrointestinal tract/lower large intestine (GI/LLI) of an Adult due to Ingestion of Fish and Shellfish. The annual Total Body dose due to radioactive liquid effluents was 0.0006 mrem.

Solid radioactive waste shipped offsite for processing or direct disposal included 710 Curies and 88,500 m³, shipped in 1209 shipments.

In addition to monitoring radioactive effluents, SONGS has a Radiological Environmental Monitoring Program (REMP) that monitors for levels of radiation and radioactive materials in the local environment. Data from the REMP is published in the Annual Radiological Environmental Operating Report (AREOR).

2.1 Comparison to Regulatory Limits

During 2025 all liquid and gaseous radioactive effluents from San Onofre Nuclear Generating Station were well below regulatory limits, as summarized in Table 1 and Table 2.

Table 1, San Onofre Nuclear Generating Station Units 2/3 Dose Summary¹

		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual
Liquid Effluent Dose Limit, Total Body	Limit	3 mrem	3 mrem	3 mrem	3 mrem	6 mrem
	Total Body Dose	0.0006	0	0	0.00004	0.0006
	% of Limit ²	0.02%	0.00%	0.00%	0.00%	0.01%
Liquid Effluent Dose Limit, Any Organ	Limit	10 mrem	10 mrem	10 mrem	10 mrem	20 mrem
	Max Organ Dose	0.0029	0	0	0.0003	0.0032
	% of Limit ²	0.03%	0.00%	0.00%	0.00%	0.02%
Gaseous Effluent Organ Dose Limit (Iodine, Tritium, Particulates with > 8-day half-life)	Limit	15 mrem	15 mrem	15 mrem	15 mrem	30 mrem
	Max Organ Dose	0	0	0	0	0
	% of Limit ²	0.00%	0.00%	0.00%	0.00%	0.00%

Table 2, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for SONGS³

	Whole Body	Thyroid	Max Other Organ
Gaseous Dose ⁴	0	0	0
Liquid Dose	0.0006	0.0001	0.0032
Unit 1 Outfall Dose ⁵	0.0796	N/A	N/A
Direct Shine Dose	0	0	0
Total Site Dose⁶	0.0802	0.0001	0.0032
Limit	25 mrem	75 mrem	25 mrem
% of Limit²	0.32%	0.00%	0.01%

¹ Table 1 demonstrates compliance with 10 CFR Part 50, App. I Limits. All doses are in mrem and have been reported in floating point notation to enhance clarity for non-technical readers.

² Percentages in Table 1 and Table 2 are rounded to the nearest 0.01%.

³ Table 2 is a summation of Units 1, 2 & 3 to show compliance with 40 CFR Part 190 Limits. All doses are in mrem.

⁴ Gaseous dose values in Table 2 include organ dose from tritium and particulates.

⁵ The methodology for determining 40 CFR 190 compliance includes an estimate of annual Total Body dose due to residual licensed material in the Unit 1 discharge conduit, as described in the SONGS ODCM.

⁶ There are no other fuel cycle sources within 5 miles of SONGS.

3.0 INTRODUCTION

3.1 About Nuclear Power

Commercial nuclear power plants are generally classified as either Boiling Water Reactors (BWRs) or Pressurized Water Reactors (PWRs), based on their design. A BWR includes a single coolant system where water used as reactor coolant boils as it passes through the core and the steam generated is used to turn the turbine generator for power production. A PWR, in contrast, includes two separate water systems: radioactive reactor coolant and a secondary system. Reactor coolant is maintained under high pressure, preventing boiling. The high-pressure coolant is passed through a heat exchanger called a steam generator where the secondary system water is boiled, and the steam is used to turn the turbine generator for power production. SONGS included three PWR units, which were permanently shut down and are in the process of being decommissioned.

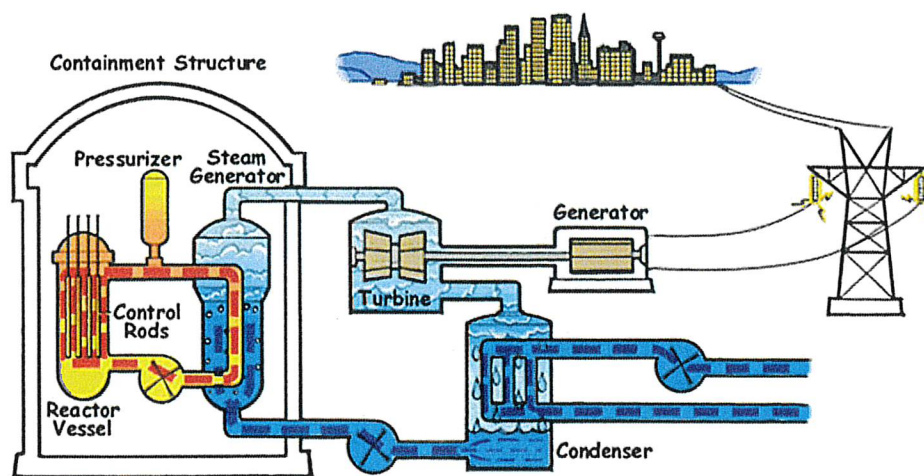


Figure 1, Pressurized Water Reactor (PWR) [1]

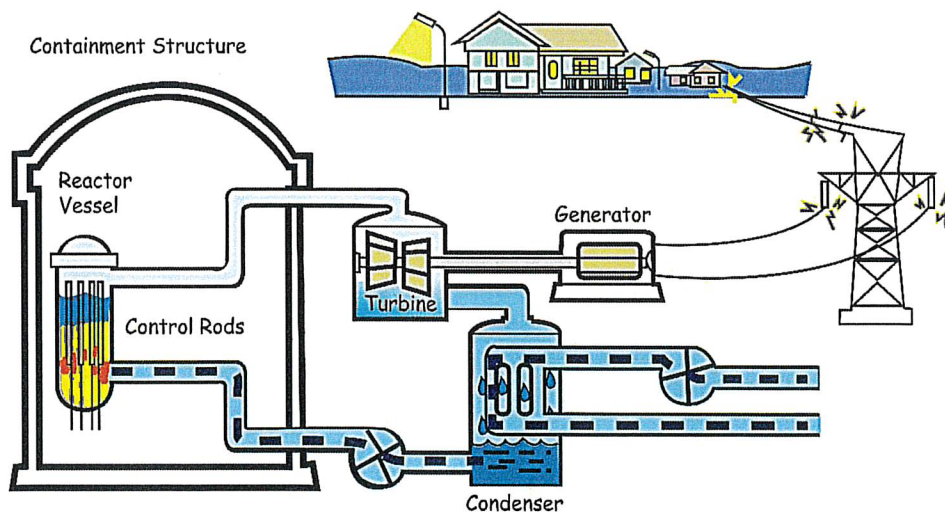


Figure 2, Boiling Water Reactor (BWR) [2]

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3.1 (Continued)

Electricity is generated by a nuclear power plant similarly to the way that electricity is generated at other conventional types of power plants, such as those powered by coal or natural gas. Water is boiled to generate steam; the steam turns a turbine that is attached to a generator and the steam is condensed back into water to be returned to the boiler. What makes nuclear power different from these other types of power plants is that the heat is generated by fission and decay reactions occurring within and around the core containing fissionable uranium (U-235).

Nuclear fission occurs when certain nuclides (primarily U-233, U-235, or Pu-239) absorb a neutron and break into several smaller nuclides (called fission products) as well as producing some additional neutrons.

Fission results in production of radioactive materials including gases and solids that must be contained to prevent release or treated prior to release. These effluents are generally treated by filtration and/or hold-up prior to release. Releases are generally monitored by sampling and by continuously indicating radiation monitors. The effluent release data is used to calculate doses in order to ensure that dose to the public due to plant operation remains within required limits.

3.2 About Radiation Dose

Ionizing radiation, including alpha, beta, and gamma radiation from radioactive decay, has enough energy to break chemical bonds in tissues and result in damage to tissue or genetic material. The amount of ionization that will be generated by a given exposure to ionizing radiation is quantified as dose. Radiation dose is generally reported in units of millirem (mrem) in the US.

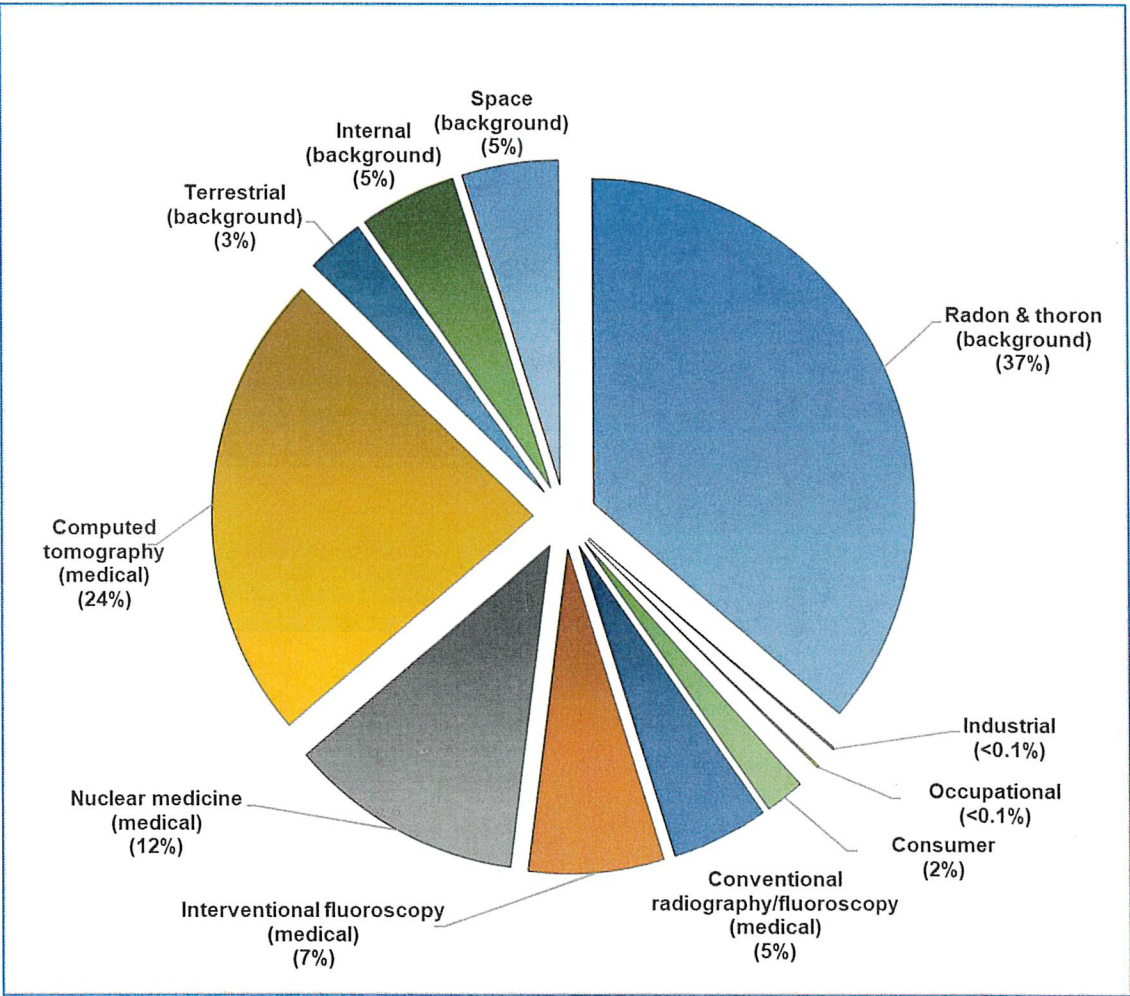


Figure 3, Sources of Radiation Exposure (NCRP Report No. 160) [3]

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3.2 (Continued)

The National Council on Radiation Protection (NCRP) has evaluated the population dose for the US and determined that the average individual is exposed to approximately 620 mrem per year [3]. There are many sources for radiation dose, ranging from natural background sources to medical procedures, air travel, and industrial processes. Approximately half (310 mrem) of the average exposure is due to natural sources of radiation including exposure to radon, cosmic radiation, and internal radiation and terrestrial due to naturally occurring radionuclides. The remaining 310 mrem of exposure is due to man-made sources of exposure, with the most significant contributors being medical (48% of total mrem per year) due to radiation used in various types of medical scans and treatments. Of the remaining 2% of dose, most is due to consumer activities such as air travel, smoking cigarettes, and building materials. A small fraction of this 2% is due to industrial activities including generation of nuclear power.

Readers that want additional information about common sources and effects of radiation dose that they may encounter can find reliable sources of information from the Health Physics Society, including the Radiation Fact Sheets [4], and from the US Nuclear Regulatory Commission website [5].

3.3 About Dose Calculation

Concentrations of radioactive material in the environment resulting from plant operations are very small and it is not possible to determine doses directly using measured activities of environmental samples. To overcome this limitation, dose calculations based on measured activities of effluent streams are used to model the dose impact for Members of the Public due to plant operation and effluents. There are several mechanisms that can result in dose to Members of the Public, including: Ingestion of radionuclides in food or water; Inhalation of radionuclides in air; Immersion in a plume of noble gases; and Direct Radiation from the ground, the plant or from an elevated plume.

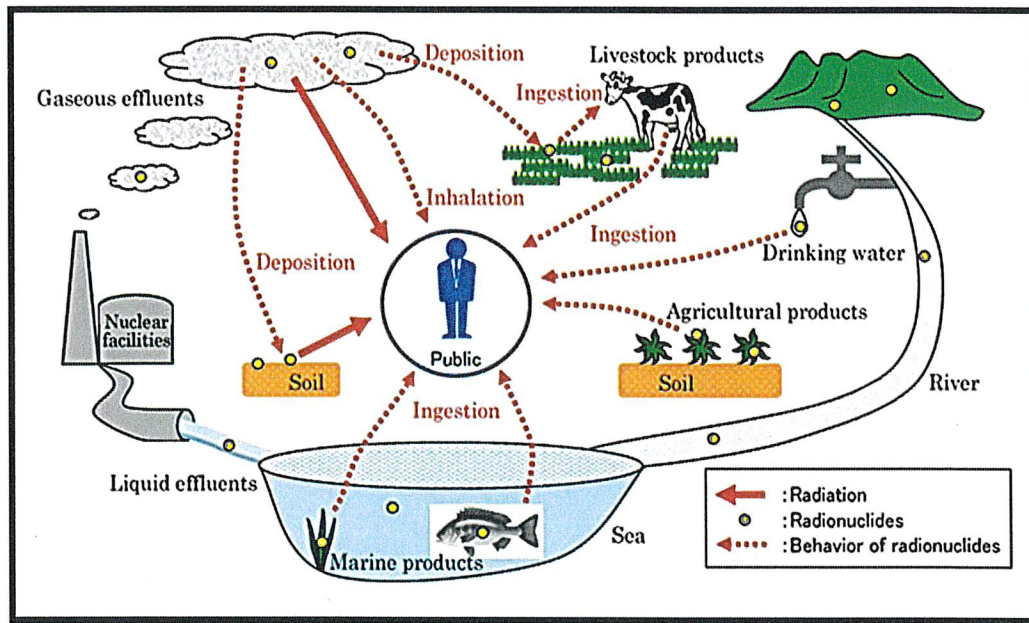


Figure 4, Potential exposure pathways to Members of the Public due to Plant Operations [6]

Each plant has an Offsite Dose Calculation Manual (ODCM) that specifies the methodology used to obtain the doses in the Dose Assessment section of this report. The dose assessment methodology in the ODCM is based on NRC Regulatory Guide 1.109 [7] and NUREG-0133 [8]. Doses are calculated by determining what the nuclide concentration will be in air, water, on the ground, or in food products based on plant effluent releases. Release points are continuously monitored to quantify what concentrations of nuclides are being released. For gaseous releases meteorological data is used to determine how much of the released activity will be present at a given location outside of the plant either deposited onto the ground or in gaseous form. Intake patterns and nuclide bio-concentration factors are used to determine how much activity will be transferred into animal milk or meat. Finally, human ingestion factors and dose factors are used to determine how much activity will be consumed and how much dose the consumer will receive. Inhalation dose is calculated by determining the concentration of nuclides and how much air is breathed by the individual.

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3.3 (Continued)

For liquid releases, dilution and mixing factors are used to model the environmental concentrations in water. Drinking water pathways are modeled by determining the concentration of nuclides in the water at the point where the drinking water is sourced (e.g., taken from wells, rivers, or lakes). Fish and invertebrate pathways are determined by using concentration at the release point, bioaccumulation factors for the fish or invertebrate and an estimate of the quantity of fish consumed.

Each year a Land Use Census is performed to determine what potential dose pathways currently exist within a five-mile radius around the plant, the area most affected by plant operations. The Annual Land Use Census identifies the locations of vegetable gardens, nearest residences, milk animals and meat animals. The data from the census is used to determine who is likely to be most exposed to radiation dose as a result of plant operation.

There is uncertainty in dose calculation results, due to modeling dispersion of material released and bioaccumulation factors, as well as assumptions associated with consumption and land-use patterns. The calculations do provide a reasonable estimate of the order of magnitude of the exposure. Conservative assumptions are made in the calculation inputs such as the number of various foods and water consumed, the amount of air inhaled, and the amount of direct radiation exposure from the ground or plume, such that the actual dose received are likely lower than the calculated dose. Even with the built-in conservatism, hypothetical doses calculated for the maximum exposed individual due to plant operation are a very small fraction of the annual dose that is received due to other sources. The calculated doses due to plant effluents, along with REMP results, serve to provide assurance that radioactive effluents releases are not exceeding safety standards for the environment or people living near the plant.

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4.0 DOSE ASSESSMENT FOR PLANT OPERATIONS

4.1 Regulatory Limits

Regulatory limits are detailed in station licensing documents such as the plant Licensee Controlled Specifications and the Offsite Dose Calculation Manual (ODCM). These documents contain the limits to which SONGS must adhere. In addition, SONGS strives to keep dose "as low as is reasonably achievable" (ALARA) and actions are taken to reduce the amount of radiation released to the environment. Liquid and gaseous release data show that the dose from SONGS is well below the ODCM limits. The instantaneous concentration of liquid radioactive material released shall be limited to ten times the concentration specified in 10 CFR 20, Appendix B, Table 2, Column 2, for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the total concentration released shall be limited to 2.0×10^{-4} microcuries/ml.

The annual whole body, skin and organ dose was computed using the 2025 source term using the dose calculation methodology provided in the ODCM. The calculated doses due to gaseous effluents are used to demonstrate compliance with offsite dose limits. The results are presented in Table 1, San Onofre Nuclear Generating Station Units 2/3 Dose Summary and Table 2, Total Annual Offsite-Dose Comparison to 40 CFR 190 Limits for SONGS.

4.2 Regulatory Limits for Gaseous Effluent Doses:

1. Fission and activation gases:
 - a. Noble gases dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to the following:
 - 1) Less than or equal to 500 mrem/year to the total body
 - 2) Less than or equal to 3000 mrem/year to the skin
 - b. Noble gas air dose due to noble gases released in gaseous effluents, from each reactor unit, to areas at and beyond the site boundary shall be limited to the following:
 - 1) Quarterly
 - a) Less than or equal to 5 mrads gamma
 - b) Less than or equal to 10 mrads beta
 - 2) Yearly
 - a) Less than or equal to 10 mrads gamma
 - b) Less than or equal to 20 mrads beta

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4.2 (Continued)

2. Iodine, tritium, and all radionuclides in particulate form with half-lives greater than 8 days.
 - a. The dose rate for iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released from the site to areas at and beyond the site boundary shall be limited to the following:
 - 1) Less than or equal to 1500 mrem/yr to any organ
 - b. The dose to a MEMBER OF THE PUBLIC from iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 DAYS in gaseous effluents released, from each reactor unit, to areas at and beyond the site boundary shall be limited to the following:
 - 1) Quarterly
 - a) Less than or equal to 7.5 mrem to any organ
 - 2) Yearly
 - a) Less than or equal to 15 mrem to any organ

4.3 Regulatory Limits for Liquid Effluent Doses

1. The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released, from each reactor unit, to unrestricted areas shall be limited to the following:
 - a. Quarterly
 - 1) Less than or equal to 1.5 mrem total body
 - 2) Less than or equal to 5 mrem critical organ
 - b. Yearly
 - 1) Less than or equal to 3 mrem total body
 - 2) Less than or equal to 10 mrem critical organ

4.4 40 CFR 190 Regulatory Dose Limits for a Member of the Public

1. Total Dose (40 CFR 190)

- a. The annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC in the unrestricted area due to releases of radioactivity and to radiation from uranium fuel cycle sources shall be limited to the following:
 - 1) Less than or equal to 25 mrem, Total Body or any Organ except Thyroid.
 - 2) Less than or equal to 75 mrem, Thyroid.

4.5 Onsite Doses (Within Site Boundary)

SONGS classifies individuals within the site boundary as either occupationally exposed individuals or members of the public. This section evaluates dose to non-occupationally exposed workers and members of the public that may be onsite for various reasons. While within controlled or restricted areas, the limits from Sections 4.1 through 4.4 do not apply; however, 10 CFR 20.1301 dose limit of 100 mrem per year TEDE and dose rate limit of 2 mrem per hour from external sources continue to apply. Occupancy times within the controlled areas are generally sufficiently low to compensate for increase in the atmospheric dispersion factor above the site boundary. Dose rates are controlled and monitored to ensure that visitors entering within the Owner Controlled Area fence receive only a small fraction of 10 CFR 20 dose limits. Revision 20 of the ODCM added a definition for Unrestricted Area, which includes "any area within the Site Boundary used for ... recreational purposes." Based on this definition, the beach walking path has been classified as an Unrestricted Area and that pathway has been included in the dose calculations in Table 1 and Table 2. The likely most exposed Member of the Public within Controlled areas would be a worker in the switchyard. A maximum occupancy time of 500 hours/year conservatively represents use of the area by this group. Direct radiation dose is estimated from the average occupancy-corrected dose of supplemental TLDs located around the switchyard.

Table 3, Onsite Doses (Within Site Boundary)

Location	Sector	Approx. Distance (Meters)	X/Q (s/m ³)	Effective Dose (mrem)	External Dose (mrem)	Total (mrem)
				Iodine, Particulate, C-14 & H-3	TLD	
Switchyard	NNW to E	150	3.90E-4	0	1.67	1.67

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5.0 SUPPLEMENTAL INFORMATION

5.1 Gaseous Batch Releases

5.1.1 SONGS Units 2/3

No gaseous batch releases occurred from SONGS during 2025.

5.2 Liquid Batch Releases

5.2.1 SONGS Units 2/3

Number of batch releases	6
Total time period for batch releases	4,697 minutes
Maximum time period for a batch release	1,342 minutes
Average time period for batch releases	783 minutes
Minimum time period for a batch release	99 minutes

5.3 Abnormal Releases

5.3.1 Gaseous Abnormal Releases

No Abnormal gaseous releases occurred from SONGS during 2025.

5.3.2 Liquid Abnormal Releases

Number of releases	1
Total activity released	0.009 Ci

Low-level tritium activity was identified in groundwater near the Site Boundary during 2025 in two separate plumes. The estimated activity flowing offsite in groundwater is reported as an Abnormal Release. At PA-2 and MW-8 wells, tritium was first identified in a sample obtained on April 25, 2024. The highest tritium concentration identified at MW-8 well during 2025 was 6,550 pCi/l. Additional wells were drilled in the area to bound the plume laterally and vertically and data from these new wells was used to assess the quantity of tritium released during 2025.

A second plume was identified at PA-4 well in the 7/30/25 sample. The highest concentration observed in PA-4 well during 2025 was 7,560 pCi/l.

PA-2 and PA-4 wells included gamma analyses quarterly during 2025 and no licensed gamma-emitting nuclides were identified.

The reported activity of 0.009 Ci of tritium is not significant compared to the reported quantity of 2.44 Ci of tritium in Table 10 for monitored batch releases during 2025. The average concentration at the site boundary was approximately 100 pCi/l and the actual dose consequence is not significant compared to doses due to normal effluent releases or dose limits. Additional information is provided in Section 6.0.

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5.4 Land Use Census Changes

No significant changes were identified in the Land Use Census during 2025. Potential critical receptors and Controlling Location Factors remained consistent with those previously identified.

5.5 Meteorological Data

Meteorological monitoring is no longer performed at SONGS.

5.6 Effluent Radiation Monitors Out of Service Greater Than 30 Days

Effluent Radiation Monitor Name	Number of Days Out of Service	Date Range Out of Service	Reason Out of Service >30 Days	Additional Notes
Liquid Radwaste Radiation Monitor 2/3RT-7813 and Flow Indicator FE7643	33	12/12/2024 – 01/14/2025	The monitor was intentionally secured, and release pathway isolated during Out of Service (OOS) periods.	No releases occurred via this path while instruments were OOS.
	41	02/07/2025 – 03/20/2025		
	267	03/20/2025 – 12/12/2025		
Minor Liquid Pathway Effluent Line Process Flow Rate Measurement Device	392	12/4/2024 – 12/31/2025	Flow meter declared administratively non-Functional with release path isolated.	One batch of water with no detectable radioactivity was released from a temporary tank using level measurements and a strapping table to determine volume.
Unit 2 Containment Demolition Ventilation Process Flow Monitor	82	03/19/2025 – 06/09/2025	Pressure transducer failed calibration test and required long lead time for replacement and reconfiguration.	Process flow was verified once per shift while indication was non-Functional, and a bounding value is used for the flow rate estimate.
Unit 2 Containment Demolition Ventilation, All Components	63	07/21/2025 – 09/22/2025	System was non-Functional following a power surge.	Ventilation fans remained secured and building closed while system was non-Functional.

Note: While daily Channel Checks are not required if releases are not in process for the Minor Liquid Pathway and Liquid Radwaste Effluent Line Flow Rate Measuring Devices, Operations administratively declares the instruments non-Functional to ensure that the instruments are verified Functional prior to performing a release. The entire period of non-Functionality is reported here based on the declared status. The Liquid Radwaste flowmeter becomes non-Functional per ODCM requirements when the quarterly Functional Test is not performed, while the Minor Liquid Pathway flowmeter becomes non-Functional per ODCM requirements when the Annual Calibration requirement is not met. The Liquid Radwaste Radiation Monitor becomes non-Functional when daily Channel Checks are not performed.

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5.7 Offsite Dose Calculation Manual (ODCM) Changes

There were no changes to the ODCM during 2025. Since there were no changes, the ODCM has not been included in this submittal.

Date of Change	Revision	Description of Change
N/A	N/A	N/A

5.8 Process Control Program (PCP) Changes

There were no changes to the Process Control Program in 2025.

5.9 Radioactive Waste Treatment System Changes

There were no significant changes to Radioactive Waste Treatment Systems during 2025.

Date of Change	System	Description of Change
N/A	N/A	N/A

5.10 Other Supplemental Information

5.10.1 Outside Tanks

No outside tanks exceeded Storage Tank Radioactivity Monitoring Program limits during 2025.

5.10.2 Carbon-14

Carbon-14 (C-14) is a naturally occurring radionuclide with a 5,730-year half-life. Nuclear weapons testing in the 1950s and 1960s significantly increased the amount of C-14 in the atmosphere. Nuclear power plants also produce C-14, but the amount is infinitesimal compared to what has been distributed in the environment due to weapons testing and what is produced by natural cosmic ray interactions.

Because SONGS did not operate during 2025, no C-14 was generated. Therefore, the estimated release of C-14 is 0 Curies.

5.10.3 Errata/Corrections to Previous ARERRs

No errors were identified during 2025 that required corrections to previous ARERRs.

6.0 NEI 07-07 ONSITE RADIOLOGICAL GROUNDWATER MONITORING PROGRAM

San Onofre Nuclear Generating Station has developed a Groundwater Protection Initiative (GPI) program in accordance with NEI 07-07, Industry Ground Water Protection Initiative – Final Guidance Document [9]. The purpose of the GPI is to ensure timely detection and an effective response to situations involving inadvertent radiological releases to groundwater in order to prevent migration of licensed radioactive material off-site and to quantify impacts on decommissioning. During 2025, SONGS collected and analyzed groundwater samples in accordance with site procedural requirements.

This section is included in this report to communicate the results of NEI 07-07 Radiological Groundwater Monitoring Program. Monitoring wells installed as part of GPI program are sampled and analyzed as summarized in Table 4, Groundwater Protection Program Monitoring Well Sample Schedule. Well locations are shown in Attachment 3, Groundwater Well Maps. In addition to reporting results from NEI 07-07 monitoring wells, voluntary communications to offsite governmental agencies per NEI 07-07 Objective 2.2, are also reported as part of this report. It is important to note, samples and results taken in support of NEI 07-07 groundwater monitoring program are not part of the Radiological Environmental Monitoring Program (REMP) but should be reported as part of ARERR.

Table 4, Groundwater Protection Program Monitoring Well Sample Schedule⁷

Well Name	Tritium	Gamma
PA 1	Quarterly	Quarterly
PA 2	Quarterly	Quarterly
PA 3	Quarterly	Quarterly
PA 4	Quarterly	Quarterly
NIA 1	Quarterly	Annually
NIA 2	Quarterly	Annually
NIA 3	Annually	Annually
NIA 4	Annually	Annually
NIA 5	Annually	Annually
NIA 6	Annually	Annually
NIA 7	Annually	Annually
NIA 10	Annually	Annually
NIA 11	Annually	Annually
NIA 12	Quarterly	Annually
NIA 13	Quarterly	Annually
NIA 14	Annually	Annually
NIA 15	Annually	Annually
OCA 1	Quarterly	-
OCA 2	Quarterly	-
OCA 3	Quarterly	-

⁷ Analyses for Hard-to-detect nuclides (Ni-63, Fe-55, and Sr-90) and gross alpha are performed if tritium and gamma results indicate contamination from plant-related nuclides.

Radiological Groundwater Monitoring Program tritium results are summarized in Table 5, Groundwater Protection Program Monitoring Well Tritium Results.

Table 5, Groundwater Protection Program Monitoring Well Tritium Results for 2025

Well Name	Number of Positive Detections	Number of Analyses	Average Concentration ^{8,9} (pCi/L)	Maximum Concentration ⁹ (pCi/L)
PA 1	0	4	<MDA	<MDA
PA 2	21	21	1,750	3,550
PA 3	0	4	<MDA	<MDA
PA 4	9	11	4,020	7,560
NIA 1	0	4	<MDA	<MDA
NIA 2	0	4	<MDA	<MDA
NIA 3	0	1	<MDA	<MDA
NIA 4	0	1	<MDA	<MDA
NIA 5	0	1	<MDA	<MDA
NIA 6	0	1	<MDA	<MDA
NIA 7	0	1	<MDA	<MDA
NIA 10	0	1	<MDA	<MDA
NIA 11	0	1	<MDA	<MDA
NIA 12	0	4	<MDA	<MDA
NIA 13	0	4	<MDA	<MDA
NIA 14	0	1	<MDA	<MDA
NIA 15	0	1	<MDA	<MDA
OCA 1	0	4	<MDA	<MDA
OCA 2	0	4	<MDA	<MDA
OCA 3	0	4	<MDA	<MDA

As discussed in the 2024 ARERR, tritium was identified in the April 2024 sample from PA-2 well. Supplemental sampling was performed at nearby MW-8 and an additional six wells were installed nearby to determine the extent of the plume. Based on 2025 sample results from these wells, the plume near PA-2 is limited to a width of about 60' and extending no more than 28' below the water table. Data is provided in Table 6 for samples taken during 2025 from MW-8 and the additional wells. A satellite view of the layout of PA-2, MW-8, and the newly installed wells is shown in Figure 7.

⁸ Results <MDA are not included in the average concentration calculation.

⁹ MDA values vary for each sample. All tritium MDAs for offsite analysis of groundwater samples taken during 2025 were < 500 pCi/L. All tritium MDAs for supplemental, onsite analyses were <750 pCi/L.

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Table 6, Non-GPI Supplemental Monitoring Well¹⁰ Tritium Results for 2025

Well Name	Location ¹¹	Number of Positive Detections	Number of Analyses	Average Concentration ^{8,9} (pCi/L)	Maximum Concentration ⁹ (pCi/L)
PA 2B	40' S of PA-2	8	19	1,580	4,310
PA 2A	20' S of PA-2	2	19	989	1,180
MW-8	20' N of PA-2	20	20	3,160	6,550
MW-8A	Deep well adjacent to MW-8	0	19	<MDA	<MDA
MW-8B	20' N of MW-8	19	19	1,750	6,850
MW-8C	40' N of MW-8	1	19	730	730
MW-8D	40' E of MW-8 (upgradient)	19	19	2,950	8,440
MW-10	30' S of PA-4	0	4	<MDA	<MDA

An additional tritium plume was identified in the July 2025 sample from PA-4 well. Subsequent samples from PA-4 during 2025 also contained detectable tritium. Sample results from nearby MW-10 did not identify tritium. Data from MW-10 is also included in Table 6. Tritium has remained at low levels in PA-4 and monitoring is ongoing.

The issues were entered into the Corrective Action Program for formal evaluation and tracking and an Abnormal Release is being reported in Section 5.3.2 to account for migration of licensed material across the Site Boundary. The source of the tritium in the wells has not been determined. As of the end of 2025, the only credible sources of tritium remaining onsite are in concrete and demolition dust suppression water.

Tritium was the only nuclide identified in groundwater and Section 5.3.2 reports that a bounding quantity of approximately 0.009 Ci of tritium was released from the Site Boundary in groundwater during 2025. This value was calculated using the methodology described in RG-4.25 [10]. Monitoring Wells PA-2, PA-4 and MW-8 are located near the Site Boundary and corrections for transit time and decay are relatively small. Groundwater flows to the Pacific Ocean from SONGS with estimated linear flow rates between 82 and 135 feet/year.

The calculated dose for groundwater release is less than that calculated for routine liquid effluent releases and does not represent a significant dose pathway for Members of the Public. Groundwater at SONGS is not a potential source of drinking water, based on proximity to the ocean. Due to the relatively low concentrations of tritium observed and the decreasing trend of tritium concentration resulting from natural attenuation, remediation was not pursued for the identified plumes.

¹⁰ Supplemental samples were taken at MW-8 and newly added wells to assess positive activity in nearby PA-2. Samples were taken at MW-10 to assess positive activity in nearby PA-4.

¹¹ Location directions for supplemental samples are given relative to Plant North.

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Other than the wells near PA-2 and PA-4 discussed above, no well sample analyses identified tritium in groundwater during 2025. No well sample analyses for gamma isotopes in groundwater identified licensed material during 2025.

6.1 Voluntary Notification

During 2025, San Onofre Nuclear Generating Station made no voluntary NEI 07-07 notifications to State/Local officials, NRC, or to other stakeholders required by site procedures.

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7.0 Bibliography

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Attachment 1, ARERR Release Summary Tables (RG-1.21 Tables)

1.0 GASEOUS EFFLUENTS

Table 7, Gaseous Effluents Summation of All Releases SONGS ¹²

A.	Fission & Activation Gases	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error %
1.	Total Release ¹³	Ci	N/A	N/A	N/A	N/A	N/A
2.	Average release rate for the period	μCi/sec	N/A	N/A	N/A	N/A	

B.	Iodine ¹³						
1.	Total Iodine – 131	Ci	N/A	N/A	N/A	N/A	N/A
2.	Average release rate for the period	μCi/sec	N/A	N/A	N/A	N/A	

C.	Particulates						
1.	Particulates with half-lives > 8 days	Ci	<LLD	<LLD	<LLD	<LLD	N/A
2.	Average release rate for the period	μCi/sec	N/A	N/A	N/A	N/A	

D.	Tritium						
1.	Total Release	Ci	<LLD	<LLD	<LLD	<LLD	N/A
2.	Average release rate for the period	μCi/sec	N/A	N/A	N/A	N/A	

E.	Gross Alpha						
1.	Total Release	Ci	<LLD	<LLD	<LLD	<LLD	N/A

F.	Carbon-14						
1.	Total Release	Ci	0	0	0	0	

¹² % of limit is provided in Table 1, San Onofre Nuclear Generating Station Units 2/3 Dose Summary

¹³ Noble gases and iodines are no longer produced at SONGS.

Table 8, Gaseous Effluents – Continuous Mode Ground Level Releases SONGS

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Particulates						
N/A ¹⁴	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Tritium						
H-3	Ci	<LLD	<LLD	<LLD	<LLD	<LLD
Gross Alpha						
Alpha	Ci	<LLD	<LLD	<LLD	<LLD	<LLD

¹⁴ No licensed material was detected in gaseous effluents from SONGs during 2025.

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2.0 LIQUID EFFLUENTS

Table 9, Liquid Effluents – Summation of All Releases SONGS¹⁵

A.	Fission & Activation Products	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error %
1.	Total Release	Ci	3.23E-04	<LLD	N/A	3.09E-05	24%
2.	Average diluted concentration	μCi/mL	1.85E-10	N/A	N/A	1.99E-11	

B.	Tritium						
1.	Total Release	Ci	2.36E+00	<LLD	N/A	7.66E-02	16%
2.	Average diluted concentration	μCi/mL	1.35E-06	N/A	N/A	4.93E-08	

C.	Dissolved & Entrained Gases						
1.	Total Release ¹⁶	Ci	N/A	N/A	N/A	N/A	N/A
2.	Average diluted concentration	μCi/mL	N/A	N/A	N/A	N/A	

D.	Gross Alpha Activity						
1.	Total Release	Ci	<LLD	<LLD	N/A	<LLD	N/A

E.	Volume of Waste Released (prior to dilution)					
1.	Batch Release Volume	Liters	1.65E+06	2.62E+04	0.00E+00	1.32E+05
2.	Continuous Release Volume	Liters	2.55E+06	2.60E+04	0.00E+00	4.19E+06

F.	Volume of Dilution Water Used During Period	Liters	1.75E+09	1.72E+08	2.71E+08	1.55E+09
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¹⁵ % of limit is provided in Table 1, San Onofre Nuclear Generating Station Units 2/3 Dose Summary

¹⁶ Noble gases are no longer produced at SONGS.

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Table 10, Batch Mode Liquid Effluents SONGS

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission and Activation Products						
Co-60	Ci	2.75E-04	<LLD	N/A	3.09E-05	3.05E-04
Cs-137	Ci	4.84E-05	<LLD	N/A	<LLD	4.84E-05
Total for Period	Ci	3.23E-04	<LLD	N/A	3.09E-05	3.54E-04
Tritium						
H-3	Ci	2.36E+00	<LLD	N/A	7.66E-02	2.44E+00
Gross Alpha						
Alpha	Ci	<LLD	<LLD	N/A	<LLD	<LLD

Table 11, Continuous Mode Liquid Effluents SONGS

Radionuclide Released	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for year
Fission and Activation Products						
Total for Period	Ci	<LLD	<LLD	N/A	<LLD	<LLD
Tritium						
H-3	Ci	<LLD	<LLD	N/A	<LLD	<LLD
Gross Alpha						
Alpha	Ci	<LLD	<LLD	N/A	<LLD	<LLD

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Attachment 2, Solid Waste Information

1.0 SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (NOT IRRADIATED FUEL)

Table 12, Types of Solid Waste Summary SONGS

Types of Waste	Total Volume (m ³)	Total Activity (Ci)	Est. Total Error (%)
a. Spent resins, filter sludges, evaporator bottoms, etc.	5.66E+01	5.79E+00	30%
b. Dry Active Waste (DAW), compactable and non-compactable	8.83E+04	2.65E+02	30%
c. Irradiated components	5.04E+01	4.39E+02	30%
d. Other (Oil/Water)	6.72E+01	1.69E-02	30%

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2.0 ESTIMATE OF MAJOR NUCLIDE COMPOSITION (BY WASTE TYPE) ONLY >1% ARE REPORTED.

Table 13, Major Nuclides SONGS

Major Nuclide Composition	%	Curies
a. Spent resins, filter sludges, evaporator bottoms, etc.		
Cobalt-60	33.60%	1.92E+00
Nickel-63	49.70%	2.84E+00
Cesium-137	16.70%	9.54E-01
b. Dry Active Waste (DAW), compactable and non-compactable	%	Curies
Carbon-14	2.10%	5.53E+00
Iron-55	14.91%	3.92E+01
Cobalt-60	9.28%	2.44E+01
Nickel-59	1.29%	3.39E+00
Nickel-63	42.22%	1.11E+02
Cesium-137	30.20%	7.94E+01
c. Irradiated components	%	Curies
Iron-55	55.10%	2.40E+02
Cobalt-60	24.10%	1.05E+02
Nickel-63	20.80%	9.06E+01
d. Other	%	Curies
Carbon-14	6.50%	1.09E-03
Iron-55	4.07%	6.82E-04
Cobalt-60	12.70%	2.13E-03
Nickel-63	61.41%	1.03E-02
Cesium-137	15.32%	2.57E-03

3.0 SOLID WASTE DISPOSITION

Table 14, Solid Waste Disposition SONGS

Number of Shipments	Mode of Transportation	Destination
1179	Rail ¹	EnergySolutions LLC, Clive Disposal Facility (BWF), Clive, UT
2	Tractor Trailer ¹	EnergySolutions LLC, Clive Disposal Facility (BWF), Clive, UT
9	Tractor Trailer ¹	EnergySolutions LLC, Clive Disposal Facility (CWF), Clive, UT
18	Tractor Trailer ²	EnergySolutions LLC, Clive Disposal Facility (TF), Clive, UT
1	Tractor Trailer ³	Erwin ResinSolutions LLC, Erwin, TN
Note 1: During 2025, 1190 shipments were made from EnergySolutions - San Onofre directly to the Clive Disposal Facility, Bulk Waste Facility (BWF) and Containerized Waste Facility (CWF) for direct burial. Note 2: During 2025, 18 shipments were made to the Clive Disposal Facility, Treatment Facility (TF) for treatment/liquid solidification/verification prior to burial at the Clive BWF. Note 3: During 2025, 1 shipment was made to the Bear Creek Operations Facility for treatment/drying/incineration/verification prior to being sent to EnergySolutions Clive for burial.		

4.0 IRRADIATED FUEL DISPOSITION

Table 15, Irradiated Fuel Shipments Disposition SONGS

Number of Shipments	Mode of Transportation	Destination
None	No shipments of irradiated fuel made in 2025	N/A

Attachment 3, Groundwater Well Maps

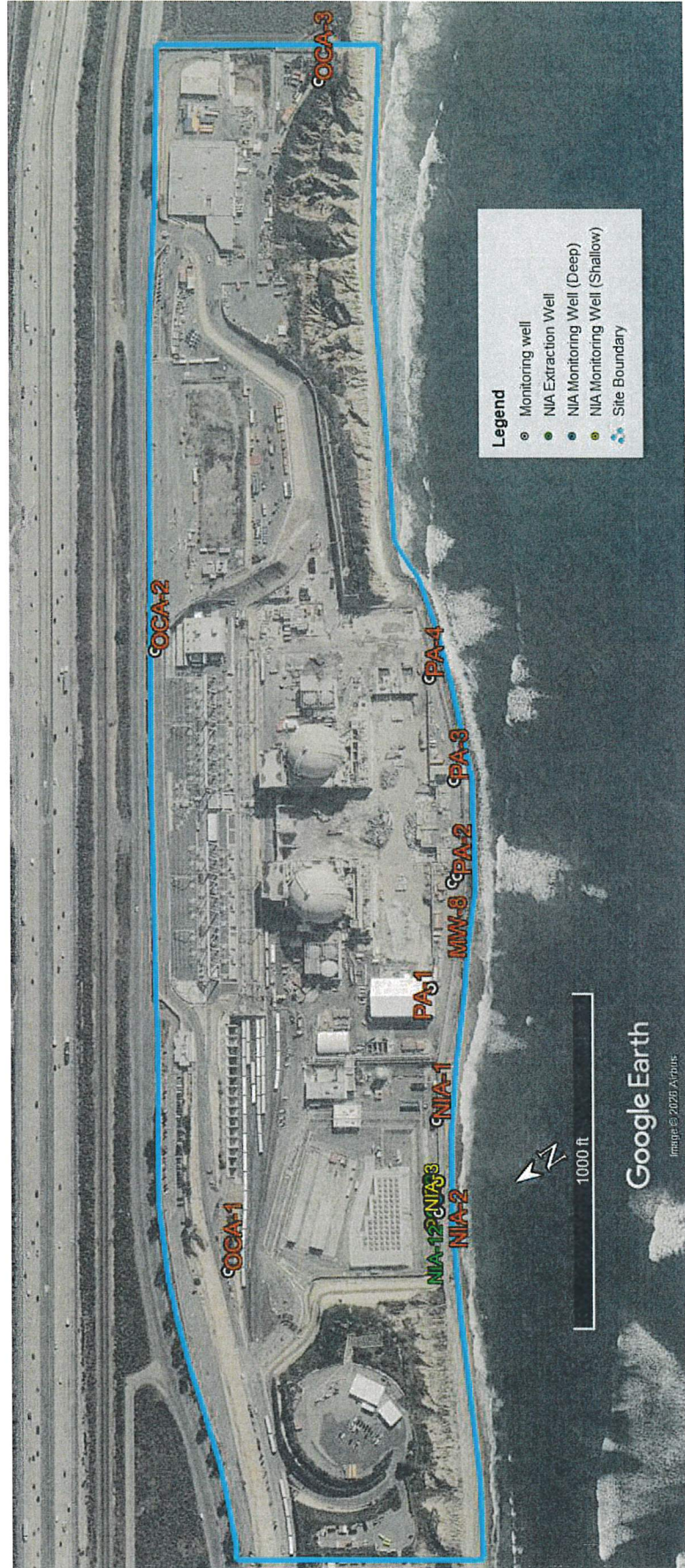


Figure 5, SONGS Groundwater Monitoring Well Locations.

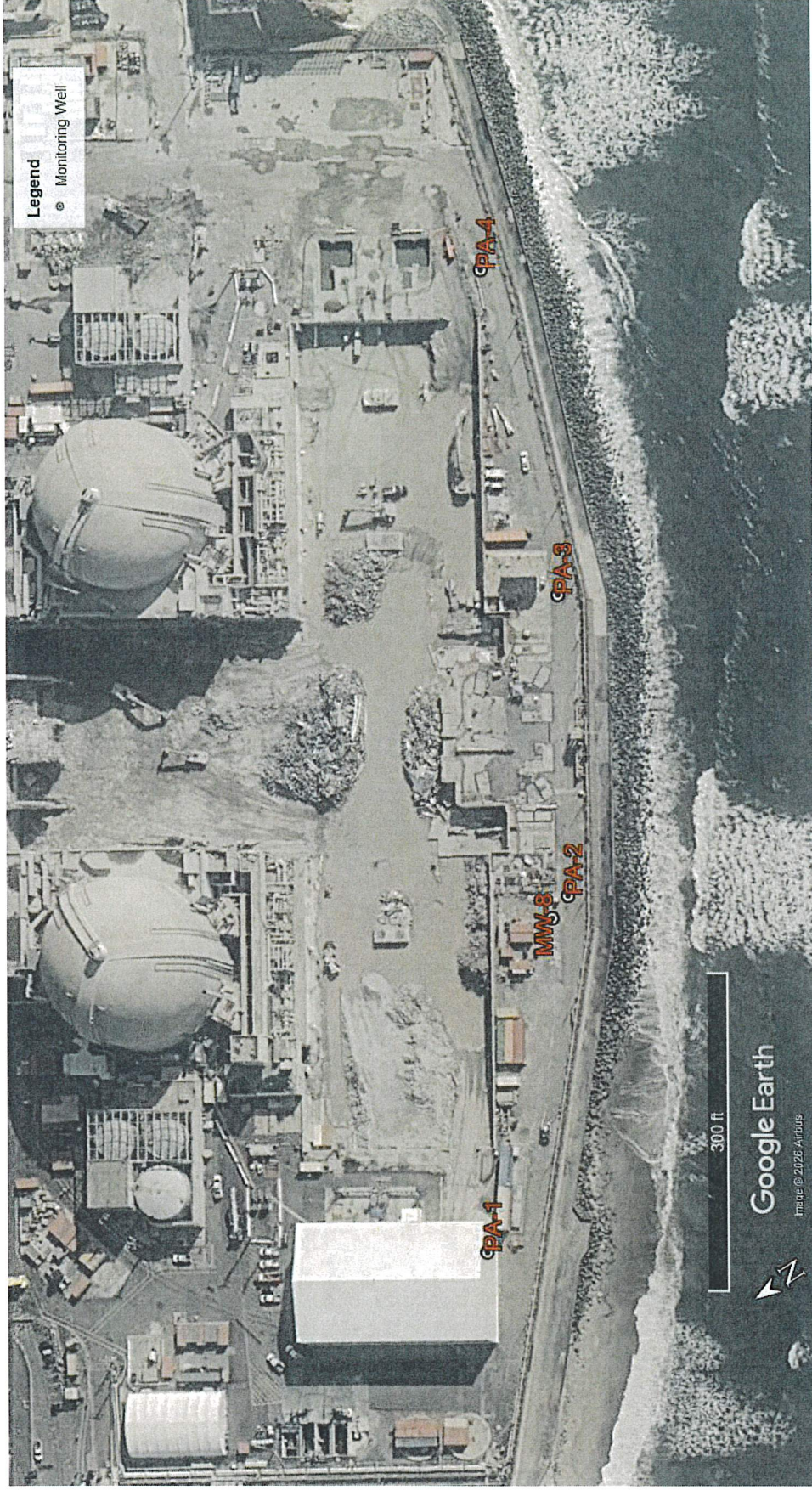


Figure 6, SONGS Restricted Area Well Locations.



Figure 7, Closeup View of PA-2 and MW-8 with supplemental wells.

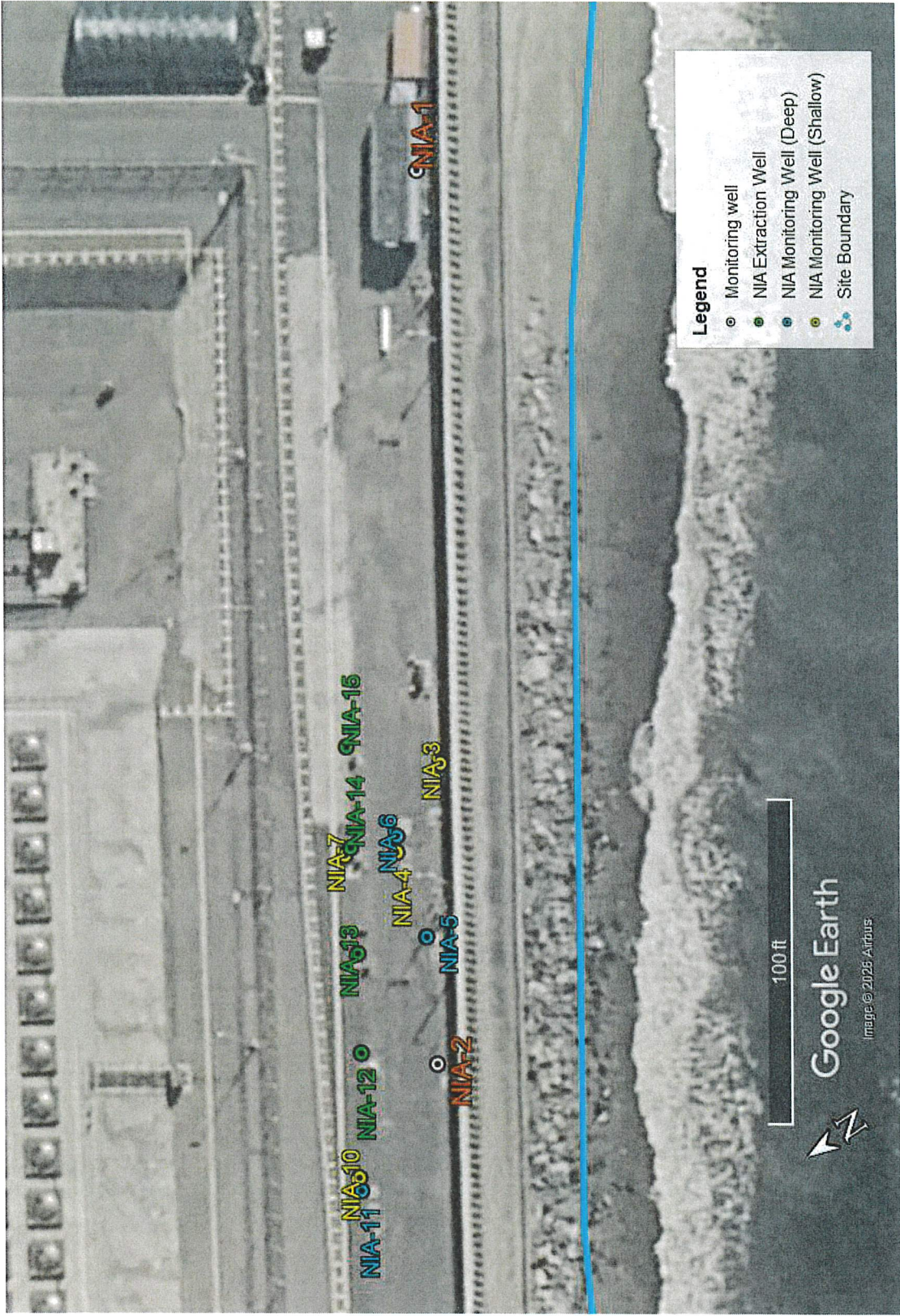


Figure 8, SONGS North Industrial Area Well Locations.