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MPC&D 05-039

April 7, 2005

U.S. Nuclear Regulatory Commission Attn.: Document Control Desk Washington, DC 20555

Docket No. 50-312 Rancho Seco Nuclear Generating Station License No. DPR-54 RADIONUCLIDES FOR CONSIDERATION DURING RANCHO SECO SITE CHARACTERIZATION OR FINAL STATUS SURVEYS

Attention: John Hickman

As discussed in our February 16, 2005, meeting, we are providing you a copy of Decommissioning Technical Basis Document DTBD-04-001 "Radionuclides for Consideration during Rancho Seco Nuclear Generating Station Characterization or Final Status Surveys," Revision 2. Included as Attachment 1, this Decommissioning Technical Basis Document (DTBD) identifies the site-specific suite of radionuclides that could potentially be present in the Rancho Seco environs or as contamination on structural surfaces at the time of site characterization or during the performance of final status surveys.

In addition, Attachment 2 provides a copy of the Rancho Seco Historical Site Assessment (HSA), Revision 0, dated March 2004. Based on a review of various historical site records and correspondence, and written questionnaires and oral interviews with current and past employees, the HSA is a preliminary component of the Radiological Site Survey Investigation process for the Rancho Seco site.

We will submit additional DTBDs as they become available, in anticipation that the review of these documents will facilitate NRC review and approval of the Rancho Seco License Termination Plan to be submitted later this year.

MM SSOL

J. Hickman

Members of your staff with questions requiring additional information or clarification may contact Bob Jones at (916) 732-4843.

Sincerely,

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Steve Redeker Manager, Plant Closure and Decommissioning

Attachments (2)

Cc w/ attachments: B.S. Mallett, NRC, Region IV



#### Attachment 1

Decommissioning Technical Basis Document DTBD-04-001 "Radionuclides for Consideration during Rancho Seco Nuclear Generating Station Characterization or Final Status Surveys," Revision 2

### Rancho Seco Nuclear Generating Station

#### **Decommissioning Technical Basis Document**

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DTBD-04-001 Revision No. 2

DPT 04-125

RIC 2A.900

Radionuclides for Consideration During Rancho Seco Nuclear Generating Station Characterization or Final Status Surveys

PREPARED BY: <u>LEBrown</u> <u>LEBrown</u>	<u>1-5-05</u>
Author	Date
REVIEWED BY: Technical Reviewer	<u>J-5-05</u> Date
REVIEWED BY: Thichael J. Brown DA Reviewer Rechard Manchemer	$\frac{3-22-05}{Date}$
APPROVED BY:	<u>3-31-05</u>
Principal Decommissioning Engineer	Date

#### Rancho Seco Nuclear Generating Station

### Review and Approval of Decommissioning Technical Basis Documents

DTBD Number 04-001 Rev.2	Fr	nal SI	ates Su	rveys
DTBD Title Radionuclides for Consideration Jurny RSN	os Ch	eract	evizat	- '0 r
Technically Reviewed By <u>John Neurey</u> Date	15	05		
	Yes	No	N/A	
1. Is the document format correct?	X	۵	Q	
2. Are the assumptions made for the DTBD correct?	শ্ব	۵	D	•
3. Has the technical development of material in the DTBD been appropria	ite?	· 🖸 .		
4. Is there a clear concise explanation and development of the position?	ম	ū	<u> </u>	
5. Are there clearly stated applicability and limitations of the document?	X	Q		
6. Are the reference list and tables adequate?	. X	۵	D	
7. Are the data and data collection methods adequate?	প		ū	
8. Is this DTBD consistent with existing DTBDs?	, X	Ū	∵ם	•
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13. Was the interpretation of the results proper?	. 🖈	· D	··□	•
14. Has an annual applicability review has been initiated by completion of Form ADM-256 (for tracking only)?	À	Q	D	•
For any item checked "No", provide an explanation below (reference atta	chment	s as nee	eded).	•

DEC-014, Rev. 0.

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#### TITLE: Radionuclides for Consideration During Rancho Seco Nuclear Generating Station Characterization or Final Status Surveys

#### 1.0 <u>PURPOSE</u>

The purpose of this Decommissioning Technical Basis Document (DTBD) is to identify a site-specific suite of radionuclides that could potentially still be present in the Rancho Seco Nuclear Generating Station (RSNGS) environs or as contamination on structural surfaces at the time of characterization and final status survey (FSS) performance. This DTBD is considered to be a living document until site characterization is complete and will be periodically revised as new information becomes available. This revision narrows the theoretical suite of radionuclides generated in Revision 0 by evaluation of published abundance values of radionuclides as well as historical 10 CFR Part 61 radioactive waste characterizations.

#### 2.0 DISCUSSION

NUREG-1757, Volume 2, Consolidated NMSS Decommissioning Guidance, Characterization, Survey, and Determination of Radiological Criteria [Ref. 7.1] provides guidance to identify a suite of radionuclides that could be present at a power reactor. Appendix O to NUREG-1757, Volume 2, Lessons Learned and Questions and Answers to Clarify License Termination Guidance and Plans, states:

"A unique radionuclide profile must be developed for each of the major types of materials expected to remain onsite after remediation. A commercial light-water power reactor facility will likely require profiles for contaminated soil or sediments, surface contaminated materials, and activated materials. The licensee must consider that activation products in steels and concretes vary with the constituents and operational history. Concrete will also differ between facilities because of different trace elements. While one generic list cannot be developed that would be applicable to all power reactor licensees and types of contaminated materials, once radioactive decay has been considered to the time when final status surveys (FSSes) will be conducted, a set of radionuclides may be developed for surface contamination and for activated materials....The licensee should confirm, by using characterization surveys and historical assessments, that the radionuclide lists developed are applicable to the facility and appropriate for each medium. Technical considerations and limitations are discussed in: NUREG/CR-3474, "Long-Lived Activation Products in Reactor Materials" [Ref. 7.2]; NUREG-0130, "Technology, Safety and Cost of Decommissioning" [Ref. 7.3]; and NUREG/CR-4289. "Residual Radionuclide Contamination Within and Around Commercial Nuclear Power Plants" [Ref. 7.4]".

#### 3.0 DEFINITIONS

None

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#### 4.0 TECHNICAL POSITION

The theoretical suite of radionuclides that could potentially still be present at RSNGS (based upon the guidance contained in NUREG/CR-3474, NUREG-0130 and NUREG/CR-4289) is provided as Attachment 8.1 along with their half-lives and mode of decay. All gamma spectrometry analyses that are performed onsite for characterization or FSS surveys should include the detectable gamma emitters listed in Attachment 8.1 in the gamma spectrometry libraries for analysis. At least initially and periodically thereafter, characterization or FSS samples sent to an offsite laboratory for analysis should be analyzed for the narrowed suite of radionuclides listed in Attachment 8.6.

#### 5.0 LIMITATIONS

The suite of radionuclides listed in Attachment 8.1 is a theoretical list based on NUREG/CR-3474, NUREG-0130 and NUREG/CR-4289 and should not be used as a site-specific suite for developing derived concentration guideline levels (DCGLs). The suite of radionuclides listed in Attachment 8.6 is a site-specific suite of radionuclides for developing site-specific DCGLs.

#### 6.0 TECHNICAL BASES

#### Development of a Theoretical Suite of Radionuclides

Development of the suite of radionuclides listed in Attachment 8.1 began with NUREG/CR-3474. This NUREG assessed the problems posed to reactor decommissioning by long-lived activation products in reactor construction materials. Samples of stainless steel, vessel steel, concrete and concrete ingredients were analyzed for up to 52 elements in order to develop a database of activatable major, minor and trace elements. The list of radionuclides was developed by combining those radionuclides listed in Table 5.6, "Activation of PWR Bioshield (Ci/gm) Average Rebar 30 EFPY at Core Axial Midplane," Table 5.13, "Activity Inventory of PWR Internals at Shutdown (Total Ci)," and Table 5.15, "Inventories of PWR and BWR Vessel Walls at Shutdown (Total Ci)." Only radionuclides with half-lives less than two years would not be expected to still be observed since two years or less represents seven or more half-lives since final shutdown of the RSNGS reactor.

Second, radionuclides with half-lives of two or more years identified in NUREG/CR-4289 as being present in PWRs were compared with the list generated above. NUREG/CR-4289 investigated residual radionuclide concentrations, distributions and inventories at seven nuclear power plants (four shutdown and three operating, including RSNGS) to provide a database for use in formulating policies, strategies and guidelines for the eventual decommissioning of retired nuclear power plants. This study addressed radionuclides (both activation and fission products) transported from the reactor pressure vessel and deposited in all other contaminated systems of each nuclear plant. Emphasis was placed on measuring the long-lived radionuclides that are of special TITLE: Radionuclides for Consideration During Rancho Seco Nuclear Generating Station Characterization or Final Status Surveys

concern from a low-level waste management standpoint. The study resulting in NUREG/CR-4289 was a companion study to the study that resulted in NUREG/CR-3474. Any radionuclides identified in NUREG/CR-4289 but not in NUREG/CR-3474, were added to the above list.

Third, radionuclides with half-lives of two or more years identified in Volume 1 of NUREG/CR–0130 as being present in PWRs were compared with the list generated above. These radionuclides were identified in Table 7.3-9, "Reactor Coolant Radionuclide Concentrations (12) in an Operating PWR," Table 7.3-10, "Radioactive Surface Contamination in the Reference PWR Resulting from Accumulated Coolant Leakage in an Ion Exchanger Vault (Fractional Activity Normalized at Reactor Shutdown)," and Table 7.3-11, "Isotopic Composition of Accumulated Radioactive Surface Contamination in the Reference PWR (Renormalized for Each Decay Time)." Any radionuclides identified in NUREG/CR–0130 but not in either NUREG/CR–3474 or NUREG/CR–4289, were added to the above list.

Finally, an ORIGEN computer code run was used to determine if there were additional radionuclides that should be added to the above list. The ORIGEN code run was based on Cycle 4 through 7 irradiation of selected batch 6 fuel assemblies with a decay period of 13.64 years from shutdown. This resulted in the addition of Pm-147, Pu-241, Am-243 and Cm-243 to the list, which is provided as Attachment 8.1.

Although not identified in the above regulatory guidance, U-234, U-235, U-236 and U-238 were added because they were identified in NCRP Report No. 58 [Ref. 7.5], Table 16 as being present in power reactor fuel.

#### **Discounting Insignificant Radionuclides**

#### Activation Product Considerations

Since Attachment 8.1 includes trace elements that would not likely be found at RSNGS due to their low abundance, an evaluation of activation product radionuclides that may be discounted as being of potential importance was performed. The total inventory for each radionuclide was determined from activity inventories provided in Table 5.13 and Table 5.15 of NUREG/CR-3474. From this information, the percentage of total inventory for each radionuclide was calculated. The results of this evaluation are provided in Attachment 8.2 of this DTBD.

#### Spent Fuel Radionuclide Considerations

The ORIGEN computer code run also contains trace radionuclides that would not likely be found at RSNGS due to their low abundance. The total radionuclide inventory was determined from the run as well as relative contribution from each radionuclide. The results of this evaluation are included in Attachment 8.3.

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#### Potential Discounted Dose Considerations

Based on the above evaluation, it was determined that individual radionuclides which contributed less than 0.1 percent of the total activity in both Attachments 8.2 and 8.3 could be discounted from the list of Attachment 8.1 identified radionuclides providing that potential dose contributed by the sum of the radionuclides discounted does not exceed one percent of the total calculated dose.

The radionuclides that meet the criteria of contributing less than 0.1 percent of the total activity include:

CI-36	Ar-39	Ca-41	Mn-53	Se-79	Kr-81
Kr-85	Zr-93	Mo-93	Sn-121m	I-129	Ba-133
Cs-135	Pm-145	Sm-146	Sm-151	Tb-158	Ho-166m
Hf-178m	Pb-205	Ú-233	Am-243	Cm-243	

Several additional radionuclides meet the criteria of contributing less than 0.1 percent of the total activity but cannot be discounted because they have other methods of production in addition to activation of reactor components and have been observed in 10 CFR Part 61 waste stream analyses or in site characterization samples. These radionuclides include H-3, C-14, Nb-94, Ag-108m, Eu-152, and Pu-239.

In order to evaluate compliance with the dose criteria for discounted radionuclides, the NRC developed computer code DandD, Version 2.1.0 was used to calculate doses for both residential and occupancy scenarios. The DandD code was used with the NRC determined default parameters to represent a conservative screening tool. Input concentrations for each radionuclide used in the residential scenario were their percent of total activity input as concentration in pCi/g. Input concentrations for each radionuclide used in the occupancy scenario were 1,000 times their percent of total activity input as surface contamination in dpm/100 cm<sup>2</sup>. DandD does not support the following radionuclides and could not calculate their dose contribution:

Ar-39	Mn-53	Kr-81	Kr-85	Ag-108m	Ba-133
Pm-145	Sm-146	Ťb-158	<sup>-</sup> Hf-178m	Pb-205	

Therefore doses could be calculated for only the following discounted radionuclides:

<b>CI-3</b> 6	Ca-41	Se-79	Zr-93	· Mo-93	Sn-121m
I-129	Cs-135	Sm-151	Ho-166m	U-233	Am-243
Cm-243					

The calculated total dose from discounted NUREG radionuclides represents only 3.73E-02 percent and dose from discounted ORIGEN radionuclides represents only 4.27E-02

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percent of the total calculated dose for the residential scenario. The calculated total dose from discounted NUREG radionuclides represents only 1.99E-03 percent and dose from discounted ORIGEN radionuclides represents only 5.53E-01 percent for the occupancy scenario. Therefore, it is appropriate to discount these radionuclides. Summary reports for the DandD calculations are included in Attachment 8.4.

The activity represented by the radionuclides not supported by the DandD code is calculated to be only 4.23E-03 percent of the total activity presented in NUREG/CR-3474. Of these radionuclides, Ar-39, Kr-81 and Kr-85 are noble gases and it is highly unlikely that they would still be present in soil and on structural surfaces. Therefore, it is appropriate to discount Ar-39, Kr-81 and Kr-85.

Potential dose contribution from the remaining radionuclides not supported by the DandD code was evaluated by comparison of the inhalation and ingestion exposure-to-dose conversion factors (DCFs) contained in Federal Guidance Report No.11, Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion [Ref. 7.6]. Weighted DCFs were calculated for each discounted radionuclide and summed for both inhalation and ingestion DCFs. These totals were then compared to the sum of the weighted DCFs for the two most abundant radionuclides, Co-60 and Ni-63. This resulted in a total of 5.36E-03 percent for inhalation DCFs and 1.25E-03 percent for ingestion DCFs. The calculations to demonstrate these results are provided in Attachment 8.5. Therefore, it is appropriate to discount all of the radionuclides not supported by the DandD code.

Although originally included in the list of theoretical radionuclides, the naturally occurring radionuclides K-40, U-234, U-235, U-236 and U-238 have not been detected in characterization survey samples at concentrations distinguishable from naturally occurring concentrations. Therefore, these radionuclides have been discounted from any further consideration.

#### Waste Stream Evaluation Considerations

Radioactive waste streams are periodically sampled and analyzed at RSNGS. Analyses are performed for radionuclides listed in 10 CFR 61.55 Tables 1 and 2 as well as other supplementary radionuclides on a select basis. The potential radionuclides identified for discounting as described above were compared with the Rancho Seco 2003 Waste Stream Evaluation [Ref. 7.7]. None of these radionuclides were identified as being present at RSNGS. However, an additional radionuclide, Pu-242, had been identified by waste stream analysis and was added to the site-specific suite of radionuclides.

The radionuclides remaining on the list in Attachment 8.1 constitute the Site-Specific Suite of Radionuclides for Use at RSNGS, which is provided as Attachment 8.6.

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#### 7.0 <u>REFERENCES</u>

- 7.1 NUREG-1757, Volume 2, Consolidated NMSS Decommissioning Guidance, Characterization, Survey, and Determination of Radiological Criteria, September 2003
- 7.2 NUREG/CR–3474, Long-Lived Activation Products in Reactor Materials, August 1984
- 7.3 NUREG–0130, Technology, Safety and Cost of Decommissioning, June 1978
- 7.4 NUREG/CR-4289, Residual Radionuclide Contamination Within and Around Commercial Nuclear Power Plants, February 1986
- 7.5 NCRP Report No. 58, A Handbook of Radioactivity Measurements Procedures, February 1, 1985
- 7.6 EPA-520/1-88-020, Federal Guidance Report No.11, Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors For Inhalation, Submersion, and Ingestion, September 1988
- 7.7 Rancho Seco 2003 Waste Stream Evaluation

#### 8.0 ATTACHMENTS

- 8.1 Radionuclides Potentially Present at RSNGS
- 8.2 Evaluation of NUREG/CR-3474 Total Activity Fractions
- 8.3 Evaluation of ORIGEN Computer Code Run Total Activity Fractions
- 8.4 DandD Calculation Summary Reports
- 8.5 Dose Considerations for Radionuclides Not Supported By DandD
- 8.6 Site-Specific Suite of Radionuclides for Use at RSNGS

#### 9.0 RESPONSIBLE INDIVIDUAL

Leon E. Brown

### Attachment 8.1

## Radionuclides Potentially Present at RSNGS

March 8, 2004 ·

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	Half Life	Decay		Half Life	Decay
Radionuclide	(Years)	Mode	Radionuclide	(Years)	Mode
*H-3	1.23E+01	β	*Cs135	2.30E+06	β
*C-14	5.73E+03	. β	Cs-137	3.02E+01	β
Na-22	2.60E+00	β <sup>+</sup> , γ	Pm-145	1.77E+01	γ
*CI-36	3.01E+05	β, γ	*Sm-146	1.00E+08	α
*Ar-39	2.69E+02	β	*Pm-147	2.62E+00	β, γ
K-40	1.28E+09	β, γ	*Sm-151	9.30E+01	β, γ
*Ca-41	1.03E+05	β <sup>+</sup> , γ	Eu-152	1.36E+01	β, γ
*Mn-53	3.70E+06	γ	Eu-154	8.80E+00	β, γ
*Fe-55	2.70E+00	γ	Eu-155	4.96E+00	β, γ
*Ni-59	7.50E+04	γ	Tb-158	1.50E+02	β
Co-60 ·	5.27E+00	β, γ	Ho-166m	1.20E+03	β, γ
*Ni-63	1.00E+02	·β	*Hf-178m	3.00E+01	ΙΤ, γ
. *Se-79	6.50E+04	β	*Pb-205	1.51E+07	· γ
——Kr-81—	2.10E+05	. γ	• <b>*U-233</b>	1.59E+05	•α, γ
Kr-85	1.07E+01	β,γ.	*U-234	2.45E+05	α, γ
*Sr-90	2.86E+01	β	U-235	7.04E+08	α, γ
*Zr-93	1.53E+06	β	*U-236	2.34E+07	α, γ
*Mo-93	3.50E+00	γ	*U-238	4.47E+09	α, γ
*Nb-93m	1.46E+01	γ	*Np-237	2.14E+6	α, γ
Nb-94	2.03E+04	β, γ	*Pu-238	8.78E+01	α, γ
*Tc-99	2.13E+05	β, γ	*Pu-239	2.41E+04	. α, γ.
Ag-108m	1.27E+02	. γ	*Pu-240	6.60E+03	α, γ
*Sn-121m	5.00E+00	β	*Pu-241	1.44E+01	β
Sb-125	2.77E+00	β, γ	Am-241	4.32E+02	α, γ
*1-129	1.57E+07	. β, γ	Am-243	7.38E+03	ά,γ
.Ba-133	1.05E+01	γ	Cm-243	2.85E+01	α, γ
Cs-134	2.06E+00	β. γ	*Cm-244	1.81E+01	α, γ

#### Radionuclides Potentially Present at RSNGS

 $\alpha$  – Alpha decay

 $\beta$  – Beta decay

 $\beta^+$  – Positron decay

 $\gamma$  – Gamma decay

IT – Isomeric transition

\*Hard to Detect Nuclides (HTDN – radionuclides not readily detected by gamma spectroscopy, e.g., Ni-63 or Cm-244, and requiring offsite, contract laboratory analysis)

#### Attachment 8.2

# Evaluation of NUREG/CR-3474 Total Activity Fractions

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#### Evaluation of NUREG/CR-3474 Total Activity Fractions

			Activit	y - Ci			
			Thermal	Vessel		:	
Radionuclide	Shroud	Core Barrel	Pads	Cladding	Vessel Walls	Total Activity	Percent Total
H-3	3.48E+01	6.14E+01	6.71E+00	1.65E-01	6.37E+00	1.10E+02	2.88E-02
C-14	2.32E+02	5.09E+01	_3.69E+00	8.68E-02	2.79E-01	2.86E+02	7.54E-02
CI-36	4.70E+00	1.10E+00	8.10E-02	1.85E-03	1.70E-02	5.90E+00	1.55E-03
· Ar-39	1.34E+00	1.34E-01	2.87E-03	3.27E-04	3.54E-02	1.51E+00	3.98E-04
Ca-41	4.30E-02	9.55E-03	6.97E-04	1.60E-05	2.32E-01	2.85E-01	7.51E-05
Mn-53	3.00E-02	3.60E-03	8.10E-05	9.00E-06	4.06E-04	3.41E-02	8.97E-06
· Fe-55	2.48E+04	5.21E+03	3.82E+02	9.08E+00	2.38E+02	3.07E+04	8.07E+00
Ni-59	1.02E+03	3.24E+02	2.43E+01	5.70E-01	·6.55E-01	1.37E+03	3.60E-01
Co-60	1.31E+05	2.59E+04	1.75E+03	4.72E+01	1:27E+02	1.59E+05	4.18E+01
Ni-63	1.49E+05	3.64E+04	2.74E+03	6.34E+01	7.08E+01	1.89E+05	4.96E+01
Se-79	5.70E-03	7.85E-04	3.80E-05	2.00E-06	7.90E-07	6.52E-03	1.72E-06
Kr-81	7.10E-03	5.80E-05	2.84E-07	2.77E-09	.2.80E-08	7.16E-03	1.88E-06
Kr-85	2.71E+00	1.11E-01	2.64E-03	5.89E-05	1.03E-02	2.83E+00	7.45E-04
Sr-90	-1.24E+01	5.66E-02	1.40E-02	3.17E-04	5.53E-04	1.25E+01	3.28E-03
Zr-93	1.00E-03	6.70E-05	2:00E-05	1.13E-07	3.00E-06	1.09E-03	2.87E-07
Mo-93	3.00E-01	2.30E-02	5.87E-04	5.18E-05	7.94E-03	3.32E-01	8.74E-05
Nb-94	3.70E+00	4.95E-01	2.40E-02	9.89E-04	1.10E-02	4.23E+00	1.11E-03
Tc-99	1.20E+00	1.40E-01	3.40E-03	3.17E-04	5.50E-02	1.40E+00	3.68E-04
Ag-108m	8.49E-01	1.37E-01	8.13E-03	2.66E-04	1.05E-02	1.01E+00	2.65E-04
Sn-121m	4.17E-03	5.50E-04	1.31E-05	1.42E-06	3.70E-05	4.77E-03	1.26E-06
I-129	6.00E-06	2.39E-07	6.40E-09	1.45E-10	2.50E-10	6.25E-06	1.64E-09
Ba-133	8.31E+00	1.57E+00	1.11E-01	2.89E-04	3.08E-02	1.00E+01	2.64E-03
Cs-134 .	2.38E-01	· 6.22E-02	5.02E-03	1.10E-04	9.88E-04	3.06E-01	8.06E-05
Cs-135	4.00E-04	1.50E-05	4.10E-07	1.03E-08	3.60E-08	4.15E-04	1.09E-07
Cs-137	1.28E+01	5.74E-01	· 1.49E-02	3.75E-04	2.03E-03	·1.34E+01	3.53E-03
Pm-145	4.16E-03	1.24E-03	9.25E-05	2.08E-06	6.24E-06	· 5.50E-03	1.45E-06
Sm-146	9.30E-10	2.21E-10	5.50E-12	5.70E-13	3.00E-12	1.16E-09	3.05E-13
Sm-151	·3.79E-02	6.78E-02	2.03E-02	6.87E-04	3.26E-03	· 1.30E-01	3.42E-05
Eu-152	0.00E+00	6.26E-01	5.58E-01	4.04E-02	1.26E+00	2.48E+00	6.54E-04
Eu-154	1.32E+00	2.59E+00	1.27E-01	4.07E-03	2.57E-01	4.30E+00	1.13E-03
Eu-155	· 3.26E-01	2.05E-01	3.48E-03	5.93E-05	5.23E-04	5.36E-01	1.41E-04
Tb-158	1.66E-02	2.68E-03	6.38E-04	6.47E-06	2.03E-04	2.02E-02	5.31E-06
Ho-166m	1.49E+00	2.19E-01	8.81E-03	3.96E-04	1.98E-02	1.73E+00	4.56E-04
Hf-178m	2.70E-01	3.22E-01	1.69E-02	1.08E-03	7.77E-03	6.18E-01	1.63E-04
Pb-205	1.70E-05	2.00E-06	1.05E-07	4.50E-09	2.00E-06	2.11E-05	5.56E-09
U-233	3.30E-03	1.70E-03	8.90E-03	4.00E-06	5.00E-05	1.40E-02	3.67E-06
Pu-239	6.50E-02	3.92E-02	1.00E-03	1.27E-04	1.10E-03	1.06E-01	2.80E-05
		· · · · · · · ·	1.		Tota	Is 3.80E+05	1.00E+02
		·		Tota	l percent of ac	tivity discounte	ed 6.52E-03

Radionuclides to be discounted appear in bold font.

#### Attachment 8.3

### Evaluation of ORIGEN Computer Code Run Total Activity Fractions

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#### Evaluation of ORIGEN Computer Code Total Activity Fractions

Radionuclide	Activity (Ci)	Percent Total	Radionuclide	Activity (Ci)	Percent Total
H-3	9.37E+01	4.30E-02	Eu-154	3.31E+03	1.52E+00
Fe-55	1.14E+03	5.25E-01	Eu-155	1.48E+03	6.81E-01
Co-60	2.20E+03	1.01E+00	Pu-238	1.75E+03	8.01E-01
Ni-59	3.20E+00	1.47E-03	Pu-239	1.46E+02	6.68E-02
Ni-63	4.12E+02	1.89E-01	Pu-240	2.51E+02	1.15E-01
Sr-90	5.62E+04	1.29E+01	Pu-241	4.59E+04	2.11E+01
Sb-125	1.33E+03	6.11E-01	Am-241	5.51E+02	2.53E-01
Cs-134	1.03E+04	4.71E+00	Am-243	8.78E+00	4.03E-03
Cs-137	7.96E+04	3.66E+01	Cm-243	1.97E+01	9.04E-03
Pm-147 .	1.22E+04	5.60E+00	Cm-244	8.40E+02	3.86E-01
Sm-151	· 1.55E+02	7.10E-02		. •	•
•		•	Totals	2.18E+05	1.00E+00
			Total percent of ac	tivity discounted	8.41E-02

Radionuclides to be discounted appear in bold font.

.

#### Attachment 8.4

## DandD Calculation Summary Reports

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DTBD-04-001R2.doc

# **DandD Residential Scenario**



DandD Version: 2.1.0 Run Date/Time: 1/5/2005 10:33:43 AM Site Name: RSNGS Description: Analysis of potential dose from radionuclides discounted from those identified in NUREG/CR-3474. FileName:C:\Documents and Settings\lbrown\My Documents\Projects\Rancho Seco\DTBDs\04-001R2\04-001Soil.mcd

## **Options:**

Implicit progeny doses NOT included with explicit parent doses Nuclide concentrations are distributed among all progeny Number of simulations: 229 Seed for Random Generation: 8718721 Averages used for behavioral type parameters

External Pathway is ON Inhalation Pathway is ON Secondary Ingestion Pathway is ON Agricultural Pathway is ON Drinking Water Pathway is ON Irrigation Pathway is ON Surface Water Pathway is ON

### Initial Activities:

Nuclide	Area of Contamination (m <sup>2</sup> )	Distribution
36Cl ·	UNLIMITED	CONSTANT(pCi/g)
Justification for concentrat	<u>ion:</u> Percent total	<u>Value</u> 1.55E-03
41Ca	UNLIMITED ·	CONSTANT(pCi/g)
Justification for concentra	tion: Percent total	<u>Value</u> 7.51E-05
79Se ·	UNLIMITED	CONSTANT(pCi/g)
Justification for concentra	tion: Percent total	<u>Value</u> 1.72E-06
93Zr	UNLIMITED .	CONSTANT(pCi/g)
Justification for concentration: Percent total		<u>Value</u> 2.87E-07
121mSn	UNLIMITED	CONSTANT(pCi/g)

Justification for concentration: Percent total		<u>Value</u>	1.26E-06
129I	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentra	tion: Percent total	Value	1.64E-09
135Cs	UNLIMITED ·	CONSTANT(pCi/g)	
Justification for concentra	tion: Percent total	Value	1.09E-07
151Sm	UNLIMITED ·	CONSTANT(pCi/g)	· · · · · · · · · · · · · · · · · · ·
Justification for concentration: Percent total		Value	3.42E-05
166mHo	UNLIMITED	CONSTANT(pCi/g)	) .
Justification for concentra	tion: Percent total	Value	4.56E-04
233U	33U UNLIMITED		)
Justification for concentration: Percent total		Value	3.67E-06
93Mo UNLIMITED		CONSTANT(pCi/g	)
Justification for concentra	ation: Percent total	Value	8.74E-05

## Site Specific Parameters:

### General Parameters:

None

**Element Dependant Parameters** 

None

#### **Correlation Coefficients:**

None

## **Summary Results:**

90.00% of the 229 calculated TEDE values are < 1.03E-01 mrem/year. The 95 % Confidence Interval for the 0.9 quantile value of TEDE is 9.01E-02 to 1.17E-01 mrem/year

# **DandD Residential Scenario**



DandD Version: 2.1.0 Run Date/Time: 1/5/2005 10:49:40 AM Site Name: RSNGS Description: Analysis of potential dose from radionuclides not discounted from those identified in NUREG/CR-3474. FileName:C:\Documents and Settings\lbrown\My Documents\Projects\Rancho Seco\DTBDs\04-001R2\04-001Soil2.mcd

# **Options:**

Implicit progeny doses NOT included with explicit parent doses Nuclide concentrations are distributed among all progeny Number of simulations: 189 Seed for Random Generation: 8718721 Averages used for behavioral type parameters

External Pathway is ON Inhalation Pathway is ON Secondary Ingestion Pathway is ON Agricultural Pathway is ON Drinking Water Pathway is ON Irrigation Pathway is ON Surface Water Pathway is ON

## Initial Activities:

Nuclide	Area of Contamination (m <sup>2</sup> )	Distribution	
3H	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Percent total		<u>Value</u> 2.88E-02	
14C	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Percent total		<u>Value</u> 7.54E-02	
55Fe	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Percent total		<u>Value</u> 8.07E+00	
59Ni	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Percent total		<u>Value</u> 3.60E-01	
60Co	UNLIMITED	CONSTANT(pCi/g)	

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::stification for concentration: Percent total		<u>Value</u> 4.18E+01	
3Ni	UNLIMITED	CONSTANT(pCi/g)	
Estification for concentration: Percent total		Value 4.96E+01	
'0Sr	UNLIMITED	CONSTANT(pCi/g)	
ustification for concentration: Percent total		<u>Value</u> . 3.28E-03	
9Tc	UNLIMITED	CONSTANT(pCi/g)	
rastification for concentration: Percent total		<u>Value</u> 3.68E-04	
134Cs	UNLIMITED	CONSTANT(pCi/g)	
sustification for concentration: Percent total		Value 8.06E-05	

# **Specific Parameters:**

.1 Parameters:

at Dependant Parameters

Lation Coefficients:

# nary Results:

5 of the 189 calculated TEDE values are < 2.76E+02 mrem/year. 5 % Confidence Interval for the 0.9 quantile value of TEDE is 2.74E+02 to -02 mrem/year

# **DandD Residential Scenario**



DandD Version: 2.1.0 Run Date/Time: 3/4/2004 9:27:51 AM Site Name: RSNGS Description: Analysis of potential dose from radionuclides not discounted from those identified in NUREG/CR-3474. FileName:C:\Documents and Settings\lbrown\My Documents\Projects\Rancho Seco\DTBDs\04-001R2\04-001Soil3.mcd

## **Options:**

Implicit progeny doses NOT included with explicit parent doses Nuclide concentrations are distributed among all progeny Number of simulations: 156 Seed for Random Generation: 8718721 Averages used for behavioral type parameters

External Pathway is ON Inhalation Pathway is ON Secondary Ingestion Pathway is ON Agricultural Pathway is ON Drinking Water Pathway is ON Irrigation Pathway is ON Surface Water Pathway is ON

### Initial Activities:

Nuclide	Area of Contamination (m <sup>2</sup> )	D	istribution .
137Cs	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Percent total		Value	3.53E-03
152Eu	UNLIMITED	CONSTANT(pCi/g)	· · · · · · · · · · · · · · · · · · ·
Justification for concentration: Percent total		Value	6.54E-04
154Eu	UNLIMITED	CONSTANT(pCi/g)	)
Justification for concentra	tion: Percent total	Value	1.13E-03
155Eu	UNLIMITED	CONSTANT(pCi/g)	)
Justification for concentration: Percent total		Value	1.41E-04
239Pu	UNLIMITED	CONSTANT(pCi/g)	)

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Justification for concentration: Percent total		Value	2.80E-05
94Nb	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Percent total		Value	1.11E-03

### Site Specific Parameters:

General Parameters:

None

#### **Element Dependant Parameters**

None

**Correlation Coefficients:** 

None

### **Summary Results:**

90.00% of the 156 calculated TEDE values are < 1.82E-02 mrem/year. The 95 % Confidence Interval for the 0.9 quantile value of TEDE is 1.80E-02 to 1.86E-02 mrem/year

# **DandD Residential Scenario**



DandD Version: 2.1.0 Run Date/Time: 12/16/2004 4:08:43 PM Site Name: RSNGS Description: Analysis of potential dose from radionuclides discounted from those identified in the ORIGEN computer code run for spent fuel. FileName:C:\Documents and Settings\lbrown\My Documents\Projects\Rancho Seco\DTBDs\04-001R2\04-001Soil4.mcd

# **Options:**

Implicit progeny doses NOT included with explicit parent doses Nuclide concentrations are distributed among all progeny Number of simulations: 142 Seed for Random Generation: 8718721 Averages used for behavioral type parameters

External Pathway is ON Inhalation Pathway is ON Secondary Ingestion Pathway is ON Agricultural Pathway is ON Drinking Water Pathway is ON Irrigation Pathway is ON Surface Water Pathway is ON

### Initial Activities:

Nuclide	Area of Contamination (m <sup>2</sup> )	· D	Distribution
151Sm	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Percent total		Value	7.10E-02
243Am	UNLIMITED	CONSTANT(pCi/g	)
Justification for concentration: Percent total		Value	4.03E-03
243Cm	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Percent total		Value	9.04E-03

### Site Specific Parameters:

#### **General Parameters:**

None

**Element Dependant Parameters** 

None

**Correlation Coefficients:** 

None

### Summary Results:

90.00% of the 142 calculated TEDE values are < 1.24E-01 mrem/year. The 95 % Confidence Interval for the 0.9 quantile value of TEDE is 1.17E-01 to 1.35E-01 mrem/year

# **DandD Residential Scenario**



DandD Version: 2.1.0 Run Date/Time: 12/16/2004 4:40:07 PM Site Name: RSNGS Description: Analysis of potential dose from radionuclides not discounted from those identified in the ORIGEN computer code run for spent fuel. FileName:C:\Documents and Settings\lbrown\My Documents\Projects\Rancho Seco\DTBDs\04-

001R2\04-001Soil5.mcd

### **Options:**

Implicit progeny doses NOT included with explicit parent doses Nuclide concentrations are distributed among all progeny Number of simulations: 116 Seed for Random Generation: 8718721 Averages used for behavioral type parameters

External Pathway is ON Inhalation Pathway is ON Secondary Ingestion Pathway is ON Agricultural Pathway is ON Drinking Water Pathway is ON Irrigation Pathway is ON Surface Water Pathway is ON

## Initial Activities:

Nuclide	Area of Contamination (m <sup>2</sup> )	Distribution
3Н	UNLIMITED	CONSTANT(pCi/g)
Justification for concentration: Percent total		<u>Value</u> 4.30E-02
55Fe	UNLIMITED	CONSTANT(pCi/g)
Justification for concentration: Percent total		<u>Value</u> 5.25E-01
60Co	UNLIMITED	CONSTANT(pCi/g)
Justification for concentra	tion: Percent total	Value 1.01E+00
59Ni	UNLIMITED	CONSTANT(pCi/g)
Justification for concentration: Percent total		<u>Value</u> 1.47E-03
63Ni	UNLIMITED	CONSTANT(pCi/g)

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Justification for concentration: Percent total		<u>Value</u> .	1.89E-01
90Sr	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentra	tion: Percent total	Value	1.29E+01
125Sb	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Percent total		<u>Value</u>	6.11E-01
134Cs	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentra	tion: Percent total	Value .	4.71E+00
137Cs	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Percent total		Value	3.66E+01
147Pm	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Percent total		Value	<sup>.</sup> 5,60E+00

### Site Specific Parameters:

#### **General Parameters:**

· <u>None</u>

#### **Element Dependant Parameters**

None

#### **Correlation Coefficients:**

None

#### Summary Results:

90.00% of the 116 calculated TEDE values are < 2.65E+02 mrem/year. The 95 % Confidence Interval for the 0.9 quantile value of TEDE is 2.31E+02 to 3.19E+02 mrem/year

# **DandD Residential Scenario**



DandD Version: 2.1.0 Run Date/Time: 12/16/2004 4:58:56 PM Site Name: RSNGS Description: Analysis of potential dose from radionuclides not discounted from those identified in the ORIGEN computer code run for spent fuel. FileName:C:\Documents and Settings\lbrown\My Documents\Projects\Rancho Seco\DTBDs\04-001R2\04-001Soil6.mcd

# **Options:**

Implicit progeny doses NOT included with explicit parent doses Nuclide concentrations are distributed among all progeny Number of simulations: 142 Seed for Random Generation: 8718721 Averages used for behavioral type parameters

External Pathway is ON Inhalation Pathway is ON Secondary Ingestion Pathway is ON Agricultural Pathway is ON Drinking Water Pathway is ON Irrigation Pathway is ON Surface Water Pathway is ON

### Initial Activities:

Nuclide	Area of Contamination (m <sup>2</sup> )	Di	stribution
154Eu	UNLIMITED ·	CONSTANT(pCi/g)	
Justification for concentration: Percent total		Value 1	.52E+00
155Eu	UNLIMITED .	CONSTANT(pCi/g)	
Justification for concentration: Percent total		Value	6.81E-01
238Pu	UNLIMITED	CONSTANT(pCi/g)	•
Justification for concentra	tion: Percent total	Value	8.01E-01
239Pu	UNLIMITED ·	CONSTANT(pCi/g)	•
Justification for concentration: Percent total		Value	6.68E-02
240Pu	UNLIMITED	CONSTANT(pCi/g)	•

Justification for concentration: Percent total		<u>Value</u> 1.15E-01	
241Pu . ·	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Percent total		<u>Value</u> 2.11E+01	
241Am	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Percent total		<u>Value</u> 2.53E-01	
244Cm	UNLIMITED	CONSTANT(pCi/g)	
Justification for concentration: Percent total		<u>Value</u> 3.86E-01	

# Site Specific Parameters:

**General Parameters:** 

None

**Element Dependant Parameters** 

None

**Correlation Coefficients:** 

None

# Summary Results:

90.00% of the 142 calculated TEDE values are < 2.54E+01 mrem/year. The 95 % Confidence Interval for the 0.9 quantile value of TEDE is 2.41E+01 to 2.73E+01 mrem/year

# **DandD Building Occupancy Scenario**



DandD Version: 2.1.0 Run Date/Time: 1/5/2005 11:07:43 AM Site Name: RSNGS Description: Analysis of potential dose from radionuclides discounted from those identified in NUREG/CR-3474. FileName:C:\Documents and Settings\lbrown\My Documents\Projects\Rancho Seco\DTBDs\04-001R2\04-001Building.mcd

## **Options:**

Implicit progeny doses NOT included with explicit parent doses Nuclide concentrations are distributed among all progeny Number of simulations: 100 Seed for Random Generation: 8718721 Averages used for behavioral type parameters

External Pathway is ON Inhalation Pathway is ON Secondary Ingestion Pathway is ON

### **Initial Activities:**

<u>·</u>			
Nuclide	Area of Contamination (m <sup>2</sup> )	Distribution	
36Cl ·	UNLIMITED	CONSTANT(d	pm/100 cm**2)
Justification for concentra	tion: Percent total	Value	1.55E+00
41Ca	UNLIMITED	CONSTANT(d	pm/100 cm**2)
Justification for concentration: Percent total		Value	7.51E-02
79Se	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentra	tion: Percent total	Value	1.72E-03
93Zr	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentra	tion: Percent total	Value	2.87E-04
93Mo	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentration: Percent total		Value	8.74E-02
121mSn	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentration: Percent total		Value	1.26E-03

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1291	UNLIMITED	CONSTANT(dpm/	100 cm**2)
Justification for concentration: Percent total		Value	1.64E-06
135Cs	UNLIMITED.	CONSTANT(dpm/100 cm**2)	
Justification for concentration: Percent total		<u>Value</u>	1.09E-04
151Sm	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentra	tion: Percent total	Value	3.42E-02
166mHo	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentration: Percent total		<u>Value</u>	4.56E-01
233U	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentration: Percent total		Value	· 3.67E-03

## Site Specific Parameters:

**General Parameters:** 

None

#### **Correlation Coefficients:**

None

### **Summary Results:**

90.00% of the 100 calculated TEDE values are < 2.96E-03 mrem/year. The 95 % Confidence Interval for the 0.9 quantile value of TEDE is 2.75E-03 to 3.21E-03 mrem/year

# DandD Building Occupancy Scenario



DandD Version: 2.1.0 Run Date/Time: 1/5/2005 11:16:17 AM Site Name: RSNGS Description: Analysis of potential dose from radionuclides not discounted from those identified in NUREG/CR-3474 FileName:C:\Documents and Settings\lbrown\My Documents\Projects\Rancho Seco\DTBDs\04-001R2\04-001Building2.mcd

### **Options:**

Implicit progeny doses NOT included with explicit parent doses Nuclide concentrations are distributed among all progeny Number of simulations: 100 Seed for Random Generation: 8718721 Averages used for behavioral type parameters

External Pathway is ON Inhalation Pathway is ON Secondary Ingestion Pathway is ON

### **Initial Activities:**

Nuclide	Area of Contamination (m <sup>2</sup> )	Distribution	
3Н .	UNLIMITED ·	CONSTANT(dpm/100 cm**2)	
Justification for concentra	tion: Percent total	<u>Value</u> 2.88E+01	
14C .	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentra	tion: Percent total	<u>Value</u> 7.54E+01	
55Fe .	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentra	tion: Percent total	<u>Value</u> 8.07E+03	
59Ni	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentra	tion: Percent total	<u>Value</u> 3.60E+02	
60Co	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentration: Percent total		<u>Value</u> 4.18E+04	
63Ni	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentration: Percent total		<u>Value</u> 4.96E+04	

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90Sr	UNLIMITED .	CONSTANT(dpm/100 cm**2)	
Justification for concentration: Percent total		Value	3.28E+00
99Tc	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentrat	tion: Percent total	Value	3.68E-01
137Cs	UNLIMITED	CONSTANT(dpm/	100 cm**2)
Justification for concentra	tion: Percent total	Value	3.53E+00
152Eu	UNLIMITED	CONSTANT(dpm/	100 cm**2)
Justification for concentration: Percent total		Value	6.54E-01
154Eu	UNLIMITED	CONSTANT(dpm/	'100 cm**2)
Justification for concentra	tion: Percent total	<u>Value</u>	1.13E+00
155Eu	UNLIMITED	CONSTANT(dpm/	/100 cm**2)
Justification for concentra	tion: Percent total	Value	1.41E-01
239Pu ·	UNLIMITED	CONSTANT(dpm/	/100 cm**2)
Justification for concentra	tion: Percent total	Value	2.80E-02
94Nb	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentration: Percent total		Value	1.11E+00
134Cs	UNLIMITED	CONSTANT(dpm	/100 cm**2)
Justification for concentration: Percent total		Value	8.06E-02

## **Site Specific Parameters:**

#### **General Parameters:**

None

#### **Correlation Coefficients:**

None

### **Summary Results:**

90.00% of the 100 calculated TEDE values are < 1.49E+02 mrem/year. The 95 % Confidence Interval for the 0.9 quantile value of TEDE is 1.47E+02 to 1.52E+02 mrem/year

# **DandD Building Occupancy Scenario**



DandD Version: 2.1.0 Run Date/Time: 12/20/2004 1:53:48 PM Site Name: RSNGS Description: Analysis of potential dose from radionuclides discounted from those identified in the ORIGEN computer code run for spent fuel. FileName:C:\Documents and Settings\lbrown\My Documents\Projects\Rancho Seco\DTBDs\04-001R2\04-001Building3.mcd

## **Options:**

Implicit progeny doses NOT included with explicit parent doses Nuclide concentrations are distributed among all progeny Number of simulations: 100 Seed for Random Generation: 8718721 Averages used for behavioral type parameters

External Pathway is ON Inhalation Pathway is ON Secondary Ingestion Pathway is ON

## **Initial Activities:**

Nuclide	Area of Contamination (m <sup>2</sup> )		Distribution
151Sm	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentration: Percent total		Value	7.10E+01
243Am	UNLIMITED ·	CONSTANT(dpm/100 cm**2)	
Justification for concentration: Percent total		Value	4.03E+00
243Cm	UNLIMITED	CONSTANT(dpm/100 cm**2)	
Justification for concentration: Percent total		Value	9.04E+00

## Site Specific Parameters:

#### General Parameters:

None

#### **Correlation Coefficients:**

None

### **Summary Results:**

90.00% of the 100 calculated TEDE values are < 9.48E+00 mrem/year. The 95 % Confidence Interval for the 0.9 quantile value of TEDE is 8.46E+00 to 1.08E+01 mrem/year


# **DandD Building Occupancy Scenario**

DandD Version: 2.1.0 Run Date/Time: 12/20/2004 2:58:12 PM Site Name: RSNGS Description: Analysis of potential dose from radionuclides not discounted from those identified in the ORIGEN computer code run for spent fuel. FileName:C:\Documents and Settings\lbrown\My Documents\Projects\Rancho Seco\DTBDs\04-001R2\04-001Building4.mcd

# **Options:**

Implicit progeny doses NOT included with explicit parent doses Nuclide concentrations are distributed among all progeny Number of simulations: 100 Seed for Random Generation: 8718721 Averages used for behavioral type parameters

External Pathway is ON Inhalation Pathway is ON Secondary Ingestion Pathway is ON

## **Initial Activities:**

	· · · · · · · · · · · · · · · · · · ·		
Nuclide	Area of Contamination (m <sup>2</sup> )	D	stribution
3H ·	UNLIMITED	CONSTANT(dpm/10	00 cm**2)
Justification for concentra	tion: Percent total	Value	4.30E+01
55Fe	UNLIMITED	CONSTANT(dpm/1	00 cm**2)
Justification for concentra	tion: Percent total	Value	5.25E+02
60Co UNLIMITED		CONSTANT(dpm/100 cm**2)	
Justification for concentra	tion: Percent total	Value	1.01E+03
59Ni	UNLIMITED	CONSTANT(dpm/1	00 cm**2)
Justification for concentra	tion: Percent total	Value	1.47E+00
90Sr UNLIMITED		CONSTANT(dpm/1	00 cm**2)
Justification for concentra	tion: Percent total	Value	1.29E+04
125Sb UNLIMITED		CONSTANT(dpm/1	00 cm**2)
Justification for concentra	tion: Percent total	Value	6.11E+02

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134Cs	Cs UNLIMITED		CONSTANT(dpm/100 cm**2)		
Justification for concentra	tion: Percent total	Value	4.71E+03		
137Cs UNLIMITED		CONSTANT(dpm/100 cm**2)			
Justification for concentra	tion: Percent total	Value	3.66E+04		
147Pm	UNLIMITED.	CONSTANT(dpm	/100 cm**2)		
Justification for concentra	ation: Percent total	Value	5.60E+03 .		
63Ni UNLIMITED		CONSTANT(dpm	/100 cm**2)		
Justification for concentra	ation: Percent total	Value	1.89E+02		

# Site Specific Parameters:

## General Parameters:

<u>None</u>

**Correlation Coefficients:** 

None

# **Summary Results:**

90.00% of the 100 calculated TEDE values are < 8.34E+01 mrem/year. The 95 % Confidence Interval for the 0.9 quantile value of TEDE is 7.92E+01 to 8.88E+01 mrem/year **DandD Building Occupancy Scenario** 



DandD Version: 2.1.0 Run Date/Time: 12/20/2004 3:08:30 PM Site Name: RSNGS Description: Analysis of potential dose from radionuclides not discounted from those identified in the ORIGEN computer code run for spent fuel. FileName:C:\Documents and Settings\lbrown\My Documents\Projects\Rancho Seco\DTBDs\04-001R2\04-001Building5.mcd

## **Options:**

Implicit progeny doses NOT included with explicit parent doses Nuclide concentrations are distributed among all progeny Number of simulations: 100 Seed for Random Generation: 8718721 Averages used for behavioral type parameters

External Pathway is ON Inhalation Pathway is ON Secondary Ingestion Pathway is ON

## Initial Activities:

Nuclide	Area of Contamination (m <sup>2</sup> )	Distribution	
154Eu	UNLIMITED	CONSTANT(	(dpm/100 cm**2)
Justification for concentra	tion: Percent total	Value	1.52E+03
155Eu	UNLIMITED	CONSTANT(	(dpm/100 cm**2)
Justification for concentra	tion: Percent total	Value	6.81E+02
238Pu UNLIMITED		CONSTANT(dpm/100 cm**2)	
Justification for concentra	tion: Percent total	Value	8.01E+02
239Pu	UNLIMITED	CONSTANT	(dpm/100 cm**2)
Justification for concentra	tion: Percent total	Value	.6.68E+01
240Pu UNLIMITED		CONSTANT	(dpm/100 cm**2)
Justification for concentra	tion: Percent total	Value	1.15E+02
241Pu UNLIMITED		CONSTANT	(dpm/100 cm**2)
Justification for concentra	ation: Percent total	Value	2.11E+04

DTBD-04-001R2.doc

DTBD-04-001, Attachment 8.4

241Am UNLIMITED		CONSTANT(dpr	n/100 cm**2)	
Justification for co	ncentration: Percent total	Value	2.53E+02	
244Cm UNLIMITED		CONSTANT(dpi	m/100 cm**2)	
Justification for co	ncentration: Percent total	Value	3.86E+02 ·	

# Site Specific Parameters:

**General Parameters:** 

None

**Correlation Coefficients:** 

None

## **Summary Results:**

90.00% of the 100 calculated TEDE values are < 1.63E+03 mrem/year. The 95 % Confidence Interval for the 0.9 quantile value of TEDE is 1.45E+03 to 1.85E+03 mrem/year

#### Attachment 8.5

# Dose Considerations for Radionuclides Not Supported By DandD

DTBD-04-001R2.doc

## Dose Considerations for Radionuclides Not Supported By DandD

			Inhalation			Ingestion	
Radionuclide	Percent Total	DCF*	Weighted DCF	% Total WDCF	DCF*	Weighted DCF	% Total WDCF
Ag-108m	2.65E-04	7.66E-08	2.03E-11	8.08E-04	2.06E-09	5.46E-13	1.75E-04
Ba-133	2.64E-03	2.11E-09	5.57E-12	2.22E-04	9.19E-10	2.43E-12	7.78E-04
Pm-145	1.45E-06	8.23E-09	1.19E-14	4.75E-07	1.28E-10	1.86E-16	5.95E-08
Sm-146	3.05E-13	8.26E-05	2.52E-17	1.00E-09	5.51E-08	1.68E-20	5.39E-12
Tb-158	5.31E-06	6.91E-08	3.67E-13.	1.46E-05	1.19E-09	6.32E-15	2.03E-06
Hf-178m	1.63E-04	6.65E-07	1.08E-10	4.32E-03	5.68E-09	9.26E-13	2.97E-04
Pb-205	5.56E-09	1.06E-09	5.89E-18	2.35E-10	4.41E-10	2.45E-18	7.86E-10
			Tota	5.36E-03		Tota	1.25E-03

Co-60	4.18E+01	5.91E-08	2.47E-06	7.28E-09	3.04E-07	
Ni-63	4.96E+01	8.39E-10	4.16E-08	1.56E-10	7.74E-09	
	·	· Total	2.51E-06	Total	3.12E-07	

## \*Effective Committed Dose Equivalent per Unit Intake (Sv/Bq)

DTBD-04-001R2.doc

## Attachment 8.6

## Site-Specific Suite of Radionuclides for Use at RSNGS

	Half Life	Decay	·	Half Life	Decay
Radionuclide	(Years)	Mode .	Radionuclide	(Years)	Mode
*H-3	1.23E+01	β	Cs-137	3.02E+01	β
*C-14	5.73E+03	β	*Pm-147	2.62E+00	β
Na-22	2.60E+00	β⁺, γ	Eu-152	1.36E+01	β,γ
*Fe-55	2.70E+00	γ	Eu-154	8.80E+00	β, γ
*Ni-59	7.50E+04	γ	Eu-155	4.96E+00	β, γ
Co-60	5.27E+00	β, γ	*Np-237	2.14E+6	ά, γ
*Ni-63	1.00E+02	- β	*Pu-238	8.78E+01	α, γ
*Sr-90	2.86E+01	β	*Pu-239	2.41E+04	α, γ
Nb-94	2.03E+04	β, γ	*Pu-240	6.60E+03	α, γ
*Tc-99	2.13E+05	β, γ	*Pu-241	1.44E+01	β
Ag-108m	1.27E+02	.γ	Am-241	4.32E+02	α, γ
Sb-125	2.77E+00	β, γ	*Pu-242	3.76E+05	α, γ
Cs-134	2.06E+00	β, γ	*Cm-244	1.81E+01	α, γ

#### Site-Specific Suite of Radionuclides for Use at RSNGS

 $\alpha$  – Alpha decay

 $\beta$  – Beta decay

 $\beta^+$  – Positron decay

 $\gamma$  – Gamma decay  $\cdot$ 

\*Hard to Detect Nuclides (HTDN – radionuclides not readily detected by gamma spectroscopy, e.g., Ni-63 or Cm-244, and requiring offsite, contract laboratory analysis)

DTBD-04-001R2.doc

DTBD-04-001, Attachment 8.6

## Attachment 2

Rancho Seco Historical Site Assessment, Revision 0



# Sacramento Municipal Utility District Rancho Seco Nuclear Generating Station Historical Site Assessment

March 2004

# Historical Site Assessment Document Approval

Document Preparation oversight by:

Einar T. Ronningen

Einar T. Ronamigen Principle Decommissioning Radiological Engineer

Document Approved by:

Dennis E. Gardiner Project Manager, Decommissioning

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#### **Executive Summary**

The Sacramento Municipal Utility District (herein referred to as the District) has conducted the Historical Site Assessment (HSA) of its Rancho Seco Nuclear Generating Station (RSNGS) in support of the ultimate decommissioning and license termination of the facility. The HSA, as a preliminary component in the Radiological Site Survey Investigation (RSSI), will provide guidance for subsequent activities, culminating with the final status survey (FSS) and license termination. The HSA will designate the initial segregation of the site into various Areas and Survey Units and provide guidance in the development of the procedures and maps required to document the characterization, remediation, and ultimate 10 CFR Part 50 license termination of the site when compared to the release criteria referenced in the MARSSIM standard.

The HSA was developed consistent with the methodology described in NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual"; including personnel interviews, and detailed record reviews.

RSNGS operated from 1974 through 1989 within a highly regulated environment, which continues today. This highly regulated and documented environment provided a significant foundation for the development of the HSA.

The evaluations performed to date identify locations outside of the historic power block where radioactive material contamination may have occurred due to various causes such as spills or loss of material control. These locations have been designated as Impacted Areas requiring additional investigation prior to the FSS.

The District-owned and controlled property, comprised of some 2480 acres, includes the 87 acre Industrial Area site. Of the nearly 2400 acres outside of the Industrial Area, approximately 80 acres have been impacted by licensed operations. These include the Plant Liquid Effluent Discharge water course way to the Southwest of the site and the Storm Drain outfalls located to the South of the facility. These two areas have been designated as Impacted. The remaining 2300 acres outside of the Industrial Area have been designated as Non-Impacted areas. The Industrial Area is designated as Impacted based on the diversity of operations conducted in this area.

The District believes that the information contained within the HSA and the resulting conclusions for site area classifications accurately describe the radiological conditions that currently exist at the site.

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#### 1.0 INTRODUCTION

The Sacramento Municipal Utility District (herein referred to as the District) has conducted the Historical Site Assessment of its Rancho Seco Nuclear Generating Station in accordance with the guidance of the Multi-Agency Radiation Survey and Site Investigation Manual, NUREG-1575 (MARSSIM) [Ref. 9.1] in support of the ultimate decommissioning and license termination of the facility.

The HSA formally began in July 2001, after several preliminary radiological assessments of the facility operations and their impact on remediation necessary prior to the performance of the Final Status Surveys (FSSs). These preliminary surveys, collectively referred to as the "Radiological Characterization Plan for the Rancho Seco Nuclear Power Generating Station" (RCPRSNPGS) [Ref. 9.2], were conducted shortly after the shut down and termination of commercial operation of the RSNGS in June 1989.

This characterization effort was undertaken prior to the implementation of the MARSSIM guidelines and therefore, relied primarily on the guidance of NUREG/CR-2082 "Monitoring for Compliance With Decommissioning Termination Survey Criteria" [Ref. 9.3] and Nuclear Regulatory Commission (NRC) Draft Regulatory Guide DG-1005 For Nuclear Reactor Facilities. "Standard Format and Content for Decommissioning Plans for Nuclear Reactors" [Ref. 9.4]

Additional surveys had been anticipated for the RCPRSNPGS. These included Phase III surveys and the FSS, to be performed in the 2007 and 2011 time frame respectively (phases I & II having been completed prior to 1997). With the issuance of MARSSIM, these surveys will be incorporated into the MARSSIM directed site characterization, FSS design, and the District's License Termination Plan (LTP) for the facility, the schedule of which will be determined by the District's senior management.

The HSA consisted of a review of historical:

- Plant incident records;
- Plant maintenance records;
- Plant modification records;
- Plant radiological survey records; and
- Regulatory reports submitted by the District to various governmental agencies.

The HSA also included written questionnaires and oral interviews with current and past facility employees regarding historical incidents that posed potential impacts to the facility. A review of historic site aerial photographs and physical inspections of the facility were performed to verify and validate the results of the historical record reviews.

These efforts were designed to document the District's detailed knowledge of those events with a potential to impact the decommissioning of the site and final termination of its license.

Concurrent with the performance of the HSA was the initial segregation of the facility into individual *areas* and specific, uniquely identified, *survey units*. This provides the basis for

development of area/unit specific site drawings and survey maps required to document the characterization, remediation, and final release survey process. A major output from the HSA process was the information used as the basis for the preliminary MARSSIM classifications of the initial survey units.

The initial classification of the site areas is based on the historical information and site characterization data. Data from operational surveys, surveys performed in support of decommissioning, routine surveillance, or any other applicable data may be used to change the original classification of an area up to the time of the FSS as long as the classification reflects the level of residual activity existing prior to any remediation in the area.

To prevent the spread of radioactive material, Rancho Seco was designed with multiple boundaries to contain the plants' radioactive materials within its many components, systems, and structures. During the operation of the plant from 1974 through 1989, many of these systems and structures, (and many that were not designed to become contaminated) have been impacted due to the routine operations, non-routine events and maintenance activities associated with the operational and post operational history of the plant.

The most significant of these systems and structures include:

- Reactor Containment Building;
- Auxiliary Building;
- Spent Fuel Storage Building;
- Interim Onsite (radwaste) Storage Building (IOSB);
- Turbine Building;
- Solidification Building;
- Contractor Fab Shop;
- Tank Farm;
- Regenerate Holdup Tanks;
- Auxiliary Boilers;
- Main and Auxiliary Steam Systems;
- Main and Auxiliary Feed Water Systems;
- Clean Drain System;
- Component/Turbine Cooling Water Systems;
- Nitrogen Gas System;
- Service Air System;
- Discharge piping from RHUTS
- Main circulating water basins

- Retention basins
- Control Rod Drive Cooling System; and
- Nuclear Service Cooling Water System.

The initial MARSSIM classification of these areas, the majority of which lie within that area comprising the historic power-block, was based on the design function of the area of concern or the areas' operational history.

These areas were given Impacted Area designations. Should subsequent investigations over the course of the decommissioning project support reclassification, the circumstances and rationale will be appropriately documented.

During the operational history of the facility, radioactive liquid spills, waste processing and storage activities, and maintenance activities on contaminated equipment and components occurred outside of the Radiologically Controlled Area (RCA) but within the Industrial Area fence line. These events have resulted in the assignment of an Impacted Area designation for the Industrial Area. Should data acquired during the course of the decommissioning project support reclassification; the circumstances and rationale will be appropriately documented.

The District-controlled property areas outside of the Industrial Area have been initially classified as Non-Impacted with the exception of Area 1 because of the land area north of the plant effluent watercourse and the plant effluent watercourse and Area 2 because of the storm drain outfalls within the area. These two locations will be initially managed as Impacted Areas.

The classification assignments of the areas outside of the Industrial Area have been substantiated by the non-Industrial Area surveys performed by Shonka Research Associates, Inc. (Rancho Seco Non-Industrial Area Survey Project, Final Report, June 26, 2001 [Ref. 9.17]). This project provided direct scanning of over 300,000 square meters of surface area and documented over 80,000 gamma spectral samples without detection of radioactive material of plant origin above background (spiked fields and known contamination along the effluent canal the exceptions).

The program to terminate the RSNGS license (DPR-54), including the HSA, followed by scoping, characterization, and remediation surveys will provide the information required to fully characterize the facility.

The MARSSIM process for preparing for FSS provides multiple opportunities to re-evaluate decisions reached during any phase of the program such that areas with preliminary classifications may be reclassified should subsequent information show these preliminary classifications as not justified.

The District believes the investigation associated with the development of this HSA has resulted in a knowledge base that accurately describes the areas of potential impact and provides a conservative basis for the initial classification of the site's survey units.

Based on the recommendations contained in MARSSIM, these HSA results are presented as follows:

• Section 1.0 - Introduction;

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- Section 2.0 Objectives of the Historical Site Assessment: General purpose of the Historical Site Assessment;
- Section 3.0 Terms, Acronyms, and Abbreviations: Presents a listing of the abbreviations and acronyms used in the HSA;
- Section 4.0 Property Identification: Physical and environmental characteristics of the facility;
- Section 5.0 HSA Methodology: Methodology used in the development of the HSA;
- Section 6.0 Operational History: Operational history of site including summaries of the documents providing significant information contributing to the characterization of the facility;
- Section 7.0 Findings: HSA findings on the potential contaminates and Impacted Areas, including descriptions of the major Areas and significant Survey Units;
- Section 8.0 Conclusions: Conclusions of the HSA;
- Section 9.0 References: List of references applicable to the HSA; and
- Section 10.0 Appendices: List of HSA appendices and addendums.

#### 2.0 OBJECTIVES OF HISTORICAL SITE ASSESSMENT

The Sacramento Municipal Utility District conducted the Historical Site Assessment of the Rancho Seco Nuclear Generating Station to:

- Identify known and potential sources of radioactive material and radioactively contaminated areas including systems, structures and environmental media based on the investigation and evaluation of existing information;
- Identify areas of the site with no conceivable or likely potential for radioactive or hazardous materials contamination and assign a preliminary classification of Non-Impacted while assigning a preliminary classification of Impacted to all remaining portions of the site;
- Evaluate the potential for migration of radiological and hazardous substances beyond the boundaries of the Industrial Area or District property;
- Develop the records to be utilized during the design of subsequent scoping, characterization, remediation, and the FSS; and
- Provide preliminary information necessary to identify and segregate the site into survey units evaluated against the criteria specified in the MARSSIM guidelines for classification. This classification will designate the need for and level of remedial action required within a particular survey unit as well as the level of intensity required during the FSS.

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RSNGS Historical Site Assessment

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#### 3.0 TERMS, ACRONYMS, AND ABBREVIATIONS

ACM: Asbestos Containing (or Contaminated) Material

**<u>AEC</u>**: Atomic Energy Commission (also USAEC)

 $\alpha$  - Alpha: contamination with alpha emitting radionuclides when used in the context of radiological surveys. When used in the context of the statistical analysis of survey data,  $\alpha$  will denote a Type I error (rejecting the null hypothesis when it is in fact true).

AOC: Area of Concern

<u> $\beta$  - Beta</u>: contamination with beta emitting radionuclides when used in the context of radiological surveys. When used in the context of the statistical analysis of survey data,  $\beta$  will denote a Type II error (accepting the null hypothesis when it is in fact false).

**BOP:** Balance Of Plant

**<u>BWST</u>:** Borated Water Storage Tank

CCPM: Corrected Counts per minute. (CPM minus background CPM)

**<u>CCR</u>**: California Code of Regulations

<u>CCW</u>: Component Cooling Water

**<u>CFR</u>**: Code of Federal Regulations

**<u>CEQA</u>**: California Environmental Quality Act.

<u>cm<sup>2</sup></u>: Square centimeters

<u>**Co-60**</u>: Cobalt-60 (radioactive isotope of cobalt metal)

cpm: Counts per minute

<u>Cs-137</u>: Cesium-137 (radioactive isotope of cesium)

CSCA: Controlled Surface Contamination Area

**<u>CST</u>**: Condensate Storage Tank

DCGL: Derived Concentration Guideline Level

**<u>dpm</u>**: Disintegrations per minute (DPM, Dpm, or dpm)

 $dpm/100cm^2$ : Disintegrations per minute per 100 square centimeter surface area (or dpm/100 cm<sup>2</sup>)

DSAR: Defueled Safety Analysis Report

**<u>DTSC</u>**: Department of Toxic Substance Control. California agency regulating hazardous materials and waste

**EPA**: Environmental Protection Agency (also USEPA)

**FONSI:** Finding of No Significant Impact

**FSAR:** Final Safety Analysis Report

RSNGS Historical Site Assessment

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#### Terms, Acronyms, and Abbreviations (Continued)

**FSS:** Final Status Survey

<u>Ft</u>: feet

 $\gamma$  - Gamma: contamination with gamma emitting radionuclides when used in the context of radiological surveys.

**GEIS:** Generic Environmental Impact Statement

HP: Health Physics

**<u>HSA</u>**: Historic Site Assessment

**IDAP:** Incremental Decommissioning Action Plan

**IOSB:** Interim On-site (Radwaste) Storage Building

**ISFSI:** Independent Spent Fuel Storage Installation

LER: License (e) Event Report

**<u>LLD</u>**: Lower Limit of Detection

**<u>LTP</u>**: License Termination Plan

MARSSIM: Multi-Agency Radiation Survey and Site Investigation Manual

MDA: Minimum Detectable Activity

mph: miles per hour (or MPH)

mR/hr: millirem per hour

MSL: mean sea level

<u>MWe</u>: megawatt - electrical (output)

MWt: megawatt - thermal

<u>μCi</u>: microcurie (also μCi, μCi/g (per gram), μCi/ml (per milliliter), μCi/cc (per cubic centimeter)

NOAA: National Oceanographic and Atmospheric Administration

**NPDES:** National Pollutant Discharge Elimination System

NRC: Nuclear Regulatory Commission (Also USNRC)

**ODCM:** Offsite Dose Calculation Manual

**ODR:** Occurrence Description Report

OTSG: Once Thru Steam Generator(s)

PAP: Personnel Access Point

## Terms, Acronyms, and Abbreviations (Continued)

- PASS: Post Accident Sampling System
- **<u>PCP</u>:** Process Control Program

**<u>PDP</u>**: Proposed Decommissioning Plan

**PDQ:** Potential Deviation from Quality

PE: Plant Effluent

pCi: picocurie (pCi/l (per liter), pCi/g (per gram))

**PUDF:** Plan for Ultimate Disposition of the Facility

**<u>OA</u>**: Quality Assurance

**<u>QC</u>**: Quality Control

**<u>RB</u>**: Reactor Building (or RCB Reactor Containment Building)

**<u>RCA</u>**: Radiologically Controlled Area

**<u>RCPRSNPGS</u>**: Radiological Characterization Plan for the Rancho Seco Nuclear Power Generating Station

**<u>RCRA</u>**: Resource Conservation and Recovery Act

**<u>RCS</u>**: Reactor Coolant System

**<u>REMP</u>:** Radiological Effluent Monitoring Program

**<u>RP</u>**: Radiation Protection

**<u>RSNGS</u>**: Rancho Seco Nuclear Generating Station consisting of an 87 acre Industrial Area containing the nuclear facility and a total site area of 2,480 acres

**<u>RSSI</u>:** Radiological Site Survey Investigation

**<u>RHUT</u>**: Regenerant Holdup Tank(s) (A, B, & C)

**<u>RWP</u>**: Radiation Work Permit

SAR: Safety Analysis Report

SER: Safety Evaluation Report

**SMUD:** Sacramento Municipal Utility District

**SUID:** Survey Unit Identification Number

UFSAR: Updated Final Safety Analysis Report

**USAEC:** United States Atomic Energy Commission (also AEC)

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#### 4.0 PROPERTY IDENTIFICATION

4.1 Facility Characteristics

4.1.1 Licensee Identification (DPR-54)

Sacramento Municipal Utility District

Rancho Seco Nuclear Generating Station

Physical address

6201 S Street, Sacramento, California 95817-1899

Mailing address

PO Box 15830, Sacramento, California 95852-1830

4.1.2 Location

Rancho Seco Nuclear Generating Station

14440 Twin Cities Rd

Herald, California 95638

The property, herein called the site, is located in the southeast part of Sacramento County, state of California and lies either wholly or partly within Sections 27, 28, 29, 32, 33, and 34 of township 6 North, Range 8E. The nuclear reactor unit lies entirely within section 29.

The site is approximately 25 miles southeast of Sacramento and 26 miles northeast of Stockton in the central valley of California between the foothills of the Sierra Nevada Mountains to the east and the Pacific Coast range bordering the Pacific Ocean to the west. A map of the facility and location is included as Figure 4.1.

The RSNGS site consists of an approximately 87-acre fence-enclosed Industrial Area containing the nuclear facility surrounded by District-owned and District-controlled property totaling 2,480 acres.

The District is in the process of constructing a 30-acre natural gas-fired power plant on the RSNGS site, approximately ½ mile south of the Industrial Area boundary. Also within the 2,480 acre site are the 560 acre Rancho Seco Reservoir and Recreation Area; a 50 acre solar power (photo-voltaic) electrical generating station; and the 0.9 acre, 10 CFR Part 72 licensed Independent Spent Fuel Storage Installation (ISFSI).<sup>1</sup>

<sup>1</sup> The 10 CFR Part 72 licensed ISFSI is independent of the 10 CFR Part 50 licensed facility.

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#### 4.1.3 <u>Topography</u>

The plant site's rolling terrain is not directly intersected by any streams; however, drainage from higher levels is well defined and intercepts with runoff streams at lower levels. The plant's grade level of approximately 165 feet above MSL allows excellent drainage without danger of flooding. The elevation of the site acreage varies from 130 feet to 280 feet above MSL and drainage along natural gullies varies from two to six percent. Runoff from the site drains into a seasonal "No – name" creek that is a tributary to Clay creek. Clay creek empties into Hadselville creek. Hadselville creek then empties in turn into: Laguna creek south, Consumnes River, Mokelomne River, Sacramento River, into the Pacific Ocean via the Sacramento River Delta.<sup>2</sup>

#### 4.1.4 <u>Stratigraphy</u>

Information regarding the stratigraphy of the site is taken, in part, from the FSAR [Ref. 9.5].

The stratigraphy below the site consists of a basement of Mesozoic and Paleozoic metaphoric rock, overlain with several tertiary and quaternary period formations including:

- Recent Alluvium (Qal) consisting of stream deposited gravel, sand, and silt. This material is confined to present drainage courses and ranges in depth from 0 to 5 feet.
- Older Alluvium (Qalo) consists of old stream and terrace deposits of gravel, sand, and silt. This material covers the flood plains in the southwest portion of the site and ranges in depth from 0 to 10 feet.
- Arroyo Seco formation (Qas) consists of deposits of well-rounded cobbles, pebbles, and sand derived chiefly from pre-Cretaceous sediments on pediment surfaces. This formation caps uplands in the eastern portion of the site and ranges in depth from 0 to 15 feet.
- Laguna formation (T1) consists of sand, silt, and some gravel; may or may not contain clay. Fluviatile deposits are poorly bedded, poorly exposed, and non-andesitic in composition. This is the predominant formation within the site and ranges in depth from 0 to approximately 130 feet.
- Mehrten I consists of fluviatile sandstone, siltstone, and conglomerate dominantly of andesitic detritus. Locally contains horizons of coarse andesitic agglomerate of mudflow origin. This formation has no pre-construction surface exposure and there is little possibility that any construction excavation entered this formation, which has an approximate thickness of 225 feet.

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<sup>2</sup> The site information contained in Sections 4.1.3 through 4.2.5.8 is based on the current FSAR and has not been updated to the current date of this document.

• Valley Springs formation (Tv) consists of pumice and fine siliceous ash with much greenish-gray clay and some vitreous tuff, glassy quartz sand, conglomerate; commonly well bedded; derived largely from rhyolithic ejectamenta thrown out from the high Sierra Nevada. This formation also has no site surface exposures and an estimated average thickness of 250 feet.

#### 4.2 Environmental Characteristics

#### 4.2.1 Geology

Information regarding the geology of the site is taken, in part, from the FSAR.

Rancho Seco is located about 25 miles southeast of Sacramento California in the low foothills of the Sierra Nevada Mountains. The site is founded on the Pliocene Laguna Formation and is underlain by an estimated 1500 to 2,000 feet of Tertiary or older sediments deposited on a basement complex of granite to metamorphic rocks. Field exploration included;

- 1,552 feet of bucket auger holes logged in detail;
- A 602 foot core hole visually and geophysically logged;
- 2,016 feet of small-bore hole borings that were logged and from which, soil samples were taken for laboratory analysis; and
- Approximately 11,500 feet of geophysical refraction profiles.

The resulting data from this exploration strongly indicate a lack of faulting below the Rancho Seco site.

#### 4.2.2 Seismology

Information regarding the seismology of the site is taken, in part, from the FSAR.

There are no indications of faulting below the site. The nearest fault, located approximately 10 miles to the east of the site, is the Foothill Fault System. This system has been inactive since the Jurassic Period, some 135 million years ago. The nearest active faults, located over 70 miles to the west, are the Hayward and San Andreas.

In response to questions by the NRC, prompted by a magnitude 5.7 earthquake on a fault previously believed to be inactive near Oroville, Ca. the District commissioned the reinvestigation of potential seismic activity in the vicinity of the site (Response to NRC questions on Geologic and Seismologic Conditions, 1987 [Ref. 9.14]). The results confirmed the lack of any credible faults closer than the Foothill Fault considered in the original licensing documents.

A search of the USGS database for earthquakes with intensities greater than IV on the modified Mercalli scale (Richter scale 4.0 or larger – Table 4.1) within a 200-mile radius of the plant resulted in 846 such events.

#### Table 4.1 Magnitude / Intensity Comparison

Magnitude and Intensity measure different characteristics of earthquakes. Magnitude measures the energy released at the source of the earthquake. Magnitude is determined from measurements on seismographs. Intensity measures the strength of shaking produced by the earthquake at a certain location. Intensity is determined from effects on people, human structures, and the natural environment.

The following table gives intensities that are typically observed at locations near the epicenter of earthquakes of different magnitudes.

Magnitude Intensity Description

Magnitude	Intensity	Description
1.0 - 3.0	1	I. Not felt except by a very few under especially favorable conditions.
3.0 - 3.9	11 - 111	II. Felt only by a few persons at rest, especially on upper floors of buildings.
		III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
4.0 - 4.9	IV - V	IV. Eelt indoors by many, outdoors by few during the day. At night, some awakened, Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
		V. Felt by nearly everyone, many awakened. Some dishes, windows broken. Unstable objects overlumed Pendulum clocks may stop.
5.0 - 5.9		<ul> <li>VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.</li> <li>VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.</li> </ul>
6.0 - 6.9	<u>V</u> II - IX	VIII. Damage slightin specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fail of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse, Buildings shifted off foundations.
7.0 and higher	VIII or higher	<ul> <li>X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.</li> <li>XI. Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.</li> <li>XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.</li> </ul>

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The largest event was the 1989 Loma Prieta earthquake (Magnitude 7.1 (7.2 in other literature), Modified Mercalli IX, 160 km distant) and the nearest was a magnitude 4.3, Modified Mercalli V, quake, 45.36 miles (73 km) from the site.

Restricting the search criteria to a 50-mile (80.5 km) radius results in only three monitored events.

These results, along with the geographical positioning of the site, aerial photos, and mapping of the facility are included in Appendix D.

#### 4.2.3 <u>Hydrology</u>

Information regarding the hydrology of the site is taken, in part, from the FSAR and the USAR [Ref. 9.6].

As described in section 4.1.3 Topography, above, the plant site's rolling terrain is not directly intersected by any streams; however, drainage from higher levels is well defined and intercepts with runoff streams at lower levels. Runoff from the site drains into an un-named "No-Name" creek, which in-turn empties into Clay creek. Clay creek empties into Hadselville creek. Hadselville creek then empties in turn into: Laguna creek south, Consumnes River, Mokelomne River, Sacramento River, into the Pacific Ocean via the Delta.

Within recent historical times no flooding or inundation from storms or runoff has occurred within the site boundaries. It is highly unlikely that the site could be flooded, even with abnormal rainfall intensities.

Since the commencement of operations in 1974, the only significant change in regional land use had been the conversion of several sections of land near the facility from grazing to grape production. An additional change of some note would be the population expansion that has occurred in the communities of Galt and Ione, Ca. According to the City of Galt Housing Needs Assessment, Administrative Draft, October 2001, the population of this historically-agricultural community, located between 10 and 15 miles from the site, doubled from 1990 to 2000 and the number of residential properties nearly doubled to almost 6000 units. While notable, the Ione expansion has not been as dramatic.

Surveys conducted by the County of Sacramento indicate that the land adjoining the site, within at least a 15-mile radius, will remain primarily for agricultural and grazing use; therefore, the rainfall runoff factors will remain constant and not cause any difference in the hydrological properties of the region.

Within this 15-mile radius, seven reservoirs or lakes of note exist. These include small, private impoundments for agricultural use (i.e., Arroyo Seco and Wallace – under 3,000 acre feet) and moderate, municipal reservoirs for recreation and domestic, municipal usage (Comanche and Pardee reservoirs and Lake Amador – up to 435,000 acre feet).

#### 4.2.4 <u>Hydrogeology</u>

Ground water in the area is found at depths generally greater than 100 feet in the sediments of the Laguna and Mehrten Formations. The sand and gravel zones of these formations yield water readily to wells predominately west of the facility in the Central Valley. At the site

however, the formations are less permeable, and the Laguna Formation is above the water table; depth to water in the vicinity of the site is approximately 150 feet.

Ground water flow is generally to the west. West of the site the flow is affected by a conical depression resulting from the ground water pumping center to the Southwest near the town of Galt, Ca. (Figure 4.2)

Water from the Laguna and Mehrten formations is of generally good quality in the vicinity of RSNGS. It is a sodium bicarbonate-type with low total dissolved solids, generally less than 200 ppm. Potable water for RSNGS site comes from four wells producing from the Mehrten formation at a depth interval of 200-350 feet. Two wells are located within the Industrial Area, one well serving the Rancho Seco Reservoir and Recreation Area and one well serving a residence located at the northeastern corner of the site.

Studies performed during the initial sighting evaluation and documented in the FSAR, as well as several conducted since the commencement of operations (Geotechnical Investigation for Proposed Evaporation Ponds, ERPT-C0104, Rev.1, [Ref. 9.12] and the Final Engineering Report Assessment of Spent Fuel Liner Leakage, ERPT-M0221, Rev.0, 1990, [Ref. 9.13]), indicate that the permeability of the site soils result in infiltration rates (from several hundred to several thousand years) that effectively preclude any radiological impact on the aquifer or the closest well to the site by the facility.



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Source: Based on measured spring 2000 water level data from Sacramento County Department of Water Resources

Contour numbers indicate feet from mean sea level (msl) Credit: Sacramento County 2002 Zone 40 Water Supply Master Plan EIR

http://www.saccodwr.org/files/Water/EIR/Z40%20Sect%204.7%20Water.pdf

### Figure 4.2

#### Ground Water Contour Map

**RSNGS** Historical Site Assessment

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#### 4.2.5 Meteorology

#### 4.2.5.1 General Climatology

The climate of the RSNGS site is generally that of the Great Central Valley of California. Summers are hot and cloudless and winters are mild. The rainy season occurs between October and May with more than two-thirds of the annual rainfall occurring in December through March. Heavy fog occurs in mid-winter, primarily in December and January, and may last for several days.

Incidents of severe weather, such as Tornados and thunderstorms are infrequent.

The most controlling geographical influence on climate results from the mountains, which surround the valley to the west, north, and east. During the winter, storms that pass through the area are moderated by the mountains, which collect much of the precipitation. The precipitation that does occur in the valley is usually accompanied by south to southeast winds. The cold north and northwest winds pass over the mountains to the north where the air is warmed dynamically by the descent into the valley resulting in comparatively warm, dry winds. A similar condition occurs infrequently in the summer when a steep pressure gradient develops, producing a pronounced heat wave.

The Central Valley warms greatly during the day resulting in a marked thermal contrast between the valley and the air over the Pacific Ocean. The Coast Range separates the marine air from the valley air except for a gap through the range formed by the Sacramento and San Joaquin Rivers. The heavy marine air flows through this gap and splits into a northerly flow into the San Joaquin Valley and a southerly flow into the Sacramento Valley.

The divergence zone between the two flows usually lies between Stockton and Sacramento near the site. The divergence zone is typically north of the site during the day, resulting in north to northwest winds. As the air in the valley cools, the flow decreases and calm may set in. If the drainage from the Sierra Nevada is sufficient, the winds may shift to southeasterly and increase in speed.

During the hottest mid-summer months, light westerly winds may persist all night. During the winter, the synoptic gradients prevail much of the time and the wind trajectories over the Sacramento-Stockton-RSNGS region are reasonably uniform.

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# 4.2.5.2 Extreme Winds

Wind data from Sacramento Executive Airport from 1951 to 1971 were used to conduct an extreme wind probability distribution approximate to the RSNGS site. Table 4.2 presents the highest expected wind speed that will be expected for the indicated recurrence interval.

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Expected Extreme wind Speeds				
Return Period (years) Wind speed (mph				
50	90			
100	101			
1000 149				
10000	169			

# Table 4.2 Expected Extreme Wind Speeds

The highest recorded average wind speed for Sacramento during the period of July 1877 through December 1989 was 70 mph (recorded in both December 1952 and November 1953).

#### 4.2.5.3 Tornados

Tornados have been recorded in California but with a frequency of only two per year (National Climatic Summary, 1969). They are generally not severe, and in many cases amount to little more than a whirlwind that may cause damage to trees and light structures. An examination of newspaper accounts of nine tornados in California indicates that only one may have been accompanied by wind speeds higher than 100 mph.

The location of a possible tornado strike can be approximated by a geometrical point. The probability of a tornado occurring at a specific point can be estimated by the principle of geometric probability. If two tornados per year are used, the return period for RSNGS is approximately 27,855 years. Because the intensity of California tornados is much less than the "classical mid-western types", winds in only one of five of these tornados would be expected to exceed 100 mph.

This information is reasonably confirmed by searches conducted of the National Oceanic and Atmospheric Administration's (NOAA) database which result in the following information

From 1950 through 1995, California, as a whole, averaged 5 tornados per year. This relates to an average of 0.3 tornados per year per 10,000 square miles.

The annual average number of strong-violent (F2-F5) tornados in California for the same period is zero (0).

#### 4.2.5.4 Tropical Storms and Hurricanes

The possibility of severe storms in the area can be limited to thunder storms and tornados. A discussion of tropical storms and hurricanes is not applicable to RSNGS.

#### 4.2.5.5 Precipitation Extremes

The precipitation Climatology of the Great Central Valley is characterized by a dry season from June through September and a rainy season from October to May. No precipitation records were taken from RSNGS, but because precipitation is associated with large-scale synoptic systems, the data in Table 4.3 below, taken from the ISFSI FSAR [Ref. 9.19], are believed to be representative of the site.

The annual rainfall occurs almost exclusively in the winter months.

#### Table 4.3

#### **Precipitation Climatology**

Month	Sacramento	Stockton
January	3.18	2.55
February	2.99	2.46
March	2.36	2.05
April	1.40	1.14
May	0.59	0.44
June	0.1	0.07
July	0.01	0.01
August	0.02	0.01
September	0.19	0.19
October	0.77	0.63
November	1.45	1.17
December	3.24	2.66
Total	16.29	13.37

### Averages (inches)

A frequency of occurrence of a given precipitation intensity for Sacramento is presented in Table 4.4 (from the ISFSI FSAR). As stated above, this data is believed representative of the conditions that exist at the site and shows that virtually all of the precipitation falls at a rate of under a quarter inch per hour.

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#### Table 4.4

Year	Intensity (inches/hour)					
	0.01-0.09	0.10-0.24	0.25-0.49	0.50-0.99		
1961	79.5%	17.7%	2.3%	0.5%		
1962	81.8%	17.0%	0.8%	0.4%		
1963	80.0%	17.8%	2.2%	0.0%		
1964	86.2%	11.3%	2.2%	0.3%		
1965	89.0%	10.0%	1.0%	0.0%		
Average	83.5%	14.6%	1.7%	0.2%		

#### **Precipitation Intensity**

#### 4.2.5.6 Snow and Ice Storms

The possibility of severe storms in the area can be limited to thunderstorms and tornados. Snow in the Sacramento area is extremely rare. Most snow that has been observed in the Sacramento Valley occurs in January. Given the lack of significant snowfall in the region, a detailed discussion of snow and ice is not applicable to the RSNGS site.

#### 4.2.5.7 Thunderstorms

Thunderstorms, and associated lighting strike, occur infrequently in the area, with the mean number of days per year with thunderstorm activity ranging between 5 in the Sacramento area to 3 in the Stockton area.

#### 4.2.5.8 Restrictive Dilution Conditions (Inversions)

Inversions occur in the Great Valley as a result of cold air advection near the ground or cooling of the earth causing a cooling of the air near the ground. Radiational cooling occurs at night when there are no low clouds. Both types occur at RSNGS with the advection type usually associated with the westerly wind bringing in cool air from the Pacific Ocean.

Temperature inversions at the ground can be expected to occur every night during the summer upwards to several hundred feet. These temperature inversions are the result of the flow of cool maritime air in to the area during the late afternoon and evening hours. During the winter, shallow (a few hundred feet) but intense surface inversions can be expected occasionally during the nighttime hours under light wind conditions.

#### 5.0 HSA METHODOLOGY

The methodology used for the RSNGS Historical Site Assessment is that found in NUREG-1575, MARSSIM. As described in MARSSIM, RSNGS, being a NRC licensee has much of the HSA related information within the records management system used to maintain its records throughout its operational history.

#### 5.1 Approach and Rationale

The primary objective of the HSA records search process was the identification of those events posing a significant probability of impacting the hazardous or radiological characterization of the site. These included system, structure, or area contamination from system failures resulting in airborne releases, liquid spills or releases, or the loss of control over solid material management.

Each incident identified that posed a realistic potential to impact the characterization of the site was further investigated. This investigation focused on the scope of contaminant sampling and analysis, remedial actions taken to mitigate the situation, and any post-remedial action sampling, survey, and analysis in an attempt to identify the "as left" condition of the incident location. The records management system provided the source of a vast majority of the documents inspected.

Also included in the research associated with the development of the HSA were:

- Relevant excerpts from written reports and correspondences;
- Personnel interviews, including the use of questionnaires, of current, former and retired plant personnel to confirm documented incidents and identify undocumented incidents; and
- Site inspection, utilizing historic site drawings, photographs, prints, and diagrams to identify, locate, confirm, and document areas of concern.

Information from this research was used in the HSA development, including the compilation of data, evaluation of results, documentation of findings, and the characterization and identification of Areas and Survey Units.

Relevant information that becomes available following the publication of the HSA during the characterization and remediation phases of the License Termination Program will be evaluated and documented.

#### 5.2 Documents reviewed

In researching the HSA, the records reviewed include:

- License and Technical Specification reports;
- Annual operational and environmental reports;
- Environmental investigations performed by independent entities;
- Regulatory actions against the site;

- Documentation from interviews conducted with currently employed and retired/separated site personnel;
- Radiological control surveys associated with identified events;
  - Site inspection and surveillance documents associated with identified events;
- Federal, State and local regulations;
- Regulatory and Industry guidance documents;
- Annual Environmental and Operational documents;
- License Event Reports (LERs);
- Occurrence Description Reports (ODRs);
- Quality departure documents, including Potential Deviations from Quality (PDQ) and Deviation from Quality (DQ);
- Radiological and environmental survey documents;
  - Routine radioactive release reports;
  - Non-routine reports provided to the NRC under the provisions of the facility's technical specifications, 10 CFR Part 20, and 10 CFR Part 50;
  - Plant incident or condition reports;
  - Radiological assessments; and
  - Quality control/Quality Assurance finding documents.

Records maintained to satisfy the requirements of 10 CFR Part 50.75(g)(1) provided a major source of documentation for the HSA records review process.

Appendix A contains a summary of the details found in the documents reviewed. A brief incident description, radiological implications, and finding synopsis, are included.

#### 5.3 Site Reconnaissance

As provided for in MARSSIM Section 3.5, a formal site reconnaissance was not performed, based on the continuous occupancy of the site by the licensee, the detailed information available through the records, and the personnel interviews performed. Appropriate site reconnaissance has been performed to verify locations and current conditions of items or issues discovered during these investigations.

#### 5.4 Personnel Interviews

Between August 2001 and December 2002, approximately 150 observations were noted from the individuals contacted in the HSA questionnaire program. These individuals represented a combination of current and past employees, primarily from the operations and radiation protection staffs. These two groups were chosen due to their knowledge of and association with the systems and source terms being investigated for this assessment. The personnel surveys included a combination of questionnaires completed by a majority of the participants as well as individual and group interviews with several of the participants.

With few exceptions, the personnel observations were corroborated by either the observations of other interviewees or documentation discovered during the records search. Table 5.1 contains a brief summary of the survey results showing the number of observations recorded for the various general areas identified. Appendix B contains copies of the questionnaire and a response summary sheet.

#### Table 5.1

#### **Personnel Observations Summary**

General Area of Observation	Number of Observations
Auxiliary Boiler, pad, drains sump	10
Auxiliary Building	7
"B" Warehouse	4
Barrel Farm (Waste Storage Area)	4
Balance of Plant (BOP)	14
Building Maintenance/Machine	4
Shop	<b>4</b>
"C" Warehouse	2
Circulating Water Basins	16
surrounding area	10
Fabrication and Weld Shops	2
Building	Ζ
Contractor Fab Shop	8
"GRS" Warehouse	1
Interim Onsite Storage Building (IOSB)	5
Non-Radiological Observations	4
Plant Effluent	4
Quonset Hut	11
Retention Basin	2
RHUT's	13
Storm Drains	5
Training and Records Laboratory	1
Tank Farm	13
Tool Room	1
Turbine Building	9
Tritium Evaporator	3
Training Simulator Building	1
(offsite)	1
"Upper/Outer" Storage Yard	. 1
Sewer Plant	

#### 5.5 Historical Construction Photograph Review

Collections of historical construction photographs were reviewed to assess their contribution to this HSA. A selection of construction photographs is included as Appendix E. Also, additional original construction photographs are contained in the Construction Report issued by Bechtel Corporation [Ref. 9.20]

#### 6.0 OPERATIONAL HISTORY

The following summary of the facility's history was determined through a review of site records, documents and personnel interviews.

#### 6.1 Introduction

The RSNGS was issued its 10 CFR Part 50 operating license (DPR-54) on August 16, 1974 and attained initial criticality one month later, on September 16, 1974. The facility became commercial on April 18, 1975.

The facility is described in multiple licensing documents including:

- "Rancho Seco Nuclear Generating Station Unit 1 Defueled Safety Analysis Report" [Ref. 9.7]; and
- US Nuclear Regulatory Commission (formerly the US Atomic Energy Commission), Safety Evaluation by the Directorate of Licensing, US Atomic Energy Commission, in the matter of Sacramento Municipal Utility District Rancho Seco Nuclear Generating Station, Unit 1, "Docket 50-312 (SER) [Ref. 9.8].

RSNGS had a pressurized water reactor (PWR) designed and constructed by Bechtel Power Corporation with its nuclear steam supply system (NSSS), rated at 2,770-MWt, 913 MWe, provided by Babcock and Wilcox. Condenser cooling and make-up water was provided via the Folsom-South canal, constructed by the Bureau of Reclamation.

The RSNGS site is located in southern Sacramento County, California, approximately 25 miles southeast of Sacramento and 26 miles northeast of Stockton. The site is located on 2,480 acres entirely owned by the District. The facility is located between the Sierra Nevada Mountains to the east, and the Pacific Coast range bordering the Pacific Ocean to the west. The rural area is used almost entirely for agricultural purposes including row and silage crops, cattle graze land, and in recent years, grape production. Within the five-mile radius of the site, there are no significant tourist attractions or variations in population. The nearest population area is approximately 6.5 miles from the site while the closest substantial populations (>20,000) are Galt, and Lodi, CA. at 10 and 17 miles from the site, respectively. The main access to the site is State Highway 104 (Twin Cities Road), which runs from highway 99 (just north of Galt, CA) in the west, to State Highway 88 (just east of Ione, CA) to the east.

After approximately 15 years of operation, RSNGS was shut down for the last time on June 7, 1989, after passage of a non-binding referendum by the voters of Sacramento County recommending the District discontinue operation of RSNGS.

The reactor was completely defueled on December 8, 1989

Unable to attract a buyer for the facility, the District formally notified the U.S. Nuclear Regulatory Commission (NRC) of its intent to permanently shut down the facility, requesting a possession-only license on April 26, 1990.

As noted in the "Rancho Seco Nuclear Generating Station Proposed Decommissioning Plan" (PDP) [Ref. 9.9], RSNGS operated for approximately 2,149 effective full power days (seven fuel cycles), over the course of its operating lifetime.

A summary of the operational history is provided in Table 6.1 below.

#### TABLE 6.1

#### **Operational History - RSNGS**

Date	Event	
Oct. 1968	Received construction permit	
Mar. 1969	Commenced site preparation/construction	
Aug. 1974	Operating License (OL) issued	
Aug. 1974	Completed initial fuel loading	
Sept. 1974	Achieved initial criticality	
Apr. 1975	Commenced commercial operations	
Jun. 1975 – Oct 1976	Two unplanned outages to repair material deficiencies. Full power achieved in Mar. 1976. Full power regained in Oct. after 7-month stator coil outage.	
1977	8 months of full power operations (75% capacity factor Jul-Dec.)	
Nov. 1978	Completed cycle three refueling in 35 days	
Aug. 1980	Turbine rotor failure resolved	
Jun. 1982	Frequent electrical inverter trip resolution achieved	
Apr. 1983	Turbine oil system associated trip issues resolved	
Aug. 1984	Steam Generator repairs and Aux. Feed water modification outage	
Dec 1985	Extended plant shutdown resulting from overcooling unusual event	
Mar. 1986-88	Extended plant shutdown for post TMI-mod installation, emergency feed water system modifications, detailed system analysis and test program implemented, and installation of two additional backup diesel generators.	
Jun 1989	Resolved feed water transient issue, completed restart testing. Public referendum voted to have SMUD discontinue operation of RSNGS. Plant shuts down for last time on June 7, 1989.	
Aug. 1989	SMUD notifies NRC of its intent to seek a decommissioning amendment to its license.	

### TABLE 6.1

### **Operational History – RSNGS**

### (Continued)

Date	Event
Sept. 1989	District fails in its attempts to sell RSNGS or convert to non-nuclear operation.
Dec. 1989	Reactor defueling completed on December 8, 1989.
Jul. 1990	SMUD submits the Plan for Ultimate Disposition of the Facility in response to NRC request.
	MAY - SMUD submits RSNGS Proposed Decommissioning Plan (PDP)
1991	October - Board approves California Environmental Quality Act "Negative Declaration" for PDP (State clearinghouse number (SCH#) 91062072)
Mar. 1992	RSNGS OL amended to Possession Only
Mar. 1995	NRC approves PDP
1997	January - SMUD Board approves Incremental Decommissioning Action Plan (IDAP for 1997 through 1999) and California Environmental Quality Act "Subsequent Negative Declaration" (SCH# 96112047) for IDAP
	Post Shutdown Decommissioning Activities Report (PSDAR) Submitted IAW 10 CFR Part 50.82 (PSDAR supercedes the PDP)
1999-2000	January 1999 – SMUD Board approves IDAP – Rev. #1 (continue decommissioning through license termination) and CEQA "Subsequent Negative Declaration" for IDAP Rev. #1 (SCH#99042092)
Jun. 2000	June 30, 2000 – NRC issued SMUD a 10 CFR Part 72 license to store RSNGS's spent nuclear fuel at the ISFSI
Aug. 2002	Spent fuel transfer to ISFSI complete – TS amendments. 129 and 130 take affect – precludes SF possession on the 10 CFR Part 50 licensed facility and eliminates the need for an Operations Shift Supervisor or Certified Fuel Handlers
Oct 2002	TS amend. 131 takes effect eliminating security plan requirements from the 10 CFR Part 50 licensed facility

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Revision 0 March 2004 The fact that the plant was shut down years before the expiration of its operating license resulted is several significant impacts, two of which include:

- The District's inability to comply with the requirements of 10 CFR Part 50.75 regarding the submission of a preliminary decommissioning plan five years prior to the cessation of operations; and
- A significant shortage of funds within the decommissioning trust fund.

#### 6.2 Decommissioning Plan Chronology

Prompted by a NRC staff request, the "Plan for Ultimate Disposition of the Facility" (PUDF), was submitted in July 1990 [Ref. 9.10]. The original intent of the licensee, as outlined in this document, was to decommission RSNGS using the SAFSTOR – Deferred DECON alternative. This alternative was to include Custodial, as well as Hardened, – SAFSTOR applications as generally defined in the "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," NUREG-0586, August 1988 (GEIS) [Ref. 9.11]. Dismantlement following the SAFSTOR period was estimated to occur in the 2008 to 2012 time frame.

On May 20, 1991, the District submitted the PDP for the Rancho Seco facility, dated April 15, 1991, for NRC approval. The District subsequently submitted supplements to the PDP for review dated April 15, August 6, & August 31, 1992; January 7, April 7, & April 19, 1993; and March 23, April 28, July 26, & October 26, 1994. After an extensive NRC staff review, the PDP was approved on March 20, 1995.

Simultaneous with this review was the amendment of the District's Operating license (DPR-54), to reflect a possession-only authorization on March 17, 1992 and the NRC staff's review of the associated safety evaluation and environmental assessment of the impacts associated with the decommissioning of RSNGS resulted an initial Finding Of No Significant Impact (FONSI), issued on June 16, 1993.

Also occurring during this period was the decision by the District to commence, in an incremental manner, the dismantlement of the site during the Custodial SAFSTOR period.

In 1991, the District Board of Directors approved the negative declaration prepared for the original PDP (Resolution No. 91-10-18) on October 17, 1991. (State Clearinghouse No. 91062072)

In January 1997, the District Board of Directors approved (Resolution 97-01-07) a significant revision to the Decommissioning Plan titled "Incremental Decommissioning Action Plan" (IDAP) and a subsequent negative declaration regarding the potential environmental impacts. (State Clearinghouse No. 96112047)

In April of 1999, the District Board of Directors approved revisions to the IDAP (IDAP – R1) accelerating the schedule of the decommissioning effort. (State Clearinghouse No. 99042092)

In accordance with the applicable provisions of the California Environmental Quality Act (CEQA), the District prepared and circulated the studies and evaluations necessary to support

the subsequent negative declarations associated with the PDP, IDAP, and IDAP -R1. This included multiple public meetings convened by the District and the NRC.

#### 6.3 Regulatory Overview

The RSNGS has been, and continues to be, closely monitored in a highly regulated environment. Regulatory oversight is provided by an extensive collection of Federal, State, Local, and licensee personnel in addition to non-regulatory industrial peer groups and local stakeholders.

This hierarchy of oversight has carried out its various responsibilities during the sighting, licensing, construction, operations, and decommissioning phases of the plant's life and includes:

- United States Atomic Energy Commission (AEC);
- United States Nuclear Regulatory Commission;
- United States Environmental Protection Agency (EPA);
- US Army Corps. Of Engineers Bureau of Reclamation;
- California Department of Health Services Radiological Health Branch;
- California Department of Toxic Substance Control (DTSC);
- California Regional Water Quality Control Board;
- State Water Resources Control Board:
- California Department of Fish and Game;
- Sacramento Metropolitan Air Quality Management District;
- Local/County Governments; and
- District Regulatory affairs/licensing.

6.3.1 <u>Permits and Licenses</u> Permits, issued to the District in association with the construction, operation, and dismantlement of RSNGS, are summarized in Table 6.2

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#### TABLE 6.2

#### **Licenses and Permits**

Issuing Agency	Permit/License Number
USAEC	CPPR-56
Construction Permit – Pressurized Water Nuclear Plant	
USAEC	SNM-1333
SNM License	
USAEC	04-14866-01
Byproduct Materials License	
California Department of Health – Radiation Health Section	2239-34
Radioactive Materials License	l i
USAEC	#DPR-54
Possession Only License (POL)	
USAEC	#DPR-54
Facility Operating License (FOL issued 8/16/74)	
California Regional Water Quality Control Board	# CA0004758
NPDES permit	
California Regional Water Quality Control Board	Annual order renewal
Waste Discharge Order	
California Department of Health – ELAP	1681
(Environmental Lab analysis permit)	
County of Sacramento – Air Pollution Control District	#292
Permit to operate Steam Boiler #3677 (E-365)	
County of Sacramento – Air Pollution Control District	#293
Permit to operate Steam Boiler #3680 (E-360)	
County of Sacramento – Air Pollution Control District	#294
Permit to operate Diesel Generator (G866A)	
County of Sacramento – Air Pollution Control District	#295
Permit to operate Diesel Generator (G866B)	
County of Sacramento – Air Pollution Control District	#7731
Permit to operate Diesel Generator (G100A)	
County of Sacramento – Air Pollution Control District	#7732
Permit to operate Diesel Generator (G100B)	
County of Sacramento – Air Pollution Control District	#4175
Permit to operate Gasoline Dispensing Facility	
County of Sacramento – Air Pollution Control District	None
Permit to operate Steam Boiler V-200 Reactor Pressure Vessel	
Sacramento Regional County Sanitation District	#LWH-5/98
Class II discharge permit	

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## TABLE 6.2 (continued)

### Licenses and Permits

Issuing Agency	Permit/license number
State of California	None
Department of Public Health Laboratory Services	IVOIIC
Sanitation and Radiation Laboratory.	
Non-Commercial Water Laboratory.	
Sacramento County	#232
Health Department – Environmental Health Branch	TTAJZ
Non-Community Water System Permit	
Sacramento County	#302
Health Department – Environmental Health Branch	# <b>J</b> 02
Non-Community Water System Permit	
Sacramento Metropolitan Air Quality Management District	13018 & 13019
(Formerly - County of Sacramento, Air Pollution Control District)	15718 & 15717
Operation of abrasive blasting booth and bag house exhaust vent	
Sacramento Metropolitan Air Quality Management District	11345
Operation of stand-by diesel driven fire pump	
Sacramento Metropolitan Air Quality Management District	11344
Operation of 80 horse power Diesel back-up electrical generator	11344
Sacramento Metropolitan Air Quality Management District	13302
Operation of gasoline storage and dispensing station	13372
(One 4000 gallon tank with one nozzle)	
Sacramento Metropolitan Air Quality Management District	13833 & 13834
Operation of unconfined abrasive blaster and bag house exhaust vent	13035 @ 13054
Sacramento Metropolitan Air Quality Management District	13769 & 13770
Operation of abrasive blasting booth and bag house exhaust vent	- 15707 @ 15770
Sacramento Metropolitan Air Quality Management District	11343
Operation of stand-by air compressor (Gasoline driven)	
State of California	2 6 921 84
Agricultural & Services Agency, Department of Industrial Relation,	2.0.721.04
Division of Industrial Safety	
Operate bridge crane (TDI diesel cranes) - Load down rated	· ·
State of California	2 6 922 84
Agricultural & Services Agency, Department of Industrial Relation,	
Division of Industrial Safety.	· ·
Operate bridge crane (TDI diesel cranes) – Load down rated	· ·
State of California	6.25,1249.85
Agricultural & Services Agency, Department of Industrial Relation,	
Division of Industrial Safety	
Operate bridge crane (IOSB crane No. Y-112)	

#### TABLE 6.2 (continued)

#### Licenses and Permits

State of California	
Department of Industrial Relations	7955
Division of Occupational Safety and Health	
Operation of Auxiliary Building grade level monorail crane No. A-1	
State of California	9150
Department of Industrial Relations	8159
Division of Occupational Safety and Health	
Operation of Reactor Building polar crane No. Y-204A	
State of California	9012
Department of Industrial Relations	8015
Division of Occupational Safety and Health	
Operation of Turbine Building gantry crane No. Y-304	
State of Washington	6170
Department of Social and Health Services	
Disposal site use permit	
Cooling tower transite removal /Bechtel building asbestos removal	Provided by
permits	contractor
State of California	Various
Department of Industrial relations	
Pressure vessel Permits	

#### 6.4 Waste Handling Procedures

Waste materials generated at RSNGS are generally described as radioactive, hazardous, mixed (radioactive/hazardous), universal, or non-regulated.

To ensure the conformance with prescribed regulatory requirements, waste handling evolutions are controlled through various administrative and operational procedures.

#### 6.4.1 Process Control Program (PCP)

The PCP established a program to provide the District and regulators with a reasonable assurance that the radioactive wastes generated at the facility are properly classified, characterized, processed, packaged, manifested, marked, labeled and transported in accordance with the wide spectrum of regulations governing these activities.

#### 6.4.2 Rancho Seco Administrative Procedures (RSAP)

RSAP's provide general departmental guidance in the control of various activities within the facility including those associated with radioactive and hazardous material/waste handling

#### 6.4.3 <u>Radiation Control Manual (RCM)</u>

The RCM provides implementing procedures for the control of radioactive material including training requirements, material receipt procedures, and controls for the release of personnel and materials from the controlled area.

#### 6.4.4 Radwaste Control Manual (RWCM)

The RWCM provides implementing procedures for the management of radioactive waste generated at the RSNGS including material receipts, waste classification, container selection, waste-stream specific processing procedures and characterization verifications.

#### 6.4.5 <u>Chemistry Department Procedures Manual</u>

These procedures include chemical controls, off-site dose calculation, and radioactive effluent control implementing procedures.

#### 6.4.6 <u>Surveillance Procedures (SP)</u>

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SP's are used to document the performance of tests to demonstrate the effectiveness and efficiency of the various implementing procedures and performance of equipment and personnel activities associated with the waste management program.

### 6.5 Current Site Usage

RSNGS was shut down on June 7, 1989.

#### 6.5.1 Description of Operations

Current operations, post fuel transfer to the ISFSI, center on the administrative, technical and physical tasks associated with the dismantlement of the RSNGS.

In August 2002, the transfer of spent fuel from the spent fuel pool to the ISFSI was completed and RSNGS transitioned into the Defueled Technical Specifications, greatly reducing the procedural and operational controls required at the facility.

#### 6.5.2 Preliminary Site Characterization

The initial characterization of the RSNGS site resulted from the review and evaluation of surveys and evaluations previously conducted to determine the extent and nature of residual contamination. In accordance with the guidance of MARSSIM, this initial site characterization (as to the Impacted or Non-Impacted nature of the site) began in 2001 and was completed in 2002. The HSA including the initial site characterization is the product of the evaluations and investigation necessary to define the current condition at the site and assign preliminary Area classifications. This effort also addressed the hazardous material and "state-only" regulated material at the site that may impact future remediation/dismantlement.

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#### 6.6 Site Dismantlement

#### 6.6.1 Dismantlement activities within the Power Block

As of January 2003, the decommissioning project has removed virtually all (with the exception of imbedded or buried piping) of the secondary plant systems including:

- Main Steam;
- Auxiliary Steam;
- Main Feed Water;
- Main Condensate and Make-up;
- Main Circulating Water Pumps;
- Main turbine and Condenser; and
- The vast majority of the support systems located in the Turbine Building.

Within the Auxiliary Building, a majority of the systems have been removed. Spent Fuel Building dismantlement began in October 2002.

Within the Reactor Containment Building, significant progress has been made including removal of all four reactor coolant pumps and motors, a substantial portion of the reactor coolant system, reactor building ventilation system, and support/electrical/mechanical systems.

#### 6.6.2 Dismantlement activities outside the Power Block

Dismantlement activities outside of the facility power block are directed at the removal of temporary buildings and structures and are being carried out in accordance with standard site procedures for the release of potentially contaminated materials and equipment. Final Status Survey's will be conducted of the "footprint" left from these structures' dismantlement to verify that no residual contamination above the established derived concentration guideline level (DCGL) will remain following license termination.

#### 6.7 Radiological Sources

The majority of regulated waste resulting from the decommissioning of the RSNGS will result from the radiological contamination of plant structures and equipment. The primary source of this contamination was the operation of the facility nuclear reactor and its associated support systems. Based on information developed for the IDAP (section 3.1.3), the radiological inventory of the facility is described in the following sections.

#### 6.7.1 Spent Fuel

The largest single contributor to the radioactive inventory at the facility was spent fuel. Based on estimates performed in 1989, 140,800,000 curies, consisting of primarily (~70%) Cs-137, Pr-144, Ce-144, Ba-137m, Sr-90, Y-90, Pm-147, and Pu-241 remain. This will decay to approximately 39,630,000 curies by 2009 with Cs-137, Ba-137m, Sr-90, Y-90, and Pu-241 representing over 97% of the remaining activity.

#### 6.7.2 Irradiated Hardware

Non-Fuel contributors to the radiological inventory, estimated at approximately 95,000 curies of primarily (>99%) Co-60, Fe-55, and Ni-63, include:

- Orifice rod assemblies (ORA's);
- Burnable poison rod assemblies (BPRA's);
- Retainer assemblies (RA's); and
- Incore instruments.

The ORA's, BPRA's, and RA's were transferred to the ISFSI, along with the spent fuel. The incore instruments were sectioned for shielded storage pending transfer to the ISFSI. The activity associated with these irradiated components will decay to under 9,000 Ci of Co-60 and Ni-63 by 2009.

#### 6.7.3 Reactor Vessel and Internals

As of May 1, 2003, approximately 99,500 curies of primarily (>61%) Co-60, comprised of reactor pressure vessel internals and the reactor pressure vessel, are contained within the primary shield wall [Ref. 9.21].

#### 6.7.4 Plant Systems

Systems internally contaminated by the operation of the RSNGS have been characterized repeatedly during plant operations. The most substantial of these characterizations was performed in 1984 by Pacific Northwest Laboratory (PNL-1546, 1984) [Ref. 9.22] showing an estimated 4,500 curies resulting primarily of (>88%) Fe-55, Co-58, Ni-63, and Co-60.

### 6.7.5 Industrial Area Contamination

Several areas within the Industrial Area have been identified as having been radiologically impacted by the operation of the facility including:

- Retention Basins;
  - Tank Farm:
- Barrel Farm;
- Regenerant Hold Up Tanks (RHUT's);
- Storm Drains;
- Oily Water Separator;
- Cooling Tower Basins; and
- Turbine Building drains and sumps.

#### 6.7.6 Non-Industrial Area Contamination

Four locations outside of the Industrial Area have historically had radionuclide concentrations detected above background.

#### 6.7.6.1 Discharge Canal Sediment

The plant discharge canal sediment has shown detectable concentrations of licensed radioactive material resulting from 10 CFR Part 20.2001(a)(3) authorized radioactive liquid releases. This release path has been the subject of numerous studies by the facility staff as well as the Lawrence Livermore National Laboratory (LLNL) and is routinely monitored via the Radiological Environmental Monitoring Program. As discussed in the PDP, the most recent of the LLNL studies (UCRL-ID-106111, November 1990) reported maximum radioactive sediment concentrations of 1.47 pCi/g Co-60 (April 1989), 1.20 pCi/g Cs-134 (January 1989), and 11.00 pCi/g Cs-137 (January 1989) at points within 1,640 feet (0.5 kilometer) of the plant effluent discharge point (0.3 km for January 1989 sampling, 0.5 km for April 1989 sampling).

Current (March 1, 2004) concentrations can be estimated to be  $\leq 0.207$  pCi/g Co-60, 0.007 pCi/g Cs-134, and 7.74 pCi/g Cs-137 (based on the radioactive decay of the 1989 results). Washout and other transport mechanisms will have also affected the concentrations of radioactive material in the effluent discharge path. RSNGS will update the status of this source term as additional studies are completed.

Oak Ridge National Laboratory also evaluated the environmental impact of the authorized radioactive liquid releases for the NRC. This evaluation was applied to both onsite and offsite locations. The results of this evaluation are documented in NUREG/CR-4286, Evaluation of Radioactive Liquid Effluent Releases From the Rancho Seco Nuclear Power Plant [Ref. 9.15].

As part of the Radiological Environmental Monitoring Program and reported to the NRC in the 2002 Annual Radiological Environmental Operating Report [Ref. 9.16], 24 samples of sediment were collected from the discharge canal and the Clay/Hadselville/Laguna Creeks during 2002. Gamma spectrometry analysis of these samples indicated the presence of Cs-137 in the range of 0.017 to 0.604 pCi/g with a mean of 0.111 pCi/g and Co-60 in the range of 0.008 to 0.035 pCi/g with a mean of 0.021 pCi/g.

#### 6.7.6.2 Discharge Canal Soil

During plant operation and during the period of authorized radioactive liquid releases, discharge canal sediment was dredged from the canal and deposited as a band adjacent to the canal. Because the discharge canal sediment was known to contain radioactive materials of plant origin, sampling of the soil adjacent to the discharge canal was added to the Radiological Environmental Monitoring Program. As reported to the NRC in the 2002 Annual Radiological Environmental Operating Report, eight soil samples were collected from this area. Cs-137 was identified in seven out of eight of these samples at a concentration range of 0.042 to 0.266 pCi/g.

#### 6.7.6.3 Depression Area Soil

The depression area is an onsite location adjacent to "No Name" Creek. The discharge canal, discussed above, flows into "No Name" Creek. On occasion and during periods of authorized radioactive liquid releases, "No Name" Creek overflowed and collected in the depression area. Because of this, sampling of the soil in the depression area was added to the Radiological Environmental Monitoring Program. As reported to the NRC in the 2002 Annual Radiological Environmental Operating Report, 14 soil samples were collected from this area. Cs-137 was identified in 12 of these 14 samples at a concentration range of 0.060 to 0.177 pCi/g. Co-60 was identified in six samples at a concentration range of 0.086 to 1.10 pCi/g.

#### 6.7.6.4 Storm Drain Outfall

The Radiological Environmental Monitoring Program has routinely identified low levels of radioactive materials of potential plant origin in soil samples taken at storm drain locations. As reported to the NRC in the 2002 Annual Radiological Environmental Operating Report, 30 soil samples were collected from 15 storm drain outfall locations during 2002. Gamma spectrometry analysis of these samples indicated the presence of Cs-137 in the range of 0.013 to 0.102 pCi/g with a mean of 0.043 pCi/g and Mn-54 in one sample at a concentration of 0.007 pCi/g.

During the fourth quarter of 2000, Shonka Research Associates, Inc. (SRA) conducted detailed surveys of selected areas outside of the Industrial Area. These surveys were conducted to support consideration of an area south of the Industrial Area proposed for the Cosumnes Power Plant (CPP) to be constructed on the RSNGS site. The surveys also determined the boundary of any Impacted Areas and determined background survey values for comparison to Impacted Area values. These surveys included scan surveys conducted using the Subsurface Multi-Spectral Contamination Monitor (SMCM) system developed by SRA, fixed point *in situ* NaI(Tl) spectroscopy measurements and soil sampling for laboratory analysis. To manage the surveys, the site was divided into twelve survey areas. Non-Impacted Areas required 10% areal scan surveys and Non-Impacted Areas bounding Impacted Areas required 50% areal scan surveys.

The final report on these surveys noted that due to several factors, including the marshy conditions of the fields to the south of the plant, several *in situ* sample points had to be relocated. According to the study's authors, this relocated configuration represented the best combination of complete west-east coverage along the storm drain outfall area to the south of the plant.

The SMCM scan and the *in situ* measurement survey results for the outfall area immediately south of the Industrial Area and for the proposed CPP location showed no evidence of plantderived contaminants in these areas. Cs-137 MDCs for the SMCM scans of these areas ranged from 0.26 to 0.77 pCi/g and for *in situ* measurements from 0.31 to 0.40 pCi/g. Two out of five soil samples from these areas tested positive for Cs-137 at a range of 0.03 to 0.30 pCi/g with an analysis MDA of 0.03 pCi/g.

NUREG/CR-4286 established Cs-137 background concentrations in the vicinity of RSNGS. Four locations, at distances of 4 to 10 miles from RSNGS and lying approximately north, south, east and west of the site. The average concentration of Cs-137 in these locations was 0.41 pCi/g. Decaying this average value from December 1984 (the approximate sampling date for NUREG/CR-4286) to December 2002 gives a background concentration of 0.27 pCi/g.

#### 6.7.6.5 Comparison of Soil Concentrations with NRC Screening DCGLs

As discussed above, Mn-54, Co-60, Cs-134 and Cs-137 have been identified at concentrations above background in four locations outside of the Industrial Area. On December 7, 1999 the NRC published screening DCGL values in the Federal Register [Ref. 9.18] for various common radionuclides. These screening DCGL values may be used to evaluate the significance of the soil contamination found outside of the Industrial Area.

The published NRC generic screening DCGL values are as follows:

Mn-54	15 pCi/g
Co-60	3.8 pCi/g
Cs-134	5.7 pCi/g
Cs-137	11 pCi/g

Based on these values, the discharge canal sediment, the discharge canal soil and the storm drain outfall soil will likely not exceed site-specific DCGL values. The depression area soil does exceed the NRC screening DCGL values. However, it must be compared with site-specific DCGL values developed for surface soils before determination if remediation is necessary.

#### 6.8 Waste Stream Description

#### 6.8.1 Hazardous Materials/Wastes

The RSNGS site contains a variety of hazardous materials. The use, storage, handling, and disposal of these materials are controlled through the same procedures and programs used during the operation of the facility. In addition to the material management programs in place, the District complies with the OSHA Hazard Communication Standard (29 CFR Part 1910.120) that requires all employers to provide information to its employees about the hazardous substances that they may come into contact with. This is accomplished through the District's Hazard Communication Program that includes training, labeling, other forms of warning, and the availability of Material Safety Data Sheets (MSDS). The District is not abandoning the site, nor do they intend to discontinue the possession or use of hazardous materials or any permits associated with their use. Therefore, the review of hazardous material events for this HSA has not been performed in the same detail as would be done for a site that is to have an unrestricted release from the aspect of hazardous materials.

#### 6.8.1.1 Universal Waste

Universal waste means any of the following hazardous wastes that are managed under the universal waste requirements of 40 CFR Part 273:

- Batteries as described in 40 CFR Part 273.2
- Pesticides as described in 40 CFR Part 273.3
- Thermostats as described in 40 CFR Part 273.4.

Additionally, in accordance with California regulatory requirements, "the hazardous wastes listed in this section are exempt from the management requirements of chapter 6.5 of division 20 of the California Health and Safety Code and its implementing regulations except as specified in chapter 23 and, therefore, are not fully regulated as hazardous waste. The wastes listed in this section are subject to regulation under chapter 23 and shall be known as "universal waste."

- Batteries as described in section CCR 66273.2;
- Thermostats as described in section CCR 66273.4;
- Lamps as described in section CCR 66273.5;
- Cathode ray tube material as described in CCR 66273.6;
- Aerosol cans as specified in Health and Safety Code section 25201.16;
- Mercury-containing motor vehicle light switches as specified in Health and Safety Code section 25214.5 (M001 Wastes) and motor vehicles that contain such switches, as described in section 66273.7.1);
- Non-automotive mercury switches and products that contain such switches (including, but not limited to, M002 Wastes), as described in section 66273.7.2;
- Mercury-containing pressure or vacuum gauges, as described in section 66273.7.4;
- Mercury counterweights and dampers, as described in section 66273.7.6;
- Mercury thermometers, as described in section 66273.7.7;

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- Mercury dilators and weighted tubing, as described in section 66273.7.8;
- Mercury-containing rubber flooring, as described in section 66273.7.9; and

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• Mercury gas flow regulators, as described in section 66273.7.10.

#### 6.8.1.2 <u>RCRA Waste</u>

The California DTSC and EPA regulate the packaging, storage, processing and disposal of listed or characteristic waste materials. RSNGS must demonstrate compliance with both the federal EPA and State program requirements. Material at RSNGS in this category include:

- Polychlorinated Biphenyls (PCBs);
- Asbestos-Containing Material (ACM);
- Laboratory solvents and reagents;
- Chrome containing waste materials;

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- Lead waste;
- Mercury waste from instrumentation;
- Cadmium waste;
- Corrosive waste from laboratory and cleaning processes;
- Spent aerosol cans;
- Ignitable waste from Laboratory and maintenance activities; and
- Paint related waste solvents from maintenance activities.

#### 6.8.1.3 Mixed Waste

Mixed wastes are those wastes regulated by the EPA or equivalent state agency, that are also contaminated with radioactive material. At RSNGS, these wastes include,

- Mercury from radioactive system sampling or monitoring instrumentation;
- Chromium containing radioactive air filters generated during decommissioning;
- Radiologically contaminated solvent from the laboratory and painting and decontamination processes; and
- Radiologically contaminated lead from shielding and paint.

### 6.8.2 Low Level Radioactive Waste (LLRW)

Low level radioactive waste means those waste materials contaminated with radioactive material. LLRW is collected, characterized, classified, packaged and shipped for either processing or disposal at appropriately licensed facilities.

Between 1974 and 1990, RSNGS made 459 LLRW shipments in support of facility operations.

309 dry solid shipments ~  $147,000 \text{ ft}^3$ 

150 bulk liquid shipments ~ 458,000 gals. (Prior to the discontinuation of liquid waste shipments in 1980).

After the station's shut down in 1989, the site made only 8 waste shipments totaling less than  $4,500 \text{ ft}^3$  between 1990 and 1992 and did not ship radwaste again until 1997 when dismantlement activities in the Turbine building commenced. The original decommissioning waste volume estimate, based on the 1991 PDP, was estimated to be approximately 200,000 ft<sup>3</sup>.

This material can include:

- Dry Active Waste (DAW) paper, plastic, glass, wood, used PPE, scrap metal, floor sweeping, etc.;
- Contaminated asbestos insulation material

- Soil and soil like debris including rubblized concrete and asphalt from various site vard areas;
- Equipment, tanks, pumps, motors, generator, and other metal components;
- Sludge's organic and inorganic solids from tanks, pipes, and pumps; and
- Charcoal contaminated filter media used to filter liquid process system and ventilation systems.

Since the commencement of incremental decommissioning in 1997, several changes to the volume estimates and inventories have been made as well as significant progress in the dismantlement and disposal of wastes. Spanning the period 1997 to 1999, the successful incremental phase of the decommissioning project demonstrated that decommissioning could be effectively undertaken by completing the dismantlement and disposal of the secondary system at a cost avoidance of approximately 42 million dollars over what had been estimated.

This success provided the basis for the Board's approval of full scale decommissioning, which commenced in 2000.

The progress of the decommissioning program to date (December 31, 2003) and the revised projection of remaining waste volumes are summarized below.

Class A

- Shipped to date  $\sim 190,000 \text{ ft}^3$ 
  - Processors ~ 59,000  $ft^3$
  - o Disposal ~ 131,000 ft<sup>3</sup>
- Remaining ~ 123,274  $\mathrm{ft}^3$

Class B

- Shipped to Date none
- Remaining ~ 949 ft<sup>3</sup>

Class C

• Shipped to date - none which have a first out of the Snipped to date - none
 Remaining ~ 424 ft<sup>3</sup>
 GTCC -

GTCC - service service to service the service service

The estimated volume of Greater than Class C (GTCC) waste, resulting from the dismantlement of the reactor internals, is approximately 48.4 cubic feet. Current plans call for the amendment of the ISFSI 10 CFR Part 72 license to accommodate the storage of the GTCC material within the ISFSI until its final disposition, anticipated to be in the Spent Fuel Repository.

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#### 6.8.3 Spent Fuel

The spent fuel transfer to the ISFSI was completed in August 2002. Spent fuel will remain in the ISFSI until the Federal Spent Fuel Repository becomes operational, sometime after 2010 based on current estimates attained from the Department of Energy's Yucca Mountain Project website.

#### 6.9 Incident Descriptions

Based on the review of existing plant records (annual and semi-annual reports, licensee notifications, Occurrence description reports, and PDQ's) approximately 260 incidents with radiological or hazardous material implications occurred between commencement of plant operation in 1974 and approval to continue decommissioning through license termination in 1999. A number of these took place within the power block and, while contributing to the radiological contamination of the power block structures, were generally contained within the RCA. Those occurring outside of the power block have contributed to the Impacted classification of substantial portions of the industrial area. These include:

- Airborne releases with structural or geological contamination potential;
- Spills outside of the power block or incidents involving potential contamination based on system leakage from systems that had been historically contaminated by primary to secondary leaks;
- Loss of control of radioactive materials resulting in the potential for contamination outside of the power block;
- Plant liquid radioactive effluents resulting in soil contamination;
- Hazardous material spills or losses of control; and
- Contamination of systems not originally designed as radioactive systems outside of the historic power block.

A summary index of these incidents is included as Appendix A.

#### 6.9.1 <u>Radiological Spills</u>

The records search showed that between 1974 and 1999, 158 documented spills occurred at the facility. Less than forty of these documented spills occurred within the power block and, while contributing to the radiological contamination of the power block structures, were generally contained within the radiologically controlled drains and waste systems. These spills and releases can be grouped into three basic categories as described below.

- Spills that were ultimately contained within the site's controlled process drain system (including the oily water separator, RHUT's, and retention basins), contaminating the surfaces between the spill site and drain;
- Spills ultimately entering the site's uncontrolled storm drain system contaminating the drain system as well as the surfaces between the spill site, the drain and the outfall; and

• Spills resulting in the saturation and contamination of the media in the immediate area surrounding the spill (i.e., concrete, soil, asphalt, gravel, etc.).

These spills generally resulted in the affected areas being designated as Impacted Areas for FSS design purposes.

#### 6.9.2 <u>Chemical Spills</u>

The records search revealed that between 1974 and 1999, twenty-eight documented cases involving the mishandling or loss of control over hazardous chemical materials exist. These range from spills of acids and caustics used in the plant's various systems to anti-freeze and transmission fluid from District vehicles. There were a minimal number of chemical spills occurring outside of the building comprising the historic power block. A majority of these occurred within one of the facility's structures.

These spills were controlled and remediated in accordance with the policies and procedures associated with these occurrences, including:

- Ranch Seco Hazardous Materials Business Plan;
- RSAP 0229, Hazardous Waste Management;
- RSAP 0223, Oil Spill Prevention, Control, and Countermeasures,
- OP-C-32, Onsite Oil Spill;
- OP-C-46A, Hazardous Material Spill/Release; and
- Rancho Seco Emergency Plan.

#### 6.9.3 Loss of Material Control

The records search showed that between 1974 and 1998, there are 12 documented cases regarding the loss of control of radioactive material or material contaminated with radioactive material resulting in the potential for contamination spread in the immediate vicinity. Areas affected by these incidents will be initially classified as Impacted Areas.

#### 6.9.4 System Cross-Contamination

Starting in 1975, with indications of cross contamination of the CCW system from the RCS and expanding dramatically in 1981 with the first indications of primary to secondary leakage through the OTSGs, systems not originally expected to contain radioactivity became contaminated. The level of contamination varied from system to system and in general, was minimal.

In accordance with plant chemistry and surveillance procedures, open cycle and closed cycle cooling systems, auxiliary systems, tankage, and standing water were routinely monitored. In accordance with the guidance of NRC IE Notice 80-10, non-contaminated systems were routinely monitored for radioactivity, and those systems with measurable activity were evaluated (typically through an Engineering or 10 CFR Part 50.59 review process) for potential impacts against the 10 CFR Part 50 Appendix I criteria.

The potential exists for leaks from these systems to have resulted in the contamination of additional site systems and locations not originally expected to be contaminated.

Based on the records search performed for the HSA investigation, 165 documented cases involving events of this nature occurred during the operation of RSNGS. These areas, primarily within the Turbine Building and Tank Farm, are classified as Impacted Areas.

#### 6.10 Survey Unit Identification and Classification

#### 6.10.1 Site Classification

The identification, designation, and classification of individual survey units are an ongoing process that will be completed prior to submittal of the Final Status Survey Plan contained within the License Termination Plan.

#### 6.10.2 Assessment Performance

The Site Characterization working group of the Decommissioning Planning Team will perform the assessments required to assign preliminary Area and Survey Unit classifications, and Survey Unit identification codes to the site.

#### 6.10.3 Areas

The entire 2,480 acre site is divided into Areas. Areas are typically larger physical sections of the site that may contain one or more survey units depending on their classification. Areas that have no reasonable potential for residual contamination are classified as Non-Impacted Areas. These Areas have no radiological impact from site operations and are typically identified early in decommissioning. Areas with reasonable potential for residual contamination are classified as Impacted. Impacted Areas of the site are depicted in Figure 6.1, Impacted Area Designations. Areas of the 2,480 acre site not depicted in Figure 6.1 as Impacted are classified as Non-Impacted.

#### 6.10.4 Survey Units

A Survey Unit is a physical area consisting of buildings, structures, or land areas of specifically defined shapes and sizes, for which a unique decision will be made regarding if the presence of any residual radioactive material meets or exceeds predetermined release criteria. A Survey Unit is a single contiguous area, whose size is dependent upon its physical characteristics (open land vs. structural building, dry hillside vs. wetland marsh), radiological conditions (Impacted vs. Non-Impacted, remote material storage area vs. a CSCA), and whose operational conditions are reasonably consistent with the exposure modeling used to determine the classification. (A Survey Unit will carry a single classification as described in table 6.3. An area whose physical or radiological conditions mandate multiple classifications will be divided such that each Survey Unit will have a single, consistent classification.)

#### 6.10.5 Initial Designation of Areas

Using reasonable and available physical and documented references, nine Areas were identified and assigned Area identification numbers. Except as noted below, Areas one (1)

through seven (7) are located outside of the Industrial Area while Area eight (8) is comprised of the entire Industrial Area. Area nine (9) contains all portions of the 2,480 acre site not included in Areas one through eight.

Current Area designations (coordinates as referenced on SK-RP-0001, Radiological Characterization Plot Map) are:

- Area 1, Plant Effluent Water Course bounded by AA2, AA16, AF16, AI18 and AY2 (back to AA2);
- Area 2, South Plant Outfall bounded by AI19, AI39, AO39, and AO13 (back to AI19);
- Area 3, Southern region bounded by AY2, AP13, AP39, and AZ39 (back to AY2);
- Area 4, South Eastern region bounded by Y40, Y66, AY66, and AY40 (back to Y40);
- Area 5, North Eastern region bounded by AE37, T37, U35, V35, V38, X38, X66, and AE66 (back to AE37) Note: Area 5 contains two Impacted Survey Units; one that is bounded by Q40, R40, R37, U37, U35, V35, V38, X38, X44, and Q44 (back to Q40) plus one consisting of those cells through which the access road to highway 104 passes;
- Area 6, Northern region bounded by AE2, L2, L36, and AE36 (back to AE2);
- Area 7, Western region (excluding ISFSI and that portion transversed by the railroad spur) bounded by M2, M20, N20, Q19, U19, W16, Z16, and Z2 (back to M2); and
- Area 8 Those portions of the District-controlled Rancho Seco property not included in and surrounded by SA01-SA07. Area 8 (SA08) is also commonly referred to as the Industrial Area and lies primarily within the industrial area fence with the notable exception of parking areas located to the east of the site. (bounded by M21, N21, P19, U19, X17, AF17, AH19, AH39, Y39, Y37, W37, W34, T34, T36, and M36 (back to M21)).
- Area 9 Those portions of the District-controlled Rancho Seco property not included in Areas 1 through 9.

Areas of the site are depicted in Figure 6.2, Area Designations.

#### 6.10.6 <u>Survey Unit Designation Program</u>

The Impacted Areas are being further subdivided into survey units and assigned a unique Survey Unit Identification Number (SUID) along with a preliminary classification. Descriptions of the initial Survey Units identified are provided in Appendix C. These initial Survey Units may be either further divided or combined and will be classified during design of the FSS. The guidance provided by the MARSSIM Classification matrix is provided in Table 6.3 below.

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### TABLE 6.3

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### MARSSIM Survey Unit Classification Matrix

		Arca Survey requirements					
Area Classification	Definition	Structures	Land	Scan	Sampling / direct measurement	EMC evaluation	Instrument MDC
Non- Impacted	Areas, as determined during the HSA, having no reasonable potential for residual radioactive contamination.	No limit	No limit	None required	None required	Not required	N/A
Impacted Class III	Impacted areas not expected to contain residual contamination above fraction of DCGL <sub>w</sub> [10%]	No limit	No limit	Judgmental	Random	Required	0.1 DCGL <sub>w</sub> Max
Impacted Class II	Impacted areas not expected to exceed DCGL <sub>w</sub>	1,000 m <sup>2</sup>	10,000 m <sup>2</sup>	10-100%	Systematic	Required	0.5 DCGL <sub>w</sub> Max
Impacted Class I	Impacted areas with potential to exceed DCGL <sub>w</sub> , isolated areas to exceed DCGL <sub>EMC</sub> , or where remediation has been performed to meet DCGL criteria	100 m <sup>2</sup>	2,000 m <sup>2</sup>	100%	Systematic	Rcquired	0.5 DCGL <sub>w</sub> Max

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#### 6.11 Radiological Impact Summaries

### 6.11.1 Area 1 (SA01) - Plant Effluent Area

Available documentation of the radiological impacts associated with the evaluations from specific incidents during the operational and post operational period include:

6.11.1.1	Licensee identified events

Document	Equipment/System/location	Remarks
ODR 75-46	RHUT overflow	~1,765 gal overflowed to PE before divert (H-3 only)
ODR 76-79	PE diversion for road construction altered PE flow measurements	Flow rate calculation re- verified with minimal impact noted.
ODR 81-192	RHUT sample line discharges directly to PE	Cumulative impact unknown (≥ 500 µCi Co-60) [Also ODR81-193, 209]
ODR 84-223	CST (T-358) overflow ~900 gallons	Release within 10 CFR Part 20 limits 96 $\mu$ Ci H-3, 0.21 $\mu$ Ci Cs-137 to PE
ODR 87-764	System drained in contaminated area removed without sample 55 gal. Dumped down uncontrolled storm drain between Aux and RB	Cs-137 at 1.75E-7 $\mu$ Ci/ml (no mention of any diversion of PE) 1987 semi-annual report ~1000 gal. Max dose 3.33E-4 mrem.
1988 annual report	Cs-137 detected during routine monitoring	57 $\mu$ Ci Cs-137 in 3.10 E+06 gal. release – Est. dose 0.0125 mrem
1988 annual report	MSR valve leakage between April and September	Turbine Building floor drains to PE - $\sim$ 88 gal. / $\sim$ 3 $\mu$ Ci H- 3, Cs-134, and Cs-137 released.
PDQ 89-512	Radiological survey results (up to 58 uR/hr contact) along creek raise concerns associated with EPA criteria	No limits were exceeded (activity resulted from permitted releases)

#### 6.11.1.2 Independent Evaluations Conducted

Document	Equipment/System/location	Remarks
	Rancho Seco Liquid Effluent	Study to establish and define the
	Pathway Aquatic and	notential exposure nathways
	Terrestrial Dietary Survey	associated with the liquid
	Report - November 30, 1084	affluent releases from PSNGS
TICID 20205	Concentration of	Established basic correlations
OCID-20295	Padionualidas in Fresh Water	between species dist size and
•	Fish Doumstroom of Donoho	rediclogical concentration of
	Seco Nuclear Generating Plant	common some fish in
	December 27, 1094	doumstream waterways Heing
1 . · · · ·	– December 27, 1964.	consumption data from LICID
		20267 coloulated maximum
		20207, calculated maximum
		$nCi(y_{1},y_{2},y_{3},$
	Dedianualidas in Cadimanta	Estimated that an ly 2004 of the
UCID-20298	Collected Description from	Estimated that only $20\%$ of the
	Collected Downstream from	CS-154/157 discharged between
	Concerting Station	1981 and 1984 are associated
	Generating Station.	denth of 12 cm ) in Class
		Le destrille and Le sume Creater
		Hadselville, and Laguna Creeks
· · ·		to a distance of 16.2 miles (20
11010 000/7		km) from the plant
UCID-20367	Environmental Radiological	Primarily summarizes UCID –
	Studies Downstream from	20207, 20295, & 20298 and
	Rancho Seco Nuclear Power	recommends further
	Generating Station. March 22,	investigation of aquatic and
		Terrestrial food source painways
UCID-20641	Environmental Kadiological	Part I documents follow-up
	Studies Downstream from the	investigation of radioactivity
	Kancho Seco Nuclear Power	concentrations in fish and
	Generating Station - 1985.	sediment samples. Part II
	February 6, 1986.	contains appendices with
	L	sample data

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**RSNGS** Historical Site Assessment

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### Independent Evaluations Conducted

(Continued)

Document	Equipment/System/location	Remarks
NUREG/CR-4286 (ORNL-6183)	Evaluation of Radioactive Liquid Effluent Releases From the Rancho Seco Nuclear Power Plant. March 1986.	Based on the analysis of the data gathered, the potential for exposures above 25 mrem/yr appear highly unlikely, stating that in its summary " it seems reasonable to assume that unless some individual is eating 14 to 18 kg of fish per year caught in the sump, Clay Creek, or Hadselville Creek at Clay Station Road, a 25 mrem/year dose is not reached by any individual around Rancho Seco."
UCID – 20963	Environmental Radiological Studies Conducted During 1986 in the Vicinity of the Rancho Seco Nuclear Power Generating Station. March 22, 1987	Documents the continuation of the environmental monitoring research being performed. Cs concentration in fish has returned to background at distances greater than 7.5 km from the plant effluent boundary.
UCRL-106111	Environmental Radiological Studies in 1989 Near the Rancho Seco Nuclear Power Generating Station. November 1990.	Documents the 1989 follow-up to the environmental effluents studies performed in 84-87. Recommendations include suspension of the studies unless a normal or above normal precipitation cycle prompts an evaluation of the potential redistribution of the activity inventory.
None	Rancho Seco Non- Industrial Area Survey Project. Shonka Research Associates, Inc. June 2001.	Determined that there is now "no presence of contamination discernable from background" with the exception of the effluent path itself and the swales associated with it.

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#### 6.11.1.3 <u>District Initiated Evaluations</u>

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Document	Equipment/System/location	Remarks
RPDP 90-001	Over reporting of effluent	Based on residual activity
	release activities for Ag110m,	detected in retention basin
	Co-57, Co-58, Co-60, Cs-134,	sludge during clean up activities
	Cs-137, Mn-54, & Sb-125 by	in 1985 & 1989. Ag-110m~30%,
	up to 40%	Co-57~2%, Co-58<1%, Co-
		60~26%, Cs-134~2%, Cs-
		137~3%, Mn-54~2.5%, & Sb-
		$125 \sim 42\%$
RPDP 90-010	A multiple topical study,	Estimate that ~350 it of
	including Field #14 Soll	dreaging wastes will fail to
	contamination.	10 mrem/standard utilized in
: •		1000 (See 91-006 for follow-up)
RPDP 91-006	Radiological characterization	Summarized investigation
	Along the Plant Effluent	documentation between 1985
	Stream.	and 1989 in preparation for
· · ·		further studies. Noted the
		elevated levels detected in the
		dredge piles and that $\sim 1020 \text{ ft}^3 \text{ of}$
		these piles had been
		containerized as radwaste.
RPDP 92-004	Effluent course	Soil contamination depth profile
	characterization	

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RSNGS Historical Site Assessment
## District Initiated Evaluations

(Continued)

Document	Equipment/System/location	Remarks
RPDP 92-005	Offsite Soil Sector survey	Provided characterization data from within an approximate 2000-foot radius of Reactor Containment Building (360°) surrounding facility with direct measurement and soil sample correlations.
RPDP 92-006	Effluent wastewater course radiological characterization	Provides a summary of studies to date and established soil contamination half-lives and remediation options.
RPDP 92-008	Soil activity vs. Measured exposure rate wastewater course area.	Early attempt to correlate the soil activity to direct gamma readings.
RPDP 92-009	Half-life Calculations for Clay Creek Bank	Estimates environmental half- life of effluent creek at ~ 4 years
RPDP 92-010	TEDE calculation for soil sample taken at grid location AI- 16	186 mrem/year, decaying to 9.9 mrem/year in ~4 half-lives (17 years).
RPDP 93-002A	Evaluation of Soil in Area AH & AI-15	Additional data attempting to correlate soil activity and direct dose measurements
RPDP 93-003	Evaluation of Soil in Area AM-5	Additional data attempting to correlate soil activity - direct dose measurements and various depth of soil removal.
RPDP 93-006	Evaluation of Soil in Area AN-2	Activity concentration vs. depth to 6"
RPDP 93-008	Offsite Soil Sector Survey	Provided characterization data within 3-mile radius, 360° surrounding facility with direct measurement and soil sample correlations.

## District Initiated Evaluations

(Continued)

Document	Equipment/System/location	Remarks
RPDP 94-003	Soil environmental half-life evaluation.	Estimates environmental half-life of effluent creek at ~ 4 years
RPDP 95-004	Radiological Characterization Report	Summarizes the characterization effort and the decision not to remediate the effluent canal.
RPDP 95-007	Offsite uR/hr versus Soil Activity Correlation	Provides two different models with which to estimate annual exposure from measured dose rates in the effluent canal area.

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## 6.11.2 Area 2 (SA02) - South Plant Outfall Area

Available documentation of the radiological impacts associated with the evaluations from specific incidents during the operational and post operational period include:

Document	Equipment/System/location	Remarks
ODR 82-0248	Leakage from (auxiliary) large boiler ran down storm drain	Plant Effluent H-3 4.5E-06 to 6.6E-06 (μCi/ml)
ODR 84-0217	Hydro-pump hose burst – water down storm drain	Hydro source CST – H-3 2.00E-05 μCi/ml
ODR 84-0317	Drain hose fails releasing 500 gallons from T-993 to storm drain	2.20E-05 μCi/ml – 2880 μCi total release
ODR 85-0075	Hole in "B" RHUT releases ~ 1000 gallon to storm drain	2.00E-04 $\mu$ Ci/ml at storm drain - < 4.30E-06 at the outfall
PDQ 90-0367	H-3 Evap (RWS-730) leaks 500 gallons across Tank Farm into storm drain south of East cooling tower	H-3 at 3.8E-02 and Cs- 137 at 3.6E-08 μCi/ml
PDQ 93-0088	A RHUT agitator leaks 450 gallons down storm drain.	Release – 37 μCi H-3, 8.30E-03 μCi Co-60, 3.15E-03 μCi Cs-134, 8.52E-02 μCi Cs-137
PDQ 02-0015	B RHUT agitator leaks 450 gallons down storm drain resulting in an unmonitored release	H-3 at 4.42E-06 and Cs- 137 at 2.80E-09 μCi/ml

## 6.11.2.1 Licensee Identified Events

## 6.11.3 <u>Areas 3 – 7</u>

With the exception of two Impacted Survey Units contained in Area 5 as described in Section 6.10.5, no radiological impacts were identified that impacted these Areas.

One Impacted Survey Unit within Area 5 consists of the employee parking lot, Parking Area #2 and Parking Area #4. One event was identified in this area, ODR 870301 where a pallet with articles tagged "Contact RP prior to disassembly outside RCA" was found in this area. Also, this area has been used as a staging area for radioactive material shipments, both incoming and outgoing.

The second Impacted Survey Unit consists of those cells through which the access road to highway 104 passes. Since this access road serves as the point of egress and ingress of radioactive material shipments, it must be classified as Impacted in accordance with MARSSIM classification guidance.

## 6.11.4 Area 8 (SA08)

Area 8 is comprised of that area of the site known as the Industrial Area. The identified radiological impacts on the Industrial Area are too numerous to summarize here. A brief summary of each radiological occurrence is included in Appendix A, HSA 10 CFR Part 50.75(g) Document Review Summary.

### 6.11.5 <u>Area 9 (SA09)</u>

Area 9 is comprised of those areas of the entire 2,480 acre site not contained in Areas 1 through 8.

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#### 7.0 FINDINGS

RSNGS, like all commercial nuclear power plants, is designed with multiple boundaries to contain the unit's radioactive contents within its many systems, components, and structures. Many of these systems and structures have been impacted due to routine operations and maintenance activities during the operational and post operational history of the plant. Structures anticipated to be classified as Impacted by the unit's operation include the Reactor Containment Building, Auxiliary Building, Spent Fuel Storage Building, Interim Onsite (radwaste) Storage Building (IOSB), and much of the Tank Farm and the systems contained within it. Other systems, components and structures that were not originally anticipated to be contaminated have been impacted as the result of system cross contamination between the primary coolant system and secondary steam systems due to the failure of tubes within the unit's OTSGs. Areas and systems impacted as a result of these primary to secondary leaks include:

- Turbine Building;
- Emergency Feed pumps;
- CST in the tank farm;
- Regenerate Holdup Tanks;
- Auxiliary Boilers;
- Main and Auxiliary Steam Systems;
- Main Feed Water System;
- Retention basins:
- Condensate System; and
- Auxiliary Feed Water System. ٠

Other major non-nuclear systems became contaminated by leakage directly from the primary system or by materials that had been in contact with primary coolant including;

- Nitrogen Gas System;
  Control Rod Drive Cooling System;
  - Service Air System;
  - Nuclear Service Cooling Water System; and
  - Turbine/Component Cooling Water System.

System leakage from these systems in turn contaminated the Clean Drain system.

As referenced earlier in the report, Area 8, comprising the Industrial Area, as well as Areas 1 and 2 and the Impacted portion of Area 5 will be divided into unique survey units consistent with the guidance contained in MARSSIM. The initial MARSSIM classification of these areas will be based on the design function of the area of concern (AOC) or its operational

history. Of particular significance are those areas historically referred to as the power block. These include:

- Reactor Containment Structure;
- Auxiliary Building;
- Spent Fuel Building;
- Turbine Building; and
- Tank Farm.

In general, these areas are being assigned Impacted Area classifications. Should information be developed during the course of the project supporting reclassification of these areas, the circumstances and rationale will be documented appropriately.

During the operational history of the facility, radioactive liquid spills, radioactive waste processing, storage, and certain maintenance activities on contaminated equipment and components occurred outside of the historic power block. These occurrences have resulted in the preliminary assignment of Impacted Area classifications to the areas affected. These include, in part:

- North and South Turbine Building lay down areas;
- Radioactive Waste Barrel Farm;
- Radioactive Waste Solidification Pad (East of Auxiliary Building grade);
- Machine Shop;
- Auxiliary Building yard area;
- Construction and Pipe Fabrication Shops; and
- "C" warehouse.

Should future survey data support reclassification of these areas, the circumstances and rationale will be documented appropriately.

Several occurrences involving radioactive materials have potentially impacted other areas outside the RCA. These include the storage of radioactive materials in the following locations:

- Turbine Rotor Storage Shed;
- Paved access surrounding the East and West Spray Ponds;
- Quonset Hut;
- Switchyard;
- Main site tool room; and
- North and South Storage Yards.

Incident specific survey and post remediation survey results have been used in the assignment of a preliminary Survey Unit classification of Impacted.

The District-controlled property outside of the Industrial Area has been initially classified as Non-Impacted with the exception of the storm drain outfalls (Area 02) and the plant effluent water course way (Area 01).

These preliminary classification assignments have been substantiated by the non-Industrial Area survey work performed by Shonka Research Associates, Inc. This project provided direct scanning of over 300,000 square meters accompanied by over 80,000 gamma spectral samples without the detection of any radioactive material of site origin above background.

Area 01 (SA01)	Impacted
Area 02 (SA02)	Impacted
Area 03 (SA03)	Non-Impacted
Area 04 (SA04)	Non-Impacted
Area 05 (SA05)	Non-Impacted*
Area 06 (SA06)	• Non-Impacted
Area 07 (SA07)	Non-Impacted
Area 08 (SA08)	Impacted
Area 09 (SA09)	Non-Impacted

#### **Area Designations**

Table 7.1

\* Area 05 contains an impacted area within it as described in Section 6.10.5.

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#### 8.0 <u>CONCLUSIONS</u>

The RSNGS HSA provides sufficient evidence to support Impacted Area classification for SA01, SA02, and SA08 only. Area's SA03 through SA07 and SA09 shall be classified as Non-Impacted Areas and excluded from further investigation and survey actions with the exception of two Impacted Areas within Area SA05 as described in Section 6.10.5.

Based on current and historic sample results from the licensees Radiological Environmental Monitoring Program (REMP), there is no indication that surface waters on or near the facility or the ground water off of the site has been affected by the licensed operation of the facility. However, further evaluations of the groundwater directly below the licensed facility are also planned prior to the LTP submittal. The plant effluent watercourse contains deposits with measurable amounts of radioactive material resulting from liquid releases conducted in accordance with the regulatory and permit requirements imposed on the facility.

There were periods of liquid effluent releases during operation of the plant where it was determined that calculated dose to a maximally exposed individual via the liquid effluent pathway exceeded the design objective level of 10 CFR Part 50, Appendix I. However, it was also determined that these liquid effluent releases did not exceed the concentration limits of 10 CFR Part 20 or the fuel cycle dose limit of 40 CFR Part 190. The need for remediation of this material, the dose from which has already been accounted for in accordance with the regulation governing radioactive effluent from power plants will be determined prior to submittal of the LTP.

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#### 9.0 <u>REFERENCES</u>

9.1 NUREG-1575 - Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)

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- 9.2 Radiological Characterization Plan for the Rancho Seco Nuclear Power Generating Station (RCPRSNPGS including Quick Look (April 4 and 14, 1990), Phase I (April 14 through May 9, 1990), and Phase II (1991 through 1997)
- 9.3 NUREG/CR-2082 "Monitoring for Compliance with Decommissioning Termination Survey Criteria".
- 9.4 NRC draft Regulatory Guide DG-1005 "Standard Format and Content for Decommissioning Plans for Nuclear Reactors
- 9.5 Sacramento Municipal Utility District, Rancho Seco Nuclear Generating Station, Unit No. 1, Final Safety Analysis Report
- 9.6 Sacramento Municipal Utility District, Rancho Seco Nuclear Generating Station, Unit No. 1, Updated Final Safety Analysis Report
- 9.7 Sacramento Municipal Utility District, Rancho Seco Facility, Defueled Safety Analysis Report
- 9.8 Safety Evaluation by the Directorate of Licensing, US Atomic Energy Commission, in the matter of Sacramento Municipal Utility District, Rancho Seco Nuclear Generating Station, Unit 1, Docket 50-312
- 9.9 Rancho Seco Nuclear Generating Station Proposed Decommissioning Plan" (PDP)
- 9.10 Plan for Ultimate Disposition of the Facility" (PUDF), July 1990
- 9.11 Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, NUREG-0586, August 1988 (GEIS)
- 9.12 Geotechnical Investigation for Proposed Evaporation Ponds, ERPT-C0104, Rev.1, 1989
- 9.13 Final Engineering Report Assessment of Spent Fuel Liner Leakage, ERPT-M0221, Rev.0, 1990
- 9.14 Response to NRC questions on Geologic and Seismologic Conditions 1987
- 9.15 NUREG/CR-4286, Evaluation of Radioactive Liquid Effluent Releases From the Rancho Seco Nuclear Power Plant, March 1986
- 9.16 Annual Radiological Environmental Operating Report, January December 2002, Rancho Seco Nuclear Station, Herald, California
- 9.17 Rancho Seco Non-Industrial Area Survey Project Rev. 2 Shonka Research Associates, Inc June 26, 2001. Appendices and Addendums

- 9.18 Federal Register, Vol. 64, No. 234, December 7, 1999, FR Doc. 99-31508
- 9.19 Rancho Seco Independent Spent Fuel Storage Installation Final Safety Analysis Report Volumes I, II, and III
- 9.20 Bechtel Corporation, Construction Report for Rancho Seco Nuclear Generating Station Unit No. 1, January 15, 1976
- 9.21 Report 2041-RE-009, Rev. 1, Rancho Seco Activation Analysis and Component Characterization, WMG, Inc., July 2003
- 9.22 PNL (Pacific Northwest Laboratory), 1984 "Residual Radionuclide Distribution and Inventory at Rancho Seco Nuclear Generating Station." PNL-5146, June 1984.

## 10.0 APPENDICES AND ADDENDUMS

Appendix A: HSA 10 CFR Part 50.75(g) Document Review Summary

Appendix B: Personnel Interview Program

Appendix C: Area Summary and Preliminary Survey Unit Identification

Appendix D: Miscellaneous Location and Earthquake Data and Figures

Appendix E: Miscellaneous Historical Construction Photographs

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## Appendix A

# HSA 10 CFR Part 50.75(g) Document Review Summary

Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
1/21/74	ODR	740121	2802-1602	Loss rad monitor R15021	GSE monitor (pre Primary-sec leak)	
1/21/74	ODR	750004	2802-0206	Loss rad monitor R15021 burned out motor	Gland steam exhaust monitor - plant in CSD	No release
9/7/74	LER	7402	0204-019	Emergency sump isolation valve RB failure	Valve failed to cycle during SP	
9/12/74	ODR	740017	2802-0069	OOS discharge	Discharges from A spent regen tank and misc waste tank into storm drain	Boron detected at south outfall, area diked and diluted, no reference to radiological contaminants.
10/3/74	LER	7405	0204-0031	SFP coolant demin pump BWST	BWST < min. TS level for power ops	a andre kundes is the an of a spectrum in the state of a spectrum in the spect
11/4/74	ODR	740038	2802-0136	Failure to follow RWP resulted in contamination of worksite	PSV-29 RB Spray system	Find survey RWP 74-72 for extent of contamination
12/18/74	ODR	740052	2802-0190	Unmonitored radioactive release	Flush water down storm drain between Aux and Admin bldg	H3 <2.9E-6 µCi/ml, SE outflow <3.4E-6, PE <5.9E-7
1/13/75	ODR	750008	2802-0214	Contamination of CCW system	Increasing activity from 1/13 to 2/18/74 1 to 2 leak A Letdown cooler RCP seal cooler A1	H3 2.19E-4 µCi/ml,
1/22/75	LER	7502	0204-0066	Valve demin water – BWST	Valve line up issue	
2/19/75	LER	7505	0204-0075	CCW radioactivity	1st occurrence of activity discovered in CCW 1/13/75	H3 6.7E-5 μCi/ml
2/19/75	LER	7505	0204-0077	H3 in RCP seal water cooler	Follow-up - A RCP seal water cooler leak	
2/25/75	ODR	750011	2802-0230	Unmonitored radioactive release	Aux, RB, Air ejector and gland seal exhaust monitors - no flow recorders or monitors to estimate release volumes.	Administrative Issue
4/25/75	ODR	750021	2802-0258	Chemical leakage	Sr89/90 separation issue -	No apparent release involved
7/21/75	ODR	750043	2802-0329	ABS particulate pump trip unmonitored release	CSD	
7/29/75	ODR	750044	2802-0331	Unauthorized radioactive release	Overflow RHUT via overflow line	RHUT overflow to Basin -
8/17/75	ODR	750048	2802-0335	RHUT overflow	~1765 gal overflowed to PE before divert (only H3)	
3/18/76	LER	7603	0204-0125	Bypass line weld leakage	M/U pump suction bypass -	No significant volume noted
3/18/76	ODR	760014	2802-0436	Weld leak	MU pump room,	No significant volume noted
4/3/76	ODR	760169	2802-0440	Unmonitored release charcoal/particulate isolated	Estimate provided for annual report	
4/16/76	LER	7603	1899-1384	Leak MU pump suction bypass	Minor leak in SIM-001 bypass	No significant volume noted
8/5/76	LER	7611	0204-0149	Leak vent valve B Decay Heat Removal Cooler	No significant volume noted	
8/5/76	ODR	760057	2802-0531	Weld leak	DHS-522,	No significant volume noted
8/22/76	LER	7613	0204-0156	B DHRP leakage	Packing leak > 0.63 gph	
8/22/76	ODR	760061	2802-0541	DHR pump leak	Pump casing leak during testing,	No significant volume noted
8/27/76	ODR	760063	2802-0545	Plant effluent valve in manual	FV95103, 201, 301 in manual	Potential release related event
9/1/76	ODR	760069	2802-0559	MAIN FEED PUMP seal leakage, hydrazine offsite/retention basin	0.25ppm hydrazine at PE	

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Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
10/12/78	ODR	760079	2802-0580	Plant effluent. Diverted	Drain pipes installed in effluent canal during road construction, effluent backed up into weir affecting discharge rate monitor	Unknown affect on dilution, therefore concentration of effluent
12/6/76	ODR	760090	2802-0607		Failure to record tilt and imbalance readings	Not release related
4/1/77	LER	7704	0204-0186	ABS radiation monitor	Missed sample while monitor OOS -	No abnormal release noted
6/20/77	LER	7707	0204-0197	PZR SAMPLE ISO VALVE LEAK	Valve failed to cycle during SP	
11/17/77	LER	7719	0204-0236	PZR vent sample valve leak rate	> 1 gpm leak from valve < 24 hrs	
1/1/78	LER		0204-0001	INDEX 78-83	11 additional items to investigate	
5/22/78	ODR	780031	2802-0698	Unidentified leak rate	PZR code safety -	No release noted
6/13/78	ODR	780032	2802-0700	High leak rate calculation	PZR code safety -	No release noted
6/28/78	LER	7807	0204-0282	B DHR pump seal leak	Outboard seal ~ 1-2 gpm	No significant volume noted
7/5/78	LER	7806	0204-0279	Excess RCS leakage (dresser valve)	PV-21506,507,&505. Majority of leakage to Pressurizer relief tank	No significant volume noted
3/21/79	ODR	790015	2802-0934	WGDT V665A sample R15006 valve WGS060 hot lab	Possible unmonitored release from hot lab valve gallery (gas not particulate)	No long term impact
7/6/79	ODR	790043	2802-1011	Steam Generator shell Thermocouples	TC=thermocouples -	No release noted
7/9/79	ODR	790044	2802-1013	Failure weekly sample aux building vent	CSD -	No release
7/19/79	LER	7908	0204-0348	B DHRP seal leak	Packing leak > 0.63 gph	
7/20/79	ODR	790048	2802-1023	Overflow misc, waste water tank	The Aux Building -20' level flooded -	~1.0E+6 dpm/100 cm <sup>2</sup> - no volume noted
11/25/79	LER	7920	0204-0381	Weld leak	Pin hole in weld socket	No significant volume noted
12/7/79	LER	7920	0204-0384	Weld leak	Pin hole in weld socket	No significant volume noted
12/7/79	LER	7920	0204-0438	Weld leak	F/U 7920 postpone repairs	
1/12/80	LER	8004	0204-0419	RCS leak rate	PZR spray valve PV21509	Up to 2 gpm
1/12/80	ODR	800009		RCS unidentified leakage	7 consecutive leak rate tests failed -	No rate identified
1/17/80	LER	8005	0204-0422	A DHRP seal leak	3 gpm outboard seal	
1/17/80	ODR	80011A		A DHR pump seal leak	Outboard seal - 3 gpm	
1/17/80	ODR	800010		Water on RX building floor	4-5 inches on -27 floor, sump appears plugged	
1/17/80	ODR	800011		PV-21509 leakage (LER 80-4)	PZR spray valve leakage	
2/26/80	LER	7920	1899-1428	MU pump discharge header leak		No additional information
3/16/80	ODR	810059		Radiation monitor plugged	RB atmosphere sample,	Not release sample
3/24/80	LER	8015	0204-0458	Failed fuel assembly	During in SFP inspection	No release impact
3/25/80	ODR	800048		Controlled substance in dumpster (filed 3/25/80)	Herculite ground cover front of RB equip. Hatch blew loose, dumped in "site dump east of plant"	

Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
4/22/80	ODR	800071		Missing radioactive material	CSCA Polaroid marked with RAM tag missing from hot lab	2000 cpm loose, 2000 cpm internal contamination no record of decon
5/8/80	ODR	800085		FSAR analysis of steam	Admin -	No actual release involved
5/21/80	LER	8026	0204-0490	OTSG tube rupture	FSAR issue	No release impact
7/9/80	ODR	800100		Environmental monitoring limits	Barrel farm storage caused west fence dose to exceed limit no contamination noted	No actual release involved
7/25/80	LER	8033	0204-0508	Environ TLD >10>bkgd 2nd qtr	Barrel Farm	No release impact
8/4/80	ODR	800111		Water leakage/seepage SFB/Turbine. Bldg wall	Potential release via TB floor drains TB floor drain contamination evident	H3 — 1.0E-3 µCi/ml
10/10/80	LER	7922	0204-0398	Purge valves	Valve positioning/stroke issue	No release noted
10/28/80	LER	8042	0204-0533	TLD > limit	X-ray machine	No release impact
12/18/80	ODR	800154	•	Environmental liquid release H3 anal. OOS	Effluent H3 monitor OOS	<i>.</i>
1/5/81	LER	.8050	0204-0564	West perimeter TLD reading high	Barrel farm	
1/9/81	LER	8050	0204-0562	West perimeter TLD reading high	Barrel farm	
1/12/81	LER	8102	0204-0572	Leak search CCW contamination	A letdown cooler	
1/12/81	ODR	810004		Primary to CCW leak	Unknown component primary to CCW	H3 6.4E-6, GB 9.5E-7, Cs137 2.6E- 7μCi/ml
1/23/81	ODR	810008		SRB Release H3 (filed 1/23/81)	Effluent H3 monitor OOS	
1/25/81	ODR	810009		NRB release H3 (filed 1/25/81)	Effluent H3 monitor OOS	· · · · · · · · · · · · · · · · · · ·
1/26/81	ODR	810014		Leaving site without exiting radiation monitor	Admin -	No actual release involved
1/27/81	ODR	810013		Potential - Unmonitored radioactive release	POTENTIAL issue regarding fan 538 during LOCA	
2/5/81	LER	8102	1870-1542	CCW H3 > MDA	30 day follow up report, no new data	
2/5/81	LER	8102	3086-1093	CCW tritium	30 day follow up report, no new data	
2/23/81	ODR	810039		Containment integrity	Both personnel hatches open at same time	No actual release involved
3/6/81	ODR	810045		RB leakage SFV-53504	RB purge isolation valves - excessive leakage	
3/15/81	LER	8119	1870-1584	RDM sample line plugged	CSD - <24 hour duration	No release impact
3/17/81	LER	8111	3086-1133	Blank flange RB sump	Admin Issue Re: SF movement	No release noted
3/23/81	LER	8113	1870-1571	Breeched containment integrity	Both personnel hatches open during "fuel movement"	No release noted
3/26/81	LER	8120	1870-1581	PE chart exceed TS (parameter?)	рН	No radiological impact
5/1/81	LER	8121	3086-1185	BWST valve failure	SP valve stroke issue	No release noted
5/12/81	ODR	810098		Contaminated liquid spill	Sample valve DRCST left open.	~ 73 gallons at 2E-1 $\mu$ Ci/ml, ~ 50 mCi leached into ground
5/16/81	LER	8126	0204-0654	OTSG tube leak	B OTSG	

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Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
5/16/81	ODR	810097		OTSG leak	B OTSG tube leak creating rad areas in turbine building	1st OTSG tube leak
5/18/81	LER	8124	3086-1198	RCS transfer to emergency sump	30 day follow up report, no new data	
5/18/81	LER	8124	1870-1599	RCS transfer to Emergency sump	30 day follow up, no new data	
5/18/81	LER	8124	1870-1599	RCS to emergency sump during valve testing	4,000 gals RCS to Emergency sump due to x-connect of A&B DHR systems	
5/18/81	LER	8126	3086-1202	Leak steam generator radiation secondary system	Initial notification OTSG tube leak	
5/29/81	LER	8126	3086-1206	Condenser. Air eject radiation monitor alarm	Follow up - 1.7 gpm tube leak B OTSG	
6/4/81	ODR	810119		RHUT LWR	Admin -	No actual release involved
6/12/81	ODR	810112		OTSG leak cool down	Procedural issue regarding OTSG isolation times,	No actual release involved
6/12/81	ODR	810120		RHUT discharge	Admin -	No actual release involved
6/12/81	ODR	810123		RHUT valve lineup	Admin -	No actual release involved
6/26/81	ODR	810126		R-15002 A&B secured during WGDT release	Release could be under estimated due to unknown sample volume	Gas release - no contamination impact
8/4/81.	ODR	810148		Air ejector monitor alarm	AE monitor alarm, sampling of A&B steam, CPD, CRT indicated primary to secondary potential	
8/20/81	ODR	810155	al. 6-10 4-194 -6-40	Indication of primary to secondary leak	Activity in AE condenser, polisher demins, and OTSG liquid samples	ann na an a suidh ad al dhe an suid a bha an a suid an
8/25/81	LER	8144	1870-1631	Radioactivity in secondary system, PZR to N <sub>2</sub>	30 day repot regard PZR contamination of $N_2$ system which contaminated the OTSG	No additional information
8/25/81	LER	8144	0204-0699	Primary to N <sub>2</sub> system leak	NGS contamination from the PZR to OTSG	
8/27/81	LER	8145	0204-0701	DHRP leakage	<1 GPH	No significant volume noted
9/1/81	ODR	810157		Primary to nitrogen system leak	Containment building N2 system contaminated (from PZR)	
9/15/81	ODR	810167		Spray add tank contamination	Co, Mn, Cs, İ, Xe 1.0E-5 to 1.0E-3 µCi/ml	
9/15/81	ODR	810161		DH system leakage	B DHRP seal leakage @ 0.87 GPH - not a significant volume in a CSCA,	No indication of release or significant contamination
9/18/81	LER	8144	3086-1273	Radioactivity in secondary system	30 day follow up report, no new data	
9/23/81	LER	8145	3086-1275	DH pump leak	Shaft seal leak < 1 gpm	No significant volume noted
10/27/81	ODR	810194		Non-monitored release	Particulate filter torn in half from ABS sample. Conservative assumption made for release	
10/27/81	ODR	810192	<u>iiii: Sin iiviniala</u>	Annual report activity>MDA	Plant effluent activity due to RHUT sample line effluent directly to PE (no basin divert) during neutralization	1
, 10/27/81	ODR	810193		Annual report activity>MDA	Plant effluent activity due to RHUT sample line effluent directly to PE (no basin divert) during neutralization	
11/20/81	ODR	810210		Contamination of NGS & ACS	Fresh fission gases indicate leakage from MU tank into NGS then into ASCT	

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Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
. 12/1/81	ODR	810209		Annual report activity>MDA	Plant effluent activity due to RHUT sample line effluent directly to PE (no basin divert) during neutralization	
12/8/81	ODR	810212		Incorrect radioactivity calculation	CR not notified of RB purge start/stop - samples not changed IAW procedure -	Conservative assumption used for release calc.
2/1/82	ODR	820009		Radioactive liquid release	Leak from DRCST, PLS-089, 0.5 to 25 gpm	Est. release 17.9 mCi H3 PE <mda< td=""></mda<>
2/4/82	ODR	820010		Missing radioactive sources	2 exempt Cs137 and 1 exempt Tc99 source missing	· · · · · · · · · · · · · · · · · · ·
2/8/82	ODR	820012		NGS contamination	Noble gases E-3 to -6 uCi/cc	
2/8/82	ODR	820031		Missed aux stack sample	No long term impact	H3 5.07 Ci, Xe 28.8 Ci
3/1/82	ODR	820032		Missed aux stack sample	Conservative assumption made for release calculations	
3/12/82	LER	8206	3086-1340	Plant effluent level	рН	
3/22/82	LER	8208	3086-1342	Plant effluent level	рН	
4/8/82	ODR	820038		Overflow MWHUT T-993	Diverted to basin, increased dilution flow	
4/16/82	ODR	820042	1	Basin release without sample		Annual report explanation
4/20/82	LER	8210	3086-1596	OTSG deformation	AFW header deformation	No release noted
5/5/82	LER	8212	0204-0794	DHRP leakage	Oil leak	No radiological impact
5/5/82	LER	8212	0204-0796	DHRP leakage	Oil leak	No radiological impact
5/25/82	ODR	820050		Leak in DH pump	Oil leak	No release impact
5/26/82	ODR	820056		Contamination of NGS (7/12/82)	~ 10 gal water drained during weekly sample	H3 2E-5, Cs 8E-7 μCi/ml
7/26/82	LER	8220	0204-0819	Contamination N <sub>2</sub> from OTSG	Contamination of NGS from PZR	< MDA after flushing
7/26/82	LER	8220	0204-0822	Contamination N <sub>2</sub> from OTSG	Contamination of NGS from PZR	< MDA after flushing
8/2/82	ODR	820118		Contamination of LP LGS		Kr85 at 1.6E-2 µCi/cc
8/15/82	ODR	820107		RCS liquid spill (1/17/82)	SIM-549 (test valve cap) leak based on "fast decrease in M/U tank level"	Large spill Penetration #21 (WDHCR)
8/18/82	ODR	820088		A&B OTSG contaminated	PZR to OTSG via NGS system "A"	Cs137 3.0E-7, Cs134 5.6E-7, H3 1.4E- 5
9/9/82	ODR	820101		Contamination of NGS	Probable source, surge tank hydro	<b>Xe133 6.28E-2 µCi/ml</b>
					Acid transfer line from storage tank to TB.	
10/6/82	LER	8226	0204-0847	Leak acid line storage tank TB	Acid collected in trough drained directly offsite	pH 6.2 for ~ 15 minute
10/6/82	LER	8223	3086-1458	Xe133 in NGS	30 day follow up, no new data	
10/11/82	ODR	820114		Contamination of NGS		Xe 133 at 1.5E-1 µCi/ml
10/12/82	LER	8227	0204-0849	N <sub>2</sub> contamination	M/U tank back leakage	< MDA after flushing
10/12/82	LER	8227	0204-0851	N <sub>2</sub> contamination	Follow up	< MDA after flushing
10/15/82	LER	8226	3086-1460	Acid leak storage tank turbine building	Drainage into storm drains caused low effluent pH	a ann an san an an ann ann ann ann an ann an

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Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
10/17/82	ODR	820123		High rad on aux stack (unusual event)	Xe133 peak concentration calculated at 7.2E-4 uCi/cc (- 2.5 Ci release)	Nobel gas release
10/22/82	ODR	820125		Gross Beta on NRB (11/82?)	Basin release w/o rad release form	(GB >5E-8 μCi/ml)
11/1/82	ODR	820106		Annual report missed ABS sample	Admin. Issue	Before/after sample OK
11/1/82	ODR	820132		Culvert clogged, vault flooded	Flooded electrical vault	Non-Rad issue
11/1/82	ODR	820135		Storage tank flooded	DFO storage tank vault	Non-Rad issue
11/1/82	ODR	820122	,	Unidentified RCS leakage more than 0.1 GPM	No record of leak location or final disposition	No record of excessive volume
11/16/82	LER	8227	3086-1471	Xe in N <sub>2</sub> system	30 day follow up report, no new data	
11/18/82	ODR	820111		ABS sample missed	Admin. Issue	Before/after sample OK
11/20/82	LER	8231	0204-0863	OTSG leak		
11/20/82	LER	8231	0204-0866	OTSG leak		
11/22/82	LER	8231	0204-0862	OTSG leak	4-5 gpm A OTSG	1 mR/hr on 3 polisher demins
11/22/82	ODR	820139		OTSG tube leak	A/E and Steam Line monitors in alert	R15004 @ 500,000 cpm
11/26/82	LER	8232	0204-0869	Effluent channel course comparison baseline photograph	Administrative issue	
11/26/82	LER	8232	0204-0871	Effluent channel course comparison baseline photograph	Administrative issue	n an stad an an an Albani da stadar Calance an an
12/2/82	ODR	820141		Effluent watercourse comparison	SP issue	Non-Rad issue
12/3/82	LER	8231	3086-1487	OTSG leak	14 day follow up, no new data	
12/3/82	LER	8234	0204-0873	DHR system leakage	Leak estimate 5 mi/minute	No significant volume noted
12/29/82	LER	8227	3086-1494	Xe in N <sub>2</sub> system	Supplemental report, Make up tank apparent leak, system cleaned to < MDA	Noble gases 1.0E-3 to 1.0E-2 levels
1/1/83	LER		1032-1783	INDEX 8301-8341	Info included in 78-83 index	
1/20/83	LER	8304	0204-0889	Holdup tank overflow	~ 2000 gallons T993 overflow to storm drains	PE 9.57E-4, Site Boundary 9.01E-5 μCi/ml H3 (32% and 3% MPC respectively) (ODR83008)
1/25/83	ODR	830008		MWHUT overflow (LER 8304)	Overflow during misc, waste condensate tank transfer	2000 gallons H3 4.6E-2 $\mu$ Ci/ml calc assume ~ 85% contained in NRB
1/28/83	LER	المنتخلية المست 8304	3086-1513	Water holdup tank overflow	Transfer from MWCHUT	H3 from 3 to 32% MPC
2/1/83	ODR	830016		ABS sample missed	Admin. Issue	Before/after sample OK
2/1/83	ODR	830021	**************************************	R15019 OOS	Indication works, alarm OOS	a na na sa
2/10/83	ODR	830023		Retention basin overflow	Priming tank float stuck, tank overflowed, ~100 gal.	Cs & Co 1E-7 µCi/ml and H3 @ 3E-3 . µCi/ml
2/25/83	ODR	830028	harman an a	CCW monitor alert R15008	falintes a tall tours an investigation at a Valit Varia summer.	Cs 1E-7, GB and H3 <mda< td=""></mda<>
3/9/83	LER	8311	0204-0913	Contamination N <sub>2</sub> system blind flange MU tank		Noble gases, < MDA W/I 2 days
3/11/83	ODR	830035	and and related to	Contamination of NGS (4/8/83)	fan de ser de la contra de la c	Xe133 @ 2E-3 μCi/cc
8/29/83	LER	8330	1032-1825	Xe in N <sub>2</sub> system	Disposition/Close out letter	
		Ilmoni	الالا فاستعاده فستحاد فالمعادية	والمستحدين فستنقذ فالمتكوم والمنافرة فتحط المحاور المحا	يستحدثه الأمرر فالمتدع بالمتحد فللمحم ساه شما بالتكف	استشابها والمستورجة فالمتراجين والتراجين والمتحاسية

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Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
9/8/83	ODR	830175		RB purge system	RDM testing issue for Spent Fuel handling	
9/17/83	LER	8332	1032-1818	OTSG tube leak	A OTSG ~ 1 gpm	
9/17/83	LER	8332	1032-1821	OTSG tube leak	A OTSG ~ 1 gpm	
9/20/83	LER	8335	1032-1809	CCW H3 > MDA	B letdown cooler	H3, GB, I, & Xe
9/20/83	ODR	830098		CCW contamination	B letdown cooler leakage	H3 at 5E-5, GB @ 1.7E-4 µCi/ml
9/21/83	ODR	830199		Contamination of stearn. Condenser. Storage	Aux Bidg Steam Condenser Tank V373	H3 1.2E-5 µCi/ml
10/1/83	ODR	830211		Outboard seal leak (see odr200)	A DHR pump	WR# 80318
10/1/83	ODR	830221		Lost particulate filter	Atternate sampling in place	
10/4/83	ODR	830200		Mechanical seal leak	A DHR pump	WR# 80317
10/4/83	ODR	830197		Leak OTSG	1.25 gpm leak rate	H3 ~1E-3 µCi/ml in A&B steam lines and hotwell
11/14/83	ODR	830238		RHUT release (12/83)	Resin catch bag failure, ~ 300 gal RHUT release out SW access gate into pasture area.	H3 2E-4 μCi/ml,  131/133 ~ 3E-7 μCi/ml
11/15/83	ODR	830241		RHUT release (12/83)	Trouble with resin catch bag cause and unknown quantity of BRHUT to spray onto ground surrounding the area.	
11/18/83	ODR	830239		RHUT release (12/83)	Trouble with resin catch bag unknown quantity of BRHUT to spray onto ground	
11/28/83	ODR	830248		Unmonitored release	Leakage from boiler down storm drain.	Boundary fence 4.5E-6, Culvert inlet 4.5E-6, creek inlet 6.6E-6 µCi/ml
12/1/83	ODR	830235	, sandaras da dege gener des a secondad	SFV-26006 leaking	Minor leakage during cycle testing	
12/1/83	ODR	830228		Air ejector monitor alarm	A/E monitor and sampling indicate 0.8 gpm	H3 fluctuates during feed and bleed
12/1/83	ODR	830233		Air ejector monitor alarm	A/E monitor and sampling indicate 0.8 gpm	H3 fluctuates during feed and bleed
1/1/84	LER		1032-1836	Index 8401-8425	No new items identified	
1/3/84	ODR	840002	354-0759	AB leak water to drain	E-360 mud drum leak down storm drain.	Insignificant IAW NRC-RI (H Canter)
1/12/84	ODR	840010	2399-1208	Contaminated Pb blanket in the "B" warehouse	Blankets removed from CSCA after outage	26K fixed, 4K loose dpm/100cm <sup>2</sup> - no loose Contamination on structure or floors (<200 dpm/100cm <sup>2</sup> )
1/24/84	ODR	840048		Hole in resin catch bag (3/84?)	Resin catch bag failure, ~ 500 gal RHUT release out SW access gate into pasture area.	H3 1E-3 µCi/ml
1/27/84	ODR	840023		Oil spill washed to drain		
1/31/84	ODR	840127	354-1065	Resin catch bag failure	Algae sample > 3x bkgd, resin found in sample	Co60, Cs134/137, l131
3/3/84	LER	8412 -	1032-1889	Missed BAS stack sample	> 10% gas MPC @ site boundary .	Nobel gas issue, no long term impact
3/4/84	ODR	840064	2399-1340	No abs sample>10% MPC		<90% MPC no contamination or release impact
3/7/84	ODR	840065	2399-1342	CCW activity increasing		Cs137 @ 1E-6 µCi/cc
3/15/84	ODR	840071		Contaminated pallet	5 pallets discovered with measurable contamination outside CSCA	2-55K dpm/100cm <sup>2</sup> loose, 0.2-8 mR/hr, 1.0-240 mRad/hr

Date	· .	Doc. #	Doc Location	Index description	Record remarks	Survey data
3/20/84	ODR	840078		Oil vent overflow	Generator oil vent overflowed in storm drain tank farm between RB and SFB	Site boundary samples 27.5 ppm @ 1330, 10 ppm @ 1620, 1 ppm @ 1710 (Hadselville creek)
4/20/84	ODR	840111		Blow line spraying	During surface blow, ~ 100 gallon on pavement and down storm drain	Local and offsite samples taken
5/22/84	ODR	840137		Transmission fluid spill into circ water area		
7/3/84	LER	8420	1032-1857	B OTSG tube leak	1.37 gpm max calc leak rate	Calculated release ~ 24 mCi Noble gas, 1.6 mCi lodine
7/5/84	ODR	840165		Unmonitored release AE hoggers :	Xe and I during hogger operations,	Noble gas release
7/17/84	ODR	840176		Water release (7or 8/84)	~1200 gal evaporated via V627 (misc. water evaporator)	I-131 ~ 0.33 µCi
7/31/84	ODR	840183		Water release (7or 8/84)	Leakage from AFW pump	Gear box cooler - VOIDED
8/4/84	ODR	840189			~100 gal from T674 - T993 transfer	No off site release
8/20/84	ODR	840199		Missing radioactive sources (mid 1984)	During investigation into missing sources, discovered four sources purchased outside normal procurement system.	
8/21/84	ODR	840200	a contra d'anna bail a sua start.	Missing radioactive sources	Tc99, Cs137 (each exempt)	ja menungan penteka tertemenyangi Krajaman pentekan kanak kanak sebar tertekan pentekan Bakabadan B
9/4/84	ODR	840242		Contaminated water (mid 1984)	Wide spread Aux bldg roof contaminated when hogger blew contaminated water during startup.	H3 8E-5, Cs137, 9.6E-5, Cs134 3.8E-5, 1131 6.2E-5 (µCl/ml)
9/10/84	ODR	840217	and the second second second second		Water source from CST, down storm drain	H3 at 2E-5 uCi/ml
9/11/84	ODR	840218		T-358 (CST) overflow	Down storm drain - diverted to basin	H3 at 2E-5   at 1.5E-7
bas in the set		an <b>H</b> aran A			~900 gallons, 96 $\mu$ Ci primarily H3 release	
9/15/84	ODR	840223		CST overflow (T-358)	within 10CFR20 limits	96 μCi H3, 0.21 μCi Cs137 to PE
9/21/84	ODR	840237	999 200 (1999) 23 -	Aux Boiler E-360	No means to calculate release from steam leaks on A-360	H3 2.1 E-5, Cs134/137 4.0E-7, I131 7.6E-7 (µCi/ml)
9/23/84	ODR	840225	354-1353	CST overflow, H3 at site boundary	CST flow path checked at site boundary (verify path)	H3 at 2.4E-6 µCi/ml, no gamma peaks.
9/28/84	ODR	840253		Runoff water samples	Runoff sample 11 pCi/l (sample taken during basin release)	
10/11/84	LER	8422	1032-1846	A OTSG tube leak	1.2 gpm tube leak	
10/11/84	LER	8422	1032-1850	A OTSG tube leak	Supplemental letter	
10/11/84	ODR	840252	·····	Tube leak	2.1 gpm tube leak A OTSG	
11/8/84	ODR	840304		Source inventory (12/84)	8 µCi Cs137 source lost (exempt) last seen at rerack cut-up tent)	
12/27/84	ODR	840317		Drain hose blew 500 gal H3 to drain	DMW-053, water from T-993, associated with B/D	H3 - 7.6E-3 $\mu$ Ci/ml @ source, 2.2E-5 $\mu$ Ci/ml storm drain Total release estimate, 2880 $\mu$ Cl.
1/1/85	LER		1032-1928	Index 8423-8525	No new items identified	
1/17/85	ODR	850013	2356-0025	Overpressure system (reducer failure - relief lift)	PSV36012A&B lift1	19.9 μCi Xe133, 8.4 μCi Xe135, 459 μCi H3
1/22/85	ODR	850036	2356-0089	Unmonitored offsite release	~ 15 gallons released from loose expansion joint - A RHUT	Post repair, testing fill with site service water

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Date		Doc.#	Doc Location	Index description	Record remarks	Survey data
2/7/85	ODR	850075	2356-0213	B RHUT leak (hole)	~1000 gallons	H3 2.24E-4 $\mu$ Ci/ml into storm drain ND at outfall of storm drains (<4.26E-6 $\mu$ Ci/ml)
2/11/85	ODR	850034		Coolant waste holdup Tank off gas via ABS	-26 Ci Xe133 release ABS	Noble gases - no contamination impact
3/5/85	ODR	850226	2356-0588	Failure to report OOS plant effluent	Reporting violation -	Not release related
3/13/85	ODR	850068	2356-0162	Contaminated dollar found [in] change room	No Contamination -	No release
3/21/85	ODR	850081	2356-0229	Smoke generated overheated component rad monitor R15001A	CSD - no release -	No release impact
3/28/85	ODR	850095	2356-0261	Unscheduled release	BRHUT ~200 gallons	
4/28/85	ODR	850112	2356-0300	RHUT leak down storm drain	~2000 gallon into storm drains (discharge valve removed no blank installed	Samples < MDA (not provided) PE samples (5000 gal. from 1985 annual report)
5/8/85	ODR	850126	2356-0333	Missing sources	Co60 # DC-1	No indication source found, no indication of source activity
5/12/85	ODR	850149	2356-0391	No unmonitored offsite release	No unmonitored offsite release	No release - no impact
5/24/85	ODR	850143	2356-0379	Leak above acceptance limit	LLRT RSP-73 - containment -	No release - no impact
6/12/85	ODR	850179	2356-0455	Loud noise steam in containment	~600 gallon PZR drop during steam leak	SFV22006
6/14/85	ODR	850190	2356-0481	RCS leakage	> TS 1gpm leak rate (~5 gpm) -	
6/23/85	LER	8510	1021-2234	Non- isolatable RCS leak (Reactor Coolant Drain Tank)	B OTSG high point vent	~ 16,000 gallons released within containment before CSD
6/23/85	LER	8510	1032-1993	B OTSG tube leak	Duplicate SDC entry of 8510	
6/23/85	LER	8510	1035-0074	LEAK RB DRAIN TANK	16,000 gals RCS into containment from B OTSG high point vent valve	
7/9/85	ODR	850221	2356-0577	Spill	~ 120 gal A OTSG drained to ground in TF	Local to tank farm, some down drain near FWS-021
7/30/85	ODR	850237	2356-0644	Release from site	HP turbine stop valve leakage routed to storm vs. controlled drain	, Cs134 0.49 MPC, Cs137 0.48 MPC
8/21/85	ODR	850270	2356-0712	Clogged discharge strainer making rad monitor inoperable	Dual lineup/sample issue	No release - no impact
8/29/85	ODR	850275	2356-0724	R15001 being changed out unmonitored release	CSD - H3 release only	
9/6/85	LER	8517	1032-2019	HEPA filter leakage	< 0.1% flow bypass filter	No radiological impact
9/9/85	ODR	850295	2356-0773	Radioactive leak - missing gauge	PI 22014	Local letdown pressure gauge
9/20/85	ODR	850299	2356-0781	Water down uncontrolled drain	~ 1 gal. From ABS tailpiece down uncontrolled drain	H3 at 3.6E-3 µCi/ml - ND at plant effluent.
9/28/85	ODR	850329	2356-0842	R15044 OOS	Not release issue - no impact	
9/29/85	ODR	850325	2356-0834	R15001 power off	R15001A,C,D,E OOS (CSD)	R15001B in service
11/26/85	ODR	850427	2356-1086	Samples not being taken	>12 hr mini-purge in progress (CSD)	
12/8/85	ODR	850431	2356-1096	Body to bonnet leak	SFV22006	WR 96447/NCR55218
12/15/85	ODR	850442	2356-1128	Leak (secured pump/leak stopped)	Duplicate of 437	

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12/15/85	ODR	850437	2356-1114	Leak (secured pump/leak stopped)	1-3 gpm leak, secured MU pump, closed SIM 001, 003, & 080	MU pump room
12/22/85	LER	8524	1032-2044	Leak PZR sample isolation valve	~ 50 gallons from PZR sample line	
12/22/85	ODR	850441	2356-1126	Leak stopped by closing SFV-70001/2	20 gpm leak from SFV70001	
12/26/85	ODR	850457	2356-1169	Unable to track gaseous/particulate monitor unable to read monitor	Monitor display issue -	No release impact
12/26/85	ODR	850459	2356-1173	Unable to access radiological release during unusual event	Monitor display issue -	No release impact
12/28/85				30-gallon spill of H3 south side of protected area.		T-993 spill - 1930 µCi total
12/30/85	ODR	850468	2356-1206	H3 analysis CRD system		8.8E-4 µCi/ml H3
1/2/86	ODR	860018	1569-1655	RB purge wrong flow rate	No alarm/release limit exceeded	
1/6/88	ODR	860006	1569-1603	H3 contamination CRD	Suspect. PASS back leakage	
1/12/86	ODR	860023		BW mix tank leakage	~ 1 gallon puddle from BWST (fill hole covered, not bolted)	
1/13/86	ODR	860022	1569-1668	Excessive DHR pump seal leakage	No significant volume/activity noted - routine spill	
1/14/86	ODR	860026	1569-1681	RB purge wrong flow rate	No alarm/release limit exceeded	herrien de la companya de la companya de service de service de service de service de la companya de la company La companya de la comp
1/18/86	LER	8627	1083-2078	Rev to RBD filter lost	Extended CSD	No radiological impact
1/26/86	PDQ	880152	2335-1035	P939 leakage (converted ODR860042)	PVC inlet to RHUT sample pump leakage ~ 1 pint, area isolated and sampled (results)	(Work Request's 061434, 069009, 069013, 067432, 072437, 08013, 081833, 080247, 083780, 100770, 109937
1/28/86	ODR	860043	1569-1753	"C" WGDT release instead of "B"	Admin not a release issue	
1/28/86	ODR	860072	1569-1878	RB purge limit violation	R15001&049 OOS, R15050 in service monitoring release	
2/14/86	ODR	860074	1569-1887	1000 cpm tool box found in tool room	1000 ccpm fixed/625 dpm loose	Tool room surveyed w/o additional contamination
2/18/86	LER	8602	1024-0032	PINHOLE LEAK B DHRP CASING	< 1 gallon contained within AB drain system	
2/18/86	ODR	860082	1569-1931	DHRP casing drain failure	P-261-B leaked to floor drain - RWS	No significant volume noted
2/27/86	ODR	860090	1569-1968	Spill from open vent/drain valves	SFC pad flooded overflowing to storm drain MH-D11.	OTSG Cs134/137 1.5-5E-6 Several Co60 peaks, suspect faulty GeLi. No indication of off site release.
3/10/86	ODR	860065	1569-1847	H3 contamination CRD	Suspect. PASS back leakage	
3/10/86	ODR	860106	2857-1511	H3 contamination of CRD	PASS sample cooler leak	H3 1.75E-5 μCi/ml
3/14/86	ODR	860128	2857-1611	Unmonitored RB purge	CSD, <1 hr.	
4/7/86	ODR	860148	2857-1691	Gamma scan missing	LWR-no release-no gamma peaks noted in log	· · ·
4/9/86	ODR	860150	2857-1695	Liquid samples release 86-48/51 missing	Composite sample retention issue	
4/15/86	ODR	860163	2857-1768	Unmonitored ABS release	CSD - ~ 24 minutes	

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Date	·· .	.Doc.#	Doc Location	Index description	• Record remarks	Survey data
4/17/86	LER	8603	1034-0022	Unmonitored RB Purge	Extended CSD	No radiological impact
4/22/86	ODR	860187	2926-1629	Cs137 source missing during inventory	8.6 $\mu$ Ci (15 mrem if ingested)	Removed from inventory
5/2/86	ODR	860199	2926-1660	Particulate filter tom	Investigation showed no data lost,	No unmonitored release.
7/2/86	LER	8602	1046-0143	B DHRP CASING LEAK	Two pin hole leaks total < 0.63 gpm	No significant volume noted
7/7/86	ODR	860287	2857-1920	Missing Cs137 source	Cs137 source # 102981 (1.18 µCi)	
7/7/86	ODR	860288	2857-1925	H3 contamination in CRD	PASS sample cooler leak	H3 at 8.8E-6 µCi/ml
7/7/86	ODR	860416	2348-0677	Contamination In CRD	Suspect. PASS back leakage	
7/8/86	ODR	860299	2348-0029	Potential radioactive release, no high alarm	Potential issue -	No release impact
7/9/86	ODR	860298	2348-0023	Hazardous waste drum rupture	Sodium hydrochloric acid drum ruptured at hazardous waste storage area -	
7/22/86	LER	8614	1076-0652	DHRP drain line leak	Closure letter 8414	
7/22/86	ODR	860377	2348-0462	HDV-053 removed w/o rad survey in uncontrolled area	HDV-053 removed from CSCA to fab shop w/o survey (bonnet surveyed, body not)	Salvage area survey found several additional incidents
7/26/86	ODR	860371		HDV-053 removed w/o rad survey in uncontrolled area	HDV-053 removed from CSCA to fab shop w/o survey (bonnet surveyed, body not)	Salvage area survey found several additional incidents
9/1/86	ODR	860416		CRD contamination	Suspect. PASS back leakage	9.87E-6 µCi/ml
9/17/86	ODR	860437	2857-1978	Temp piping attached to DRCST	Admin issue, (no PRC approval)	Not release related
9/27/86	ODR	860472	2349-1848	Misc. liquid radwaste tank overflow	Flooding on floor	~4 mRad/2.5 mR
10/1/86	ODR	860455	2349-1753	DHP casing drain failure	~ 2 drops/min - no impact	·
10/2/86	ODR	860462	2349-1800	DHP casing drain failure	~ 2 drops/min - no impact	
10/3/86	LER	8616	1843-1556	DH system trip following ARC sump level indicator - B room sump stack	Electrical Issue	No radiological Impact
10/6/86	ODR	860477	2349-1867	Blower seized on radiation monitor	Compensatory measures taken - CSD	No release impact -
10/11/86	ODR	860494	2348-0696	Leak temp line RHUT to DRCST	Packing leak in temp valve wet asphalt and soil in area	Additional surveys performed to determine source of Cs137 contamination - results indicate environmental levels (0.2 pCi/g max.)
10/13/86	ODR	860495	2348-0705	RDM H3 sample not taken or analyzed	Procedural issue -	No release impact
10/23/86	ODR	860514		Temp line leak T-621 to RHUT	Coupling upstream transfer pump	Volume and concentrations
10/29/86	ODR	860522	2857-2000	Contamination of polisher sump H3	From draining unidentified system to the PDS after OTSG tube leakage	H3 @ 1.06E-5 µCi/ml
11/5/86	ODR	860530	2348-0843	Thru wall leak FT-26003	~ 1 gallon puddle of RCS on floor	Fine mist contaminated immediate surroundings
11/7/86	ODR	860536	2348-0862	CCW contamination Cs137	Cs137@ 0.04 pCi/cc, GB at 0.026 pCi/cc	System feed and bleed
11/16/86	LER	8625	1092-0223	SFP liner leak Rx CDT isolation valve BWST boric acid clean drain system TF	East wall to TF storm drain	H3, Co60, Cs134/137, Ag110m, Sb125 ranging from 5.7E-2 to 4.8E-5
11/16/86	ODR	860542	2348-0887	SFP water leak	SFP leakage into "uncontrolled" drain in TF between SF and RB	~275 gal.

Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
11/18/86	ODR	860544	2348-0897	RB AS particulate missing	Composite samples - due to no gamma peaks and extended CSD -	No release impact
11/18/86	ODR	860555	2379-0250	Inspection valve leak in TF	-200 gal FPS water drained through CSCA and down storm drain	Plant effluent <lld (not="" stated)<="" td=""></lld>
12/15/86	LER	8625	1067-0624	SFP liner leak thru TB wall	East wall to TF storm drain	H3, Co60, Cs134/137, Ag110m, Sb125 ranging from 5.7E-2 to 4.8E-5 µCi/ml
12/18/86	LER	8627	1067-0958	RBD particulate filter lost	Extended CSD	No radiological impact
1/6/87	ODR	870052	2348-1495	Inoperable Rad Monitor RC leakage system	Procedural set point issue -	No release impact
1/6/87	ODR	870053	2348-1506	Inoperable Rad Monitor RC leakage system	Procedural set point issue	No release impact
1/15/87	ODR	870048	2348-1481	R-15044, 45, &48 OOS	CSD - no releas <del>e</del> -	No release impact
1/16/87	ODR	870050	2348-1488	Inoperable Rad Monitor RC leakage system	Procedural set point issue -	No release impact
1/19/87	ODR	870064	2349-0211	RB particulate air sample filter data lost	Conservative value (pre/post release) used	LER 86-27R1
1/26/87	ODR	870065	2349-0215	RB particulate air sample filter data lost	RWSAV - no alpha sample (no alpha activity pre or post release -	No release impact
1/29/87	ODR	870100	2379-1432	Radiation monitor does not exist	Procedural - RHUT vs. Basin release point	No impact
2/2/87	LER	8913	3069-0053	Leaking sealed source	Failure to perform semi-annual leak test	No release, no contamination noted
2/2/87	ODR	870119	2348-1728	RC spill in containment	Approx. 5 gal RCS spilled via A RB spray system	
2/9/87	ODR	870155	2349-0348	RB particulate air sample filter data lost	Conservative value (pre/post release) used	LER 86-27R1
2/9/87	ODR	870168	2348-1904	Unmonitored RB purge due to power loss to stack sampler	CSD - < 1hr -	No significant release impact
2/21/87	ODR	870226	2349-0451	Portable sampler ABS not running	CSD - no release -	No release impact
2/23/87	LER	8614	1075-1873	DHRP drain line leak	Small leak	No significant volume noted
2/26/87	ODR	870203	2349-0402	Radiation monitor OOS during RB purge	Leak detection capability issue -	No release impact
3/5/87	ODR	870273	1569-0298	ABS particulate filter torn, loss of release data	On investigation, data not lost -	No release impact
3/9/87	ODR	. 870264	1569-0259	Gaseous effluent dose calculation delinquent sample	Calculation 1 day late	No release impact
3/10/87	ODR	870290	1569-0382	ABS grab sample not taken [in] required time limit	Admin. Time issue -	No release impact
3/11/87	ODR	870293	1569-0392	Gas sample analysis did not meet required LLD	On investigation, before and after samples did (CSD)	No release impact
3/16/87	ODR	870301	1569-0428	Loss of control RAD MAT package	Pallet with articles Tagged Contact RP prior to disassembly outside RCA	From "upper-outer storage yard". N/D fixed or loose
3/24/87	ODR.	870333	1569-0604	Contaminated tape in dumpster	Poly carboys W/ RAM markings in dumpster west of tool room.	1 of 5 > bkgd (450 ccpm - Radwaste)
4/28/87	ODR	870489	1569-1331	Non sufficient notice sample RP tech RB purge	End of purge sample - (CSD)	No release impact
5/6/87	ODR	870514	2379-0516	Low flow rad monitor	No unmonitored release -	No release impact

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Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
5/19/87	ODR	870582		NSCW Co60 contamination	· · ·	1.59E-7 پCi/ml Co60
5/27/87	ODR	870619	2926-0203	PC's at PAP (contaminated)	Possible attempt by contractor to smuggle cotton (contaminated) PC's offsite.	No contamination in area detected.
5/28/87	ODR	870638	2926-0287	Contaminated instrument	WR violation,	No release impact
6/2/87	ODR	870661	2926-0369	ABS sampler not running	CSD <1 hr	
6/3/87	ODR	870664	2379-1616	FP spill in TF	~200 gal down drain below B Main Steam Line No Divert	Cs137 5E-7 µCi/ml (similar 860555 (done rd1) 1.9E-4 mrem per semi- annual report
6/11/87	ODR	870714	2349-0519	Leak in temp repair	BA Evaporator feed pump leakage	Procedural violation - no significant volume (pin hole leak)
6/11/87	ODR	870701	2926-0530	Spill resulted from open valve prior to closing vent	Spill/flooding of EDHCR -	Up to 300Kdpm/100 cm <sup>2</sup>
6/30/87	ODR	870764	2926-0748	System drained in contaminated area removed without sample	55 gal. Dumped down uncontrolled storm drain between Aux and RB	Cs137 1.75E-7 µCi/ml (no mention of any diversion of PE) 1987 semi-annual report ~1000 gal. Max dose 3.33E-4 mrem.
7/13/87	ODR	870800	2926-0882	Cooling water sample Cs137	CCW H <sub>2</sub> lube oil cooler	Cs137 6E-8 µCi/ml Feed and bleed removed contamination 9/10/87
7/30/87	ODR	870826	2857-0067	R-15020 inoperable without tracking system	Admin issue, not release related	
8/17/87	ODR	870863	2926-1113	TS violation Liquid Effluent Environ. Monitoring program	No unmonitored release -admin issue	No release impact
8/29/87	ODR	870903	2926-1252	Contaminated spill in tank farm	Atmospheric steam dumps (wet lay- up/pinned) lift during testing. ~2000 gal (controlled drain in TF per FWK)	"Low levels" Cs137-5.3E-7, Cs134- 1.08E-7 µCi/ml (max Dose WB/O =3.3/4.8E-3 mrem per semi-annual report)
9/1/87	ODR	870905	2349-0643	Valve leak contaminated water into storm drain	FWS-020 leaking into local storm drain plant effluent diverted to basin	Cs137 5.3E-7, 134 1.1E-7 µCi/ml (max dose 5E-3 mrem - semi-annual report)
9/11/87	ODR	870998	2349-0910	Radiation monitor set wrong	Startup new monitor - old monitor still in service -	No release impact
9/14/87	ODR	870942	2349-0722	Gamma contamination detected	ccw -	Cs137 0.04 pCi/ml
9/19/87	ODR	870993	2349-0878	Weld leak A DH pump	CSD - system inoperable - TS issue - not spill	
9/23/87	ODR	870975	2349-0799	Fan test without rad monitoring	Startup testing on A546/R15546 -	No release impact
9/24/87	LER	8743	1833-0464	Error monitoring new effluent release point	Unmonitored releases during S/U testing of new system	No release impact
9/24/87	ODR	870979	2349-0812	RP not informed prior to fan start for sample	Startup testing on A546/R15546 -	No release impact
10/12/87	ODR	871022	2349-0977	Spray pump seal rupture causing spill	~ 1 gal. Latex paint (acrylic polymer/ethylene glycol) hosed into storm drain near "A" warehouse (CWQCB informed)	
10/20/87	ODR	871053	2857-0149	Filter paper missing from RB stack sample	CSD-no gamma-no Sr prior sample	
10/30/87	ODR	871073	2379-0769	RP office floor spot direct frisk	2000 cpm on carpet, removed, no residual	
11/1/87	ODR	871076	2349-1205	Delta-P across HEPA Charcoal zero	CSD - no release -	No release impact

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11/15/87	ODR	871122	2349-1314	Poly bottle overflow	OTSG fill vent - ~5 gal. To TB drain -	Cs137 1E-7 µCi/mi (max dose WB/O 0.95/1.42E-6 mem per semi-annual report)
11/16/87	ODR	871149	2379-1953	RB purge started prior to sample	~ 7 min, CSD, procedures issue, no release impact	
11/17/87	ODR	871134	2379-0924	Contamination in oily water separator	S/G level indicator leakage routed to OWS	Cs137 0.07 pCi/ml, Co60 .0448 pCi/ml
11/24/87	LER	8747	1861-1752	Failure to continuously sample RB purge	Similar 86-03,19,22,28,29,22,&43	No radiological impact
11/25/87	ODR	871155		OTSG drainage into WDHCR and Reactor Containment Building	OTSG drain via FWS-520 flooding WDHCR fill DHRP sump	
11/27/87	ODR	871156	2379-0993	RCS backup thru demin pump into diked area	300-400 gal through the SF demin pump into diked area	
11/30/87	ODR	871150	2857-0201	Uncontrolled area rainwater sample	Rainwater sample not counted to environmental LLD	
1/14/88	ODR	880039	2857-0519	RB particulate air sample filter lost	Plant CSD - no gross alpha count	n den an provinsi and Laurrent anni à ann a stàireanna (A
1/14/88	LER	8801	1866-1754	Lost air filter sample	Composite sample retention issue, no impact on releases	No radiological impact
1/18/88	ODR	880055	2857-0627	Sample point leaking	Leakage from BRHUT into drain sump, unto ground and into storm drain	Local survey taken, no results referenced
1/26/88	ODR	880077	2857-0727	Contaminated sample	V-373 (Aux Building steam condensate tank) (and CST) contaminated	H3 1.4E-6 µCi/ml (via phone with contract lab [LSC OOS])
1/27/88	ODR	880083	2857-0774	H3 in CST		5E-6 H3
2/7/88	ODR	880108	2857-0916	Containment spray actuation	~1100 gal BWST in containment via "A" spray train	Location "A" train,
2/25/88	ODR	880144	2857-1135	RHUT radioactive release	88-18 designated a rad release based on non-procedural criteria (contaminated surface oil which was removed and disposed as LLRW)	
3/11/88	PDQ	880367	2860-0415	Code safety lifted on ground below CCW cooler (Co60)	Drained to TF below CCW cooler	Co60 @ 2.6E-7 µCi/ml
3/15/88	LER	8805	2596-0825	Letdown relief lift to RB sump	~800 gals (two events) contained within RB sump	
3/15/88	PDQ	880063	2335-0707	Steam leak	LP turbine steam leakage into Fire protection zone 52 (doghouse)	Fire protection zone 52
3/15/88	PDQ	880369		ODR conv.	A letdown cooler relief lifting in RB	~91 gpm - ~ 800 gallon to RB sump
3/15/88	PDQ	880541	3480-0191	SF Pool leakage ~ 80 Gallon per Day	Issue concerned volume and inability to dentify exact location,	Leakage contained within the system.
3/15/88	PDQ	880950	2334-0901	Leak	(NCR-7875) MCM-165 leak at condenser penetration.	WR#141858/859
3/17/88	PDQ	880958	2871-1141	HV-21510 leaking (converted NCR S7883)		
3/18/88	PDQ	880963	2871-1157	ASC-029 leakage	E-302C steam isolation (Turbine building) B to B leak	
3/19/88	PDQ	880378	2335-1221	Cs137 in CCW	Crud burst as no H3 detected	Cs137 @ 7.3E-8 µCi/ml
3/19/88	PDQ	880933	2871-1067	FWS-020 leaking	FW start up to B OTSG	

Date		Doc.#	Doc Location	Index description	Record remarks	Survey data
3/20/88	PDQ	880970	2871-1175	Packing leak	PZR spray line service drain	Couple drops /minute
3/23/88	PDQ	880012	2871-0001	MCM-166 leak	B FW RECIRC line leakage	
3/28/88	PDQ	880046	2871-0082	Atomizer malfunction steam	E-360 atomizing regulator steam leak	
3/29/88	PDQ	880051	2871-0085	Body to bonnet leak	FW Sample valve TSS-094 leakage	WR145861
4/5/88	PDQ	880085	2860-0139	Water into storm drain	Main Steam Reheater to turbine bldg drain (OWS to plant effluent) water trail - (~450 gal. Per semi-annual report)	Cs137 at 8E-9 µCi/ml, max release 8.1E-11 Ci, max exposure 1.8E-8 mrem
4/5/88	NA	ANN RPT	. •	Main Steam Reheater leakage	~ 423 gallons to OWS to PE -	8.62E-3 µCi max WB dose - 1.88E-6 mrem.
·4/14/88		ANN RPT		Main Steam Reheater valve leakage	Turbine building floor drains to PE 2 gal.	Co60 2.48pCi, Cs134 4.02E-2 pCi Cs137 3.59E-1 pCi - 2.9 pCi total - Max WB dose - 4.07E-8 mrem
4/18/88		ANN RPT	•	Main Steam Reheater valve leakage	Turbine building floor drains to PE - ~1 gal.	1.36E-2 pCi Cs137 Max WB dose 2.65E-9 mrem
5/3/88		ANN RPT		Cs137 detected during routine monitoring PE		57 $\mu$ Ci in 3.1E6 gal release0125 mrem per semi-annual report
5/10/88	PDQ	881020	2860-1333	B RHUT liner leak	Liner melted on aux boiler blowdown line, water leakage between liner and tank	
5/11/88	PDQ	881024	2871-1212	Valve leak	MSS-032 (PV-36014A) (MSS to ASC supply valve)	
5/11/88	PDQ	881025	2871-1228	FWS-542 leak	FWS-021 bypass valve (start up bypass)	
5/13/88	PDQ	880993	2334-1966	Waste in A RHUT during maintenance	~ 50 gallon spill Cs137 at 1.6e-8 $\mu$ Ci/ml,	No contamination above free release detected
5/20/88	PDQ	881077	2860-1417	B RHUT hot particle	Several Ru106 particle found, (8 in B, 1 in A) from resin dewatering system pump. (possibly contaminated at Trojan) several additional particle found during decon activities.	PDS and associated piping to the RHUT were deconned and Pacific Nuclear Services Inc. equipment replaced as necessary.
5/29/88	PDQ	881120		Activity in A&B Steam lines-hot well	Within 50.59 bounds	H3 at 3-7E-6
6/1/88	PDQ	881131	2334-1738	Uncontrolled release during pump down	T-950-A RHUT improper hose routing, spillage on pavement	
6/2/88	PDQ	881179	3480-0255	LV38505 steam leak	E-365 (Aux boiler) steam leak	
6/2/88	PDQ	881181	8482-0169	Oily water separator	Cs137 in oil phase pumped from OWS (from turbine deck drains)	Cs137 5.6E-8 $\mu$ Ci/cc No measurable contamination on August 1989
6/5/88		ANN RPT		Hogger release (Unmonifored)		78.8 µCi - 2.52E-5 mrem per semi- annual report.
6/11/88	PDQ	881185	3480-0277	MSS-623 steam leak	"C" MAIN STEAM REHEATER instrument roots	
6/17/88	PDQ	880985	2334-0988	Channel 1 R-15045 failed source check	Compensatory measures taken, PDQ voided -	No release impact
6/25/88		ANN RPT	·	Main Steam Reheater valve leakage	Turbine building floor drains to PE - ~8 gal.	269 pCi Max WB dose 2.27E-9 mrem
6/27/88	PDQ	880079	2335-0778	R-15546A missing filter screen and I cartridge	Accident monitors	No release impact
7/11/88	PDQ	881150	2334-1820	H3 in PDS	Redundant to 881002/1120 H3 in routine concentration range	

Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
8/2/88	PDQ	881158	2860-1513	R-15110 SP failure	Area rad monitor - no release impact	
8/3/88	PDQ	881502	2860-2141	CCW contamination has contaminated TCW	CCW & TCW contaminated,	Spills at CCW cooler sample points and CCW pump drains
8/5/88	PDQ	881437	2860-1958	LV36505 stéam leak	E-365 (Aux boiler) steam leak	
8/6/88	LER	8811	3017-1545	AFW pump packing failure	Wrong packing size issue	No release noted
8/6/88	PDQ	881444	2860-1974	Boron buildup on pump stand	RCP	
8/12/88	PDQ	881489	2860-2122	Packing problem	AFW pump	
8/12/88		ANN RPT		Cs134/137 contaminated liquid from NGS low point drain	~ One (1) pint inadvertently dumped down I&C shop sink (PDQ 88-1496)	Cs134 6.34E-2 pCl Cs137 7 0E-1 pCl Max WB dose 2.17E-7 mrem
8/14/88	PDQ	881434	2860-1930	Solidification liner overflow at pad	~ 3 gallon leaked from improperly tied down fill head,	Max contamination on solidification pad 30K dpm/100cm <sup>2</sup>
					MSS-606 (MSS052 bypass) main steam	
8/15/88	PDQ	881508	3480-0420	Packing leak	E-302A	WR153357 location/survey
8/19/88		ANN RPT		Main Steam Reheater valve leakage	Turbine building floor drains to PE ~75 gal.	2.55E5 ml H3 1760 pCi, Cs137 3.34 pCi - Max WB dose 7.36E-78 mrem
8/22/88	· · · · · · · · · · · · · · · · · · ·	ANN RPT		Main Steam Reheater valve leakage	Turbine building floor drains to PE - ~1.9 gal.	35 pCl -
8/23/88	PDQ	881549	2871-1670	T310A steam leak	MS coil drain TANK leakage	
8/26/88	PDQ	881567	2871-1688	Wet/contaminated perimeter monitor	Suspect failure of installed Cl38 source 5000 dpm/100cm <sup>2</sup>	
8/29/88	PDQ	881002	2860-1135	Cs137/Xe133, I131 in A&B OTSG steam line	No stated cause PDQ closed IAW RSAP- 1308 R2	50.59 evaluation has good information on release impacts
8/29/88	PDQ	881579	2871-1703	Body to bonnet leak	MSS-308 "D" main steam reheater 2nd stage sample	
9/9/88		ANN RPT		AFW seal leakage into uncontrolled drain	-26130 gal (9.89E7 ml) between 8/13/88 & 9/9/88	H3 - 247 μCi, Cs137 5.98E-7 μCi - Max WB dose 1.63E-4 mrem
9/21/88	PDQ	880608	2871-0666	B to B leak DHS-003	Boron crystals at Body to bonnet joint -	No significant volume noted
9/27/88	PDQ	880112	2871-0177	B OTSG lower manway leakage	< 0.48 GPM	
9/28/88	PDQ	881231	. 2871-1459	J polisher contamination RCS leakage	Cs, Co, I, Mn present from 3E-7 to 4E-5	
9/28/88	PDQ	881234	2871-1459	J polisher contamination RCS leakage	Cs, Co, I, Mn present from 3E-7 to 4E-5 µCi/cc disposable resin processed as radwaste	
10/5/88	PDQ	880754	2871-1016	B to B SIM-020	Boron crystals at Body to bonnet joint -	No significant volume noted
10/25/88	LER	8814	3017-1566	PZR spray block valve leakage	< 1 gpm	No significant volume noted
10/27/88	LER	8816	3017-1560	Failure to continuously monitor ABS	RB purge	Before/after samples indicate no release
10/28/88	LER	8812	3069-0058	Failure to isolate A RHUT	Only LER cover letter no details	Released to basin not PE
11/7/88	PDQ	881839		TSS (1771) secondary plant chilled water system contaminated Cs137/H3 from CCW MU	Cs137 3.00E-07, H3 4.00E-04 <i>u</i> /Cl/ml	Max dose 0.0005 mrem
11/20/88	PDQ	881892	3480-0680	Xe contamination in SAS aux building	Noble gases	Xe133 6.6E-7, Xe135 1.24E-7 μCi/cc
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Date		· Doc. #	Doc Location	Index description	Record remarks	Survey data
11/23/88	LER	8814	3083-2230	RCS leak	30 day follow up report, no new data	
11/23/88	LER	8816	3083-2225	Failure to continuously monitor AB grade level vent	30 day follow up report, no new data	
11/25/88	PDQ	881907		T-991 overflow	~ 1 gallon hypo chlorite down storm drain	PE centerline in spec after one hour SWS flush of drain
12/9/88		ANN RPT		Hogger release (Unmonitored)	Steam/gaseous release ~ 9.06E7 cc	H3 75.8 µCi, Cs137 6.22 µCi, gases and lodine 78 µCi (max WB dose - 2.99E-3 mrem)
Jan-89	PDQ	890089		Bead formation in retention basin	Resin beads and fines detected in NRB	
Jan-89	PDQ	890091		Bead formation in retention basin	Approx one cup resin detected in the SRB	٠. ٠ ٢ ٠ ٠ ٠
1/3/89		ANN RPT		B RHUT instrumentation leak	- 20 gals: Down storm drain near B RHUT	~ 20 $\mu$ Ci (primarily H3 w/ Cs) 1989 semi-annual report
1/17/89	PDQ	890058	8481-1155	Furmanite nipple steam leak	MSS-623 (PDI30227 root valve)	
1/18/89	PDQ	890064	8481-1200	Leaking pipe	MSS508 steam vent "D" main steam reheater packing leak	
1/18/89	PDQ	890066	V2-STLT0518- BX06995	Man way cover leakage	Cold reheat to B Main Steam reheater above ladder to mini-mezzanine	
1/18/89	PDQ	890067	8481-1219	Furmanite nipple steam leak	MSS525 atmospheric. Dump isolation bypass	
1/19/89	PDQ	890075	8481-1253	Body to bonnet leak	FWS027 A Main Feed Pump to LP Condenser ISO	
1/19/89	PDQ	890079	8481-1274	Vatve leak	FWS304 B MAIN FEED PUMP to 2nd pt FW heater drain	
1/22/89	PDQ	890092	8481-1305	Valve leak	MSS508 steam vent "D" main steam reheater leaks by causing steam leak from pipe cap	
1/23/89	PDQ	890095	8481-1324	Valve leak	ASC031 blanketing steam to D main steam reheater	
1/26/89	PDQ	890086	V2-STLT0518- BX06995	Bead formation in retention basin	NRB sample containing contaminated resin and silt	Cs134, 137, Co60
1/29/89	PDQ	890117		Xe contamination in SAS aux building	Closed, follow up per PDQ881892 Noble gases	
3/19/89	PDQ	890367	3480-0831	Detectable fission gases	Xe 133/135 in SAS (clear W/I 48 hours)	
3/20/89	LER	8904	3071-1677	Error LWR 89-028A	Admin Issue	No release noted
3/26/89	PDQ	890367	3480-0740	Xe contamination in SAS aux building	Xe133 9.1E-7, Xe135 1.99E-7 μCi/cc	Clear of noble gases W/I 48 hours
3/30/89	PDQ	890384	V2-STLT0518- BX06995	Condenser pit sump contaminated OTSG leak	Activities increasing from OTSG leakage	Disposition in 881120
4/3/89	PDQ	881522	3480-0441	R-15017B pump failure	Priority for replacement request - (basin inlet monitor)	No release impact
4/6/89	PDQ	881583	V2-SLT0518- BX06995	Leaking relief valve Decay tank	Minor leakage during cycle testing	No contamination or release impact
4/9/89	PDQ	890412		SAS contamination		Noble gases - no contamination impact
4/9/89	PDQ	890425	V2-STLT0518- BX06995	ASC nipple failure	E360 blow down line near forced draft fan steam leak	

Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
4/10/89	PDQ	890063	8481-1196	Pipe leak in -23 at weld failure	E360(small boiler) mud drum to F-3508 north of shack in overhead pipe chase	
4/11/89	PDQ	890341	V2-SLT0518- BX06995	A radwaste exhaust fan breaker trip	No release issue documented	
4/12/89	PDQ	890062	8481-1175	Pipe cap leak 3" from MSS-504	Steam header vent to A Main Steam Reheater	
4/13/89	PDQ	890431	V2-STLT0518- BX06995	Rupture disc failure liquid effluent RWS	Liquid effluent release treatment system skid	Limited to berned area of LIQUID EFFLUENT RELEASE TREATMENT SYSTEM skid
4/25/89	PDQ	890451	V2-SLT0518- BX06995	Environmental Air Sample OOS	Less than 7 day sample run	
5/3/89	PDQ	890486		PDV-36541 steam leak	Small aux boiler atomizer	No significant volume noted
5/10/89	PDQ	890499	V2-SLT0518- 06995	SAS Xe-133 contamination		Xe133 2.1E-7 µCi/ml noble gas
5/10/89	PDQ	890512	and for a set of the set	Clay Creek Radiological survey	Detailed survey ~ 700 feet out from effluent	
5/16/89	PDQ	890536	V2-STLT0518- BX06995	Valve leak	3rd point heater drain to E360/365 MCM- 084	
6/13/89	PDQ	890392	V2-SLT0518- BX06995	North perimeter monitor failure		Rad monitor, not release related
· 7/1/89	PDQ	890600	3480-1009	CCW M/U (leak in system)	20 gallons into bermed area of Tank Farm between Aux and Rx bldg near B MSS penetration,	No contamination noted in post incident surveys
7/5/89	PDQ	882019	V2-SLT0518- BX06995	ABS monitor high background	No release impact	MDC four orders magnitude below alert set point
8/23/89	PDQ	890634	8481-0370	B RHUT leak	Tank leak into drain	8E-8 µCi/ml (4016 gal IAW semi- annual report)
10/18/89	PDQ	890739	8482-0630	Offsite dose rate above background	RTL0.3PO monitoring area of deposited material near clay creek, RTL0.4NO post on IOSB fence vs. site boundary fence,	Based on circumstances, no unusual reading
Dec-89	PDQ	ة سنة عمل المست 890701	hand in an	Contamination detected in OWS	f Alexandri on and an	Cs137 6.2E-9 µCi/ml
12/5/89	PDQ.	890832	8482-0857	Unexpected well water sample results	H3 at 435 pCi/l in well at feed lot SW station.	Subsequent sample show no elevated tritium activity
12/5/89	PDQ	890831	8482-0857	Unexpected runoff water sample results	H3 at 520 to 580 pCi/l,	ang against find he foreight and g helicity ( B an Line ( Bank ( Bank ( Bank) ( Bank)))
12/12/89	LER	8912	3067-1197	Failure to re-establish sample flow ABS	62 minutes, CSD >60 days	No release noted
12/15/89	PDQ	890849	V1-3098-8587	Hazardous waste inspection	Numerous finding and observations	No radiological impact
12/16/89	PDQ	890850		CST overflow	No activity detected in sample	Spill contained within plant drains, monitored at basin
12/22/89	PDQ	890775	3480-1407	Containment not set prior to head lift	Procedural issue,	No release indicated
1/4/90	PDQ	900004		Fire in RB	Small fire in a lighting fixture	No release impact
1/19/90	PDQ	900015	3480-1821	Secondary plant chilled water system contaminated Cs134/H3	From CCW make up. Drain and flush completed	Cs137 1.62E-7, Cs134 1.23E-8, H3 2.8E-4 µCi/ml
1/23/90	PDQ	900016		Contaminated material discovered at site portal	Contaminated burke tube recovered from north salvage area	No ground contamination & decon noted

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Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
2/6/90	PDQ	900038		SF liner leaks	Leakage past studs in wall of liner	Leakage contained in leak chase (by design)
3/7/90	PDQ	900076	3480-2006	Liquid sample NGS-556 (IN Training and Records BUILDING) contaminated Cs137	Liquid from NGS drain handle as contaminated during dismantlement	1.82E-6 µCi/ml Cs137
3/9/90	PDQ	900061 ·	3480-1946	SP failures R-15029, 40	Area radiation monitor - no release impact	
3/16/90	PDQ	900085	V1-3098-8587	MCW sludge contamination	Co60 3.6E-8/Cs1373.2E-7	Dose projections 7.03E-4 mrem adult WB, 1.49E-3 mrem child bone using very conservative assumptions.
3/19/90	PDQ	890588	3480-0996	R-15045 set point	Conservative error,	No release impact
3/19/90	PDQ	890842	3480-1784	R-15017A OOS > 30 days	Administrative reporting Issue - not release document	
3/28/90	PDQ	881940	3480-0711	> 90 day hazardous waste drum storage	Admin violation - no material release	
3/29/90	PDQ	900103	8482-1245	A RHUT agitator leak	Small spill below overflowed bucket near agitator	
4/3/90	PDQ	890746	3480-1363	Two drums hazardous material (89- 295/296) over 90 day limit	Administrative issue.	Possible drum leakage behind paint shed prior to transfer to poly drums
4/4/90	PDQ	900081	3480-2026	West end storage tank - dark stain indicating leakage	T-741 caustic storage tank -	Leakage contained within bermed area
4/6/90	PDQ	881422	3480-0575	Rad Monitor alarm on ceiling fan cycle	Basin inlet monitor -	No release impact
4/6/90	PDQ	90486	3480-0904	Steam leak PDV-38541 (e-365 atomizer)	Small steam leak	
4/17/90	PDQ	881867	3480-0680	R-15106 filter clogged	IOSB monitor -	No release impact
4/20/90	PDQ	900133	3480-2130 ,	R-15045A flow transmitter failure	Local samples taken to monitor release	No release impact
4/23/90	PDQ	900143	8482-1429	Poly bottle emptied into wrong sump	Sump transferred to drum and disposed of down decon drain	
4/24/90	PDQ	881542	3480-0615	Effluent computer code error.	TS violation	No release
4/26/90	PDQ	900152	8482-1473	Contamination of LP (50# header) $N_2$ and associated systems	H3 from liquid drain at 3.43E-2 $\mu$ Ci/cc	DRCST backflow past PLS-630 into LP $N_2$ header
4/27/90	PDQ	900153	8482-1474	H3 in CST	CST contamination from N2 system during repressurization, drain/filled 6/11/90 <mda< td=""><td>DWS (from CST) feed and bleed/survey prior to return to unrestricted service</td></mda<>	DWS (from CST) feed and bleed/survey prior to return to unrestricted service
5/3/90	PDQ	900161	8482-1498	SFC demin pump leakage	Bucket used to collect seal leakage dumped in sump, east of Spent fuel coolers which pump to RHUT.	
5/19/90	PDQ	900149	8482-1465	Contaminated turbine part west of west spray pond	Turbine parts stored since 85 (when release criteria was 1 mR/hr fixed) parts above current criteria (100 ccpm) controlled.	Trailer #20 (staged on Southwest road to basins) discovered to contain contaminated equipment also. Moved to IOSB.
5/31/90	PDQ	900188	8482-1642	R-15007 failed SP		No indication of release impact
6/1/90	PDQ	900190	8482-1651	R-15042 failed SP		No indication of release impact
6/4/90	PDQ	890503	8482-0421	High coolant activity -	Monitor reading concern	
6/4/90	PDQ	900092	8482-1202	R-15017 severe spring	Procedure/Admin -	No release indicated

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Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
6/6/90	PDQ	900207		FWS-010 FW into (grade level) dehumidifier	Water trapped within FW piping drained into grade level dehumidifier while opening FWS-010	
6/8/90	PDQ	900210	8481-0727	Drinking bird leakage	Leakage contained within TF leak chase pit and WDHCR berned area	
6/11/90	PDQ	900135	8482-1352	RB exhaust supply fan	Fan tripped during re-energizing H4SCB -	No indication of release impact
6/12/90	PDQ	900183	8482-1632	lodine flow check failed		No indication of release impact
6/29/90	PDQ	890700	8482-0602	1131 at Lodi Environ. Air sample	RSNGS CSD - no I131 inventory - no release implications	
7/10/90	PDQ	900240		H3 in well sample (RWW2.1MO)	Abnormal Controls for Environmental Pollution results apparent lab sample control issue	
7/12/90	PDQ	900239	V2-SLT0518- BX06995	Sample taken early due to schedule error	Sample taken 9 vs. 7+/- 25%	No unmonitored release.
7/18/90	PDQ	900247		Source damage (83-428)		
7/16/90	PDQ	900247	8481-0878	Damage/leaking source	Ba133 # 83-428	No release, no contamination
7/18/90	PDQ	900241	8482-1784	Monitor source check	Area rad monitor -	No release impact
7/19/90	PDQ	900220	8481-0811	Activity on charcoal of Turbine	Co60 & Cs134/137 at < 1.5E-12	No release or contamination impact noted
7/19/90	PDQ	900227	8481-0845	Channel failures R-15045&545		No release indicated
7/25/90	PDQ	880110	8482-0001	Plant effluent ODCM non-conformance		No indication of release impact
7/26/90		ANN RPT		Valve leakage into uncontrolled drain in TF		< 4 gals 1 µCl H3&Cs
9/4/90	PDQ	900216	8481-0769	Basin release to support I&C	Monitor set point during surveillance issue,	No impact on release
9/4/90	PDQ	900215	8481-0760	Reactor coolant drain tank drain via tygon to EDHR pump room sump	Tygon blew off REACTOR COOLANT DRAIN TANK pump, spraying water on floors and walls	
9/11/90	PDQ	900261	8481-0976	R-15044, 045, 545 OOS w/o samples	Administrative reporting issue -	Not release document
9/11/90	PDQ	900285	8481-1121	R-15028 failed SP	Alarm function issue,	No related release
9/12/90	PDQ	900219	8481-0799	Monitor line up error R-15546, 045, 044	Procedure/Admin -	No release indicated
9/26/90	PDQ	900299	8481-1843	Tank farm radioactive spills (various locations)	No indication remediation completed	
10/16/90	PDQ	900201	8482-1686	I131 in milk sample	PDQ cancelled	
10/22/90	PDQ	900198	8482-1657	Inconsistency in ODCM	Procedural issue secondary plant alert points (CSD) -	No release impact
10/29/90	PDQ	900272	8482-1801	Hazardous Material program deficiency	Admin issue -	No indication of release or contamination.
11/6/90	PDQ	900328		B WGDT uncontrolled release	B WGDT leaked to Waste Gas Storage Tank to ABS (monitored per 1990 semi- annual report)	
11/29/90	PDQ	890731	8481-1395	RS out of compliance with 29CFR1910.120	Program/admin issue	

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Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
11/29/90	PDQ	890656	8481-1374	EPA violation during walk down	Hazardous material. Impact mainly Admin.	Overflow of one drum on 1/23/89 included radioactive reference (800 cpm)
12/3/90	PDQ	900129	8481-1438	R-15044 alert point incorrect		No release impact
12/3/90	PDQ	900167	8481-1660	R-15049 count time incorrect		No release impact
12/23/90	PDQ	900363	V1-3098-8587	A RHUT sample pump leak	No contamination measured in post spill surveys	
12/23/90	PDQ	900364	V1-3098-8587	PASS cooler leak	Cooler - non-radioactive, post spill surveys background	
12/25/90	PDQ	900367	V1-3098-8587	Spill in TF	RWS-730 H3 Evaporator - ~500 gals water thru TF wall down storm drain south-east of east tower	H3 3.8E-2, Cs137 3.6E-8 μCi/ml (6.98E-2 Ci H3 & 6.52E-2 μCi Cs137 total)
12/25/90		ANN RPT		Valve leak on H3 evaporator	~480 gals. Down uncontrolled rain in TF	~70 mCi H3, <1µCi Cs137
1/14/91	PDQ	910012		Contamination in sluice header and blender/dryer system	OTSG backflow thru check valve during recirculation contaminated header, blender/dryer, and aux. boiler	Cs137 6E-9 μCi/ml @CST, 2E-8 μCi/ml blender - drier, 1E-7 μCi/ml @E360/365
2/20/91	PDQ	910038		Chemical spill in QHUT	Formula 65 MW Evaporator anti form agent , ~ 250 ft <sup>2</sup>	Spill originally reported as floor wax
4/3/91	PDQ	900375	,	Freeze damage various systems	A&B RHUT'S, Blender/Dryer, acid addition west tower	
7/17/91	PDQ	910046	V2-SLT0518- BX06995	Chemical storage	Administrative issue	Material stored in Aux vs. B warehouse
10/1/91	PDQ	910130	• :	Blender/dryer (B/D) relief lifted to floor	Standing water noted as no floor drains exist	No contamination levels referenced in PDQ
1/13/92	PDQ	920003	V2-528-8819	Leak in "A" RHUT line during discharge	Water from under asphalt ~ 5 feet west of A RHUT	No contamination levels referenced in PDQ
12/8/92	PDQ	920075		CCW monitor alarm	Inadvertent x-connect RCS to CCW	H3 1.5E-3, Cs137 2.68E-5, Cs134 2.12E-6 µCi/ml
1/20/93	PDQ	930011	V2-1333-9344	Spill in -20	Rain water leaking thru street crack into - 20	No contamination released
4/13/93	PDQ	930026	V2-1333-9344	A RHUT liner leakage	Contamination of A RHUT due to liner leak	No contamination levels referenced in PDQ
6/17/93	PDQ	930036		Contamination in east cooling tower sludge		Cs137 up to 9.6E-7, Co60 at 4E-7 µCi/g
9/2/93	PDQ	930055		60 gallon transformer oil spill	Tanker overflowed during transfer from stationary tank	No offsite release
9/30/93	PDQ	930063	· · · · · · · · · · · · · · · · · · ·	R15045 OOS W/O sampling		No contamination or release impact
12/26/93	PDQ	930088	1 	A RHUT agitator leak	-450 gals. Down uncontrolled storm drain	H3 37.3 μCi, Co60 8.33E-3 μCi, Cs134 3.15E-3 μCi, Cs137 8.52E-2 μCi
2/10/94	PDQ	940022	-	RM-80's stack overflow		No contamination or release impact
3/2/94	PDQ	940025		Contamination on Nuclear Service Electrical Building sanitary sump grate	CRD cooler scupper, A HPI pump room cooler coil drain, SF-A-2 fan drain, and CR HVAC room drains routed to sanitary sump.	Drains isolated/rerouted, no activity detect in sump or sewer system AERIFLO pump
5/18/94	PDQ	940052		Engine coolant spill	~ 1.5 gal ethylene glycol coolant mixture down storm drain	

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Date		Doc. #	Doc Location	Index description	Record remarks	Survey data	
6/1/94	PDQ	940071		CCW leakage ~ 20 gallon per day - unknown location??	Total of ~ 1800 gallons lost. Main Feed Pump oil coolers, C condensate pump cooler, or A Main air compressor/after cooler potentially contaminated		
7/21/94	PDQ	940074	V2-459-9237	DHS-066 leaking thru fuel transfer tube	~ 90 gallons per year into RWS/containment	No release impact	
8/17/94	PDQ	940083		PDS overflowed	Flooding of TB floor, Nuclear Service Electrical Building hallway	H3, Co, & Cs E-9 to E-7 µCi/ml	
10/12/94	PDQ	940092		CRDM components (contaminated) found in south scrap yard	200-1000 ccpm fixed, 2000 dpm/100 loose within wooden crate	No residual contamination recorded in extensive post discovery surveys	
11/21/94	PDQ	940100		CCW leak in TF	~ 5 gals leaked onto gravel/ground near CCW cooler vent	Cs137 at 6E-8 µCi/cc - insignificant impact	
9/19/95	PDQ	950076		B RHUT leak (agitator)	~400 gals. Spilled, ~ 100 gals. down uncontrolled storm drain	-7 μCl (primarily H3 w/ Cs per 1995 annual report)	
12/11/95	PDQ	950102		Detenoration of radwaste drums		No release impact	
12/20/95	PDQ	950104	V2-1333-9344	Fork lift fell into acid line trench	Acid transfer line ruptured, no acid released from trench		
1/22/96	PDQ	960015		H3 at site boundary and lake per Controls for Environmental Pollution analysis report			
5/22/96	PDQ	960041	V2-1333-9344	Inadequate WR-RP review, water spill	During maintenance of CDS ( 520,525,557,and/or 584, ~ 10-15 gallons of contaminated water was spilled on floor	Cs137 at 1.66E-8 µCi/cc. No release	
1/21/97	PDQ	97001	V2-1333-9344	Pb paint peeling from DFO tank	Peeling paint blowing around site, similar situation on turbine deck noted	County seemed to indicate that soil testing and remediation would need to be evaluated (Ken Hawkeswood)	
12/22/97	PDQ	970082		Scrap dumpster alarmed recycler monitor	Contaminated boiler end bell and insulation	Cs137 4.2E-3 vCi(2000 cpm)	
2/12/98	PDQ	980009	V2-1333-9344	EPA-Radiological Quality Assurance results OOS	Administrative issue, not release related	No contamination or release impact	
3/11/98	PDQ	980017		Contaminated scaffolding discovered near B warehouse	Four to six sticks, contamination up to 400 ccpm, no contamination of B warehouse detected	Survey of associated materials, 7 boards, 21 more sticks, one clamp from 40 to 1100 ccpm	
4/29/98	PDQ	- <b></b> 980025		Unmonitored ABS release	abarrahitaan lamaan barra bir bir dhamara	an hao see ay bahan Bahara dhi badda ahaana an asasaad	
					Aggregate resurvey < limit, during re-		
4/30/98	PDQ	980026		Scrap dumpster alarmed recycler	survey found ~ 13,000 in <sup>2</sup> of material with max fixed of 200 ccpm	Total activity 0.81 $\mu$ Ci, no contamination or release impacts	
6/3/98	PDQ	980035	n onor i stân înveni retan u	Acid spill cause basin to divert on low pH	~16 gals. Of acid escaped berned area of acid/caustic storage tanks and entered drain to PE	enter er er en einen das er blieft binner i ber ann mit den for den das die benandt.	
Jul-98	PDQ	980046		SWS line cut in TB	Spilled into TB		
10/14/98	PDQ	980066	an - rentere - Andres mendent	T950A H3 concentration may exceed NPDES limit	anden in de sense de verseeren en bestelle sense sense kan en sense en bestelle verseeren en bestelle verseeren De sense	ana kana ang ing panganan ng panganan ng panganang panganang panganang panganang panganang panganang panganang Panganang panganang pa	
12/26/98	PDQ	980081		Tritium evaporator leak.	Spill flooded berm overflow into gravel		
2/25/99	PDQ	990012	andar da anta anta anta anta anta anta anta a	Spill in -20	~ 200 gals Concentrated Boric Acid Storage Tank dumped into crud filter, M/U pump rooms, -20 hallway and -27 pump alley	n ban (maxim) - db an bran brinningananananananananananananananananan	
4/1/99	PDQ	990029		AB HVAC expansion tank drained to AB mezzanine floor drain	Nitrate-Borated water		

Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
4/1/99	PDQ	990031		Contamination detected in dumpster	Detected at exit truck monitors, never left site. Contaminated tape from BWST remediation tent	Material removed, dumpster surveyed and released
4/13/99	PDQ	990028		Spill M/U Pump and B HPI rooms	BWST drop line	
9/9/99	PDQ	990074		Leak from A RHUT discharge pipe during B RHUT release	~ 200 gal on ground, 25 gal down storm drain, no off site release	H3 5E-5, Cs137/Co60 5E-7 µCi/ml in water. Soil and gravel in area Cs137/Co60 9E-7 µCi/gm
10/8/99	PDQ	990087		0.5 by 39 inch split in exhaust duct	<1% based on release calculation's)	
2/7/02	PDQ	020015		Potential unmonitored release from B RHUT through agitator seal following maintenance on the agitator	Approximately 450 gal of water leaked through the agitator seal and went down a nearby storm drain	H-3 at 4.42E-06 and Cs-137 at 2.80E- 09 μCi/ml
	ODR	840051		Solvent down storm drain	5 gallon can of trichlorotriflouroethane found draining into storm drain south side aux boilers	
	OŅR	840106	i	Offsite release	N₂H₄ concentration - not a radioactive issue	
	ODR	860097	237 <del>9</del> -0112	Drûm rupture in hazardous mat storage area	Hypo chlorite-oil waste -	Non radioactive issue
	PDQ	930050		Leak spent regen pump	Large document regarding caustic and acid spills	
	ODR	840087		Particulate filter broken		
	ODR	840308	-	3rd qtr dose calculation's	Error found and corrected	<b>k</b> 7
	PDQ	890689		H3 in Tripley well (RWW2, 1MO)	1445 pCi/l, Controls for Environmental Pollution states results valid	No disposition noted, (text from 900240 states analytical error) REMP limit not exceeded
	PDQ	990070		AB vent monitor OOS>30 days	System abandoned	Last release 8/18/1999
	PDQ	900123	8482-1326	CDS610 open controls flow to sewage system (contamination??)	Sewage to effluent terrace flow rate vs. National Pollutant Discharge Elimination System permit issue	No contamination/no release
	LER	8323	0204-0948	P-261A (DHR pump)	Electrical breaker issue	No release noted
	ODR	760036	2802-0478	H3 contamination (no PAS)	SF movement issue,	No release
	ODR	760046	2802-0507	SRB dilution incorrect	Conductivity and TDS issue	
	ODR	790068	2802-1074	Residual radioactivity in tanker 196	Tanker return from vendor, not facility licensed material	
	ODR	800141		Plant effluent exceeding limits	Sewer release -	Non-radioactive
-	ODR	810124		Radioactive liquid release	Lack of signature on permit issue	No actual release involved
	ODR	810129		Radioactive liquid release	Lack of signature on permit issue	No release impact
	ODR	810146		Plant effluent w/o sample	No additional information on ODR	
<b></b>	ODR	820002	·	Plant effluent w/o sample	Instrument instrumby the big and instrument and a second second second second second second second second second	a <del>an an a</del>
	ODR	820011		Two missed ABS samples		Noble gas & H3 only
	ODR	820028		Radwaste transport (3/23/82)	No impact to facility	
	ODR	830004		Improper handling contaminated material	No RWP issued	Administrative issue

Date		Doc. #	Doc Location	Index description	Record remarks	Survey data	
	ODR	830106		Effluent release limit exceeded	pH - not radioactive		
	ODR	830151		Radioactive release	Ventilation system fan bearing fallure and potential it could have on release monitoring		
	ODR	830183		Plant Effluent	Chlorine spec - not radioactive		
	ODR	840020		Hole in coolant hose	Fire protection water system		
	ODR	840021		Discharge valve leaking	Retention basin outlet valve	No measurable release indicated	
	ODR	840063		Coolant waste holdup tank	Admin. Issue - no 50.59 done when used as Evaporator bottoms tank		
	ODR	840121		Leakage into RB spray add tanks	Boron concentration issue		
	ODR	840122		Liquid effluent dose calculation(s)	Admin, Issue		
	ODR	840140		Tube leak	South HP condenser	Non-rad issue	
	ODR	840163		Retention basin release	Incorrect dilution flow - not > MPC		
	ODR	840194		Portal monitors	Background/MDA issue		
	ODR	840224		Plant Effluent	RETS dose calculation issue		
	ODR	840249		MSS 051	Ops issue plant S/U		
	ODR	840250		MSS 052	Ops issue plant S/U		
	ODR	840254		HEPA filter bank	Failed SP	No release impact	
	ODR	840262		Particulate filter	Filter not retained for composite analysis	CSD - no release impact	
	ODR	840293	354-1533	Overfill tank	Filled beyond spec, not capacity - no spill		
	ODR	850276	2356-0728	Release exceeded limit Auto make up failure	10,000 gpm flow rate, not release related		
	ODR	850456	2356-1167	Unable to access radiological release from secondary system	Timely access to information -	Not relevant to actual release	
	ODR	860164	2857-1772	Unmonitored release during surveillance	Potential (admin review of S.P.)		
	ODR	860301	2348-0041	HVS possible unmonitored release	Administration		
	ODR	860351	2348-0298	Sources 231-240 missing :	Beckman sources used to setup LSC -	Returned to Beckman	
	ODR	860550	2348-0925	Shed not secured	BBC component security issue, not radiological		
	ODR	870067	2349-0219	SFCP drain open	Admin concern Re: pool level, not actual occurrence		
	ODR	• 870199	1569-0001	Record storage violation (in QHUT or Re: QHUT)	N/A - in QHUT not regarding QHUT		
	ODR	870739	2928-0665	Rad monitor output differ(s)	Electrical issue - not radioactive issue		
	ODR	870819	2926-0952	Cooling water pump seal leakage	Emergency Diesel cooling water pump - not radioactive		
	ODR	871016	2379-0692	Brown mass from polisher sample line	Non-radiological issue		
	PDQ	880115	2335-0915	Missing source #204-88-5	Source found		

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Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
	PDQ	880153		ODR860153 conv.	Spill while pulling lower manway OTSG	No significant volume noted
	PDQ	880156		ODR conv.	SFP boron concentration issue	· · ·
	PDQ	880159		ODR conv.	Diesel SP issue	
	PDQ	880161		ODR conv.	R15044&045 flow calibration SP Failure	No release impact
	PDQ	880164		ODR conv.	Posting of security guard issue	
	PDQ	880165		ODR conv.	TS Issue Re: pump combination/duration at power	
	PDQ	880167		ODR conv.	Waste Gas surge tank maintenance issue	
	PDQ	880168		ODR conv.	Admin issue Re: LCO reference in SF Handing procedures	a k
	PDQ	880169		ODR conv.	USAR cable tray issue	
	PDQ	880171	4	ODR conv.	Procedure reference tech spec issue	
	PDQ	880173		ODR conv.	Fire Protection SP issue	
	PDQ	880175		ODR conv.	USAR issue Re: Release via NSRW evaluation	i come
	PDQ	880176		ODR conv.	NSCW temp increase 87 to 95 of USAR	
	PDQ	880177	;	ODR conv.	Turbine / Main Feed Pump trip set point issue	
	PDQ	880178		ODR conv.	Battery charger maintenance issue	
	PDQ	880180		ODR conv.	Test procedure issue	
	PDQ	880182		ODR conv.	Posting of fire watch issue	
	PDQ	880187		ODR conv.	Emergency lighting duration issue	· · · ·
	PDQ	880188		ODR conv.	Electrical X-tie load issue	
	PDQ	880202		ODR conv.	No fire watch	
	PDQ	880284		ODR conv.	WR not IAW ECN - admin issue	
	PDQ	880331		ODR conv.	Failure to perform scheduled maintenance on BV turbine component issue	
	PDQ	880341		ODR conv.	Effluent max flow reporting issue	
	PDQ	880352	" .	ODR conv.	Procedure Issue Re: independent verifications	
	PDQ	880357		ODR conv.	TS issue Re: minimum fuel oil inventory during operations.	
	PDQ	880360		ODR conv.	EFIC power restoration issue	
	PDQ	880364		ODR conv.	EFIC power restoration issue	
	PDQ	880365		ODR conv.	Operability issue	No release impact
	PDQ	880415	2871-0377	Water in pull box H71537	Rain water	

Date		Doc. #	Doc Location	Index description	Record remarks	Survey data	
	PDQ	880587	2871-0595	Leakage NRW .	NRW no record of contamination		
	PDQ	880971	2334-0988	Liquid under governor cap ;	Non-Rad issue		
	PDQ	881104	2334-1555	Moisture in J-box	Non-Rad issue		
	PDQ	881132	2334-1741	During blowdown to RHUT - spray on equipment (Main Transformer/others)	No contamination monitored, "a potential issue"		
	PDQ	881340	2871-1544	C RHUT (contaminated??)	Chemistry issue (CWQCB)		
	PDQ	881748	V2-STLT0515- BX06995	Spent regen line acid waste sump removed	Admin issue	Not a PDQ occurrence	
	PDQ	890078	V2-STLT0518- BX06995	Inner cooler relief lift	Emergency diesel air start compressor	Non-rad issue	
	PDQ	890112		Body to bonnet leak	890122 related to tie wrap of razor ribbon to security fence		
	PDQ	890302		Socket weld leak	Pin hole leak between MSS-031 & ASC- 620	No significant volume noted	
	PDQ	890340	V2-STLT0518- BX06995	Aux Steam weld failure/leak	Steam leak E360/385 steam trap line downstream ASC-473	No significant volume noted	
	PDQ	890349	V2-STLT0518- BX06995	Aux Boiler steam leak	Steam leak E360/365 steam trap line downstream ASC-473	No significant volume noted	
	PDQ	890351	V2-STLT0518- BX06995	Feed heater relief cover missing	Security TB to TF access issue		
	PDQ	890354	V2-STLT0518- BX06995	LP turbine line shear	Condenser air in- leakage issue		
	PDQ	890364		Leaking Flow transmitter	FE31027 MS coil drain tank reheater	No significant volume noted	
	PDQ	890382	V2-STLT0518- BX06995	Feed heater relief cover missing	Security TB to TF access issue	· ·	
	PDQ	890394	V2-STLT0518- BX06995	Valve failure (system)	Valve electrical failure issue		
	PDQ	890416	V2-STLT0518- BX06995	Cooling tower blowdown monitor failure	Monitor failed SP due to failure of BD valve to close		
	PDQ	890421		Monitor flow rate	R15546A failed SP	Compensatory actions taken	
	PDQ	890438	V2-STLT0518- BX06995	Resin missing treatment	On re-inspection, resin levels verified as normal		
	PDQ	890615		ABS without sampling	~ 18 hours - CSD	No impact	
	PDQ	890758	V2-STLT0518- BX06995	SF pool liner separated from concrete	Liner deformation	No change in leak or leak rate	
	PDQ	900331		NSCW contamination H3	H3 only 50.59 no impact		
	PDQ	910086	V2-1331-8864	Uncontrolled release pathway	MSS steam trap cover	<0.005% app. 1	
	PDQ	910148	V2-1331-8864	Wax in spent regen tank	B/D condensate tank	No release	
	PDQ	910156	V2-1331-8864	Radioactive source incident	H <sub>2</sub> analyzer Cs137 source (30 µCi) not added to inventory	No release	
	PDQ	920014	V2-1331-8864	B RHUT leak FV95008	Water contained in drain sump to basin	No release	

Date		Doc. #	Doc Location	Index description	Record remarks	Survey data
	PDQ	920019		Radioactive package receipt	Yellow II labeled package received by security and transferred to Training and Records building W/O RP notification	No loss of package integrity or contamination noted
	PDQ	930049	V2-1331-8864	Aux bldg uncontrolled area contamination	Auxiliary Building Grade Level, small area, decon and released	RPOR-93-002
	PDQ	930053	V2-1331-8864	Mislabeled radioactive material package aux building	Box DR vs. ID sheet issue	No contamination or release impact
	PDQ	950062	V2-1333-9344	Unmonitored SF leakage	Gage issue, leakage contained in poly bottle	No contamination or release impact
	PDQ	960063	V2-1333-9344	Leaking drum found in IOSB	No contamination noted	No contamination or release impact
	PDQ	970021	V2-1333-9344	CSCA HEPA vacuum used outside CSCA	Location not noted - no contamination noted	No contamination or release impact
		7919		Weld leak	Pin hole in weld socket	No significant volume noted
		8033		West perimeter TLD reading high	Barrel farm	
	ODR	810051		Rx Coolant spill (filed 4/19/81)	COULD NOT LOCATE	
	ODR	810200		Unmonitored Radioactive release (12/4/81)	COULD NOT LOCATE	
	ODR	820091			PZR to OTSG via NGS system "A"	
	ODR	860637	2348-1248	Water leak from respiratory cleaning trailer	No contamination detected in water released or surfaced wetted	According to semi-annual report 1.36E- 2 $\mu$ Ci Cs137 released in ~56 gal.
	PDQ	890097	V2-STLT0518- BX06995	Steam leak at furmanite fixture	MSS524 ADV bypass in TF +20 mezzanine	
	PDQ	890538		Surge tank level drop	CRD sample valve left open	
	PDQ	900316		Unmonitored release	~ 7 gal. Via FWS-020 Closed IAW PDQ 910006	
	PDQ	910015		SWS line break in TF	~250 gals down uncontrolled drain	~ 30 µCi Cs137/Co60
	PDQ	980082		Holes in drum 93-0220	Discovered during shipment /preps	

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# **Appendix B**

# **Personnel Interview Program**

### Rancho Seco Historic Site Assessment Questionnaire (RSHSAQ)

#### **Introduction**

The historic site assessment is part of the license termination program for the Rancho Seco Nuclear Generating Station.

This assessment is intended to identify areas, facilities, and systems that may have been contaminated with radioactive materials during the plants operational and post-operational phases.

Once these radiological impacted areas are identified, additional investigations will determine the scope and magnitude of the contamination and their potential impact on demonstrating compliance with the license termination release criteria.

#### **History**

Rancho Seco Nuclear Generating Station operated from September1974 through June 1989. During this period several secondary and auxiliary systems were contaminated as the result of primary to secondary leaks. As a result, there are many areas of the plant that have become contaminated through leakage from or maintenance on these systems not anticipated for in the original plant design and procedures.

In order to accurately and completely assess the potential radiological impact on post license termination occupants of the site, a thorough knowledge of these areas is required.

#### Currently known conditions

Many of these areas, systems and facilities have already been identified based on the investigation to date.

This investigation has included reviews of:

- a) Potential deviations from quality (PDQ's),
- b) Occurrence description reports (ODR's),
- c) Radiation protection decommissioning projects summaries (RPDP's)
- d) Interviews with facility staff personnel

Attached is a map of the restricted area depicting the primary areas of known radiological impact (highlight yellow) including the Reactor building, Auxiliary building, Spent fuel building, Turbine building, Interim on-site (radwaste) storage building, and Barrel farm.

#### **Informational needs**

The decommissioning staff believes there may be additional areas of impact (areas where radioactive materials were stored (i.e. the turbine rotor shed), spill locations (i.e. RHUT's and Aux boilers), and temporary maintenance locations (machine and fabrication shops). The decommissioning staff appreciates your willingness to assist in the process of identifying these additional areas.

The decommissioning staff is confident that, with the extensive experience of personnel still remaining at the facility, only a limited distribution of this questionnaire outside current facility employees will be required.

#### **Instructions**

Included in this package, you will find the Rancho Seco Historic Site Assessment Questionnaire (RSHSAQ) and the site layout map showing areas of known potentially impacted areas.

- 1. Please complete section A of the RSHSAQ regarding personal and contact information.
- 2. Please complete section B regarding your knowledge of any systems, facilities, or areas of potential radiological impact not already identified. In your description, be as complete as possible including where, when, and what occurred that leads you to believe these may require additional investigation. Use the attached site map (figure 1-4) or draw a map of your own to identify the system, facility, or area as nearly as possible. You may also indicate an area on the attached map and provide an explanation as to what may have occurred leading you to believe that a radiological impact may exist there.
- 3. Should you have any questions regarding the questionnaire or have difficultly describing the area or circumstances surrounding a potential area of impact, feel free to contact Dan Tallman at ext. 4081.
- 4. Please complete the questionnaire and return to decommissioning (attn: D. Tallman MS N103) by Monday, September 17, 2001.

Thank you for your cooperation and assistance in this project.

# Rancho Seco Historic Site Assessment Questionnaire

Section A:			
Name:		 	 •
Phone: Ext			_

Section B:

EXAMPLE

Approximate Date:	late 19801s				
Location: between	ihe cooling towers				
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bundles, radwasted	laums, etc) between	thettoy	vers, n	orthio	filhe
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# Section C: (continued)

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	<b>Comment details</b>	documented	in impact	ed area	summaries
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	Aux Boilers	Aux Building	B Whrs	Barrel Farm	BOP	Bldg Maint. Shop	C Whrs	Circ Basin	Fab/ Weld Shop	NPS Fab Shop
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# Appendix C

# Area Summary and Preliminary Survey Unit Identification

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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m²)
			1 x -		
800001	Reservoir filter/pump station	Grade	NA	AH22 - AF23 of RSNGS Plot Plan	5575
800002	Helicopter Landing pad	Grade	NA	AH24 - AF27 of RSNGS Plot Plan	11150
800003	"South" scrap yard	Grade	NA	AH28 - AF30 of RSNGS Plot Plan	8365
800004	Area surrounding Bechtel Building site	Grade	NA	AE28 - AC29 of RSNGS Plot Plan W/E of "C"RHUT and GRS FAB SHOP PADs	5575
800005	Road "C" south site	Grade	NA	AG32, AF32-39 of RSNGS Plot Plan W/E of that portion covered by "C" warehouse and the south most portion of the TDI building.	9300
800006	South area directly adjacent to IA fence	Grade	NA	AG32-39, AH31-39 of RSNGS Plot Plan	15800
800007	East Industrial Area	Grade	NA	Area bounded by AC17, X17, V19, P19, N21, M21, M24, T24, T21, & AC21 of RSNGS Plot Plan	79,000

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SUID 800 - Industrial Area - Balance of Plant

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SUID 801 - Receiving	Warehouse
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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m²)
					•
500001	Receiving Warehouse	Grade	NA	W 39 of RSNGS plot plan	175
500002	Receiving Warehouse (Upper - Outer)	Grade	NA	R-S 38 of RSNGS plot plan	150
500003	Storage Yard Bordering 801002	Grade	NA	S 37 - R 39 of RSNGS Plot Plan	3700
500004	Parking lot east of Receiving Warehouse	Grade	NA	M 40 - X44 of RSNGS plot plan	55750
801005	RSNGS access road hwy 104 to 801004	Grade	NA	Extending through cells between S45 - E52	3500

#### SUID 803 - Quonset Hut

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m <sup>2</sup> )
	is for the state of the state	ала (1968) 2.	:	ni al contratti di co	. 10000 <u>3</u>
803001	Quonset Hut Pad	Grade	NA	M 34 of RSNGS Plot Plan	465
803002	Historic waste yard south of Quonset Hut	Grade	NA	R 34 - M35 (plus S 35) of RSNGS Plot Plan	13,000

SUID 804 - Personnel	Access	Point (	(PAP)
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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m²)
		· · · · · ·		· · · · · · · · · · · · · · · · · · ·	
804001	PAP	Grade	NA	X 36 - W 37 of RSNGS Plot Plan	465
804002	PAP	Second Floor	NA	X 36 - W 37 of RSNGS Plot Plan	465
804003	PAP	Roof	NA	X 36 - W 37 of RSNGS Plot Plan	465

## SUID 805 - Administration Building

, SUID,#	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m²)
		* 2 · · · · · · ·			
805001	Admin. Building	Grade	NA	AF 35 - X 37 of RSNGS Plot Plan	15,000
805002	Admin. Building	Second Floor	NA	AF 35 - X 37 of RSNGS Plot Plan	15,000
805003	Admin. Building	Roof	NA	AF 35 - X 37 of RSNGS Plot Plan	15,000

## SUID 806 - Spray Ponds

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m <sup>2</sup> )
			:	• • • • • • • • • • • • • •	-,
806001	West Spray ponds	Grade and below	NA	R 26 - N 28 of RSNGS Plot Plan	6500
806002	East Spray ponds	Grade and below	NA	R 31 - N 32 of RSNGS Plot Plan	6500
806003	Area bordering 806001 & 002	Grade including hill side/berms	NA	R 25 - N33 of RSNGS Plot Plan not including 001 & 002	6500

## SUID 808 - Cooling Tower Basins

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m²)
				······ · · · · · · · · · · · · · · · ·	
808001	West Cooling Tower Basin	Below Grade	NA	W 26 - T 28 of RSNGS Plot Plan	13900
808002	East Cooling Tower Basin	Below Grade	NA	W 30 - T 33 of RSNGS Plot Plan	18500
808003	Area around East and West Cooling towers	Grade	NA	X25 - S 34 of RSNGS Plot Plan W/E X30 (823001)	23,300

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#### SUID 810 - Tank Farm

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m²)
		· · · ·	· · ·		
810001	Tank Farm	Grade	NA	SF Cooler Pad bounded by columns H, K, 3.4, & 4.3	
810002	Tank Farm	Grade	NA	"B" main steam sump Area bounded by columns 3.4, 4.4, K, & the containment building.	

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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m <sup>2</sup> )
1			<i></i>	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	
811200	Reactor Bldg	From -27 to -19	NA	Primary Bioshield (360 °)	
811201	14	-19 to -10	NA	Primary Bioshield (360 °)	
811202	Li Li	-10 to -2	NA	Primary Bioshield (360 $^{\circ}$ )	
811203	22	-2 to +5	NA	Primary Bioshield (360 °)	
811204	56	+5 to +13	NA	Primary Bioshield (360 °)	
811205	26	+13 to +21	NA	Primary Bioshield (360 °)	
811001	e4	-27 to -19	NA	A - D-Ring Wall [8 foot vertical W/E of primary Bioshield [12 feet E&W of PRV centerline])	~82
811002	<i>ce</i>	-19 to -10	NA	A - D-Ring Wall [8 foot vertical W/E of primary Bioshield [12 feet E&W of PRV centerline])	~90
811003	44	-10 to -2	NA	A - D-Ring Wall [8 foot vertical W/E of primary Bioshield [12 feet E&W of PRV centerline])	~90
811004	и	-2 to +5	NA	A - D-Ring Wall [8 foot vertical W/E of primary Bioshield [12 feet E&W of PRV centerline])	~90
811005	4	+5 to +13	NA	A - D-Ring Wall [8 foot vertical W/E of primary Bioshield [12 feet E&W of PRV centerline])	~90
	£4		NA	A - D-Ring Wall [8 foot vertical	
811006		+13 to +21		feet E&W of PRV centerline])	~90
811007	66	+21 to +29	NA	A - D-Ring Wall [8 foot]	~108
811008	66	+29 to +37	NA	A - D-Ring Wall [8 foot]	~108
811009	56	+37 to +45	NA	A - D-Ring Wall [8 foot]	~108

SUID 811 - Reactor Containment Building

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ment Building	1				

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m <sup>2</sup> )
				х. з тэр	
811010	Reactor Bldg	+45 to +53	NA	A - D-Ring Wall [8 foot]	~108
811011	"	+53 to +61	NA	A - D-Ring Wall [8 foot]	~100
811012		+61 to +67	NA	A - D-Ring Wall [8 foot]	~46
811013	<i>u</i>	-27 to -19	ŇA	B - D-Ring Wall [8 foot vertical W/E of primary Bioshield [12 feet E&W of PRV centerline])	~82
811014	a	-19 to -10	NA	B - D-Ring Wall [8 foot vertical W/E of primary Bioshield [12 feet E&W of PRV centerline])	~90
811015	"	-10 to -2	NA	B - D-Ring Wall [8 foot vertical W/E of primary Bioshield [12 feet E&W of PRV centerline])	~90
811016	4	-2 to +5	NA	B - D-Ring Wall [8 foot vertical W/E of primary Bioshield [12 feet E&W of PRV centerline])	~90
811017	4	+5 to +13	NA	B - D-Ring Wall [8 foot vertical W/E of primary Bioshield [12 feet E&W of PRV centerline])	~90
811018	6	+13 to +21	NA	B - D-Ring Wall [8 foot vertical W/E of primary Bioshield [12 feet E&W of PRV centerline])	~90
811019	"	+21 to +29	NA	B - D-Ring Wall [8 foot]	~108
811020	44	+29 to +37	ŇA	B - D-Ring Wall [8 foot]	~108
811021	66	+37 to +45	NA	B - D-Ring Wall [8 foot]	~108
811022		+45 to +53	ŇA	B - D-Ring Wall [8 foot]	~108
811023	<b>44</b>	+53 to +61	NA	B - D-Ring Wall [8 foot]	~100
811024	<b>44</b>	+61 to +67	ŇA	B - D-Ring Wall [8 foot]	~46

# SUID 811 - Reactor Containment Building

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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m <sup>2</sup> )
	an an an an		ו ;		
811025	Reactor Bldg	-27	NA	0-30 degrees lower	~ 88
811026	4	-27	NA	0-30 degrees upper	~ 88
811027	u	-27	NA	30-60 degrees lower	~ 88
811028	66	-27	NA	30-60 degrees upper	~ 88
811029	"	-27	NA	60-90 degrees lower	~ 88
811030	"	-27	NA	60-90 degrees upper	~ 88
811031	66	-27	NA	90-120 degrees lower	~ 88
811032	4	-27	NA	90-120 degrees upper	~ 88
811033	14	-27	NA	120-150 degrees lower	~ 88
811034	14	-27	NA	120-150 degrees upper	~ 88
811035	"	-27	NA	150-180 degrees lower	~ 88
811036	64	-27	NA	150-180 degrees upper	~ 88
811037	**	-27	NA	180-210 degrees lower	~ 88
811038	16	-27	NA	180-210 degrees upper	~ 88
811039	46	-27	NA	210-240 degrees lower	~ 88
811040	4	-27	NA	210-240 degrees upper	~ 88
811041	4	-27	NA	240-270 degrees lower	~ 88
811042	86	-27	NA	240-270 degrees upper	~ 88
811043	4	-27	NA	270-300 degrees lower	~ 88
811044	14	-27	NA	270-300 degrees upper	~ 88
811045		-27	NA	300-330 degrees lower	~ 88
811046	15	-27	NA	300-330 degrees upper	~ 88

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SUID 811 - Reactor Containment Building

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m²)
			:	· · · · · · · · · · · · · · · · · · ·	
811047	Reactor Bldg	-27	NA	330-360 degrees lower	~ 88
811048	44	-27	NA	330-360 degrees upper	~ 89
811049	66	Grade	NA	0-30 degrees lower	~ 88
811050	22	Grade	NA	0-30 degrees upper	~ 88
811051	<u>к</u>	Grade	NA	30-60 degrees lower	~ 88
811052	<b>14</b> -	Grade	NA	30-60 degrees upper	~ 88
811053	· 66	Grade	NA	60-90 degrees lower	~ 88
811054	. 4	Grade	NA	60-90 degrees upper	~ 88
811055	66	Grade	NA	90-120 degrees lower	~ 88
811056	44	Grade	NA	90-120 degrees upper	~ 88
811057	44 .	Grade	NA	120-150 degrees lower	~ 88
811058	<b>44</b>	Grade 🤼	NA	120-150 degrees upper	~ 88
811059	66	Grade	ŅA	150-180 degrees lower	~`88
811060	64	Grade	NA	150-180 degrees upper	~ 88
811061	<b>4</b>	Grade	NA	180-210 degrees lower	~ 88
811062	"	Grade	NA	180-210 degrees upper	~ 88
811063	64	Grade 🕖	NA	210-240 degrees lower	~ 88
811064		- Grade	NA	210-240 degrees upper	~ 88
811065	· · · · · · · · · · · · · · · · · · ·	Grade	NA	240-270 degrees lower	~ 88
811066		Grade	NA	240-270 degrees upper	~ 88
811067		Grade	ŇA	270-300 degrees lower	~ 88

### SUID 811 - Reactor Containment Building

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m <sup>2</sup> )
			· +•		1
811068	Reactor Bldg	Grade	NA	270-300 degrees upper	~ 88
811069	64	Grade	NA	300-330 degrees lower	~ 88
811070	4	Grade	NA	300-330 degrees upper	~ 88
811071	66	Grade	NA	330-360 degrees lower	~ 88
811072	26	Grade	NA	330-360 degrees upper	~ 88
811073	26	20	NA	0-30 degrees lower	~ 88
811074	26	20	NA	0-30 degrees upper	~ 88
811075	LE	20	NA	30-60 degrees lower	~ 88 .
811076	44	20	NA	30-60 degrees upper	~ 88
811077		20	NA	60-90 degrees lower	~ 88
811078	44	20	NA	60-90 degrees upper	~ 88
811079	4	20	NA	90-120 degrees lower	~ 88
811080		20	NA	90-120 degrees upper	~ 88
811081		20	NA	120-150 degrees lower	~ 88 ·
811082		20	NA	120-150 degrees upper	~ 88
811083	56	20	NA	150-180 degrees lower	~ 88
811084	66	20	NA	150-180 degrees upper	~ 88
811085	44	- 20	NA	180-210 degrees lower	~ 88
811086	4	20	NA	180-210 degrees upper	~ 88
811087	<i>ii i i i</i>	20	NA	210-240 degrees lower	~ 88
811088	4	20	NA	210-240 degrees upper	~ 88

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SUID 811 - Reactor Containment Building

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m <sup>2</sup> )
	· · · · · · · · · · · · · · · · · · ·	•		· · · · · · · · · · · · · · · · · · ·	
811089	Reactor Bldg	20	NA	240-270 degrees lower	~ 88
811090	"	20	NA	240-270 degrees upper	~ 88
811091	24	20	NA	270-300 degrees lower	~ 88
811092	£2	<b>20</b> ·	NA	270-300 degrees upper	~ 88
811093	"	20	NA	300-330 degrees lower	~ 88
811094	"	20	NA	300-330 degrees upper	~ 88
811095	44	20	NA	330-360 degrees lower	~ 88
811096	22	20	NA	330-360 degrees upper	~ 88
811098	· · · •	40	NA	0-30 degrees lower	~ 88
811099	. 44	40	NA	0-30 degrees upper	~ 88
811100	24	40	NA	30-60 degrees lower	~ 88
811101	<b>64</b>	40 <sub>.</sub>	NA	30-60 degrees upper	~ 88
811102	44	40	NA	60-90 degrees lower	~ 88
811103	2 <sup>17</sup> <b>44</b>	40	NA	60-90 degrees upper	~ 88
811104	<b>44</b>	40	NA	90-120 degrees lower	~88
811105	` <b>4</b>	40	NA	90-120 degrees upper	~ 88
811106	<b>44</b>	<b>40</b>	NA	120-150 degrees lower	~ 88
811107	·· 44	40	NA	120-150 degrees upper	~ 88
811108	1. <b>66</b>	40	NA	150-180 degrees lower	~ 88
811109	· · · · · · · · · · · · · · · · · · ·	40	NA	150-180 degrees upper	~ 88
811110	46 ×	40	ŅA	180-210 degrees lower	~ 88
811111		40	NA	180-210 degrees upper	~ 88

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SUID 811 - Reactor Containment Building

SUID 811 - Reactor	Containment Building
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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m <sup>2</sup> )
	···· • • • • • • • • • • • • • • • • •				
811112	Reactor Bldg	40	NA	210-240 degrees lower	~ 88
811113	56	40	NA	210-240 degrees upper	~ 88
811114	86	40	NA	240-270 degrees lower	~ 88
811115	66	40	NA	240-270 degrees upper	~ 88
811116	66	40	NA	270-300 degrees lower	~ 88
811117	66 .	40	NA	270-300 degrees upper	~ 88
811118	£Ê	40	NA	300-330 degrees lower	~ 88
811119	et	40	NA	300-330 degrees upper	~ 88
811120	4E	40	NA	330-360 degrees lower	~ 88
811121	ii e	40	NA	330-360 degrees Upper	~ 88
811122	4E .	60	NA	0-30 degrees lower	~ 88
811123	48	60	NA	0-30 degrees upper	~ 88
811124	4	60	NA	30-60 degrees lower	~ 88
811125	4	60	NA	30-60 degrees upper	~ 88
811126	64 .	60	NA	60-90 degrees lower	~ 88
811127	ei	60	NA	60-90 degrees upper	~ 88
811128	4	60	NA	90-120 degrees lower	~ 88
811129	46	60	NA	90-120 degrees upper	~ 88
811130	64	60	NA	120-150 degrees lower	~ 88
811131	4	60	NA	120-150 degrees upper	~ 88
811132	4	. 60	NA	150-180 degrees lower	~ 88
811133	4	60	NA	150-180 degrees upper	~ 88

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m <sup>2</sup> )
		· · · ·		1	12 - 14 K K - 14 - 14 - 14 - 14 - 14 - 14 - 14 - 14
811134	Reactor Bldg	60	NA	180-210 degrees lower	~ 88
811135	"	60	NA	180-210 degrees upper	~ 88
811136	u.	60	NA	210-240 degrees lower	~ 88
811137		60	NA	210-240 degrees upper	~ 88
811138	"	60	NA	240-270 degrees lower	~ 88
811139		60	NA	· 240-270 degrees upper	~ 88
811140	<i>44</i>	60	NA	270-300 degrees lower	~ 88
811141	"	60 🔶	NA	270-300 degrees upper	~ 88
811142	"	60	NA	300-330 degrees lower	~ 88
811143	"	60	NA	300-330 degrees upper	~ 88
811144		60	NA	330-360 degrees lower	~ 88
811145	u	60	NA	330-360 degrees upper	~ 88
811146	<i>ci</i>	-27	NA	North Containment stairwell -27 to -20	~50
811147	u	-20	NA	North Containment stairwell -20 to grade level	~50
811148	4	0	NA	North Containment stairwell Grade level to +40	~50
811149	4	40	NA	North Containment stairwell +40 to +60	~50
811150	u	-27	NA	South Containment stairwell -27 to -20	~50
811151	u	-20	NA	South Containment stairwell -20 to grade level	~50
811152	44	0	NA	South Containment stairwell Grade level to +40	~50

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#### SUID 811 - Reactor Containment Building

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m²)
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811153	Reactor Bldg	40	NA	South Containment stairwell +40 to +60	~50
811154	"	0	NA	Emergency Escape hatch	~50
811155	и	0 to 60	NA	Elevator/ shaft/ works	~100
811156	u		NA	Containment walls from +60 to Containment dome	
811157	4		NA	Containment dome	~1100
811158	4		NA		
811159	u		NA	Tendon gallery access and gallery proper	

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## SUID 811 - Reactor Containment Building

## SUID 812 - Spent Fuel Building

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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m <sup>2</sup> )
4.		16 830 - M	•	C.A.	- Créste
812001	Spent Fuel Building	+40	NA	SFB +40 column 9.3/H to 7.6/J	56
812002	e	+40	NA	SFB +40 column 9.3/J to 7.6/K	72
812003	14	+40	NA	SFB +40 walkways column 7.6/H to 4.3/K	90
812004	44	+40	NA	SFB +40 column 4.3/H to 3.4/K	6 <b>5</b> - 5
812005	и	+40	NA	SFB stairwells and platforms above +40 column 4.3/H to 3.4/K	40
812006	"	Grade level	NA	SFP - cask pit	15
812007	. 4	Grade level .	ŃA	SFP - SF rack area	95
812008	. 4	+15"	NA	SFP - cask temporary storage area.	15
812009	4		NA	SFP - Upender pit	35
812010	64	-4.5' to Grade	NA	SFB West wall below grade level (Cask pit wall)	35
812011	4	Grade to +20	NA	SFB east wall column 3.4 to 5.8 (N. 1/2 wall)	83
812012	"	Grade to +20	NA	SFB east wall column 5.8 to 7.5 (S. 1/2 wall)	56
812013	u	+20 to +40	NA	SFB east wall column 3.4 to 5.8 (N. 1/2 wall)	83
812014	64	+20 to +40	NA	SFB east wall column 5.8 to 7.5 (S. 1/2 wall)	56
812015		Grade to +20	NA	SFB South wall Column H to K	80

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SUID	812	- Spent	Fuel	Building
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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m <sup>2</sup> )
	r p. g1 (e.)-21	vis - Engel			1 0 0 :
812016	Ľ	+20 to +40	NA	SFB South wall column H to K	80
812017	16	Grade to +20	NA	SFB west wall column 3.4 to 5.8 (N. 1/2 wall)	83
812018	16	Grade to +20	NA	SFB west wall column 5.8 to 7.5 (S. 1/2 wall)	56
812019	<b>1</b> 4	+20 to +40	NA	SFB west wall column 3.4 to 5.8 (N. 1/2 wall)	83
812020	u	+20 to +40	NA	SFB west wall column 5.8 to 7.5 (S. 1/2 wall)	56
812021	<i>té</i>	Grade to +20	NA	SFB North wall Column H to K	83
812022	4	+20 to +40	NA	SFB North wall column H to K	56
812023		+40 to +60	NA	SFB North wall column H to K	125
812024		+40 to +60	NA	SFB West wall column 3.4 to 9.3	315
812025	ч	+40 to +60	NA	SFB East wall column 3.4 to 9.3	315
812026	14	Roof	NA	SFB roof	470

# SUID 813 - AUXILIARY BUILDING -47

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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approximate Area (m <sup>2</sup> )
					:
813001	Auxiliary Bldg	-47	001	West decay heat removal pump room - lower	90
813002	4	-47	001	West decay heat removal pump room - upper	90
813003	4	<b>-47</b>	. 002	East decay heat removal pump room - lower	90
813004	44	-47	002	East decay heat removal pump room - upper	90
813005		-47	003	Reactor coolant drain tank room - lower	90
· 813006	"	-47	003	Reactor coolant drain tank room - upper	90
813007	£6	-38 to -47 . 🕻	002	Stair well - landing east decay heat removal pump room	38
813008	"	-47 to -20	001	Stair well - decay heat removal pump rooms	50
813009	u	-20 to Grade	056 & 127	West stairwell -20 to grade level	45

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#### SUID 813 - AUXILIARY BUILDING -29

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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
	;	· · ·	;		
813045	Auxiliary Bldg	-29	036/057	Radwaste pump Area North wall to column 9.2	35
813046	и	-29	036/057	Radwaste pump Area Column 9.2 to column 11.7	55
813047	4	-29	036/057	Radwaste pump Area Column 11.7 to south wall	45
813048	56	-29	037	Conc. BA storage Tk Rm - Lower	95
813049	66	-29	037	Conc. BA storage Tk Rm - Upper	95
813050	4	-29	038	"B" Coolant Waste Hold-up Tk Rm - Lower	95
813051	4	-29	038	"B" Coolant Waste Hold-up Tk Rm - Upper	95
813052	4	-29	039	"A" Coolant Waste Hold-up Tk Rm - Lower	95
813053	45	-29	039	"A" Coolant Waste Hold-up Tk Rm - Upper	95
813054	45	-29	040	Spent Regen Tk Rm - Lower	95
813055	46	-29	040	Spent Regen Tk Rm - Upper	95
813056	4	-29	041	"A" Coolant Waste Receiver Tk Rm - Lower	95
813057		-29	041	"A" Coolant Waste Receiver Tk Rm - Upper	95
813058	14	-29	042	"B" Coolant Waste Receiver Tk Rm - Lower	95
813059	56	-29	042	"B" Coolant Waste Receiver Tk Rm - Upper	95

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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m <sup>2</sup> )
		· · · ·			
813010	Auxiliary Bldg	-20	010	Corridor -DHRC room(s)	25
813011	<b>46</b>	-20	011	Spray Add Tank Area	55
813012	64	-20	012	Flash Tank pump room	25
813013	4	-20	013	Letdown Filter room	10
813014	4	-20	014	Flash tank room	35
813015	"	-20	015	Corridor - Main east/west Columns P-T - lower	75
813016	41	-20	015	Corridor - Main east/west Columns P-T - upper	75
813017	"	-20	015	Corridor - Main east/west Columns T-V Upper/lower	50
813018	<b>66</b>	<b>-20</b>	016	Misc. Waste tank pump room	25
813019	4	-20	017 -	Misc. waste tank room	35
813020	4	-20	018	Waste gas decay tank room - lower	100
813021	.4	-20	018	Waste gas decay tank room - upper	100
813022	u	-20	- 019	DeBorating IX & Misc Waste Cond. Demin. Rm lower & upper	50
813023	64	-20	59	Waste gas valve gallery	19
813024	4	-20	020	Radwaste control panel area - lower	75
813025	4	-20	020	Radwaste control panel area - upper	75
813026	44	-20	021	Misc. Waste gas cond. Tank rm Iower	75

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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
· · ·	1	- Di lan	-17	20 H (104)	
813027	Auxiliary Bldg	-20	021	Misc. Waste gas cond. Tank rm upper	75
813028	4 ·	-20	022	Waste gas compressor room - lower	100
813029		-20	022	Waste gas compressor room - upper	100
813030	"		023	Misc. Waste Evap. Rm Lower	75 ·
813031	14	-20	023	Misc. Waste Evap. Rm upper	75
813032	56	-20	024	Misc. Waste concentrate Tk Rm - upper lower	35
813033	54	-20	025	BA Evap Rm - Lower	75
813034	45	-20	025	BA Evap Rm - Upper	75
813035	45	-20	026	Misc. Waste filter Rm	35
813036	u	-20	27	IX valve gallery	35
813037	ч	-20	28	IX Vault	5
813038	4	-20	29	IX Vault	5
813039	"	-20	30	IX Vault	5
813040	16	-20	31	IX Vault	5
813041	"	-20	32	IX Vault	5
813042	45	-20	33	IX Vault	5
813043	u	-20	34	IX Vauit	5
813044	4	-20	35	IX Vault	5
See - 29'	for SUID 045-059				
813060	Auxiliary Bldg	-20	043	"B" HPI Pump Rm - Lower	55

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
	•	:			•
813061	Auxiliary Bldg	-20	043	"B" HPI Pump Rm - Upper	55
813062	4	-20	044	Make-up Pump Rm - Lower & Upper	45
813063	s	-20	045	North-East -20 Corridor - Lower & Upper	35
813064	86	-20	046	Seal Return Cooler Rm - Lower & Upper	50
813065	66	-20	047	Spent Resin Tk Rm - Lower & Upper	10
813066	64 · ·	-20	048	Crud Tk Rm - Lower & Upper	5
813067	"	-20	049	Crud Tk Pump Rm - Lower & Upper	5
813068	<b>4</b>	-20	050	Radwaste Air Supply Fan Rm - Lower & Upper	20
813069	44	-20	051	East Decay Heat Removal Cooler Rm Column P-T - South of Column 9.7 - Lower	90
813070	54	-20	051	East Decay Heat Removal Cooler Rm Column P-T - South of Column 9.7 - Upper	90
813071	66	<b>-20</b>	051	East Decay Heat Removal Cooler Rm Column P-T - Between Column 9.7 - 9.1 Lower	90
813072	44	-20	051	East Decay Heat Removal Cooler Rm Column P-T - Between Column 9.7 - 9.1 Upper	90
813073	u	-20	051	East Decay Heat Removal Cooler Rm North of Column 9.1 Upper & Lower	50

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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
			:		
813074	Auxiliary Bldg	-20	052	West Decay Heat Removal Cooler Rm West of Column N Upper	95
813075	u	-20	052	West Decay Heat Removal Cooler Rm West of Column N Lower	95
813076	4	-20	052	West Decay Heat Removal Cooler Rm East of Column N Lower	100
813077	st	-20	052	West Decay Heat Removal Cooler Rm East of Column N Upper	100
813078		-20	053	"A" HPI pump Rm	40
813079	4	-20 to grade	056&127	West -20 to grade level stairwell	30
813080	14	-20	055	Sanitary sump Electric cable spreading room - west	1
813081	4	-20	055	Electric cable spreading room - West	65
813082	u	-20	054	Electric cable spreading room - East	50
813083	45	-20	061	NSEB Tunnel - West	55
813084		-20	062	NSEB Tunnel - East	55

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SUID #	Building/ Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
813085	Auxiliary Bldg	Grade to +20	101	Stairwell - #1	25
813086	"	Grade	102	Corner, east corridor grade	15
813087	"	Grade	103	Corridor	30
813088	<b>→ 4</b>	Grade	104	Corridor	35
813089	. 44 .	Grade	105	Corridor Column K-S	112
813090	55	Grade	105	Corridor Column H-K	45
813091	<b>55</b>	Grade	106	Chemical Storage Rm - Upper	100
813092	<b>4</b>	Grade	106	Chemical Storage Rm - Lower	100
813093	4	-20 to Grade	107	Central Stairwell - (#6)	20
813094	4	Grade	109	Machine shop (change area) North of column 11.7	55
813095	 66	Grade	109	Machine Shop (change area) south of column 11.7	40
813096	. 16	Grade	110	IX Access area column S-T	55
813097	u	Grade	110	IX Access area column T-U	55
813098	4	Grade	110	IX Access area Column U-V	55
813099	**	Grade	112 & 139	Waste Solidification area	50
813100	"	Grade	Stair #4	East stairwell grade to - 10	10
813101	. 4	Grade	• 113	Make-up Tank Rm.	45
813102	4	Grade	114	Make-up value area	10
813103	"	Grade to +20	115	Elevator #1	10

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#### SUID 813 - AUXILIARY BUILDING - Grade Level

SUID #	Building/ Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
			2		
813104	Auxiliary Bldg	Grade to +20	116	Stairwell #3	18
813105		Grade	117	Service Area Column L-N	43
813106	66	Grade	117	Service Area Column N-P	43
813107	4	Grade	117	Service Area column P-R	40
813108	u	Grade	118	Contaminated Garment Area Column R-S	40
813109	54	Grade	119	Nuclear Service Battery Room	38
813110	16	Grade	120	Nuclear Service Battery Room	38
813111	"	Grade	121	Switch Gear Room	265
813112	"	Grade	122	Cable Shaft	8
813113	и	Grade	123	Cable Shaft	8
813114	u	Grade	124	Switch Gear Room	265
813115	"	Grade	125	Nuclear Service Battery Room	38
813116	16	Grade	126	Nuclear Service Battery Room	38
813117	£6	Grade	128	Elevator Machine Room	12
813118	44	Grade to +20	129	Elevator #2	10
813119	"	Grade	130	Diesel Generator Room	112
813120	"	Grade to +20	131	Stairwell #2	10
813121	"	Grade	132	Diesel Generator Room	112
813122	"	+10	133	Chemical Storage Balcony	67
813123	16	Grade	134	Decon Room	55
813124	4	Grade	135	Toilet	8

## SUID 813 - AUXILIARY BUILDING - Grade Level

SUID #	Building/ Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
			1		
813125	Auxiliary Bldg	Grade	136	Make Up Filter Vaults	10
813126	"	Grade	137	Make up filter valve gallery	7
813127	4	Grade	138	Transition room AB grade to Tank Farm	12
813128	4	Grade	139	Enclosure W/I solidification room	10
813129	۰. ۲	Grade	NA	Area between AB, SFB, & RB south of column 5.6	120

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#### SUID 813 - AUXILIARY BUILDING - Grade Level

SUID 813 - AUXILIARY BUILDING +20 Mezzanine

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Elevation Approx. Area (m<sup>2</sup>) Relative to Room Name or Grid Coordinates SUID # Building/Area Grade Room # ·\_ ..... · . . . . .... . . .... . Auxiliary Bldg +20 201 Stairwell #1 +20 to +40 813130 25 Mezzanine roof area Columns " +20 T-V & 8.5-13 450 813131 " 813132 +20 202 Elevator Machine Room 20 44 203 +20 to +40 Elevator #1 10 813133 AND **+20** 204 A/C Equipment room 160 813134 1**4** Ky +20 206 813135 Corridor 45 +20 2 66 207 Corridor 813136 150 **4** - 1 15-<sup>-</sup> 813137 +20 208 Duct Space 66 813138 +20 209 90 **Electrical Penetration room** 

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
813139	Auxiliary Bldg	+20 to +40	210	Stairwell #3	18
813140	sc	+20	211	Ventilation Equipment room	245
813141	45	+20	212	AC/DC Panel room	. 27
813142	64	+20	213	AC/DC Panel room	27
813143	"	+20	214	Electrical equipment room	255
813144	"	+20	215	Cable shaft	15
813145	56	+20	216	Cable Shaft	15
813146	**	+20	217	Electrical equipment room	175
813147	56	+20	218	AC/DC Panel room	27
813148		+20	219	AC/DC Panel room	27
813149	u	+20	220	Station Battery room	85
813150	64	+20 to +40	221	Elevator #2	10
813151	u	+20 to +40	222	Stairwell #2	18
813152	"	+20	223	Storage room (behind Elevator #2)	7
813153	66	+20	224	Communications room	150
813154	"	+20	225	Sample cooler chiller room	35
813155	4	+20	NA	"Fan platforms (2)" south of sample cooler room	41
813156	4	+20	226	Corridor & mezzanine landing (bounded by column K8.1- 9.3/K1, 9.3/L8.7-8.1)	
813157	"	+20	227	Control Rod Pit	5
813158		+20	228	Pipe Way	15

#### SUID 813 - AUXILIARY BUILDING +20 Mezzanine

					· · · · · · · · · · · · · · · · · · ·	
	SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m <sup>2</sup> )
				!		
	813159	Auxiliary Bldg	+40	301	Stairwell #1 +40 to +60	25
	813160	4	+40	302	Corridor	50
	813161	. "	+40	303	Vestibule	6
	813162	u	+40	304	Janitor locker	10
	813163	<b>4</b>	+40	305	Clean Toilet	25
	813164	د.	+40 🗄	306	Clean Shower	- 25
	813165	<b>44 .</b>	+40	307	Shower drying area	10
	813166	44	+40	308	· Clean Locker room	75
	813167	4	+40	NA	Woman's locker room	10
:	813168	4	+40	309	Instrument Issue Room (Anti- C storage)	8
	813169	66	+40	310	Decon Disrobing area	12
	813170	<b>6</b> 6	+40	311	Control Point	45
	813171	66 · ·	+40	312	Decon Shower	10
	813172	64	+40	313	Contaminated Toilet	5
	813173	66	+40	314		
	813174	44	+40	315	Elevator #1	10
I	813175	.4	2+ <b>40</b>	316	Clean Garment Storage (RP FIELD OFFICE)	30
	813176	66	+40	317	Containment lay down area	33
	813177	44	. +40 <sup>-</sup>	318	Stairwell #3	18
	813178	"	+40	319	Primary Sample Station	32

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## SUID 813 - AUXILIARY BUILDING + 40

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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m <sup>2</sup> )
(767)	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -		ert,		
813179	Auxiliary Bldg	+40	320	Radio Chemistry Room	32
813180	46	+40	321	Radio Chemistry Count Room	25
813181	sc 	+40	322	Corridor	95
813182	4	+40	323	Chemical Storage (Instrument Repair Room )	35
813183	4	+40	324	Calibration and Source storage Room	32
813184	<b>65</b>	+40	325	Storage room	12
813185	55	+40	326	Chemical Storage Room	10
813186	46	+40	327	Secondary Sample Station	25
813187	£\$	+40	328	Secondary Laboratory	38
813188	44	+40	329	Corridor	156
813189	4	+40	330	HP office (Tech drone room)	36
813190	16	+40	331	HP Supervisor's Office	10
813191	4	+40	332	Calculation and Data Storage Room	20
813192	45	+40	333	Corridor	37
813193	46	+40	334	Technical Support Center (TSC)	130
813194	64	+40	335	Conference Room #1	23
813195	44	+40	336	Conference Room #2	23
813196	4	+40	337		
813197		· +40	338	Computer Room	150

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
۰	• • • • •		273 · · · ·		, , ,
813198	Auxiliary Bldg	+40	339	Control Room	60
813199	66	+40	340	Shift Supervisor Office	15
813200	46	+40	341	Alcove	20
813201	<i>26</i>	+40	342	Control Room Kitchen	25
813202	<b>64</b>	+40	343	Control Room Rest Room	8
813203	_ 4	+40	344	Corridor	23
813204	64	+40	345	Stairwell #2 +40 to +60	10
813205	66	+40 🌧	346	Elevator #2	10
813206	84	+40	347		
813207	26	+40	348		
813208	u a	+40	349	Conference Room (weight Room)	52
813209	66	+40	<b>350</b> )	Corridor	4
813210	<b>64</b>	+40	351	Equipment access room	6
813211	66	+40	352	Closet (weight room)	5
813212	<b>44</b>	+40	353	Water closet	6

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## SUID 813 - AUXILIARY BUILDING - Roof

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
•			) 		
813213	Auxiliary Bldg	+60	Roof	Roof - West of column N	980
813214		+60	Roof	Roof - East of Column N	975

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
		· · · · · · · · · · · · · · · · · · ·	,		· · · · ·
814001	T&R BLDG	Grade	NA	AC 33 - AB35 of RSNGS Plot Plan	1400
814002		Second Floor	NA	AC 33 - AB35 of RSNGS Plot Plan	1400
814003	"	Third Floor	NA	AC 33 - AB35 of RSNGS Plot Plan	1400
814004	"	Fourth Floor	NA	AC 33 - AB35 of RSNGS Plot Plan	1400
814005	4	Fifth Flow	NA	AC 33 - AB35 of RSNGS Plot Plan	1400
814006	4	Roof	NA	AC 33 - AB35 of RSNGS Plot Plan	1400

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## SUID 815 - Nuclear Services Electrical Building (NSEB)

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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
÷			· · ·	· 1	
815001	NSEB	Grade	NA	AC 32 - AB 32 of RSNGS Plot Plan	425
815002	56	+20	NA	AC 32 - AB 32 of RSNGS Plot Plan	425
815003	56	+40	NA	AC 32 - AB 32 of RSNGS Plot Plan	425
815004	56	Roof	NA	AC 32 - AB 32 of RSNGS Plot Plan	425

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## SUID 816 - Control Alarm Station (CAS)

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
		· · · · · ·			
816001	CAS	Grade	• <b>NA</b> <sup>2</sup> *	AD 33- AC 33 of RSNGS Plot Plan	200
816002	CAS	Roof	NA	AD 33- AC 33 of RSNGS Plot Plan	200

## SUID 817 -TDI Diesel Generator Building / Cask Storage Facility

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
~		`	- · · · ·		
817001	TDI BUILDING/CSF	Grade	NA	AF 33 - AE 34 of RSNGS Plot Plan	700
817002	TDI Building/CSF	Roof	NA	AF 33 - AE 34 of RSNGS Plot Plan	700

## **SUID 818 - Electrical Fabrication Shop**

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
818001	Electrical Fabrication S procedures.	Shop to be demo	olished and	released prior to FSSS under	existing

## SUID 820 - L&D Building

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
	- u		- :		, 
820001	L&D Building to be der	molished and rel	eased prio	r to FSSS under existing proce	edures.

#### SUID 823 - Intake structure

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
	i i stati		· · · · · · · · · · · · · · · · · · ·		
823001	Intake Pump Structure	Grade	NA	X 30 of RSNGS Plot Plan	375

#### SUID 826 - TURBINE BUILDING

				· · · · · · · · · · · · · · · · · · ·	
SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
					1
826001	Turbine Bldg	-7' to grade	NA	MFP pit - column A/3 to B/5	52
826002	"	-7' to grade	NA	MFP pit - column B/3 to C/5	92
826003	. 64	-7' to grade	NA	MFP pit - column C/3 to D/5	92
826004	4	-15.5' to grade	NA	Condensate Pump Pit column D6 to E8	82
826005	"	-9.5' to grade	NA	Condenser Pit column D7 to E4.6 (approx.)	55
826006	u	-9.5' to grade	NA	Condenser Pit column D7 to E9.4 (approx.)	55
826007	4	-10' to grade	NA	Condenser Tube Pulling Pit West of column B and North of Column 7	91
826008		-10' to grade	NA	Condenser Tube Pulling Pit West of column B and South of Column 7	91
826009	"	-9.5' to grade	NA	Condenser Pit column B5 to C7	91
826010	Ľ	-9.5' to grade	NA	Condenser Pit column C5 to D7	91
826011	<b>4</b>	-9.5' to grade	NA	Condenser Pit column B7 to C9	91
826012	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	-9.5' to grade	NA	Condenser Pit column C7 to D9	91
826013	6	Grade to Mezzanine	NA	Turbine building Column A/2 to H/6	925
826014	an a	Grade to Mezzanine	NA	Turbine building Column A/6 to H/10	930
826015	"	Grade to Mezzanine	NA	Turbine building Column A/10 to H/13	745

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#### SUID 826 - TURBINE BUILDING

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
	1	· · ·	!		:
826016	Turbine Bldg	Mezzanine to + 39.5'	NA	Turbine building Column A/2 to H/6	925
826017		Mezzanine to + 39.5'	NA	Turbine building Column A/6 to H/10	930
826018	"	Mezzanine to + 39.5'	NA	Turbine building Column A/10 to H/13	745
826019	4	Turbine deck	NA	Turbine Deck 0 - 80 feet south column 2 (Including north gantry catwalks)	940
826020	4	Turbine deck	NA	Turbine Deck 80 -160 feet south column 2	940
826021	66	Turbine deck	NA	Turbine Deck 160 - 222 feet south column 2 (Including south gantry catwalks)	725
826022		Grade level	NA	North laydown column A2 - H1	365
826023	4	Grade level	NA	North laydown column A1 - H <sup>1</sup> X <sub>1</sub>	725
826024	4	Grade level	NA	South laydown area column	500
826025	4	Grade level	NA	Transformer pad between AB and NSEB	175
826026		+ 40'	NA	Station service transformer pad adjacent to AB door AU346	39
826027	4	+40	NA	Walkway from AB to turbine deck at AU346	18
826028	4	+40	NA	Control room emergency exit and vital station service transformer enclosure	46

### SUID 826 - TURBINE BUILDING

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
			· · ·		
826029	Turbine Bldg	+40	NA	Aux Building ventilation intake structure	41

## SUID 827 - Tool Room

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	- Tool Room Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m <sup>2</sup> )
827001	Tool Room to be d	emolished and	released pri	or to FSSS under existing	procedures.

### SUID 828 - GRS Warehouse

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
•				-	
828001	GRS Warehouse to b	e demolished a	nd release	d prior to FSSS under existing	procedures.

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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
		•	•	•••• · · · · · · · · · · · · · · · · ·	·
830001	IOS Perimeter	grade	NA	U24 of RSNGS plot plan	750
830002	4	grade	NA	U23 of RSNGS plot plan	425
830003	24	grade	NA	U22 of RSNGS plot plan	800
830004	14	grade	NA	V22 of RSNGS plot plan	750
830005	56	grade	NA	V23 of RSNGS plot plan	425
830006		grade	NA	V24 of RSNGS plot plan	750

## SUID 830 - Interim On-Site (Radwaste) Storage Building (IOSB)

## SUID 833 - Warehouse "B"

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
	· · · · · · · · ·		;	and and a second se	4 <sub>1</sub> = 1 = 2
833001	"B" warehouse	Grade	NA	Y 26-28 of RSNGS plot plan	1400

#### SUID 834 - Turbine Rotor Storage Shed

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
834001	Turbine rotor shed	Grade		Y25-26 of RSNGS plot plan	

#### SUID 836 - Aux Boiler Pad

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
•		· · · · · · · · · · · · · · · · · · ·			
836001	Auxiliary Boiler Pad	Grade	NA	Aux Boiler Pad Z29-30 of RSNGS Plot Plan	1860

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## SUID 837 - Regenerant Holdup Tanks

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
· · · · ·		· · · · · · · · · · · · ·			1
837001	"A" RHUT	· · ·	<u> </u>	AA29 of RSNGS Plot Plan	
837002	"B" RHUT	•	;	AB29 of RSNGS Plot Plan	60
837003	"C" RHUT			AC29/30 of RSNGS Plot Plan	60

## SUID 838 - FAB Shop (GRS)

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
Ð.,		Sizt 1	•1	o de la companya de l	10°°° -
838001	Fab Shop (GRS)	Grade	NA	AD30 of RSNGS plot plan	1025

### SUID 839 – Transformer Yard

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
		Y			
839001	Transformer Yard West of Turbine Building	Grade	NA	AA30 – AC31 of RSNGS plot plan	1860

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#### SUID 840 - Warehouse "A"

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
·-·			- '	- · · · · · · · · · · · · · · · · · · ·	· · · · · · · ·
840001	Warehouse "A"	Grade	NA	AA29 – AB28 of RSNGS plot plan	975

## SUID 842 - Warehouse "C"

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
1				Maria de Calada	# C118
842001	Warehouse "C"	Grade	NA	AF31 of RSNGS plot plan	235

## SUID 851 - Switchyard

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SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
851001	Switchyard	Grade	ı N/A	AA22 to AC27 of the RSNGS Plot Plan w/e control building (extends outside of switchyard fencing)	16725
851002	Switchyard	grade	· N/A	Z22 to Z27 of the RSNGS Plot Plan W/E of Trackage and Turbine Rotor Shed (extends outside of switchyard fencing)	4185
851003	Switchyard Control Building	grade	N/A	AC26 of the RSNGS Plot Plan	225
851004	Switchyard storage yard	grade	••••••••••••••••••••••••••••••••••••••	AD22 to AE27 of the RSNGS Plot Plan (extends outside of switchyard fencing)	11150

## SUID 852 - Machine Shop

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
852001	Machine Shop	grade	N/A	AB28 of RSNGS plot plan	465

## SUID 853 - Contractor Fab Shop

SUID #	Building/Area	Elevation Relative to Grade	Room #	Room Name or Grid Coordinates	Approx. Area (m²)
853001	Fab Shop	Grade	N/A		

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## **Appendix D**

# Miscellaneous Location and Earthquake Data and Figures

- 1. USGS National Mapping Information for Rancho Seco Power Plant
- 2. Industrial Area Overhead Photograph
- 3. USGS Rancho Seco regional map (400 km radius)
- 4. USGS Rancho Seco regional map (50 km radius)
- 5. USGS Earthquake Data Base search results magnitude 4.0 or greater within an 80.5 km (50 mile) radius
- 6. USGS Seismicity of California 1990 2001 (pictogram)

### 1. USGS National Mapping Information for Rancho Seco Power Plant **USGS** National Mapping Information

10.1 <u>Feature Name:</u>	10.2 <u>Rancho Seco Power Plant</u>				
Feature Type:	Building				
State:	California				
County:	Sacramento				
USGS 7.5' x 7.5' Map:	Goose Creek				
latitude (nn°nn'nn"):	382040N				
Longitude (nnn°nn'nn"):	1210712W				

U.S. Department of the Interior || U.S. Geological Survey 12201 Sunrise Valley Drive, Reston, VA 20192, USA

DMS 121 07 12	DMS 38 20 40
DM.m 121 7.2	DM.m 38 20.666666666666
D.d 121.12	D.d 38.344444444

The formulas are as follows:

Degrees Minutes Seconds to Degrees Minutes.m Degrees = Degrees Minutes.m = Minutes + (Seconds / 60)

Degrees Minutes.m to Decimal Degrees .d = M.m / 60 Decimal Degrees = Degrees + .d Directions Magazine: <u>Masthead | Contact Us | Advertising</u>

@1998-2003 Directions Magazine. All Rights Reserved. Privacy Statement Questions and comments to: website@directionsmag.com 2. Industrial Area Overhead Photograph







Credit: U. S. Geological Survey

Attp://geonames.usgs.gov/pls/gnis/MapServer?f\_name=Rancho+Seco+Power+Plant&f\_state=CA&f\_latlong=382040N1210712W&f\_ht=8&server=TIGER

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#### 4. USGS Rancho Seco regional map (50 km radius)



Credit: U. S. Geological Survey

Attp://geonames.usgs.gov/pls/gnis/MapServer?f\_name=Rancho+Seco+Power+Plant&f\_state=CA&f\_latlong=382040N1210712W&f\_ht=1&server=TIGER

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5. USGS Earthquake Data Base Search Results - Magnitude 4.0 or Greater within an 80.5 km (50 mile) Radius

## **NEIC: Earthquake Search Results**

U. S. GEOLOGICAL SURVEY

EARTHQUAKE DATA BASE

FILE CREATED: Thu Jan 8 14:21:59 2004 Circle Search Earthquakes= 4 Circle Center Point Latitude: 38.350N Longitude: 121.120E Radius: 80.500 km Catalog Used: PDE Magnitude Range: 4.0 - 12.0 Data Selection: Historical & Preliminary Data

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CAT	YEAR	MO DA	ORIG TIME	. LAT	LONG	DEP	MAGNITUDE	IEFM DTSVNW( NFPO TFS	; DIST kam
PDE	1985	11 23	004713.67	38.68	121.20	33	4.60 mb GS		37
PDE	1991	O3 13	163117.99	37.94	121.09	33	4.30 MLBJI		45
PDE	1997	04 12	070507.48	38.31	120.53	33	4.50 mb GS		52
PDE	1997	09 18	063201.35	38.08	121.20	33	4.80 mb GS	••••	31

Credit: USGS National Earthquake Information Center

😰 N=121.12W&CRAD=80.50085YEAR=85MONTH=85DAY=8EYEAR=8EMONTH=8EDAY=8LMAG=4.08LIMAG=12.08NDEP1=8NDEP2=8JO1=8JO2=85UBMIT=5ubmit+5carch

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6. USGS Seismicity of California 1990 - 2001 (pictogram)

Earthquake locations are from the USGS/NEIC PDE catalog.

Credit: USGS National Earthquake Information Center

# **Appendix E**

# Miscellaneous Historical Construction Photographs



December 27, 1968 – Clay access road and Clay East road intersection

 $\{e_{i}^{*}, i_{i}^{*}\} \in \{e_{i}^{*}, e_{i}^{*}\}$ 

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March 10, 1969 – Site Preparation, looking south at rough grading in turbine and reactor area



March 10, 1969 – Site Preparation, looking north at first rough grading cut into the turbine area

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April 4, 1969 – Site Preparation, looking north along the east edge of the reactor containment structure



May 1, 1969 – Site Preparation, Twin Cities access road looking north



September 9, 1969 – forming for the fill concrete under the tendon access gallery floor slab


October 10, 1969 – concrete placement in reactor building tendon access gallery walls



November 11, 1969 - a view of the shop and warehouse construction taken from the tower crane



February 9, 1970 – installing floor liner plate on reactor building floor slab





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E - 11



April 23, 1970 - reinforcing steel and tendon sheathing for the first lift of the containment wall



April 23, 1970 – overall view looking northeast



April 24, 1970 – 108" diameter circulating water pipe forming and reinforcement for concrete encasements



May 28, 1970 – looking west at the auxiliary building subbasement wall with the turbine building in the background



May 28, 1970 – view looking south at the turbine building with the reactor and auxiliary buildings on the extreme left



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May 28, 1970 – view looking south at the turbine and reactor buildings



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July 17, 1970 – auxiliary building showing reinforcing being placed