APPENDIX A
HISTORICAL INFORMATION

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

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

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

Section A2.0

A2.1.2.2 Control of Activities Unrelated to Plant Operation

. . .

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

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

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

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

A2.1.3.1.1 Population

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

REFERENCES:

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

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

A2.1.3.1.2 Population in the Vicinity of the LPZ

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

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

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

REFERENCE:

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

A2.2 HYDROLOGY

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

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

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

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

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

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

A2.3 METEOROLOGY

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

Meteorology and Climatology

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

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

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

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

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

A2.3.1 General Meteorological Conditions for Design and Operating Bases

A2.3.1.1 Temperature

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

A2.3.1.2 Precipitation

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

A2.3.1.3 Wind and Stability at the Plant Site

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

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

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

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

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

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

<u>Section A5.0</u>

A5.1 SOURCE TERMS

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

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

A5.1.1 SPENT FUEL ACTIVITY

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

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

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

A5.1.2 CORROSION PRODUCT ACTIVITIES AND DEPOSITED CORROSION PRODUCTS

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

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

A5.1.3 AUXILIARY SYSTEMS ACTIVITY

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

A5.1.4 TRITIUM ACTIVITY IN THE REACTOR COOLANT

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

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

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

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

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

REFERENCE

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

A5.1.8 OPERATIONAL EXPERIENCE

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

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

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

REFERENCES

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

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

A5.2.4 Estimated (Liquid) Releases

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

TABLE A2-1

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

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

*Excludes traverses of highway, rail, and waterway.

TABLE A2-2

MONTHLY TEMPERATURES AND PRECIPITATION
AT CAMP PENDLETON SURF AND WEATHER STATION

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

TABLE A2-3

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

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

TABLE A2-4

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

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

TABLE A2-5

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

(Percent Frequency of Occurrence)

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

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

TABLE A2-6

STABILITY MEASUREMENTS
(Percent Frequency of Occurrence)

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

Table A2-7-1

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

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

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

UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0	0.0	0.0	0.000
0.45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.005	0.0	0.0	0.0	0.005
0.89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.005	0.002	0.0	0.0	0.0	0.0	0.007
1.34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.024	0.049	0.049	0.019	0.019	0.007	0.0	0.0	0.167
1.79	0.0	0.0	0.0	0.0	0.0	0.0	0.002	0.007	0.080	0.277	0.336	0.270	0.106	0.026	0.002	0.002	1.109
2.24	0.0	0.005	0.0	0.0	0.0	0.0	0.002	0.033	0.270	0.393	0.691	0.745	0.508	0.096	0.009	0.012	2.764
2.68	0.002	0.002	0.0	0.002	0.0	0.005	0.009	0.075	0.289	0.583	0.837	0.905	1.394	0.190	0.007	0.0	4.301
3.13	0.007	0.002	0.0	0.0	0.0	0.0	0.012	0.080	0.400	0.538	0.759	1.267	1.763	0.496	0.007	0.0	5.331
3.58	0.0	0.005	0.0	0.0	0.002	0.002	0.033	0.162	0.348	0.465	0.510	0.877	1.615	0.639	0.014	0.0	4.673
4.02	0.005	0.007	0.0	0.0	0.0	0.005	0.031	0.143	0.294	0.334	0.289	0.538	1.236	0.550	0.009	0.0	3.441
4.47	0.007	0.009	0.0	0.002	0.0	0.002	0.035	0.136	0.308	0.212	0.110	0.244	0.663	0.414	0.021	0.0	2.165
4.92	0.002	0.0	0.002	0.0	0.0	0.002	0.012	0.125	0.172	0.087	0.054	0.080	0.249	0.256	0.016	0.002	1.060
7.15	0.005	0.028	0.009	0.005	0.002	0.014	0.061	0.247	0.200	0.068	0.052	0.080	0.294	0.463	0.038	0.002	1.518
TOTAL	0.03	0.06	0.01	0.01	0.00	0.03	0.20	1.01	2.38	3.01	3.69	5.03	7.00	3.14	0.12	0.02	26.54

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

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

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

UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.002	0.0	0.007	0.002	0.0	0.0	0.0	0.012
1.34	0.009	0.005	0.0	0.0	0.0	0.0	0.002	0.012	0.031	0.035	0.024	0.040	0.019	0.014	0.0	0.002	0.193
1.79	0.005	0.005	0.005	0.0	0.0	0.002	0.005	0.028	0.056	0.059	0.078	0.073	0.066	0.066	0.016	0.005	0.468
2.24	0.007	0.014	0.002	0.0	0.002	0.002	0.039	0.045	0.059	0.045	0.042	0.060	0.108	0.099	0.019	0.014	0.548
2.68	0.009	0.005	0.0	0.002	0.0	0.002	0.031	0.071	0.073	0.045	0.028	0.080	0.089	0.085	0.016	0.0	0.536
3.13	0.002	0.012	0.007	0.0	0.002	0.002	0.021	0.063	0.061	0.042	0.042	0.028	0.040	0.125	0.021	0.002	0.472
3.58	0.002	0.005	0.005	0.0	0.0	0.002	0.014	0.073	0.033	0.042	0.031	0.033	0.024	0.047	0.026	0.0	0.336
4.02	0.002	0.005	0.0	0.002	0.0	0.0	0.033	0.073	0.035	0.019	0.007	0.042	0.016	0.038	0.026	0.0	0.299
4.47	0.0	0.002	0.002	0.005	0.0	0.002	0.019	0.047	0.031	0.012	0.009	0.014	0.005	0.019	0.031	0.005	0.202
4.92	0.002	0.002	0.002	0.002	0.0	0.0	0.012	0.059	0.016	0.009	0.009	0.007	0.002	0.021	0.016	0.002	0.165
7.15	0.009	0.009	0.012	0.005	0.002	0.033	0.052	0.132	0.042	0.016	0.035	0.035	0.049	0.052	0.024	0.007	0.515
TOTAL	0.05	0.06	0.04	0.02	0.01	0.05	0.20	0.60	0.44	0.33	0.31	0.44	0.42	0.56	0.20	0.04	3.74

Table A2-7-2

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

UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.22	0.002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0	0.0	0.0	0.000	0.0	0.0	0.002
0.45	0.009	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.002	0.0	0.0	0.0	0.002	0.0	0.0	0.014
0.89	0.038	0.035	0.014	0.005	0.002	0.012	0.012	0.019	0.047	0.042	0.042	0.049	0.049	0.045	0.049	0.038	0.498
1.34	0.233	0.165	0.049	0.052	0.042	0.052	0.101	0.160	0.240	0.197	0.230	0.214	0.263	0.174	0.197	0.176	2.545
1.79	0.360	0.263	0.092	0.066	0.068	0.127	0.251	0.484	0.402	0.324	0.249	0.336	0.371	0.421	0.353	0.270	4.438
2.24	0.235	0.362	0.129	0.068	0.122	0.233	0.526	0.517	0.407	0.219	0.190	0.197	0.249	0.357	0.306	0.193	4.311
2.68	0.150	0.355	0.096	0.045	0.143	0.254	0.686	0.552	0.322	0.181	0.120	0.141	0.221	0.301	0.350	0.143	4.061
3.13	0.071	0.212	0.031	0.007	0.118	0.230	0.689	0.468	0.244	0.181	0.089	0.132	0.108	0.219	0.277	0.075	3.150
3.58	0.028	0.108	0.012	0.007	0.052	0.143	0.515	0.397	0.193	0.110	0.056	0.094	0.085	0.125	0.216	0.089	2.231
4.02	0.005	0.049	0.007	0.005	0.009	0.078	0.418	0.263	0.157	0.063	0.045	0.071	0.052	0.118	0.179	0.014	1.532
4.47	0.012	0.031	0.007	0.005	0.009	0.061	0.336	0.207	0.089	0.061	0.035	0.031	0.047	0.089	0.115	0.026	1.161
4.92	0.007	0.014	0.002	0.012	0.005	0.026	0.183	0.186	0.073	0.040	0.047	0.042	0.028	0.054	0.099	0.009	0.827
7.15	0.016	0.038	0.040	0.028	0.068	0.141	0.447	0.639	0.362	0.251	0.183	0.223	0.322	0.204	0.200	0.021	3.185
TOTAL	1.17	1.63	0.48	0.30	0.64	1.36	4.16	3.89	2.64	1.67	1.29	1.53	1.80	2.11	2.34	1.06	27.96

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

UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.000
0.45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.002	0.002	0.002	0.0	0.0	0.0	0.0	0.0	0.0	0.007
0.89	0.061	0.096	0.068	0.056	0.033	0.012	0.047	0.040	0.024	0.031	0.026	0.016	0.014	0.009	0.038	0.014	0.585
1.34	0.244	0.566	0.172	0.127	0.134	0.132	0.141	0.143	0.118	0.035	0.061	0.052	0.078	0.061	0.056	0.054	2.174
1.79	0.360	0.926	0.193	0.183	0.179	0.153	0.315	0.146	0.085	0.042	0.063	0.071	0.054	0.096	0.080	0.087	3.032
2.24	0.310	0.738	0.153	0.103	0.134	0.174	0.212	0.122	0.049	0.016	0.031	0.042	0.080	0.094	0.085	0.127	2.470
2.68	0.273	0.501	0.054	0.068	0.082	0.115	0.228	0.071	0.012	0.005	0.005	0.012	0.061	0.110	0.108	0.101	1.805
3.13	0.195	0.404	0.009	0.014	0.049	0.047	0.167	0.063	0.014	0.012	0.012	0.009	0.033	0.141	0.099	0.106	1.375
3.58	0.113	0.226	0.014	0.012	0.021	0.026	0.085	0.047	0.002	0.002	0.007	0.012	0.035	0.087	0.059	0.021	0.769
4.02	0.049	0.108	0.021	0.007	0.012	0.012	0.073	0.021	0.007	0.005	0.009	0.007	0.021	0.059	0.059	0.026	0.496
4.47	0.031	0.035	0.021	0.007	0.005	0.007	0.056	0.026	0.007	0.002	0.012	0.007	0.005	0.061	0.045	0.016	0.343
4.92	0.024	0.035	0.014	0.007	0.005	0.002	0.024	0.007	0.007	0.002	0.002	0.0	0.014	0.024	0.028	0.014	0.209
7.15	0.019	0.078	0.122	0.056	0.014	0.019	0.190	0.132	0.071	0.071	0.045	0.014	0.120	0.132	0.059	0.019	1.159
TOTAL	1.68	3.71	0.84	0.64	0.67	0.70	1.54	0.82	0.40	0.23	0.27	0.24	0.51	0.87	0.71	0.59	14.42

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

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

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

Table A2-7-3

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

TOTAL HOURS CONSIDERED ARE 42546

WIND MEASURED AT 10.0 METERS.

OVERALL WIND DIRECTION FREQUENCY

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

OVERALL WIND SPEED FREQUENCY

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

THE CONVERSION FACTOR APPLIED TO THE WIND SPEED CLASSESS IS 0.447

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

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

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

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

Table A2-7-4

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

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

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

VENT AND BUILDING PARAMETERS:

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

ALL GROUND LEVEL RELEASES.

TABLE A5-1

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

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

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

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

TABLE A5-2

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

Sheet 1 of 2

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

TABLE A5-2

Sheet 2 of 2

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

TABLE A5-3

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

Source and Energy Group, MeV	Time After Shutdown						
	0	1 h	2 h	8 h	1 day	1 wk	1 mo
	Radiation Sources Released, MeV/%						
0.4	1.0×10^{14}	1.0×10^{14}	9.9×10^{13}	9.4×10^{13}	8.0×10^{13}	3.6×10^{13}	1.9×10^{12}
0.8	9.2×10^{13}	8.0×10^{13}	7.8×10^{13}	7.6×10^{13}	7.4×10^{13}	6.9×10^{13}	6.9×10^{13}
1.7	1.5×10^{13}	9.7×10^{12}	6.5×10^{12}	5.2×10^{12}	$2.9.x.10^{11}$	2.9×10^{10}	1.9×10^{10}
2.5	4.8×10^{13}	3.1×10^{13}	2.3×10^{13}	2.9×10^{12}	9.0×10^{11}	-	-
Isotope	Iodine Activities, Ci						
I-131	267.0	267.0	267.0	260.0	244.0	147.0	20.0
I-132	88.0	66.0	50.0	0.6	0.086	neg	neg
I-133	363.0	351.0	340.0	279.0	163.0	13.0	neg
I-134	50.2	22.5	9.6	0.096	neg	neg	neg
I-135	189.0	172.0	154.0	82.3	15.7	neg	neg

UNIT 1 RADIOACTIVE RELEASES 1968-1996
TABLE A5-4

	AIRBORNE				LIQUIDS		
	FISSION/ ACTIVATION GASES	IODINE	PARTICULTE	TRITIUM	FISSION/ ACTIVATION PRODUCTS	DISSOLVED & ENTRAINED GASES	TRITIUM
1968	4.83E+00				1.64 E+00		
1969	2.56E+02			2.48E+00	8.00E+00		3.53E+03
1970	1.61E+03			1.08E+01	3.76E+00		4.77E+03
1971	5.99E+03			5.36E+01	9.51E-01		4.57E+03
1972	1.91E+04			2.81E+02	3.03E+01		3.48E+03
1973	1.07E+04	6.51E-01	1.18E+00	2.69E+02	1.60E+01	5.36E+01	4.07E+03
1974	1.78E+03	2.31E-04	8.74E-05	9.14E+01	5.03E+00	3.37E+00	3.85E+03
1975	1.79E+03	2.46E-01	3.58E-02	3.43E+01	1.22E+00	4.74E+00	4.00E+03
1976	4.17E+02	4.48E-03	1.11E+00	4.72E+01	7.39E+00	1.25E+01	3.39E+03
1977	1.67E+02	1.81E-04	4.83E-06	7.57E+01	5.10E+00	4.53E+00	1.79E+03
1978	2.20E+03	2.76E-04	2.49E-03	5.75E+01	1.22E+01	1.82E+00	4.21E+03
1979	7.99E+02	2.44E-04	3.68E-05	4.27E+01	1.20E+01	2.73E+01	3.35E+03
1980	1.05E+03	2.53E-04	8.41E-01	3.69E+01	1.12E+01	2.90E+00	1.03E+03
1981	4.22E+02	8.68E-03	3.12E-02	1.40E+01	4.16E+00	4.94E-01	2.97E+02
1982	8.61E+01	<LLD	4.66E-07	5.63E+01	2.15E+00	<LLD	5.45E+02
1983	1.06E+01	2.92E-06	2.52E-06	3.93E+00	1.22E+00	<LLD	1.57E+01
1984	8.62E+01	6.78E-06	2.71E-06	<LLD	2.74E+00	2.30E-01	3.39E+01
1985	3.83E+03	1.14E-03	2.49E-05	2.89E+01	7.79E+00	3.12E+01	2.38E+03
1986	4.11E+02	1.99E-04	9.34E-06	1.70E+00	8.51E-01	9.80E-01	4.53E+02
1987	9.81E+02	4.10E-04	7.11E-06	1.51E+01	8.42E-01	1.89E+00	2.27E+03
1988	2.99E+03	1.03E-02	50.7E-04	2.05E+01	7.11E-01	1.46E+01	1.53E+03
1989	1.12E+03	2.09E-03	1.37E-04	3.37E+01	6.66E-01	8.03E+00	9.62E+02
1990	1.80E+03	7.22E-03	2.76E-05	9.13E+01	4.00E-01	5.47E+00	1.42E+03
1991	2.49E+03	1.51E-03	9.90E-04	1.68E+01	4.20E-01	3.04E+00	1.25E+03
1992	4.12E+03	1.57E-02	1.12E-05	5.19E+01	3.42E-01	3.12E+00	3.05E+03
1993	4.20E+02	2.94E-04	6.86E-06	1.19E+01	1.14E+00	7.75E-02	4.45E+02
1994	<LLD	<LLD	<LLD	3.47E+00	2.32E-03	<LLD	1.53E-02
1995	<LLD	<LLD	<LLD	3.18E+00	6.99E-02	<LLD	8.64E+00
1996	<LLD	<LLD	<LLD	3.75E+00	4.53E-02	<LLD	3.08E+00

TABLE A5-5

AVERAGE REACTOR COOLANT ACTIVITY WITH 0.1 PERCENT DEFECTIVE FUEL CLADDING

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

TABLE A5-6

ESTIMATED ANNUAL RADIOACTIVE WASTE QUANTITIES PROCESSED DURING NORMAL OPERATION

Sheet 1 of 2

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

TABLE A5-6

Sheet 2 of 2

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