OFFSITE DOSE CALCULATION MANUAL

NUCLEAR GENERATION SITE

UNIT 1

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INTRODUCTION

The OFFSITE DOSE CALCULATION MANUAL (ODCM) is a supporting document of the RADIOLOGICAL EFFLUENT TECHNICAL SPECIFICATIONS (NUREG 0472). The ODCM enumerates dose and concentration specifications, instrument requirements, as well as describes the methodology and parameters to be used in the calculation of offsite doses due to radioactive liquid and gaseous effluents. In order to meet release limitations it additionally calculates the liquid and gaseous effluent monitoring instrumentation alarm/trip setpoints. The environmental section contains a list of the sample locations for the radiological environmental monitoring program.

The ODCM will be maintained at the Site for use as a document of acceptable methodologies and calculations to be used in implementing the Specifications. Changes in the calculational methods or parameters will be incorporated into the ODCM in order to assure that the ODCM represents the present methodology.

1.0 RADIOACTIVE LIQUID EFFLUENTS

1.1 LIQUID EFFLUENTS CONCENTRATION

1.1.1 Specification

Applicability: At all times.

Objective: Maintain the concentration of radioactive liquid material released from the site below 10 CFR 20 limits.

Specification:

A. The concentration of radioactive material released in liquid effluents to UNRESTRICTED AREAS (see Figure 6-3) shall be limited to the concentrations specified in 10 CFR Part 20, Appendix B, Table II, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to $2x10^{-4}$ uCi/ml.

B. Action:

With the concentration of radioactive material released in liquid effluents to UNRESTRICTED AREAS exceeding the above limits, without delay restore the concentration to within the above limits.

1.0 RADIOACTIVE LIQUID EFFLUENTS (Continued)

1.1 LIQUID EFFLUENTS CONCENTRATION (Continued)

1.1.2 Specification

Applicability: At all times.

Objective: To verify that discharge of radioactive liquid material to UNRESTRICTED AREAS is maintained below 10 CFR 20 limits.

Specification:

A. Radioactive liquid wastes shall be sampled and analyzed according to the sampling and analysis program of Table 1-1

B. The results of the radioactivity analyses shall be used in accordance with Section 1.4 to assure that the concentrations at the point of release are maintained within the limits of Specification 1.1.1.

TABLE 1-1

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) (uCi/ml)
A. Batch Waste Release Tanks	P Each Batch	P Each Batch	Principal Gamma Emitters[c]	5 x 10^{-7}
(1) Holdup Tanks[b]			I-131	1 x 10^{-6}
(2) Monitor Tanks[b]	P One Batch/M	M	Dissolved and Entrained Gases (Gamma Emitters)	1 x 10^{-5}
(3) Sewage Sludge (Offsite Shipment)	P Each Batch	M Composite[d]	H-3	1 x 10^{-5}
			Gross Alpha	1 x 10^{-7}
	P Each Batch	Q Composite[d]	Sr-89, Sr-90	5 x 10^{-8}
			Fe-55	1 x 10^{-6}
B. Continuous Releases[e]	3 x W Grab Sample	W Composite[f]	Principal Gamma Emitters[c]	5 x 10^{-7}
(1) Steam Generator Blowdown			I-131	1 x 10^{-6}
(2) Reheater Pit Sump	M Grab Sample	M	Dissolved and Entrained Gases (Gamma Emitters)	1 x 10^{-5}
(3) Yard Drain Sump				
	3 x W Grab Sample	M Composite[f]	H-3 Gross Alpha	1 x 10^{-5} 1 x 10^{-7}
	3 x W Grab Sample	Q Composite[f]	Sr-89, Sr-90	5 x 10^{-8}
			Fe-55	1 x 10^{-6}

TABLE 1-1
(Continued)

TABLE NOTATION

a. The LLD is defined, for purposes of these specifications as the smallest concentration of radioactive material in a sample that will yield a net count (above system background) that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66\ s_b}{E \bullet V \bullet 2.22 \times 10^6 \bullet Y \bullet \exp(-\lambda\ \Delta t)}$$

where,

LLD is "a priori" lower limit of detection as defined above (as microcuries per unit mass or volume).

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute).

E is the counting efficiency (as counts per disintegration),

V is the sample size (in units of mass or volume),

2.22 is the number of disintegrations per minute per picocurie,

Y is the fractional radiochemical yield (when applicable),

λ is the radioactive decay constant for the particular radionuclide,

Δt for plant effluents is the elapsed time between the midpoint of sample collection and time of counting,

Typical values of E, V, Y and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

b. A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed to assure representative sampling.

c. The principal gamma emitters for which the LLD specification will apply are exclusively the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. This list does not mean that only these nuclides are to be detected and reported. Other peaks that are measurable and identifiable, together with the above nuclides, shall also be identified and reported.

TABLE NOTATION (Continued)

d. A composite sample is one which results in a specimen that is representative of the liquids released.

e. A continuous release is the discharge of liquid wastes of a nondiscrete volume, e.g., from a volume of a system that has an input flow during the continuous release.

f. Prior to analyses, all samples taken for the composite shall be thoroughly mixed in order for the composite sample to be representative of the effluent release.

1.2 LIQUID EFFLUENT DOSE

1.2.1 Specification

Applicability: At all times.

Objective: Maintain the release of radioactive liquid effluents from the site as low as is reasonably achievable.

Specification:

A. The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released to UNRESTRICTED AREAS (see Figure 6-3) shall be limited:

1. During any calendar quarter to $\leq$ 1.5 mrem to the total body and to $\leq$ 5 mrem to any organ, and

2. During any calendar year to $\leq$ 3 mrem to the total body and to $\leq$ 10 mrem to any organ.

B. Action:

1. With the calculated dose from the release of radioactive materials in liquid effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

1.0 RADIOACTIVE LIQUID EFFLUENTS (Continued)

1.2 LIQUID EFFLUENT DOSE (Continued)

1.2.2 Specification:

Applicability: At all times.

Objective: To verify that doses due to the release of radioactive liquid effluents are as low as is reasonably achievable.

Specification: Cumulative dose contributions from liquid effluents shall be determined in accordance with Section 1.5 at least once per 31 days.

1.0 RADIOACTIVE LIQUID EFFLUENTS (Continued)

1.3 LIQUID WASTE TREATMENT

1.3.1 Specification:

Applicability: At all times.

Objective: Maintain radioactive releases from the site as low as is reasonably achievable by use of the liquid radwaste treatment system.

Specification:

A. The liquid radwaste treatment system shall be used to reduce the radioactive materials in liquid wastes prior to their discharge when the projected dose due to the liquid effluent from San Onofre Unit 1, to UNRESTRICTED AREAS (see Figure 6-3) would exceed 0.06 mrem to the total body or 0.2 mrem to any organ in a 31 day period.

B. Action

1. With radioactive liquid waste being discharged without treatment and in excess of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report that includes the following information:

   a. Explanation of why liquid radwaste was being discharged without treatment, identification of any inoperable equipment or subsystems and the reason for inoperability.

   b. Action(s) taken to restore the inoperable equipment to OPERABLE status.

   c. Summary description of action(s) taken to prevent a recurrence.

1.0 RADIOACTIVE LIQUID EFFLUENTS (Continued)

1.3 LIQUID WASTE TREATMENT (Continued)

1.3.2 Specification

Applicability: At all times.

Objective: To verify the operability and potential use of the liquid radwaste treatment system.

Specification: Doses due to liquid releases shall be projected at least once per 31 days in accordance with Section 3.1.

Methods of Calculation

1.4 Liquid Effluent Monitor Setpoints

Liquid Radwaste Effluent Line Monitors provide alarm and automatic termination of release prior to exceeding the concentration limits specified in 10CFR20, Appendix B, Table II, Column 2 at the release point to the unrestricted area. To meet specification 1.1.2 and for the purpose of implementation of specification 1.1.1, the alarm/trip setpoints for liquid effluent monitors and flow measurement devices are set to assure that the following equation is satisfied:

$$\frac{C_m R}{F+R} \le MPC_{eff} \qquad (1\text{-}1)$$

where:

MPC_{eff} = the effective effluent maximum concentration permissible limit (μCi/ml) at the release point to the unrestricted area for the radionuclide mixture being released,

$$= \frac{1}{\sum_{i=1}^{N} \left(\frac{F_i}{MPC_i} \right)} \qquad (1\text{-}2)$$

1.4 Liquid Effluent Monitor Setpoints (Continued)

F_i = fractional concentration of the ith radionuclide as obtained by sample analysis.

N = number of radionuclides identified in sample analysis.

MPC_i = MPC of the ith radionuclide (10CFR20, App B, Table II, Column 2).

C_m = the setpoint, in μCi/ml, representative of a radionuclide concentration for the radiation monitor measuring the radioactivity in the waste effluent line prior to dilution and subsequent release.

R = the permissible waste effluent flow rate at the radiation monitor location, in volume per unit time in the same units as for F.

F = the dilution water flow in volume per unit time. The dilution water flow is 150,000 gpm per circ pump (2 total) and 3,500 gpm per saltwater pump (3 total).

Administrative values are used to reduce each setpoint to account for the potential activity in other releases. These administrative values shall be periodically reviewed based on actual release data (including, for example, any saltwater discharge of the component cooling water heat exchanger) and revised in accordance with the Unit 1 Technical Specifications.

1.4.1 Batch Release Setpoint Determination

The waste flow (R) and monitor setpoint (C_m) are set to meet the condition of equation (1-1) for the effective MPC (MPC_{eff}) limit. The method by which this is accomplished is as follows:

STEP 1: The isotopic concentration for each batch tank to be released is obtained from the sum of the measured concentrations in the tank as determined by analysis.

$$C = \sum_i C_{\gamma i} + C_\alpha + C_s + C_t + C_{Fe} \qquad (1\text{-}3)$$

where:

C = the total concentration in each tank. (μCi/ml)

$\sum_i C_{\gamma} i$ = the sum of the measured concentrations for each radionuclide, i, in the gamma spectrum. (μCi/ml)

C_{Fe} = the Fe-55 concentration as determined in the previous quarterly composite sample. (μCi/ml)

C_α = the gross alpha concentration determined in the previously monthly composite sample. (μCi/ml)

1.4.1 Batch Release Setpoint Determination (Continued)

C_s = the Sr-89 and Sr-90 concentrations as determined in the previous quarterly composite sample. (μCi/ml)

C_t = the H-3 concentration as determined in the previous monthly composite sample. (μCi/ml)

STEP 2: The effective MPC (MPC_{eff}) for each batch tank, sump, or blowdown line is determined using:

$$MPC_{eff} = \frac{1}{\sum_i \frac{(C_{\gamma i}/C)}{(MPC_{\gamma i})} + \frac{(C_s/C)}{(MPC_s)} + \frac{(C_t/C)}{(MPC_t)} + \frac{(C_\alpha/C)}{(MPC_\alpha)} + \frac{(C_{Fe}/C)}{(MPC_{Fe})}} \quad (1\text{-}4)$$

$MPC_{\gamma i}$, MPC_s, MPC_t, MPC_{Fe}, MPC_α = the limiting concentrations of the appropriate radionuclide from 10CFR20, Appendix B, Table II, Column 2.

NOTE: For dissolved or entrained noble gases, the concentration shall be limited to 2.0E-4 μCi/ml total activity.

1.4.1 **Batch Release Setpoint Determination** (Continued)

STEP 3: The radioactivity monitor setpoint, C_m (μCi/ml), may now be specified based on the values of C, $\sum_i C_{\gamma i}$, F, MPC_{eff} and R to provide compliance with the limits of 10CFR20, Appendix B, Table II, Column 2. The monitor setpoint in cpm is obtained by applying the appropriate calibration constant given in Table 1-2 to the calculated monitor concentration limit, C_m (μCi/ml).

1.4.1.1 LIQUID RADWASTE EFFLUENT LINE (RT-1218)

The value for C_m, the concentration limit at the detector, is determined by using:

$$C_m \leq \frac{(RW)\ (F)\ (C_{eff})}{\frac{R_1 C_1}{MPC_{eff1}} + \frac{R_2 C_2}{MPC_{eff2}} + \ldots + \frac{R_n C_n}{MPC_{effn}}} \qquad (1\text{-}5)$$

where:

n = number of tanks to be released.

C_{eff} = effective gamma isotopic concentration at the monitor for the tank combination to be released (equal to $\sum_i C_{\gamma i}$ for single tank releases).

$$= \frac{R_1\ (\sum_i C_{\gamma i})_1 + R_2\ (\sum_i C_{\gamma i})_2 + \ldots + R_n\ (\sum_i C_{\gamma i})_n}{R_1 + R_2 + \ldots + R_n} \qquad (1\text{-}6)$$

1.4.1.1 LIQUID RADWASTE EFFLUENT LINE (RT-1218) (Continued)

$(\sum_i C_{\gamma i})_1$, $(\sum_i C_{\gamma i})_2$, etc. = the total gamma isotopic concentration of first tank, second tank, etc. (μCi/ml).

R_1, R_2, etc. = the effluent flow rate from first tank, second tank, etc. Values of R for each tank are as follows:

Radwaste holdup tanks R = 50 gpm/pump (x no. of pumps to be run)

Radwaste monitor tanks R = 50 gpm/pump (x no. of pumps to be run)

Primary plant makeup tank R = 100 gpm/pump (x no. of pumps to be run)

NOTE: Since the values of R are much smaller than F, the term (F + R) in equation (1-1) may be replaced by F.

MPC_{eff1}, MPC_{eff2}, etc. = values of MPC_{eff} from equation (1-4) for first tank, second tank, etc.

C_1, C_2, etc. = values of C, the total concentration, from equation (1-3) for the first tank, second tank, etc. in (μCi/ml).

1.4.1.1 LIQUID RADWASTE EFFLUENT LINE (RT-1218) (Continued)

RW_{1218}, SG_{1216}, S_{2100}, and S_{2101} are administrative values used for simultaneous releases from the Radwaste Effluent discharge, Steam Generators, the Reheater Pit Sump, and the Yard Drain Sump. The fractions RW_{1218} and SG_{1216}, S_{2100}, and S_{2101} will be assigned such that $RW_{1218} + SG_{1216} + S_{2100} + S_{2101} \leq 1.0$. The 1.0 is an administrative value used to account for the potential activity for all release pathways. This assures that the total concentration from all release points to the plant discharge will not result in a release of concentrations exceeding the limits of 10CFR20, Appendix B, Table II, Column 2 from the site.

NOTE: If $C_m \leq C_{eff}$, then no release is possible. To increase C_m, increase dilution flow F (by running more pumps in the applicable discharge structure), and/or decrease the effluent flow rates R_1, R_2, etc. (by throttling the combined flow as measured on CV110 and recalculate C_m using the new F, R and equation (1-5). If there is no release associated with this monitor, the monitor setpoint should be established as close to background as practical to prevent spurious alarms and yet assure an alarm should an inadvertent release occur.

1.4.1.2 STEAM GENERATOR BLOWDOWN EFFLUENT LINE (RT-1216)

The value for C_m, the concentration limit at the detector, is determined by using:

$$C_m \leq \frac{(SG_{1216})\ F\ \sum_i C_{\gamma i}}{RC/MPC_{eff}} \qquad (1\text{-}7)$$

where:

C, $\sum_i C_{\gamma i}$, MPC_{eff} = the values of C, $\sum_i C_{\gamma i}$ and MPC_{eff} in STEPS 1) and 2) above for the Steam Generator blowdown.

R = blowdown flow rate (maximum 400 gpm)

RW_{1218}, SG_{1216}, S_{2100}, and S_{2101} are administrative values used for simultaneous releases from the Radwaste Effluent discharge, Steam Generators, the Reheater Pit Sump, and the Yard Drain Sump. The fractions RW_{1218} and SG_{1216}, S_{2100}, and S_{2101} will be assigned such that $RW_{1218} + SG_{1216} + S_{2100} + S_{2101} \leq 1.0$.

NOTE: If $C_m < \sum C_{\gamma i}$, then no release is possible. To increase C_m, increase dilution flow F (by running more pumps), and/or decrease the effluent flow rate R, and recalculate C_m using the new F, R and equation (1-7).

1.4.1.2 STEAM GENERATOR BLOWDOWN EFFLUENT LINE (RT-1216) (Continued)

If there is no release associated with this monitor, the monitor setpoint should be established as close to background as practical to prevent spurious alarms and yet assure an alarm should an inadvertent release occur.

1.4.2 **Continuous Release Setpoint Determination**

STEP 1: The isotopic concentration for the continuous releases are obtained for each release stream (steam generator blowdown, reheater pit sump, or yard sump) from the sum of the respective measured concentrations as determined by analysis:

$$C = \sum_i C_{\gamma i} + C_\alpha + C_t + C_s + C_{Fe} \qquad (1\text{-}8)$$

where:

C = total concentration (μCi/ml)

$\sum_i C_{\gamma i}$ = the total gamma activity (μCi/ml) associated with each radionuclide, i, in the weekly composite analysis for the release stream.

C_α = the total measured gross alpha concentration (μCi/ml) determined from the previous monthly composite analysis for the release stream.

1.4.2 **Continuous Release Setpoint Determination** (Continued)

C_{Fe} = the total Fe-55 concentration as determined in the previous quarterly composite sample for the release stream. (μCi/ml)

C_t = the total measured H-3 concentration (μCi/ml) determined from the previously monthly composite analysis for the release stream.

C_s = the total measured concentration (μCi/ml) of Sr-89 and Sr-90 as determined from the previous quarterly composite analysis for the release stream.

STEP 2: The effective MPC (MPC_{eff}) for each release stream (steam generator blowdown, reheater pit sump, or yard drain sump) is determined using:

$$MPC_{eff} = \frac{1}{\sum_i \frac{(C_{\gamma i}/C)}{(MPC_{\gamma i})} + \frac{(C_s/C)}{(MPC_s)} + \frac{(C_\alpha/C)}{(MPC_\alpha)} + \frac{(C_{Fe}/C)}{(MPC_{Fe})} + \frac{(C_t/C)}{(MPC_t)}} \quad (1\text{-}9)$$

STEP 3: The setpoint (μCi/ml), for each continuous release radioactivity monitor may now be specified based on the respective values of C, $\sum_i C_{\gamma i}$, F, MPC_{eff}, and R to provide compliance with the limits of 10CFR20, Appendix B, Table II, Column 2. The monitor setpoint, in cpm, is obtained by applying the appropriate calibration constant in Table 1-2 to the calculated monitor limit (μCi/ml).

1.4.2.1 STEAM GENERATOR BLOWDOWN EFFLUENT LINE (RT-1216)

The value of C_{1216}, the concentration limit at the detector, is determined by using:

$$C_{1216} \leq \frac{(SG_{1216})\ F\ \Sigma_i C_{\gamma i}}{RC/MPC_{eff}} \qquad (1\text{-}10)$$

where:

C_{1216} = limiting concentration at monitor RT-1216 (μCi/ml).

C, $\Sigma_i C_{\gamma i}$, MPC_{eff} = values of C, $\Sigma_i C_{\gamma i}$ and MPC_{eff} (as defined in STEPS 1 and 2 above)

R = blowdown flow rate (maximum 400 gpm)

RW_{1218}, SG_{1216}, S_{2100}, and S_{2101} are administrative values used for simultaneous releases from the Radwaste Effluent discharge, Steam Generators, the Reheater Pit Sump, and the Yard Drain Sump. The fractions RW_{1218} and SG_{1216}, S_{2100}, and S_{2101} will be assigned such that $RW_{1218} + SG_{1216} + S_{2100} + S_{2101} \leq 1.0$.

NOTE: $C_m \leq \Sigma C_{\gamma i}$ then no release is possible. To increase C_m, increase the dilution flow F (by running and/or decreasing the effluent flow rate R), and recalculate C_m using the new values of F, R and equation (1-10).

1.4.2.2 REHEATER PIT SUMP EFFLUENT LINE (REHEATER PIT SUMP) (RT-2100)

The value of C_{2100}, the concentration limit at the detector (μCi/ml), is determined by using:

$$C_{2100} \leq \frac{(S_{2100})\ F\ \sum_i C_{\gamma i}}{RC/MPC_{eff}} \qquad (1\text{-}11)$$

where:

C_{2100} = limiting concentration at monitor RT-2100 (μCi/ml).

C, $\sum_i C_{\gamma i}$, MPC_{eff} = values of C, $\sum_i C_{\gamma i}$ and MPC_{eff} (as defined in STEPS 1 and 2 above)

R = 350 gpm/pump (x no. sump pumps to be run)

RW_{1218}, SG_{1216}, S_{2100}, and S_{2101} are administrative values used for simultaneous releases from the Radwaste Effluent discharge, Steam Generators, the Reheater Pit Sump, and the Yard Drain Sump. The fractions RW_{1218}, SG_{1216}, S_{2100}, and S_{2101} will be assigned such that $RW_{1218} + SG_{1216} + S_{2100} + S_{2101} \leq 1.0$. The 1.0 is an administrative value used to account for the potential activity for all release pathways. This assures that the total concentration from all release points to the plant discharge will not result in a release of concentrations exceeding the limits of 10CFR20, Appendix B, Table II, Column 2 from the site.

NOTE: If $C_{2100} \leq \sum_i C_{\gamma i}$ then no release is possible from that sump. To increase C_{2100} increase the dilution flow F (by running more pumps) and recalculate C_{2100} using the new value of F and equation (1-11).

1.4.2.3 YARD SUMP EFFLUENT LINE (RT-2101)

The value of C_{2101}, the concentration limit at the detector (μCi/ml), is determined by using:

$$C_{2101} \leq \frac{(S_{2101})\ F\ \sum_i C_{\gamma i}}{RC/MPC_{eff}} \qquad (1\text{-}12)$$

where:

C_{2101} = limiting concentration at monitor RT-2101 (μCi/ml).

C, $\sum_i C_{\gamma i}$, MPC_{eff} = values of C, $\sum_i C_{\gamma i}$ and MPC_{eff} (as defined in STEPS 1 and 2 above)

R = 1000 gpm/pump (x no. sump pumps to be run)

RW_{1218}, SG_{1216}, S_{2100}, and S_{2101} are administrative values used for simultaneous releases from the Radwaste Effluent discharge, Steam Generators, the Reheater Pit Sump, and the Yard Drain Sump. The fractions RW_{1218}, SG_{1216}, S_{2100}, and S_{2101} will be assigned such that $RW_{1218} + SG_{1216} + S_{2100} + S_{2101} \leq 1.0$. The 1.0 is an administrative value used to account for the potential activity for all release pathways. This assures that the total concentration from all release points to the plant discharge will not result in a release of concentrations exceeding the limits of 10CFR20, Appendix B, Table II, Column 2 from the site.

NOTE: If $C_{2101} \leq \sum_i C_{\gamma i}$ then no release is possible from that sump. To increase C_{2101} increase the dilution flow F (by running more pumps) and recalculate C_{2101} using the new value of F and equation (1-12).

Table 1-2[a]

Liquid Effluent Radiation Monitor
Calibration Constants
(μCi/cc/cpm)

MONITOR	Co-60	Ba-133	Cs-137
RT-1216	2.73E-8	3.02E-8	4.84E-8
RT-1218	5.82E-9	6.72E-9	9.77E-9
RT-2100	1.49E-9	2.22E-9	2.97E-9
RT-2101	1.53E-9	2.19E-9	3.24E-9

(a) This table provides typical (±20%) calibration constants for the liquid effluent radiation monitors.

1.5 Dose Calculation for Liquid Effluents

The dose commitment to an individual from radioactive materials in liquid effluents released to unrestricted areas are calculated for the purpose of implementing Specification 1.2.1 using the following expression.

$$D_\tau = \sum_i^n [A_{i\tau} \sum_j^m (\Delta t_j \; C_{ij} \; F_j)] \qquad (1\text{-}13)$$

where:

$A_{i\tau}$ = the site related adult ingestion dose commitment factor to the total body or an organ, τ, for each identified principal gamma and beta emitter, i, from Table 1-3 in mrem/hr per μCi/ml.

n = the number of principal gamma and beta emitters, i.

C_{ij} = the average concentration of radionuclide, i, in the undiluted liquid effluent during time period, Δt_j in (μCi/ml).

m = the number of time periods, j.

D_τ = the dose commitment to the total body or an organ, τ, from the liquid effluent for the time period, $\sum_j^m \Delta t_j$, in mrem

F_j = the average dilution factor for C_{ij} during the time period, Δt_j. This factor is the ratio of the maximum undiluted liquid waste flow during time period, Δt_j, to the average flow from the site discharge structure to unrestricted receiving waters

$$= \frac{\text{maximum liquid radioactive waste flow}}{\text{discharge structure exit flow}}$$

Δt_j = the length of the jth time period over which C_{ij} and F_j are averaged for all liquid releases, in hours.

TABLE 1-3

DOSE COMMITMENT FACTORS*, $A_{i\tau}$
(mrem/hr per μCi/ml)

Radio-Nuclide	Total Body	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI
H-3	2.80E-1		2.80E-1	2.80E-1	2.80E-1	2.80E-1	2.80E-1
Na-24	4.57E-1	4.57E-1	4.57E-1	4.57E-1	4.57E0	4.57E-1	4.57E-1
Cr-51	5.60E0			3.30E0	1.20E0	7.04E0	1.40E3
Mn-54	1.35E3		7.08E3		2.11E3		2.17E4
Mn-56	3.15E1		1.78E2		2.26E2		5.67E3
Fe-55	8.24E3	5.12E4	3.53E4			1.97E4	2.03E4
Fe-59	7.27E4	8.07E4	1.90E5			5.30E4	6.23E5
Co-57	2.36E2		1.42E2				3.60E3
Co-58	1.35E3		6.04E2				1.22E4
Co-60	3.83E3		1.74E3				3.26E4
Cu-64	1.01E2		2.14E2		5.40E2		1.83E4
Zn-65	2.32E5	1.61E5	5.13E5		3.43E5		3.23E5
Br-84	9.39E-2		2.14E2				7.37E-7
Rb-88	9.49E-1		1.79E0				0.00E0
Sr-89	1.43E2	4.99E3					8.00E2
Sr-90	3.01E4	1.23E5					3.55E3
Sr-91	3.70E1						4.37E2
Sr-92	1.50E0	3.48E1					6.90E2
Y-90	1.62E-1	6.06E0					6.42E4
Y-91m	2.22E-3	5.72E-2					1.68E-1
Y-92	1.55E-2	5.32E-1					9.32E3
Zr-95	3.47E0	1.60E1	5.12E0		8.03E0		1.62E4
Zr-97	8.14E-2	8.80E-1	1.80E1		2.70E-1		5.51E4
Nb-95	5.51E-1	1.84E0	1.02E0		1.01E0		6.22E3
Nb-95m	5.51E-1	1.84E0	1.02E0		1.01E0		6.22E3
Nb-97	1.43E-3	1.55E-2	3.91E-3		4.56E-3		1.44E1
Mo-99	2.44E1		1.28E2		2.90E2		2.97E2
Tc-99M	4.66E-1	1.30E-2	3.66E-2		5.56E-1	1.79E-2	2.17E1
Ru-103	4.61E1	1.07E2			4.08E2		2.25E4
Ru-106	2.01E2	1.59E3			3.07E3		1.03E5
Ag-110m	8.61E2	1.57E3	1.45E3		2.85E3		5.91E5
Sn-113							2.20E5
Sb-124	1.10E2	2.77E2	5.23E0	6.70E-1			7.85E3
Sb-125	4.42E1	2.20E2	2.37E0	2.00E-1		2.30E4	1.94E3
Te-129m	1.48E2	9.33E2	3.48E2	3.20E2	3.89E3		4.67E3
Te-132	1.24E2	2.40E2	1.32E2	1.46E2	1.27E3		6.25E3
I -131	1.79E2	2.18E2	3.12E2	1.02E5	5.36E2		8.24E1
I- 132	9.96E0	1.06E1	2.84E1	9.96E2	4.54E1		5.35E0
I -133	3.95E1	7.46E1	1.30E2	1.91E4	2.26E2		1.17E2
I -134	5.40E0	5.56E0	1.51E1	2.52E2	2.40E1		1.32E-2
I -135	2.24E1	2.32E1	6.08E1	4.01E3	9.75E3		6.87E1

*Source: USNRC NUREG-0133, Section 4.3.1

TABLE 1-3

DOSE COMMITMENT FACTORS*, $A_{i\tau}$
(mrem/hr per μCi/ml)

Radio-Nuclide	Total Body	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI
Cs-134	1.33E4	6.84E3	1.63E4		5.27E3	1.75E3	2.85E2
Cs-136	2.04E3	7.16E2	2.83E3		1.57E3	2.16E2	3.21E2
Cs-137	7.85E3	8.77E3	1.20E4		4.07E3	1.35E3	2.32E2
Cs-138	5.94E0	6.07E0	1.20E1		8.81E0	8.70E-1	5.11E-5
Ba-139	2.30E-1	7.85E0	5.59E-3		5.23E-3	3.17E-3	1.39E1
Ba-140	1.08E2	1.65E3	2.07E0		7.00E-1	1.18E0	3.39E3
La-140	2.10E-1	1.58E0	8.00E-1				5.84E4
Ce-141	2.60E-1	3.43E0	2.32E0		1.08E0		8.86E3
Ce-143	4.94E-2	6.00E-1	4.47E-2		2.00E-1		1.67E4
Ce-144	9.59E0	1.99E2	7.47E1		4.43E1		6.04E4
Nd-147	2.74E-1	3.96E0	4.58E0		2.68E0		2.20E4
W -187	2.68E0	9.16E0	7.66E0				2.51E3
Np-239	1.92E-3	3.53E-2	3.47E-3		1.08E-2		7.13E2

*Source: USNRC NUREG-0133, Section 4.3.1

1.6 Representative Sampling

Prior to sampling of a batch release, each batch shall be thoroughly mixed to assure representative sampling. The methodology for mixing and sampling is described in SO123-III-5.11.1, "Unit 1 Radioactive Liquid Release Permit" and SO123-III-5.2.1," Unit 1 Radioactive Liquid Effluent Sample Collection."

2.0 RADIOACTIVE GASEOUS EFFLUENTS

2.1 DOSE RATE

2.1.1 Specification

Applicability: At all times.

Objective: Maintain the dose rate at the exclusion area boundary from radioactive gaseous effluents within 10 CFR 20 limits.

Specification: A. The dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the SITE BOUNDARY (see Figure 6-3) shall be limited to the following values:

1. The dose rate limit for noble gases shall be ≤ 500 mrem/year to the total body and ≤ 3000 mrem/year to the skin, and

2. The dose rate limit for I-131, I-133, for tritium and for all radionuclides in particulate form with half lives greater than 8 days shall be ≤ 1500 mrem/year to any organ.

B. Action

With the dose rate(s) exceeding the above limits, without delay restore the release rate to within the above limit(s).

2.0 RADIOACTIVE GASEOUS EFFLUENTS (Continued)

2.1 DOSE RATE (Continued)

2.1.2 Specification

Applicability: At all times.

Objective: To verify the dose rate due to the discharge of radioactive gaseous effluents is maintained within 10 CFR 20 limits.

Specification:

A. The dose rate to due to noble gases in gaseous effluents shall be determined to be within the limits of Specification 2.1.1 in accordance with Section 2.6.1.

B. The dose rate due to iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents shall be determined to be within the limits of Specification 2.1.1 in accordance with Section 2.6.2 by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in Table 2-1.

TABLE 2-1

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) (uCi/ml)
A. Waste Gas Storage Tank	P Each Tank Grab Sample	P Each Tank	Principal Gamma Emitters[b]	1×10^{-4}
B. Containment Purge	P Each Purge[c] Grab Sample	P Each Purge[c]	Principal Gamma Emitters[b]	1×10^{-4}
			H-3	1×10^{-6}
C. Plant Stack	M[c] Grab Sample	M[c]	Principal Gamma Emitters[b]	1×10^{-4}
			H-3[d,e]	1×10^{-6}
	Continuous[f]	W[g] Charcoal Sample	I-131	1×10^{-12}
	Continuous[f]	W[g] Particulate Sample	Principal Gamma Emmiters[b] (I-131, Others)	1×10^{-11}
	Continuous[f]	M Composite Particulate Sample	Gross Alpha	1×10^{-11}
	Continuous[f]	Q Composite Particulate Sample	Sr-89, Sr-90	1×10^{-11}
	Continuous[f]	Noble Gas Monitor	Noble Gases Gross Beta or Gamma	1×10^{-6}

TABLE 2-1
(Continued)

TABLE NOTATION

a. The LLD is defined, for purposes of these specifications as the smallest concentration of radioactive material in a sample that will yield a net count (above system background) that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66\ s_b}{E \bullet V \bullet 2.22 \times 10^6 \bullet Y \bullet \exp(-\lambda\ \Delta t)}$$

where,

LLD is "a priori" lower limit of detection as defined above (as microcuries per unit mass or volume).

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute).

E is the counting efficiency (as counts per disintegration),

V is the sample size (in units of mass or volume),

2.22 is the number of disintegrations per minute per picocurie,

Y is the fractional radiochemical yield (when applicable),

λ is the radioactive decay constant for the particular radionuclide,

Δt for plant effluents is the elapsed time between the midpoint of sample collection and time of counting,

Typical values of E, V, Y and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

b. The principal gamma emitters for which the LLD specification applies are exclusively the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for gaseous emissions and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144 for particulate emissions. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall also be identified and reported.

TABLE 2-1
(Continued)

TABLE NOTATION (Continued)

c. Sampling and analysis shall also be performed following shutdown, startup, or a THERMAL POWER change exceeding 15 percent of RATED THERMAL POWER within one hour unless (1) analysis shows the DOSE EQUIVALENT I-131 concentration in the primary coolant has not increased more than a factor of 3; and (2) the noble gas activity monitor shows that effluent activity has not increased by more than a factor of 3.

d. Tritium grab samples shall be taken at least once per 24 hours when the refueling canal is flooded.

e. Tritium grab samples shall be taken at least once per 7 days from the ventilation exhaust from the spent fuel area, whenever spent fuel is in the spent fuel pool.

f. The ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period covered by each dose or dose rate calculation made in accordance with Specifications 2.1.1, 2.2.1, and 2.3.1.

g. Samples shall be changed at least once per 7 days and analyses shall be completed within 48 hours after changing, or after removal from sampler. Sampling shall also be performed at least once per 24 hours for at least 7 days following each shutdown, startup or THERMAL POWER change exceeding 15 percent of RATED THERMAL POWER in one hour and analyses shall be completed within 48 hours of changing. When samples collected for 24 hours are analyzed, the corresponding LLD's may be increased by a factor of 10. This requirement does not apply if (1) analysis shows that the DOSE EQUIVALENT I-131 concentration in the primary coolant has not increased more than a factor of 3; and (2) the noble gas monitor shows that the effluent activity has not increased more than a factor of 3.

2.0 RADIOACTIVE GASEOUS EFFLUENTS (Continued)

2.2 DOSE, NOBLE GASES

2.2.1 Specification

Applicability: At all times.

Objective: Maintain the dose due to noble gases in gaseous effluents as low as is reasonably achievable.

Specification:

A. The air dose due to noble gases released in gaseous effluents from San Onofre Unit 1 to areas at and beyond the SITE BOUNDARY (see Figure 6-3) shall be limited to the following:

1. During any calendar quarter: $\leq$ 5 mrad for gamma radiation and $\leq$ 10 mrad for beta radiation.

2. During any calendar year: $\leq$ 10 mrad for gamma radiation and $\leq$ 20 mrad for beta radiation.

B. Action:

1. With the calculated air dose from radioactive noble gases in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

2.2 DOSE, NOBLE GASES (Continued)

2.2.2 Specification

Applicability: At all times.

Objective: To verify the dose due to noble gases in radioactive gaseous effluent is maintained as low as is reasonably achievable.

Specification: Cumulative dose contributions for noble gases for the current calendar quarter and current calendar year shall be determined in accordance with Section 2.7.1 at least once per 31 days.

2.0 RADIOACTIVE GASEOUS EFFLUENTS (Continued)

2.3 DOSE, IODINE-131, IODINE-133, TRITIUM AND RADIONUCLIDES IN PARTICULATE FORM

2.3.1 Specification

Applicability: At all times.

Objective: Maintain the dose due to radioiodine, radioactive materials in particulate form and radionuclides other than noble gases in gaseous effluents as low as is reasonably achievable.

Specification: A. The dose to a MEMBER OF THE PUBLIC from I-131, I-133, from tritium and from all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released from San Onofre Unit 1 to areas at and beyond the SITE BOUNDARY (see Figure 6-3) shall be limited to the following:

1. During any calendar quarter: ≤ 7.5 mrem to any organ; and

2. During any calendar year: ≤ 15 mrem to any organ.

B. Action:

1. With the calculated dose from the release of I-131, I-133, tritium and radionuclides in particulate form with half-lives greater than 8 days, in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report that identifies the cause(s) for exceeding the limit and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

2.0 RADIOACTIVE GASEOUS EFFLUENTS (Continued)

2.3 DOSE, IODINE-131, IODINE-133, TRITIUM AND RADIONUCLIDES IN PARTICULATE FORM (Continued)

2.3.2 Specification

Applicability: At all times.

Objective: To verify the dose due to iodine-131, iodine-133, tritium and radionuclides in particulate form with half-lives greater than 8 days is maintained as low as is reasonably achievable.

Specification: Cumulative dose contributions for the current calendar quarter and current calendar year for iodine-131, iodine-133, tritium and radionuclides in particulate form with half-lives greater than 8 days shall be determined in accordance with Section 2.7.2 at least once per 31 days.

2.0 RADIOACTIVE GASEOUS EFFLUENTS (Continued)

2.4 GASEOUS RADWASTE TREATMENT

2.4.1 Specification

Applicability: At all times.

Objective: Maintain radioactive gaseous releases from the site as low as is reasonably achievable by use of the GASEOUS RADWASTE and VENTILATION EXHAUST TREATMENT SYSTEMS.

Specification: A. The GASEOUS RADWASTE TREATMENT SYSTEM and the VENTILATION EXHAUST TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected effluent air doses due to gaseous effluent releases from San Onofre Unit 1 to areas at and beyond the SITE BOUNDARY (see Figure 6-3) would exceed 0.2 mrad for gamma radiation and 0.4 mrad for beta radiation over 31 days. The VENTILATION EXHAUST TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected doses due to gaseous effluent releases from San Onofre Unit 1 to areas at and beyond the SITE BOUNDARY (see Figure 6-3) would exceed 0.3 mrem to any organ over 31 days.

B. Action:

1. With gaseous waste being discharged without treatment and in excess of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report which includes the following information:

   a. Explanation of why gaseous radwaste was being discharged without treatment, identification of any inoperable equipment of subsystems and the reasons for the inoperability.

   b. Action(s) taken to restore the inoperable equipment to OPERABLE status.

   c. Summary description of action(s) taken to prevent a recurrence.

2.0 RADIOACTIVE GASEOUS EFFLUENTS (Continued)

2.4 GASEOUS RADWASTE TREATMENT (Continued)

2.4.2 Specification

Applicability: At all times.

Objective: To verify the OPERABILITY and potential use of the GASEOUS RADWASTE TREATMENT SYSTEM and the VENTILATION EXHAUST TREATMENT SYSTEM.

Specification: Doses due to gaseous releases from San Onofre Unit 1 shall be projected at least once per 31 days in accordance with Section 3.2.

2.0 RADIOACTIVE GASEOUS EFFLUENTS (Continued)

Methods of Calculation

2.5 Effluent Monitor Setpoints

2.5.1 PLANT VENT STACK

a. RT-1214, Gross Activity Monitor
RT-1219, Noble Gas Monitor
RT-1212, Noble Gas Monitor

For the purpose of implementation of Specification 2.1.1, the alarm setpoint level for noble gas monitors is based on the gaseous effluent flow rate and meteorological dispersion factor.

The concentration at the detector is determined by using the smaller of the values from equations (2-1) and (2-2) below:

Total Body

$$C_{det} = \frac{(2120 \frac{cfm}{m^3/sec})(500 \text{ mrem/yr})(10^{-6} \text{ m}^3/\text{cc})}{(\text{Flow rate, cfm})(X/Q, \text{ sec/m}^3) \sum_i (K_i, \frac{mrem/yr}{\mu Ci/m^3})(\frac{C_i}{C_{tot}})} \quad (2\text{-}1)$$

Skin

$$C_{det} = \frac{(2120 \frac{cfm}{m^3/sec})(3000 \text{ mrem/yr})(10^{-6} \text{ m}^3/\text{cc})}{(\text{Flow rate, cfm})(X/Q, \text{ sec/m}^3) \sum_i (L_i + 1.1M_i \frac{mrem/yr}{\mu Ci/m^3})(\frac{C_i}{C_{tot}})} \quad (2\text{-}2)$$

2.0 RADIOACTIVE GASEOUS EFFLUENTS (Continued)

2.5.1 PLANT VENT STACK (Continued)

where:

C_{det}	= the instantaneous concentration at the detector, μCi/cc
K_i	= the total body dose conversion factor for the ith gamma emitting noble gas, mrem/yr per $\mu Ci/m^3$, from Table 2-3
L_i	= Skin Dose Conversion Factor for the ith noble gas, mrem/yr per $\mu Ci/m^3$, from Table 2-3
M_i	= Air Dose Conversion Factor for the ith noble gas, mrem/yr per $\mu Ci/m^3$, from Table 2-3
1.1	= Conversion factor to convert gamma air dose to skin dose.
3000 mrem/yr	= skin dose rate limit, as specified by Specification 2.1.1
500 mrem/yr	= total body dose rate limit, as specified by Specification 2.1.1
C_i	= Concentration of the ith noble gas, as determined by sample analysis, μCi/cc

2.5.1 PLANT VENT STACK (Continued)

C_{tot} = total concentration of noble gases, as determined by sample analysis, μCi/cc

Flow Rate = the plant vent flow rate, cfm
= 20,000 cfm/fan (x no. of fans to be run)

2120 = conversion constant, cfm to m^3/sec

X/Q = historical annual average dispersion factor,
= 1.3E-5 sec/m^3

The smaller of the values of C_{det} from equations (2-1) or (2-2) is to be used in the determination of the maximum permissible monitor alarm setpoint (cpm), as follows:

The maximum permissible alarm setpoint (cpm) is determined using the calibration constant for the applicable Plant Stack Airborne Monitor given in Table 2-2. The maximum permissible alarm setpoint is the value corresponding to the concentration, C_{det} (the smaller value from equation (2-1) or (2-2)). The calibration constant used is based on Kr-85 or on Xe-133, whichever yields a lower detection efficiency.

The alarm setpoint will be maintained at a value not greater than the maximum permissible alarm setpoint.

2.5.1 PLANT VENT STACK (Continued)

If there is no release associated with this monitor, the setpoint should be established as close as practical to background to prevent spurious alarms and yet assure an alarm should inadvertent release occur.

b. RT-1254, Wide Range Gas Monitor

The maximum release rate (µCi/sec) is determined by converting the concentration at the detector, C_{det} to an equivalent release rate in µCi/sec, as follows:

$$A_{max} = (C_{det}, \mu Ci/cc)\ (\text{flow rate, cc/sec}) \quad (2\text{-}3)$$

where:

A_{max}	=	the maximum permissible release rate
C_{det}	=	the smaller of the values of C_{det} obtained from equations (2-1) and (2-2).
Flow Rate	=	Vent stack flow rate in cc/sec
	=	9.44×10^6 cc/sec x (number of fans)

The release rate setpoint will not be set greater than the maximum release rate determined above, when this monitor is being used to meet the requirements of Specification 1.1.1.

2.0 RADIOACTIVE GASEOUS EFFLUENTS (Continued)

2.5.2 CONTAINMENT PURGE - RT-1212

For the purpose of implementation of Specification 1.1.1, the alarm setpoint level for noble gas monitors is based on the gaseous effluent flow rate from containment and the meteorological dispersion factor.

The limiting concentration at the detector is determined by using the smaller of the values of C_{det} from equations (2-5) and (2-6).

Total Body

$$C_{det} = \frac{(2120 \frac{cfm}{m^3/sec})\ (500\ mrem/yr)\ (10^{-6}\ m^3/cc)}{(\text{Flow rate, cfm})\ (X/Q,\ sec/m^3)\ \sum_i (K_i,\ \frac{mrem/yr}{\mu Ci/m^3})\ (\frac{C_i}{C_{tot}})} \tag{2-1}$$

Skin

$$C_{det} = \frac{(2120 \frac{cfm}{m^3/sec})\ (3000\ mrem/yr)\ (10^{-6}\ m^3/cc)}{(\text{Flow rate, cfm})\ (X/Q,\ sec/m^3)\ \sum_i (L_i + 1.1M_i\ \frac{mrem/yr}{\mu Ci/m^3})\ (\frac{C_i}{C_{tot}})} \tag{2-2}$$

where:

C_{det} = the instantaneous concentration at the detector (RT-1212) in μCi/cc.

Flow Rate = the containment purge flow rate in cfm
= 20,000 cfm

Other parameters are as specified in 2.5.1 above.

2.5.2 CONTAINMENT PURGE - RT-1212 (Continued)

The smaller value of C_{det} from equations (2-4) and (2-5) is to be used in determining the maximum permissible monitor alarm setpoint in cpm.

The maximum permissible alarm setting in cpm is determined by using the calibration constant for the Containment Airborne Monitor given in Table 2-2. The maximum permissible alarm setpoint is the cpm value corresponding to the concentration, C_{det}. The calibration constant is based on Kr-85 or Xe-133 whichever yields a lower detection efficiency.

The alarm setpoint will not be set greater than the maximum permissible alarm setting determined above.

If there is no release associated with this monitor, the monitor setpoint should be established as close as practical to background to prevent spurious alarms yet assure an alarm should an inadvertent release occur.

2.5.3 WASTE GAS HEADER - RT-1219

For the purpose of Specification 1.1.1, the alarm setpoint level for noble gas monitors is based on the gaseous effluent flow rate and meteorological dispersion factor. Since the waste gas header discharges to the plant vent stack, RT-1219 is used to monitor waste gas header releases.

2.5.3 WASTE GAS HEADER - RT-1219 (Continued)

When plant vent stack monitor RT-1219 is being used to monitor waste gas header releases, the setpoint determined by the smaller of the values from equations (2-1) and (2-2) will provide automatic termination of release from the waste gas header. Determine the maximum permissible waste gas header effluent flow rate corresponding to the vent stack monitor setpoint, C_{det} in accordance with the following:

$$f \leq \frac{(C_{det})\ (F)}{\sum_i C_{\gamma i}} \qquad (2\text{-}6)$$

where:

f = waste gas header effluent flow rate (cfm)

F = plant vent stack flow rate (cfm) used in equations (2-1) and (2-2)

C_{det} = limiting concentration (μCi/cc) at detector RT-1219 as determined from the smaller of the values from equations (2-1) and (2-2) in Section 2.5.1.

$\sum_i C_{\gamma i}$ = total gamma activity (μCi/cc) of the waste gas holdup tank to be released, as determined from the pre-release sample analysis.

Table 2-2[a]

Gaseous Effluent Radiation Monitor Calibration Constants (μCi/cc/cpm)

MONITOR	Kr-85	Xe-133
RT-1212	2.17E-8	1.48E-7
RT-1219 [b]	1.47E-8	4.36E-8

[a] This table provides typical (±20%) calibration constants for the gaseous effluent radiation monitors.

[b] Calibration constants for Monitor RT-1219 include a 5.17% dilution factor (air in-leakage).

2.6 Gaseous Effluent Dose Rate

The methodology used for the purpose of implementation of Specification 1.1.1 for the dose rate above background to an individual in an unrestricted area is calculated by using the following expressions:

2.6.1 FOR NOBLE GASES:

$$\dot{D}_{TB} = \sum_i \left[K_i \ \overline{(X/Q)} \ \dot{Q}_i \right] \tag{2-7}$$

$$\dot{D}_S = \sum_i \left[(L_i + 1.1M_i) \ \overline{(X/Q)} \ \dot{Q}_i \right] \tag{2-8}$$

where:

$\dot{D}_{TB}$ = total body dose rate in unrestricted areas due to radioactive materials released in gaseous effluents, in mrem/yr.

$\dot{D}_S$ = skin dose rate in unrestricted areas due to radioactive materials released in gaseous effluents, in mrem/yr.

K_i = the total body dose factor due to gamma emissions for each identified noble gas radionuclide, i, in mrem/yr per $\mu Ci/m^3$ from Table 2-3.

2.6.1 FOR NOBLE GASES: (Continued)

L_i = skin dose factor due to the beta emissions for each identified noble gas radionuclide, i, in mrem/yr per $\mu Ci/m^3$ from Table 2-3

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide, i, in mrad/yr per $\mu Ci/m^3$ from Table 2-3. (Unit conversion constant of 1.1 mrem/mrad converts air dose to skin dose.)

$\dot{Q}_i$ = the release rate of radionuclide, i, in gaseous effluents in $\mu Ci/sec$

$\overline{(X/Q)}$ = 1.3E-5 sec/m³. The highest calculated annual average relative concentration for any area at or beyond the unrestricted area boundary.

2.6.2 FOR I-131, I-133, RADIOACTIVE MATERIALS IN PARTICULATE FORM WITH HALF LIVES GREATER THAN EIGHT DAYS AND H-3:

$$\dot{D}_o = \sum_i [\sum_k (P_{ik} \overline{W}_k) \dot{Q}_i] \qquad (2\text{-}9)$$

where:

$\dot{D}_o$ = organ dose rate in unrestricted areas due to radioactive materials released in gaseous effluents, in mrem/yr

2.6.2 FOR I-131, I-133, RADIOACTIVE MATERIALS IN PARTICULATE FORM WITH HALF LIVES GREATER THAN EIGHT DAYS AND H-3: (Continued)

$\dot{Q}_i$ = the release rate of radionuclide, i, in gaseous effluents in μCi/sec

P_{ik} = the dose parameter for radionuclide, i, for pathway, k, from Table 2-4 for the inhalation pathway in mrem/yr per $\mu Ci/m^3$. The dose factors are based on the critical individual organ and the child age group.

$\overline{W}_k$ = the highest calculated annual average dispersion parameter for estimating the dose to an individual at or beyond the unrestricted area boundary for pathway k.

= 1.3E-5 sec/m^3 for the inhalation pathway. The location is the unrestricted area in the NW sector.

2.7 Gaseous Effluent Dose Calculation

2.7.1 DOSE FROM NOBLE GASES IN GASEOUS EFFLUENT

The air dose in unrestricted areas due to noble gases released in gaseous effluents is calculated using the following expressions:

2.7.1.1 For historical meteorology:

$$D_\gamma = 3.17x10^{-8} \sum_i [M_i \overline{(X/Q)} Q_i] \quad (2\text{-}10)$$

$$D_\beta = 3.17x10^{-8} \sum_i [N_i \overline{(X/Q)} Q_i] \quad (2\text{-}11)$$

where:

D_γ = the total projected gama air dose from gaseous effluents, in mrad

D_β = the total projected beta air dose from gaseous effluents, in mrad

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide, i, in mrad/yr per μCi/m³ from Table 2-3

N_i = the air dose due to beta emissions for each identified noble gas radionuclide, i, in mrad/yr per μCi/m³ from Table 2-3

$\overline{(X/Q)}$ = 1.3E-5 sec/m³. The maximum annual average atmospheric dispersion factor for any sector and distance at or beyond the unrestricted area boundary.

2.7.1.2 For meteorology concurrent with release: (Continued)

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide, i, in mrad/yr per $\mu Ci/m^3$ from Table 2-3.

N_i = the air dose factor due to beta emissions for each identified noble gas radionuclide, i, in mrad/yr per $\mu Ci/m^3$ from Table 2-3.

Δt_j = the length of the jth time period over which $(X/Q)_{j\theta}$ and $\dot{Q}_{ij}$ are averaged for gaseous releases in hours

$(X/Q)_{j\theta}$ = the atmospheric dispersion factor for time period Δt_j at exclusion boundary location in sector θ determined by concurrent meteorology, in sec/m^3

$\dot{Q}_{ij}$ = the average release rate of radionuclide, i, in gaseous effluents during time period, Δt_j, in $\mu Ci/sec$

1.4×10^{-4} = inverse hours/year

2.7.1.1 For historical meteorology: (Continued)

Q_i = the amount of noble gas radionuclide, i, released in gaseous effluents in μCi.

3.17×10^{-8} = inverse seconds/year

2.7.1.2 For meteorology concurrent with release:

$$D_{\gamma\theta} = 1.14 \times 10^{-4} \sum_i [M_i \sum_j (\Delta t_j \, (X/Q)_{j\theta} \, \dot{Q}_{ij})] \quad (2\text{-}12)$$

$$D_{\beta\theta} = 1.14 \times 10^{-4} \sum_i [N_i \sum_j (\Delta t_j \, (X/Q)_{j\theta} \, \dot{Q}_{ij})] \quad (2\text{-}13)$$

where:

$D_{\gamma\theta}$ = the total gamma air dose from gaseous effluents in sector θ, in mrad

$D_{\beta\theta}$ = the total beta air dose from gaseous effluents in sector θ, in mrad

2.7.2 DOSE FROM I-131, I-133, RADIOACTIVE MATERIAL IN PARTICULATE FORM AND H-3

The dose to an individual from I-131, I-133, radioactive materials in particulate form with half lives greater than eight days and H-3 in gaseous effluents released to unrestricted areas is calculated using the following expressions:

2.7.2.1 For historical meteorology:

$$D_o = 3.17\times10^{-8} \sum_i [\sum_k (R_{ik}W_k)\ Q_i] \quad (2\text{-}14)$$

where:

D_o = the total projected dose from gaseous effluents to an individual, in mrem

Q_i = the amount of radioiodines, radioactive materials in particulate form and radionuclides other than noble gases with half lives greater than eight days, i, released in gaseous effluents in μCi

$\sum_k R_{ik}W_k$ = the sum of all pathways k for radionuclide, i, of the R_i, W product in mrem/yr per μCi/sec. The $\sum_k R_{ik}W_k$ value for each radionuclide, i, is given in Table 2-5. The given is the maximum $\sum_k R_{ik}W_k$ for all locations and is based on the most restrictive age groups.

2.7.2.1 For historical meteorology: (Continued)

R_{ik} = the dose factor for each identified radionuclide, i, for pathway k (for the inhalation pathway in mrem/yr per μCi/m^3 and for the food and ground plane pathways in m^2 - mrem/yr per μCi/sec) at the controlling location. The R_{ik}'s for each age group are given in Tables 2-6 thru 2-16. The R_{ik} values in these tables are obtained using the NRC supplied computer code, PARTS (NUREG-0133), utilizing default and site specific (where available) parameters listed in Table 2-17.

W_k = the annual average dispersion parameter for estimating the dose to an individual at the controlling location for pathway k.

= $\overline{(X/Q)}$ for the inhalation pathway in sec/m^3. The $\overline{(X/Q)}$ for each controlling location is given in Tables 2-6 thru 2-16.

= $\overline{(D/Q)}$ for the food and ground plane pathways in m^{-2}. The $\overline{(D/Q)}$ for each controlling location are given in Tables 2-6 thru 2-16.

2.7.2.2 For meteorology concurrent with releases:

$$D_\theta = 1.14 \times 10^{-4} \sum_{i}^{l} \sum_{j}^{m} \sum_{k}^{n} [(\Delta t_j)\ (R_{ik\theta})\ (W_{jk\theta})\ (\dot{Q}_{ij})] \qquad (2\text{-}15)$$

where:

D_θ = the total annual dose from gaseous effluents to an individual in sector θ in mrem.

Δt_j = the length of the jth period over which $W_{jk\theta}$ and $\dot{Q}_{ij}$ are averaged for gaseous released in hours

$\dot{Q}_{ij}$ = the average release rate of radionuclide, i, in gaseous effluents during time period Δt_j in μCi/sec

$R_{ik\theta}$ = the dose factor for each identified radionuclide i, for pathway k for sector θ (for the inhalation pathway in mrem/yr per $\mu Ci/m^3$ and for the food and ground plane pathways in m^2 mrem/yr per μCi/sec) at the controlling location.

The dose factor is based on the maximum dose to the most restrictive age group. A listing of R_{ik} for the controlling locations in each landward sector for each group is given in Tables 2-6 thru 2-16. The θ is determined by the concurrent meteorology.

2.0 RADIOACTIVE GASEOUS EFFLUENTS (Continued)

2.7.2.2 For meteorology concurrent with releases: (Continued)

$W_{jk\theta}$ = the dispersion parameters for the time period Δt_j for each pathway k for calculating the dose to an individual at the controlling location in sector θ using concurrent meteorological conditions.

= (X/Q) for the inhalation pathway in sec/m^3

= (D/Q) for the food and ground plane pathways in m^{-2}

TABLE 2-3

DOSE FACTORS FOR NOBLE GASES AND DAUGHTERS**

Radio-Nuclide	Total Body Dose Factor K_i (mrem/yr per μCi/m³)	Skin Dose Factor L_i (mrem/yr per μCi/m³)	Gamma Air Dose Factor M_i (mrad/yr per μCi/m³)	Beta Air Dose Factor N_i (mrad/yr per μCi/m³)
Kr-85m	1.17E3*	1.46E3	1.23E3	1.97E3
Kr-85	1.61E1	1.34E3	1.72E1	1.95E3
Kr-87	5.92E3	9.73E3	6.17E3	1.03E4
Kr-88	1.47E4	2.37E3	1.52E4	2.93E3
Xe-131m	9.15E1	4.76E2	1.56E2	1.11E3
Xe-133m	2.51E2	9.94E2	3.27E2	1.48E3
Xe-133	2.94E2	3.06E2	3.53E2	1.05E3
Xe-135m	3.12E3	7.11E2	3.36E3	7.39E2
Xe-135	1.81E3	1.86E3	1.92E3	2.46E3
Xe-138	8.83E3	4.13E3	9.21E3	4.75E3
Ar-41	8.84E3	2.69E3	9.30E3	3.28E3

*1.17E3 = 1.17×10^3
**source: USNRC Reg. Guide 1.109, Table B-1

TABLE 2-4

DOSE PARAMETER P_{ik}*

CHILD AGE GROUP
CRITICAL ORGAN

Radionuclide	Inhalation Pathway (mrem/yr per μCi/m^3)	Radionuclide	Inhalation Pathway (mrem/yr per μCi/m^3)
H - 3	1.1E3	I -131	1.6E7
Cr-51	1.7E4	I -132	1.9E5
Mn-54	1.6E6	I -133	3.8E6
Co-57	5.1E5	I -134	5.1E4
Co-58	1.1E6	I -135	7.9E5
Co-60	7.1E6	Cs-134	1.0E6
Sr-89	2.2E6	Cs-136	1.7E5
Sr-90	1.0E8	Cs-137	9.1E5
Zr-95	2.2E6	Ba-140	1.7E6
Nb-95	6.1E5	Ce-141	5.4E5
Te-129m	1.8E6	Ce-144	1.2E7

*Source: USNRC NUREG-0133, Section 5.2.1.1

TABLE 2-5

CONTROLLING LOCATION FACTORS

Radionuclide	$\sum_k R_{ik}W_k$ mrem/yr per μCi/sec
H -3	1.12E-3
Cr-51	1.80E-2
Mn-54	4.58E0
Co-57	1.13E0
Co-58	1.32E0
Co-60	6.99E1
Sr-89	5.58E1
Sr-90	2.34E3
Zr-95	1.98E0
Nb-95	4.92E0
Te-129m	4.14E0
Cs-134	4.32E1
Cs-136	6.55E-1
Cs-137	3.96E1
Ba-140	2.63E-1
Ce-141	7.38E-1
Ce-144	2.16E1
I -131	2.35E1
I -133	3.28E0
I -135	6.88E-1
UN-ID	4.50E0

Footnote: These values to be used in manual calculations are the maximum $\sum_k R_{ik}W_k$ for all locations based on the most restrictive age group.

TABLE 2-6

DOSE PARAMETER R_i FOR SECTOR N

Pathway = Surf Beach | Distance = 0.2 miles
X/Q = 6.8E-6 sec/m3 | D/Q = 2.2E-8 m^{-2}

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	-0-	-0-	1.2E1	-0-	5.1E1	-0-	1.6E1	-0-
Cr-51	-0-	-0-	1.1E1	2.2E4	1.2E2	1.1E5	4.1E1	1.9E4
Mn-54	-0-	-0-	4.5E2	6.6E6	2.7E3	3.2E7	9.5E2	5.7E6
Co-57	-0-	-0-	1.4E2	1.6E6	1.3E3	7.9E6	3.9E2	1.4E6
Co-58	-0-	-0-	3.6E2	1.8E6	3.8E3	8.7E6	1.3E3	1.6E6
Co-60	-0-	-0-	1.0E3	1.0E8	1.0E4	4.9E8	3.5E3	8.8E7
Sr-89	-0-	-0-	6.2E3	1.0E2	1.8E4	4.9E2	3.7E3	8.9E1
Sr-90	-0-	-0-	1.1E6	-0-	4.4E6	-0-	1.2E6	-0-
Zr-95	-0-	-0-	6.3E2	1.2E6	6.0E3	5.8E6	1.8E3	1.0E6
Nb-95	-0-	-0-	3.8E2	6.6E5	3.9E3	3.1E6	1.3E3	5.6E5
Te-129m	-0-	-0-	5.2E2	9.4E4	2.1E3	4.5E5	4.5E2	8.1E4
Cs-134	-0-	-0-	1.1E4	3.3E7	4.5E4	1.6E8	1.0E4	2.8E7
Cs-136	-0-	-0-	1.8E3	7.2E5	7.8E3	3.4E6	1.8E3	6.2E5
Cs-137	-0-	-0-	8.6E3	4.9E7	3.4E4	2.4E8	7.6E3	4.2E7
Ba-140	-0-	-0-	7.7E2	9.9E4	9.2E3	4.7E5	2.7E3	8.4E4
Ce-141	-0-	-0-	5.9E2	6.6E4	5.1E3	3.1E5	1.5E3	5.6E4
Ce-144	-0-	-0-	4.0E3	3.3E5	3.5E4	1.6E6	1.0E4	2.9E5
I -131	-0-	-0-	1.7E5	8.3E4	5.9E5	3.9E5	1.5E5	7.1E4
I -133	-0-	-0-	4.0E4	1.2E4	1.2E5	5.6E4	2.6E4	1.0E4
I -135	-0-	-0-	8.2E3	1.2E4	2.5E4	5.8E4	5.5E3	1.0E4
UN-ID	-0-	-0-	1.2E3	3.6E6	5.4E3	1.7E7	1.3E3	3.1E6

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-7

DOSE PARAMETER R_i FOR SECTOR P

Pathway = Surf Beach   Distance = 0.2 miles
X/Q = 6.4E-6 sec/m³   D/Q = 2.7E-8 m⁻²

Radio-Nuclide	Infant Inhalation Pathway	Infant Food & Ground Pathway	Child Inhalation Pathway	Child Food & Ground Pathway	Teen Inhalation Pathway	Teen Food & Ground Pathway	Adult Inhalation Pathway	Adult Food & Ground Pathway
H -3	-0-	-0-	1.2E1	-0-	5.1E1	-0-	8.7E1	-0-
Cr-51	-0-	-0-	1.1E1	2.2E4	1.2E2	1.1E5	2.3E2	3.2E5
Mn-54	-0-	-0-	4.5E2	6.6E6	2.7E3	3.2E7	5.3E3	9.5E7
Co-57	-0-	-0-	1.4E2	1.6E6	1.3E3	7.9E6	2.2E3	2.3E7
Co-58	-0-	-0-	3.6E2	1.8E6	3.8E3	8.7E6	7.3E3	2.6E7
Co-60	-0-	-0-	1.0E3	1.0E8	1.0E4	4.9E8	2.0E4	1.5E9
Sr-89	-0-	-0-	6.2E3	1.0E2	1.8E4	4.9E2	2.1E4	1.5E3
Sr-90	-0-	-0-	1.1E6	-0-	4.4E6	-0-	6.8E6	-0-
Zr-95	-0-	-0-	6.3E2	1.2E6	6.0E3	5.8E6	1.0E4	1.7E7
Nb-95	-0-	-0-	3.8E2	6.6E5	3.9E3	3.1E6	7.1E3	9.8E6
Te-129m	-0-	-0-	5.2E2	9.4E4	2.1E3	4.5E5	2.5E3	1.4E6
Cs-134	-0-	-0-	1.1E4	3.3E7	4.5E4	1.6E8	5.8E4	4.3E8
Cs-136	-0-	-0-	1.8E3	7.2E5	7.8E3	3.4E6	1.0E4	1.7E7
Cs-137	-0-	-0-	8.6E3	4.9E7	3.4E4	2.4E8	4.3E4	7.0E8
Ba-140	-0-	-0-	7.7E2	9.9E4	9.2E3	4.7E5	1.5E4	1.1E6
Ce-141	-0-	-0-	5.9E2	6.6E4	5.1E3	3.1E5	8.2E3	9.4E5
Ce-144	-0-	-0-	4.0E3	3.3E5	3.5E4	1.6E6	5.6E4	4.8E6
I -131	-0-	-0-	1.7E5	8.3E4	5.9E5	3.9E5	8.2E5	1.2E6
I -133	-0-	-0-	4.0E4	1.2E4	1.2E5	5.6E4	1.5E5	1.7E5
I -135	-0-	-0-	8.2E3	1.2E4	2.5E4	5.8E4	3.1E4	1.7E5
UN-ID	-0-	-0-	1.2E3	3.6E6	5.4E3	1.7E7	7.1E3	5.1E7

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-7

DOSE PARAMETER R_i FOR SECTOR P

Pathway = Former Nixon Estate (no garden) Distance = 2.6 miles
X/Q = 1.4E-7 sec/m³ D/Q = 4.2E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	6.5E2	-0-	1.1E3	-0-	1.3E3	-0-	1.3E3	-0-
Cr-51	3.6E2	3.7E6	1.1E3	3.7E6	3.0E3	3.7E6	3.3E3	3.7E6
Mn-54	2.5E4	1.1E9	4.3E4	1.1E9	6.7E4	1.1E9	7.7E4	1.1E9
Co-57	4.9E3	2.7E8	1.3E4	2.7E8	3.1E4	2.7E8	3.1E4	2.7E8
Co-58	1.1E4	3.0E8	3.4E4	3.0E8	9.5E4	3.0E8	1.1E5	3.0E8
Co-60	3.2E4	1.7E10	9.6E4	1.7E10	2.6E5	1.7E10	2.8E5	1.7E10
Sr-89	4.0E5	1.7E4	6.0E5	1.7E4	4.3E5	1.7E4	3.0E5	1 7E4
Sr-90	4.1E7	-0-	1.0E8	-0-	1.1E8	-0-	9.9E7	-0-
Zr-95	2.2E4	2.0E8	6.1E4	2.0E8	1.5E5	2.0E8	1.5E5	2.0E8
Nb-95	1.3E4	1.1E8	3.7E4	1.1E8	9.7E4	1.1E8	1.0E5	1.1E8
Te-129m	3.2E4	1.6E7	5.0E4	1.6E7	5.2E4	1.6E7	3.7E4	1.6E7
Cs-134	7.0E5	5.5E9	1.0E6	5.5E9	1.1E6	5.5E9	8.5E5	5.5E9
Cs-136	1.3E5	1.2E8	1.7E5	1.2E8	1.9E5	1.2E8	1.5E5	1.2E8
Cs-137	6.1E5	8.2E9	8.3E5	8.2E9	8.5E5	8.2E9	6.2E5	8.2E9
Ba-140	5.6E4	1.6E7	7.4E4	1.6E7	2.3E5	1.6E7	2.2E5	1.6E7
Ce-141	2.2E4	1.1E7	5.7E4	1.1E7	1.3E5	1.1E7	1.2E5	1.1E7
Ce-144	1.5E5	5.6E7	3.9E5	5.6E7	8.6E5	5.6E7	8.2E5	5.6E7
I -131	1.5E7	1.4E7	1.6E7	1.4E7	1.5E7	1.4E7	1.2E7	1.4E7
I -133	3.6E6	2.0E6	3.8E6	2.0E6	2.9E6	2.0E6	2.2E6	2.0E6
I -135	7.0E5	2.0E6	7.9E5	2.0E6	6.2E5	2.0E6	4.5E5	2.0E6
UN-ID	6.3E4	6.0E8	1.1E5	6.0E8	1.3E5	6.0E8	1.0E5	6.0E8

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = Surf Beach Guard Shack   Distance = 0.5 miles
X/Q = 3.3E-6 sec/m³   D/Q = 1.7E-8 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	7.2E1	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	1.9E2	2.7E5
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	4.4E3	7.9E7
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	1.8E3	2.0E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	6.1E3	2.2E7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	1.6E4	1.2E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	1.7E4	1.2E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	5.7E6	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	8.6E3	1.4E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	5.9E3	7.8E6
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	2.1E3	1.1E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	4.8E4	3.9E8
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	8.4E3	8.6E6
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	3.5E4	5.9E8
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	1.2E4	1.2E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	6.9E3	7.8E5
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	4.7E4	4.0E6
I -131	-0-	-0-	-0-	-0-	-0-	-0-	6.8E5	9.8E5
I -133	-0-	-0-	-0-	-0-	-0-	-0-	1.2E5	1.4E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	2.6E4	1.4E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	5.9E3	4.3E7

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = Enlisted Beach
X/Q = 1.1E-6 sec/m³

Distance = 1.0 miles
D/Q = 5.5E-9 m-²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	1.2E1	-0-	5.1E1	-0-	1.6E1	-0-
Cr-51	-0-	-0-	1.1E1	2.2E4	1.2E2	1.1E5	4.1E1	1.9E4
Mn-54	-0-	-0-	4.5E2	6.6E6	2.7E3	3.2E7	9.5E2	5.7E6
Co-57	-0-	-0-	1.4E2	1.6E6	1.3E3	7.9E6	3.9E2	1.4E6
Co-58	-0-	-0-	3.6E2	1.8E6	3.8E3	8.7E6	1.3E3	1.6E6
Co-60	-0-	-0-	1.0E3	1.0E8	1.0E4	4.9E8	3.5E3	8.8E7
Sr-89	-0-	-0-	6.2E3	1.0E2	1.8E4	4.9E2	3.7E3	8.9E1
Sr-90	-0-	-0-	1.1E6	-0-	4.4E6	-0-	1.2E6	-0-
Zr-95	-0-	-0-	6.3E2	1.2E6	6.0E3	5.8E6	1.8E3	1.0E6
Nb-95	-0-	-0-	3.8E2	6.6E5	3.9E3	3.1E6	1.3E3	5.6E5
Te-129m	-0-	-0-	5.2E2	9.4E4	2.1E3	4.5E5	4.5E2	8.1E4
Cs-134	-0-	-0-	1.1E4	3.3E7	4.5E4	1.6E8	1.0E4	2.8E7
Cs-136	-0-	-0-	1.8E3	7.2E5	7.8E3	3.4E6	1.8E3	6.2E5
Cs-137	-0-	-0-	8.6E3	4.9E7	3.4E4	2.4E8	7.6E3	4.2E7
Ba-140	-0-	-0-	7.7E2	9.9E4	9.2E3	4.7E5	2.7E3	8.4E4
Ce-141	-0-	-0-	5.9E2	6.6E4	5.1E3	3.1E5	1.5E3	5.6E4
Ce-144	-0-	-0-	4.0E3	3.3E5	3.5E4	1.6E6	1.0E4	2.9E5
I -131	-0-	-0-	1.7E5	8.3E4	5.9E5	3.9E5	1.5E5	7.1E4
I -133	-0-	-0-	4.0E4	1.2E4	1.2E5	5.6E4	2.6E4	1.0E4
I -135	-0-	-0-	8.2E3	1.2E4	2.5E4	5.8E4	5.5E3	1.0E4
UN-ID	-0-	-0-	1.2E3	3.6E6	5.4E3	1.7E7	1.3E3	3.1E6

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = Enlisted Beach Check-In — Distance = 1.2 miles
X/Q = 8.6E-6 sec/m³ — D/Q = 4.1E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	2.9E2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	7.6E2	1.1E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	1.8E4	3.2E8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	7.2E3	7.8E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	8.7E7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	6.5E4	4.9E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	6.9E4	4.9E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.3E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	3.4E4	5.7E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	3.1E7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	8.3E3	4.5E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.6E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	3.3E4	3.4E7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.4E5	2.3E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	5.0E4	4.7E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	2.7E4	3.1E6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.6E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	2.7E6	3.9E6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	4.9E5	5.6E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	5.8E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	1.7E8

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = San Onofre Mobile Homes Distance = 1.2 miles
X/Q = 8.6E-7 sec/m³ D/Q = 4.1E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	6.5E2	-0-	1.1E3	-0-	1.3E3	-0-	1.3E3	-0-
Cr-51	3.6E2	3.7E6	1.1E3	3.7E6	3.0E3	3.7E6	3.3E3	3.7E6
Mn-54	2.5E4	1.1E9	4.3E4	1.1E9	6.7E4	1.1E9	7.7E4	1.1E9
Co-57	4.9E3	2.7E8	1.3E4	2.7E8	3.1E4	2.7E8	3.1E4	2.7E8
Co-58	1.1E4	3.0E8	3.4E4	3.0E8	9.5E4	3.0E8	1.1E5	3.0E8
Co-60	3.2E4	1.7E10	9.6E4	1.7E10	2.6E5	1.7E10	2.8E5	1.7E10
Sr-89	4.0E5	1.7E4	6.0E5	1.7E4	4.3E5	1.7E4	3.0E5	1.7E4
Sr-90	4.1E7	-0-	1.0E8	-0-	1.1E8	-0-	9.9E7	-0-
Zr-95	2.2E4	2.0E8	6.1E4	2.0E8	1.5E5	2.0E8	1.5E5	2.0E8
Nb-95	1.3E4	1.1E8	3.7E4	1.1E8	9.7E4	1.1E8	1.0E5	1.1E8
Te-129m	3.2E4	1.6E7	5.0E4	1.6E7	5.2E4	1.6E7	3.7E4	1.6E7
Cs-134	7.0E5	5.5E9	1.0E6	5.5E9	1.1E6	5.5E9	8.5E5	5.5E9
Cs-136	1.3E5	1.2E8	1.7E5	1.2E8	1.9E5	1.2E8	1.5E5	1.2E8
Cs-137	6.1E5	8.2E9	8.3E5	8.2E9	8.5E5	8.2E9	6.2E5	8.2E9
Ba-140	5.6E4	1.6E7	7.4E4	1.6E7	2.3E5	1.6E7	2.2E5	1.6E7
Ce-141	2.2E4	1.1E7	5.7E4	1.1E7	1.3E5	1.1E7	1.2E5	1.1E7
Ce-144	1.5E5	5.6E7	3.9E5	5.6E7	8.6E5	5.6E7	8.2E5	5.6E7
I -131	1.5E7	1.4E7	1.6E7	1.4E7	1.5E7	1.4E7	1.2E7	1.4E7
I -133	3.6E6	2.0E6	3.8E6	2.0E6	2.9E6	2.0E6	2.2E6	2.0E6
I -135	7.0E5	2.0E6	7.9E5	2.0E6	6.2E5	2.0E6	4.5E5	2.0E6
UN-ID	6.3E4	6.0E8	1.1E5	6.0E8	1.3E5	6.0E8	1.0E5	6.0E8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = San Clemente Ranch (No Residents) Distance = 1.9 miles
X/Q = 4.4E-7 sec/m³ D/Q = 1.8E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	3.8E3	-0-	2.4E3	-0-	1.9E3
Cr-51	-0-	-0-	-0-	4.8E6	-0-	7.4E6	-0-	6.7E6
Mn-54	-0-	-0-	-0-	6.1E8	-0-	8.3E8	-0-	8.0E8
Co-57	-0-	-0-	-0-	2.2E8	-0-	2.9E8	-0-	2.4E8
Co-58	-0-	-0-	-0-	3.3E8	-0-	5.1E8	-0-	4.7E8
Co-60	-0-	-0-	-0-	2.0E9	-0-	3.0E9	-0-	2.7E9
Sr-89	-0-	-0-	-0-	3.1E10	-0-	1.2E10	-0-	7.2E9
Sr-90	-0-	-0-	-0-	1.3E12	-0-	7.7E11	-0-	5.8E11
Zr-95	-0-	-0-	-0-	7.8E8	-0-	1.1E9	-0-	9.1E8
Nb-95	-0-	-0-	-0-	2.4E8	-0-	3.5E8	-0-	3.1E8
Te-129m	-0-	-0-	-0-	2.3E9	-0-	1.4E9	-0-	7.9E8
Cs-134	-0-	-0-	-0-	2.4E10	-0-	1.5E10	-0-	9.2E9
Cs-136	-0-	-0-	-0-	9.0E8	-0-	5.7E7	-0-	3.6E7
Cs-137	-0-	-0-	-0-	2.2E10	-0-	1.3E10	-0-	7.8E9
Ba-140	-0-	-0-	-0-	1.1E8	-0-	6.8E7	-0-	5.3E7
Ce-141	-0-	-0-	-0-	3.3E8	-0-	4.1E8	-0-	3.2E8
Ce-144	-0-	-0-	-0-	9.2E9	-0-	1.2E10	-0-	9.0E9
I -131	-0-	-0-	-0-	4.1E9	-0-	2.1E9	-0-	1.4E9
I -133	-0-	-0-	-0-	4.0E-11	-0-	1.7E-11	-0-	1.1E-11
I -135	-0-	-0-	-0-	6.9E-35	-0-	3.0E-35	-0-	1.9E-35
UN-ID	-0-	-0-	-0-	2.5E9	-0-	1.7E9	-0-	1.1E9

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = S. C. Ranch Adm. Offices   Distance = 2.3 miles
X/Q = 3.3E-7 sec/m³   D/Q = 1.3E-9 m-²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	2.9E2	1.9E3
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	7.6E2	7.8E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	1.8E4	1.1E9
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	7.2E3	3.2E8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	5.6E8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	6.5E4	7.6E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	6.9E4	7.2E9
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.3E7	5.8E11
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	3.4E4	9.7E8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	3.4E8
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	8.3E3	7.9E8
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.1E10
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	3.3E4	7.0E7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.4E5	1.0E10
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	5.0E4	5.8E7
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	2.7E4	3.2E8
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	9.0E9
I -131	-0-	-0-	-0-	-0-	-0-	-0-	2.7E6	1.4E9
I -133	-0-	-0-	-0-	-0-	-0-	-0-	4.9E5	5.6E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	5.8E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	1.2E9

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = SC Res. with Garden Distance = 3.9 miles
X/Q = 1.4E-7 sec/m³ D/Q = 4.9E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	4.0E3	-0-	2.6E3	1.3E3	2.3E3
Cr-51	-0-	-0-	-0-	6.1E6	-0-	1.0E7	3.3E3	1.5E7
Mn-54	-0-	-0-	-0-	6.5E8	-0-	9.2E8	7.7E4	2.0E9
Co-57	-0-	-0-	-0-	2.4E8	-0-	3.2E8	3.1E4	5.6E8
Co-58	-0-	-0-	-0-	3.7E8	-0-	5.9E8	1.1E5	9.1E8
Co-60	-0-	-0-	-0-	2.1E9	-0-	3.2E9	2.8E5	2.0E10
Sr-89	-0-	-0-	-0-	3.5E10	-0-	1.5E10	3.0E5	9.8E9
Sr-90	-0-	-0-	-0-	1.4E12	-0-	8.3E11	9.9E7	6.7E11
Zr-95	-0-	-0-	-0-	8.8E8	-0-	1.2E9	1.5E5	1.4E9
Nb-95	-0-	-0-	-0-	2.9E8	-0-	4.5E8	1.0E5	5.8E8
Te-129m	-0-	-0-	-0-	2.9E9	-0-	1.8E9	3.7E4	1.2E9
Cs-134	-0-	-0-	-0-	2.6E10	-0-	1.6E10	8.5E5	1.6E10
Cs-136	-0-	-0-	-0-	2.2E8	-0-	1.7E8	1.5E5	2.9E8
Cs-137	-0-	-0-	-0-	2.4E10	-0-	1.4E10	6.2E5	1.7E10
Ba-140	-0-	-0-	-0-	2.8E8	-0-	2.1E8	2.2E5	2.8E8
Ce-141	-0-	-0-	-0-	4.0E8	-0-	5.3E8	1.2E5	5.1E8
Ce-144	-0-	-0-	-0-	1.0E10	-0-	1.3E10	8.2E5	1.1E10
I -131	-0-	-0-	-0-	4.8E10	-0-	3.1E10	1.2E7	3.8E10
I -133	-0-	-0-	-0-	8.1E8	-0-	4.6E8	2.2E6	5.3E8
I -135	-0-	-0-	-0-	9.8E6	-0-	5.7E6	4.5E5	8.6E6
UN-ID	-0-	-0-	-0-	2.7E9	-0-	1.9E9	1.0E5	1.9E9

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

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TABLE 2-9

DOSE PARAMETER R_i FOR SECTOR R

Pathway = San Onofre Mobile Homes   Distance = 1.1 miles
X/Q = 6.6E-7 sec/m³   D/Q = 3.8E-9 m-²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	6.5E2	-0-	1.1E3	-0-	1.3E3	-0-	1.3E3	-0-
Cr-51	3.6E2	3.7E6	1.1E3	3.7E6	3.0E3	3.7E6	3.3E3	3.7E6
Mn-54	2.5E4	1.1E9	4.3E4	1.1E9	6.7E4	1.1E9	7.7E4	1.1E9
Co-57	4.9E3	2.7E8	1.3E4	2.7E8	3.1E4	2.7E8	3.1E4	2.7E8
Co-58	1.1E4	3.0E8	3.4E4	3.0E8	9.5E4	3.0E8	1.1E5	3.0E8
Co-60	3.2E4	1.7E10	9.6E4	1.7E10	2.6E5	1.7E10	2.8E5	1.7E10
Sr-89	4.0E5	1.7E4	6.0E5	1.7E4	4.3E5	1.7E4	3.0E5	1.7E4
Sr-90	4.1E7	-0-	1.0E8	-0-	1.1E8	-0-	9.9E7	-0-
Zr-95	2.2E4	2.0E8	6.1E4	2.0E8	1.5E5	2.0E8	1.5E5	2.0E8
Nb-95	1.3E4	1.1E8	3.7E4	1.1E8	9.7E4	1.1E8	1.0E5	1.1E8
Te-129m	3.2E4	1.6E7	5.0E4	1.6E7	5.2E4	1.6E7	3.7E4	1.6E7
Cs-134	7.0E5	5.5E9	1.0E6	5.5E9	1.1E6	5.5E9	8.5E5	5.5E9
Cs-136	1.3E5	1.2E8	1.7E5	1.2E8	1.9E5	1.2E8	1.5E5	1.2E8
Cs-137	6.1E5	8.2E9	8.3E5	8.2E9	8.5E5	8.2E9	6.2E5	8.2E9
Ba-140	5.6E4	1.6E7	7.4E4	1.6E7	2.3E5	1.6E7	2.2E5	1.6E7
Ce-141	2.2E4	1.1E7	5.7E4	1.1E7	1.3E5	1.1E7	1.2E5	1.1E7
Ce-144	1.5E5	5.6E7	3.9E5	5.6E7	8.6E5	5.6E7	8.2E5	5.6E7
I -131	1.5E7	1.4E7	1.6E7	1.4E7	1.5E7	1.4E7	1.2E7	1.4E7
I -133	3.6E6	2.0E6	3.8E6	2.0E6	2.9E6	2.0E6	2.2E6	2.0E6
I -135	7.0E5	2.0E6	7.9E5	2.0E6	6.2E5	2.0E6	4.5E5	2.0E6
UN-ID	6.3E4	6.0E8	1.1E5	6.0E8	1.3E5	6.0E8	1.0E5	6.0E8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-9

DOSE PARAMETER R_i FOR SECTOR R

Pathway = Sheep (Meat)
X/Q = 8.9E-7 sec/m^3

Distance = 0.9 miles
D/Q = 5.4E-9 m^{-2}

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	1.5E0	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E3	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	-0-	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	-0-	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	-0-	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	-0-	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.4E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-9

DOSE PARAMETER R_i FOR SECTOR R

Pathway = Deer Consumer Distance = 2.4 miles
X/Q = 1.9E-7 sec/m³ D/Q = 1.6E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	2.8E1	-0-	2.3E1	3.5E1	3.9E1
Cr-51	-0-	-0-	-0-	5.0E4	-0-	1.0E5	9.1E1	3.2E5
Mn-54	-0-	-0-	-0-	7.7E5	-0-	1.4E6	2.1E3	4.1E7
Co-57	-0-	-0-	-0-	4.6E6	-0-	8.0E6	8.6E2	2.3E7
Co-58	-0-	-0-	-0-	9.6E6	-0-	1.9E7	2.9E3	4.7E7
Co-60	-0-	-0-	-0-	3.6E7	-0-	7.2E7	7.8E3	7.2E8
Sr-89	-0-	-0-	-0-	4.9E7	-0-	2.6E7	8.3E3	3.1E7
Sr-90	-0-	-0-	-0-	1.0E9	-0-	8.0E8	2.7E6	1.2E9
Zr-95	-0-	-0-	-0-	6.2E7	-0-	1.1E8	4.1E3	2.0E8
Nb-95	-0-	-0-	-0-	2.3E8	-0-	4.5E8	2.8E3	8.2E8
Te-129m	-0-	-0-	-0-	5.9E8	-0-	4.5E8	1.0E3	5.3E8
Cs-134	-0-	-0-	-0-	1.4E8	-0-	1.2E8	2.3E4	3.4E8
Cs-136	-0-	-0-	-0-	5.1E6	-0-	4.2E6	4.0E3	9.5E6
Cs-137	-0-	-0-	-0-	1.2E8	-0-	9.3E7	1.7E4	4.0E8
Ba-140	-0-	-0-	-0-	5.0E6	-0-	4.2E6	6.0E3	7.4E6
Ce-141	-0-	-0-	-0-	1.5E6	-0-	2.4E6	3.3E3	4.2E6
Ce-144	-0-	-0-	-0-	1.8E7	-0-	2.9E7	2.2E4	4.9E7
I -131	-0-	-0-	-0-	6.5E8	-0-	4.3E8	3.3E5	5.9E8
I -133	-0-	-0-	-0-	1.6E1	-0-	8.6E0	5.9E4	6.7E4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E4	6.9E4
UN-ID	-0-	-0-	-0-	1.1E8	-0-	9.4E7	2.8E3	1.4E8

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

DOSE PARAMETER R_i FOR SECTOR R

Pathway = San Clemente Ranch (No Residents) Distance = 2.0 miles
X/Q = 2.5E-7 sec/m³ D/Q = 1.3E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	3.8E3	-0-	2.4E3	-0-	1.9E3
Cr-51	-0-	-0-	-0-	4.8E6	-0-	7.4E6	-0-	6.7E6
Mn-54	-0-	-0-	-0-	6.1E8	-0-	8.3E8	-0-	8.0E8
Co-57	-0-	-0-	-0-	2.2E8	-0-	2.9E8	-0-	2.4E8
Co-58	-0-	-0-	-0-	3.3E8	-0-	5.1E8	-0-	4.7E8
Co-60	-0-	-0-	-0-	2.0E9	-0-	3.0E9	-0-	2.7E9
Sr-89	-0-	-0-	-0-	3.1E10	-0-	1.2E10	-0-	7.2E9
Sr-90	-0-	-0-	-0-	1.3E12	-0-	7.7E11	-0-	5.8E11
Zr-95	-0-	-0-	-0-	7.8E8	-0-	1.1E9	-0-	9.1E8
Nb-95	-0-	-0-	-0-	2.4E8	-0-	3.5E8	-0-	3.1E8
Te-129m	-0-	-0-	-0-	2.3E9	-0-	1.4E9	-0-	7.9E8
Cs-134	-0-	-0-	-0-	2.4E10	-0-	1.5E10	-0-	9.2E9
Cs-136	-0-	-0-	-0-	9.0E8	-0-	5.7E7	-0-	3.6E7
Cs-137	-0-	-0-	-0-	2.2E10	-0-	1.3E10	-0-	7.8E9
Ba-140	-0-	-0-	-0-	1.1E8	-0-	6.8E7	-0-	5.3E7
Ce-141	-0-	-0-	-0-	3.3E8	-0-	4.1E8	-0-	3.2E8
Ce-144	-0-	-0-	-0-	9.2E9	-0-	1.2E10	-0-	9.0E9
I -131	-0-	-0-	-0-	4.1E9	-0-	2.1E9	-0-	1.4E9
I -133	-0-	-0-	-0-	4.0E-11	-0-	1.7E-11	-0-	1.1E-11
I -135	-0-	-0-	-0-	6.9E-35	-0-	3.0E-35	-0-	1.9E-35
UN-ID	-0-	-0-	-0-	2.5E9	-0-	1.7E9	-0-	1.1E9

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

DOSE PARAMETER R_i FOR SECTOR R

Pathway = S.C. Ranch Pac. W. Res. Distance = 2.4 miles
X/Q = 1.9E-7 sec/m³ D/Q = 9.5E-9 m-²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	3.8E3	-0-	2.4E3	1.2E3	1.9E3
Cr-51	-0-	-0-	-0-	4.8E6	-0-	7.4E6	3.0E3	1.0E7
Mn-54	-0-	-0-	-0-	6.1E8	-0-	8.3E8	7.1E4	1.939
Co-57	-0-	-0-	-0-	2.2E8	-0-	2.9E8	2.9E4	5.2E8
Co-58	-0-	-0-	-0-	3.3E8	-0-	5.1E8	9.8E4	7.8E8
Co-60	-0-	-0-	-0-	2.0E9	-0-	3.0E9	2.6E5	2.0E10
Sr-89	-0-	-0-	-0-	3.1E10	-0-	1.2E10	2.8E5	7.2E9
Sr-90	-0-	-0-	-0-	1.3E12	-0-	7.7E11	9.1E7	5.8E11
Zr-95	-0-	-0-	-0-	7.8E8	-0-	1.1E9	1.4E5	1.1E9
Nb-95	-0-	-0-	-0-	2.4E8	-0-	3.5E8	9.5E4	4.2E8
Te-129m	-0-	-0-	-0-	2.3E9	-0-	1.4E9	3.4E4	8.0E8
Cs-134	-0-	-0-	-0-	2.4E10	-0-	1.5E10	7.8E5	1.5E10
Cs-136	-0-	-0-	-0-	9.0E7	-0-	5.7E7	1.3E5	1.6E8
Cs-137	-0-	-0-	-0-	2.2E10	-0-	1.3E10	5.7E5	1.6E10
Ba-140	-0-	-0-	-0-	1.1E8	-0-	6.8E7	2.0E5	7.0E7
Ce-141	-0-	-0-	-0-	3.3E8	-0-	4.1E8	1.1E5	3.3E8
Ce-144	-0-	-0-	-0-	9.2E9	-0-	1.2E10	7.5E5	9.0E9
I -131	-0-	-0-	-0-	4.1E9	-0-	2.1E9	1.1E7	1.4E9
I -133	-0-	-0-	-0-	4.0E-11	-0-	1.7E-11	2.0E6	2.0E6
I -135	-0-	-0-	-0-	6.9E-35	-0-	3.0E-35	4.1E5	2.0E6
UN-ID	-0-	-0-	-0-	2.5E9	-0-	1.7E9	9.5E4	1.7E9

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-10

DOSE PARAMETER R_i FOR SECTOR A

Pathway = Sheep (Meat)
X/Q = 9.5E-7 sec/m³

Distance = 0.7 miles
D/Q = 7.4E-9 m-²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	1.5E0	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E3	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	-0-	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	-0-	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	-0-	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	-0-	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.4E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-10

DOSE PARAMETER R_i FOR SECTOR A

Pathway = Deer Consumer
X/Q = 2.8E-7 sec/m³

Distance = 1.6 miles
D/Q = 1.0E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	2.8E1	-0-	2.3E1	3.5E1	3.9E1
Cr-51	-0-	-0-	-0-	5.0E4	-0-	1.0E5	9.1E1	3.2E5
Mn-54	-0-	-0-	-0-	7.7E5	-0-	1.4E6	2.1E3	4.1E7
Co-57	-0-	-0-	-0-	4.6E6	-0-	8.0E6	8.6E2	2.3E7
Co-58	-0-	-0-	-0-	9.6E6	-0-	1.9E7	2.9E3	4.7E7
Co-60	-0-	-0-	-0-	3.6E7	-0-	7.2E7	7.8E3	7.2E8
Sr-89	-0-	-0-	-0-	4.9E7	-0-	2.6E7	8.3E3	3.1E7
Sr-90	-0-	-0-	-0-	1.0E9	-0-	8.0E8	2.7E6	1.2E9
Zr-95	-0-	-0-	-0-	6.2E7	-0-	1.1E8	4.1E3	2.0E8
Nb-95	-0-	-0-	-0-	2.3E8	-0-	4.5E8	2.8E3	8.2E8
Te-129m	-0-	-0-	-0-	5.9E8	-0-	4.5E8	1.0E3	5.3E8
Cs-134	-0-	-0-	-0-	1.4E8	-0-	1.2E8	2.3E4	3.4E8
Cs-136	-0-	-0-	-0-	5.1E6	-0-	4.2E6	4.0E3	9.5E6
Cs-137	-0-	-0-	-0-	1.2E8	-0-	9.3E7	1.7E4	4.0E8
Ba-140	-0-	-0-	-0-	5.0E6	-0-	4.2E6	6.0E3	7.4E6
Ce-141	-0-	-0-	-0-	1.5E6	-0-	2.4E6	3.3E3	4.2E6
Ce-144	-0-	-0-	-0-	1.8E7	-0-	2.9E7	2.2E4	4.9E7
I -131	-0-	-0-	-0-	6.5E8	-0-	4.3E8	3.3E5	5.9E8
I -133	-0-	-0-	-0-	1.6E1	-0-	8.6E0	5.9E4	6.7E4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E4	6.9E4
UN-ID	-0-	-0-	-0-	1.1E8	-0-	9.4E7	2.8E3	1.4E8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-10

DOSE PARAMETER R_i FOR SECTOR A

Pathway = Camp San Mateo Distance = 3.5 miles
X/Q = 7.6E-8 sec/m³ D/Q = 4.3E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	1.3E3	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	3.3E3	3.7E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	7.7E4	1.1E9
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	3.1E4	2.7E8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	1.1E5	3.0E8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	2.8E5	1.7E10
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	3.0E5	1.7E4
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	9.9E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.5E5	2.0E8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	1.1E8
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	3.7E4	1.6E7
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	8.5E5	5.5E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	1.5E5	1.2E8
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	6.2E5	8.2E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	2.2E5	1.6E7
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	1.2E5	1.1E7
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	8.2E5	5.6E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	1.2E7	1.4E7
I -133	-0-	-0-	-0-	-0-	-0-	-0-	2.2E6	2.0E6
I -135	-0-	-0-	-0-	-0-	-0-	-0-	4.5E5	2.0E6
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	6.0E8

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-11

DOSE PARAMETER R_i FOR SECTOR B

Pathway = Sheep (Meat) Distance = 0.7 miles
X/Q = 7.9E-7 sec/m³ D/Q = 7.8E-09 m-²

Radio-Nuclide	Infant Inhalation Pathway	Infant Food & Ground Pathway	Child Inhalation Pathway	Child Food & Ground Pathway	Teen Inhalation Pathway	Teen Food & Ground Pathway	Adult Inhalation Pathway	Adult Food & Ground Pathway
H -3	-0-	-0-	-0-	1.5E0	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E3	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	-0-	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	-0-	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	-0-	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	-0-	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.4E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-11

DOSE PARAMETER R_i FOR SECTOR B

Pathway = Deer Consumer
X/Q = 2.2E-7 sec/m³
Distance = 1.6 miles
D/Q = 2.1E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	2.8E1	-0-	2.3E1	3.5E1	3.9E1
Cr-51	-0-	-0-	-0-	5.0E4	-0-	1.0E5	9.1E1	3.2E5
Mn-54	-0-	-0-	-0-	7.7E5	-0-	1.4E6	2.1E3	4.1E7
Co-57	-0-	-0-	-0-	4.6E6	-0-	8.0E6	8.6E2	2.3E7
Co-58	-0-	-0-	-0-	9.6E6	-0-	1.9E7	2.9E3	4.7E7
Co-60	-0-	-0-	-0-	3.6E7	-0-	7.2E7	7.8E3	7.2E8
Sr-89	-0-	-0-	-0-	4.9E7	-0-	2.6E7	8.3E3	3.1E7
Sr-90	-0-	-0-	-0-	1.0E9	-0-	8.0E8	2.7E6	1.2E9
Zr-95	-0-	-0-	-0-	6.2E7	-0-	1.1E8	4.1E3	2.0E8
Nb-95	-0-	-0-	-0-	2.3E8	-0-	4.5E8	2.8E3	8.2E8
Te-129m	-0-	-0-	-0-	5.9E8	-0-	4.5E8	1.0E3	5.3E8
Cs-134	-0-	-0-	-0-	1.4E8	-0-	1.2E8	2.3E4	3.4E8
Cs-136	-0-	-0-	-0-	5.1E6	-0-	4.2E6	4.0E3	9.5E6
Cs-137	-0-	-0-	-0-	1.2E8	-0-	9.3E7	1.7E4	4.0E8
Ba-140	-0-	-0-	-0-	5.0E6	-0-	4.2E6	6.0E3	7.4E6
Ce-141	-0-	-0-	-0-	1.5E6	-0-	2.4E6	3.3E3	4.2E6
Ce-144	-0-	-0-	-0-	1.8E7	-0-	2.9E7	2.2E4	4.9E7
I -131	-0-	-0-	-0-	6.5E8	-0-	4.3E8	3.3E5	5.9E8
I -133	-0-	-0-	-0-	1.6E1	-0-	8.6E0	5.9E4	6.7E4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E4	6.9E4
UN-ID	-0-	-0-	-0-	1.1E8	-0-	9.4E7	2.8E3	1.4E8

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-11

DOSE PARAMETER R_i FOR SECTOR B

Pathway = Sanitary Landfill   Distance = 2.1 miles
X/Q = 1.4E-7 sec/m³   D/Q = 1.2E-09 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	2.9E2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	7.6E2	1.1E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	1.8E4	3.2E8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	7.2E3	7.8E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	8.7E7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	6.5E4	4.9E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	6.9E4	4.9E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.3E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	3.4E4	5.7E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	3.1E7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	8.3E3	4.5E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.6E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	3.3E4	3.4E7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.4E5	2.3E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	5.0E4	4.7E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	2.7E4	3.1E6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.6E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	2.7E6	3.9E6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	4.9E5	5.6E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	5.8E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	1.7E8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-12

DOSE PARAMETER R_i FOR SECTOR C

Pathway = Camp San Onofre Fr. Stn   Distance = 2.4 miles
X/Q = 1.1E-7 sec/m³   D/Q = 1.0E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	5.2E2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	1.4E3	1.9E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	3.2E4	5.7E8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	1.3E4	1.4E8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	4.4E4	1.6E8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	1.2E5	8.8E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	1.2E5	8.9E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	4.1E6	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	6.2E4	1.0E8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	4.3E4	5.6E7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	1.5E4	8.1E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	3.5E5	2.8E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	6.0E4	6.2E7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	2.6E5	4.2E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	9.0E4	8.4E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	4.9E4	5.6E6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	3.4E5	2.9E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	4.9E6	7.1E6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	8.8E5	1.0E6
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.8E5	1.0E6
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	4.2E4	3.1E8

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-12

DOSE PARAMETER R_i FOR SECTOR C

Pathway = Camp San Onofre X/Q = 9.1E-8 sec/m³					Distance = 2.7 miles D/Q = 8.1E-10 m⁻²			
Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	1.3E3	2.6E3
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	3.3E3	1.3E7
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	7.7E4	2.2E9
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	3.1E4	5.9E8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	1.1E5	9.2E8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	2.8E5	2.1E10
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	3.0E5	9.4E9
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	9.9E7	7.6E11
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.5E5	1.4E9
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	5.2E8
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	3.7E4	1.1E9
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	8.5E5	1.8E10
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	1.5E5	1.7E8
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	6.2E5	1.9E10
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	2.2E5	8.7E7
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	1.2E5	4.3E8
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	8.2E5	1.2E10
I -131	-0-	-0-	-0-	-0-	-0-	-0-	1.2E7	1.8E9
I -133	-0-	-0-	-0-	-0-	-0-	-0-	2.2E6	2.0E6
I -135	-0-	-0-	-0-	-0-	-0-	-0-	4.5E5	2.0E6
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	2.0E9

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-12

DOSE PARAMETER R_i FOR SECTOR C

Pathway = Sheep (Meat) X/Q = 3.2E-6 sec/m³ | Distance = 0.3 miles D/Q = 3.3E-8 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	1.5E0	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E3	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	-0-	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	-0-	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	-0-	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	-0-	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.4E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

DOSE PARAMETER R_i FOR SECTOR C

Pathway = Deer Consumer
X/Q = 2.8E-7 sec/m³

Distance = 1.3 miles
D/Q = 2.9E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	2.8E1	-0-	2.3E1	3.5E1	3.9E1
Cr-51	-0-	-0-	-0-	5.0E4	-0-	1.0E5	9.1E1	3.2E5
Mn-54	-0-	-0-	-0-	7.7E5	-0-	1.4E6	2.1E3	4.1E7
Co-57	-0-	-0-	-0-	4.6E6	-0-	8.0E6	8.6E2	2.3E7
Co-58	-0-	-0-	-0-	9.6E6	-0-	1.9E7	2.9E3	4.7E7
Co-60	-0-	-0-	-0-	3.6E7	-0-	7.2E7	7.8E3	7.2E8
Sr-89	-0-	-0-	-0-	4.9E7	-0-	2.6E7	8.3E3	3.1E7
Sr-90	-0-	-0-	-0-	1.0E9	-0-	8.0E8	2.7E6	1.2E9
Zr-95	-0-	-0-	-0-	6.2E7	-0-	1.1E8	4.1E3	2.0E8
Nb-95	-0-	-0-	-0-	2.3E8	-0-	4.5E8	2.8E3	8.2E8
Te-129m	-0-	-0-	-0-	5.9E8	-0-	4.5E8	1.0E3	5.3E8
Cs-134	-0-	-0-	-0-	1.4E8	-0-	1.2E8	2.3E4	3.4E8
Cs-136	-0-	-0-	-0-	5.1E6	-0-	4.2E6	4.0E3	9.5E6
Cs-137	-0-	-0-	-0-	1.2E8	-0-	9.3E7	1.7E4	4.0E8
Ba-140	-0-	-0-	-0-	5.0E6	-0-	4.2E6	6.0E3	7.4E6
Ce-141	-0-	-0-	-0-	1.5E6	-0-	2.4E6	3.3E3	4.2E6
Ce-144	-0-	-0-	-0-	1.8E7	-0-	2.9E7	2.2E4	4.9E7
I -131	-0-	-0-	-0-	6.5E8	-0-	4.3E8	3.3E5	5.9E8
I -133	-0-	-0-	-0-	1.6E1	-0-	8.6E0	5.9E4	6.7E4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E4	6.9E4
UN-ID	-0-	-0-	-0-	1.1E8	-0-	9.4E7	2.8E3	1.4E8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

<u>TABLE 2-12</u>

DOSE PARAMETER R_i FOR SECTOR C

Pathway = Sewage Treat. Facility — Distance = 2.3 miles
X/Q = 1.2E-7 sec/m³ — D/Q = 1.1E-9 m-²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	2.9E2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	7.6E2	1.1E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	1.8E4	3.2E8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	7.2E3	7.8E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	8.7E7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	6.5E4	4.9E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	6.9E4	4.9E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.3E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	3.4E4	5.7E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	3.1E7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	8.3E3	4.5E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.6E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	3.3E4	3.4E7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.4E5	2.3E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	5.0E4	4.7E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	2.7E4	3.1E6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.6E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	2.7E6	3.9E6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	4.9E5	5.6E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	5.8E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	1.7E8

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-13

DOSE PARAMETER R_i FOR SECTOR D

Pathway = Sheep (Meat)
X/Q = 3.0E-6 sec/m³

Distance = 0.3 miles
D/Q = 3.4E-8 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	1.5E0	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E3	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	-0-	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	-0-	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	-0-	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	-0-	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.4E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-13

DOSE PARAMETER R_i FOR SECTOR D

Pathway = Deer Consumer
X/Q = 2.6E-7 sec/m³

Distance = 1.4 miles
D/Q = 6.0E-9 m-²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	2.8E1	-0-	2.3E1	3.5E1	3.9E1
Cr-51	-0-	-0-	-0-	5.0E4	-0-	1.0E5	9.1E1	3.2E5
Mn-54	-0-	-0-	-0-	7.7E5	-0-	1.4E6	2.1E3	4.1E7
Co-57	-0-	-0-	-0-	4.6E6	-0-	8.0E6	8.6E2	2.3E7
Co-58	-0-	-0-	-0-	9.6E6	-0-	1.9E7	2.9E3	4.7E7
Co-60	-0-	-0-	-0-	3.6E7	-0-	7.2E7	7.8E3	7.2E8
Sr-89	-0-	-0-	-0-	4.9E7	-0-	2.6E7	8.3E3	3.1E7
Sr-90	-0-	-0-	-0-	1.0E9	-0-	8.0E8	2.7E6	1.2E9
Zr-95	-0-	-0-	-0-	6.2E7	-0-	1.1E8	4.1E3	2.0E8
Nb-95	-0-	-0-	-0-	2.3E8	-0-	4.5E8	2.8E3	8.2E8
Te-129m	-0-	-0-	-0-	5.9E8	-0-	4.5E8	1.0E3	5.3E8
Cs-134	-0-	-0-	-0-	1.4E8	-0-	1.2E8	2.3E4	3.4E8
Cs-136	-0-	-0-	-0-	5.1E6	-0-	4.2E6	4.0E3	9.5E6
Cs-137	-0-	-0-	-0-	1.2E8	-0-	9.3E7	1.7E4	4.0E8
Ba-140	-0-	-0-	-0-	5.0E6	-0-	4.2E6	6.0E3	7.4E6
Ce-141	-0-	-0-	-0-	1.5E6	-0-	2.4E6	3.3E3	4.2E6
Ce-144	-0-	-0-	-0-	1.8E7	-0-	2.9E7	2.2E4	4.9E7
I -131	-0-	-0-	-0-	6.5E8	-0-	4.3E8	3.3E5	5.9E8
I -133	-0-	-0-	-0-	1.6E1	-0-	8.6E0	5.9E4	6.7E4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E4	6.9E4
UN-ID	-0-	-0-	-0-	1.1E8	-0-	9.4E7	2.8E3	1.4E8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-13

DOSE PARAMETER R_i FOR SECTOR D

Pathway = Camp San Onofre Distance = 2.9 miles
X/Q = 7.1E-8 sec/m³ D/Q = 7.3E-10 m-²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	1.3E3	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	3.3E3	3.7E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	7.7E4	1.1E9
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	3.1E4	2.7E8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	1.1E5	3.0E8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	2.8E5	1.7E10
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	3.0E5	1.7E4
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	9.9E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.5E5	2.0E8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	1.1E8
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	3.7E4	1.6E7
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	8.5E5	5.5E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	1.5E5	1.2E8
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	6.2E5	8.2E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	2.2E5	1.6E7
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	1.2E5	1.1E7
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	8.2E5	5.6E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	1.2E7	1.4E7
I -133	-0-	-0-	-0-	-0-	-0-	-0-	2.2E6	2.0E6
I -135	-0-	-0-	-0-	-0-	-0-	-0-	4.5E5	2.0E6
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	6.0E8

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-14

DOSE PARAMETER R_i FOR SECTOR E

Pathway = Sheep (Meat) Distance = 0.4 miles
X/Q = 2.9E-6 sec/m³ D/Q = 3.8E-8 m-²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	1.5E0	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E3	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	-0-	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	-0-	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	-0-	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	-0-	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.4E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

DOSE PARAMETER R_i FOR SECTOR E

Pathway = Deer Consumer
X/Q = 3.0E-7 sec/m³
Distance = 1.4 miles
D/Q = 4.7E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	2.8E1	-0-	2.3E1	3.5E1	3.9E1
Cr-51	-0-	-0-	-0-	5.0E4	-0-	1.0E5	9.1E1	3.2E5
Mn-54	-0-	-0-	-0-	7.7E5	-0-	1.4E6	2.1E3	4.1E7
Co-57	-0-	-0-	-0-	4.6E6	-0-	8.0E6	8.6E2	2.3E7
Co-58	-0-	-0-	-0-	9.6E6	-0-	1.9E7	2.9E3	4.7E7
Co-60	-0-	-0-	-0-	3.6E7	-0-	7.2E7	7.8E3	7.2E8
Sr-89	-0-	-0-	-0-	4.9E7	-0-	2.6E7	8.3E3	3.1E7
Sr-90	-0-	-0-	-0-	1.0E9	-0-	8.0E8	2.7E6	1.2E9
Zr-95	-0-	-0-	-0-	6.2E7	-0-	1.1E8	4.1E3	2.0E8
Nb-95	-0-	-0-	-0-	2.3E8	-0-	4.5E8	2.8E3	8.2E8
Te-129m	-0-	-0-	-0-	5.9E8	-0-	4.5E8	1.0E3	5.3E8
Cs-134	-0-	-0-	-0-	1.4E8	-0-	1.2E8	2.3E4	3.4E8
Cs-136	-0-	-0-	-0-	5.1E6	-0-	4.2E6	4.0E3	9.5E6
Cs-137	-0-	-0-	-0-	1.2E8	-0-	9.3E7	1.7E4	4.0E8
Ba-140	-0-	-0-	-0-	5.0E6	-0-	4.2E6	6.0E3	7.4E6
Ce-141	-0-	-0-	-0-	1.5E6	-0-	2.4E6	3.3E3	4.2E6
Ce-144	-0-	-0-	-0-	1.8E7	-0-	2.9E7	2.2E4	4.9E7
I -131	-0-	-0-	-0-	6.5E8	-0-	4.3E8	3.3E5	5.9E8
I -133	-0-	-0-	-0-	1.6E1	-0-	8.6E0	5.9E4	6.7E4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E4	6.9E4
UN-ID	-0-	-0-	-0-	1.1E8	-0-	9.4E7	2.8E3	1.4E8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-14

DOSE PARAMETER R_i FOR SECTOR E

Pathway = Camp Horno
X/Q = 6.2E-8 sec/m³

Distance = 4.2 miles
D/Q = 5.8E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	1.3E3	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	3.3E3	3.7E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	7.7E4	1.1E9
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	3.1E4	2.7E8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	1.1E5	3.0E8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	2.8E5	1.7E10
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	3.0E5	1.7E4
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	9.9E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.5E5	2.0E8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	1.1E8
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	3.7E4	1.6E7
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	8.5E5	5.5E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	1.5E5	1.2E8
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	6.2E5	8.2E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	2.2E5	1.6E7
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	1.2E5	1.1E7
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	8.2E5	5.6E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	1.2E7	1.4E7
I -133	-0-	-0-	-0-	-0-	-0-	-0-	2.2E6	2.0E6
I -135	-0-	-0-	-0-	-0-	-0-	-0-	4.5E5	2.0E6
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	6.0E8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-15

DOSE PARAMETER R_i FOR SECTOR F

Pathway = Sheep (Meat) Distance = 0.7 miles
X/Q = 1.0E-6 sec/m³ D/Q = 8.8E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	1.5E0	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E3	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	-0-	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	-0-	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	-0-	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	-0-	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.4E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-15

DOSE PARAMETER R_i FOR SECTOR F

Pathway = Deer Consumer
X/Q = 7.8E-7 sec/m³

Distance = 0.9 miles
D/Q = 2.0E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	2.8E1	-0-	2.3E1	3.5E1	3.9E1
Cr-51	-0-	-0-	-0-	5.0E4	-0-	1.0E5	9.1E1	3.2E5
Mn-54	-0-	-0-	-0-	7.7E5	-0-	1.4E6	2.1E3	4.1E7
Co-57	-0-	-0-	-0-	4.6E6	-0-	8.0E6	8.6E2	2.3E7
Co-58	-0-	-0-	-0-	9.6E6	-0-	1.9E7	2.9E3	4.7E7
Co-60	-0-	-0-	-0-	3.6E7	-0-	7.2E7	7.8E3	7.2E8
Sr-89	-0-	-0-	-0-	4.9E7	-0-	2.6E7	8.3E3	3.1E7
Sr-90	-0-	-0-	-0-	1.0E9	-0-	8.0E8	2.7E6	1.2E9
Zr-95	-0-	-0-	-0-	6.2E7	-0-	1.1E8	4.1E3	2.0E8
Nb-95	-0-	-0-	-0-	2.3E8	-0-	4.5E8	2.8E3	8.2E8
Te-129m	-0-	-0-	-0-	5.9E8	-0-	4.5E8	1.0E3	5.3E8
Cs-134	-0-	-0-	-0-	1.4E8	-0-	1.2E8	2.3E4	3.4E8
Cs-136	-0-	-0-	-0-	5.1E6	-0-	4.2E6	4.0E3	9.5E6
Cs-137	-0-	-0-	-0-	1.2E8	-0-	9.3E7	1.7E4	4.0E8
Ba-140	-0-	-0-	-0-	5.0E6	-0-	4.2E6	6.0E3	7.4E6
Ce-141	-0-	-0-	-0-	1.5E6	-0-	2.4E6	3.3E3	4.2E6
Ce-144	-0-	-0-	-0-	1.8E7	-0-	2.9E7	2.2E4	4.9E7
I -131	-0-	-0-	-0-	6.5E8	-0-	4.3E8	3.3E5	5.9E8
I -133	-0-	-0-	-0-	1.6E1	-0-	8.6E0	5.9E4	6.7E4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E4	6.9E4
UN-ID	-0-	-0-	-0-	1.1E8	-0-	9.4E7	2.8E3	1.4E8

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-15

DOSE PARAMETER R_i FOR SECTOR F

Pathway = San Onofre State Park Guard Shack   Distance = 1.0 miles
X/Q = 6.2E-7 sec/m³   D/Q = 5.0E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	7.2E1	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	1.9E2	2.7E5
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	4.4E3	7.9E7
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	1.8E3	2.0E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	6.1E3	2.2E7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	1.6E4	1.2E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	1.7E4	1.2E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	5.7E6	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	8.6E3	1.4E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	5.9E3	7.8E6
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	2.1E3	1.1E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	4.8E4	3.9E8
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	8.4E3	8.6E6
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	3.5E4	5.9E8
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	1.2E4	1.2E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	6.9E3	7.8E5
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	4.7E4	4.0E6
I -131	-0-	-0-	-0-	-0-	-0-	-0-	6.8E5	9.8E5
I -133	-0-	-0-	-0-	-0-	-0-	-0-	1.2E5	1.4E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	2.6E4	1.4E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	5.9E3	4.3E7

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-15

DOSE PARAMETER R_i FOR SECTOR F

Pathway = Border-Highway Patrol Weight Station   Distance = 2.0 miles
X/Q = 2.2E-7 sec/m³   D/Q = 1.6E-9 m-²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	3.6E2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	9.5E2	1.3E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	2.2E4	3.9E8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	9.0E3	9.8E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	3.0E4	1.1E8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	8.1E4	6.1E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	8.7E4	6.2E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.8E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	4.3E4	7.2E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	3.0E4	3.9E7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	1.0E4	5.6E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	2.4E5	1.9E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	4.2E4	4.3E7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.8E5	2.9E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	6.2E4	5.9E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	3.4E4	3.9E6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	2.3E5	2.0E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	3.4E6	4.9E6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	6.1E5	7.0E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.3E5	7.2E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.9E4	2.1E8

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-15

DOSE PARAMETER R_i FOR SECTOR F

Pathway = Beach Concession
X/Q = 5.3E-7 sec/m³

Distance = 1.1 miles
D/Q = 4.3E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	1.2E2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	3.1E2	4.4E5
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	7.2E3	1.3E9
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	2.9E3	3.2E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	1.0E4	3.6E7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	2.7E4	2.0E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	2.8E4	2.0E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	9.3E6	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.4E4	2.4E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	9.7E3	1.3E7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	3.4E3	1.8E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	7.9E4	6.4E8
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	1.4E4	1.4E7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	5.8E4	9.6E8
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	2.0E4	1.9E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	1.1E4	1.3E6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	7.6E4	6.5E6
I -131	-0-	-0-	-0-	-0-	-0-	-0-	1.1E6	1.6E6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	2.0E5	2.3E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	4.2E4	2.4E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	9.7E3	7.0E7

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-16

DOSE PARAMETER R_i FOR SECTOR G

Pathway = San Onofre State Park Beach Campground   Distance = 1.0 miles
X/Q = 6.2E-7 sec/m³   D/Q = 2.9E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	8.0E1	-0-	1.4E2	-0-	1.6E2	-0-	1.6E2	-0-
Cr-51	4.4E1	5.7E5	1.3E2	5.7E5	3.7E2	5.7E5	4.1E2	5.7E5
Mn-54	3.1E3	1.7E8	5.3E3	1.7E8	8.2E3	1.7E8	9.5E3	1.7E8
Co-57	6.0E2	4.2E7	1.6E3	4.2E7	3.9E3	4.2E7	3.9E3	4.2E7
Co-58	1.4E3	4.7E7	4.2E3	4.7E7	1.2E4	4.7E7	1.3E4	4.7E7
Co-60	3.9E3	2.7E9	1.2E4	2.7E9	3.2E4	2.7E9	3.5E4	2.7E9
Sr-89	4.9E4	2.7E3	7.4E4	2.7E3	5.4E4	2.7E3	3.7E4	2.7E3
Sr-90	5.0E6	-0-	1.2E7	-0-	1.3E7	-0-	1.2E7	-0-
Zr-95	2.7E3	3.1E7	7.5E3	3.1E7	1.8E4	3.1E7	1.9E4	3.1E7
Nb-95	1.6E3	1.7E7	4.6E3	1.7E7	1.2E4	1.7E7	1.3E4	1.7E7
Te-129m	3.9E3	2.4E6	6.2E3	2.4E6	6.4E3	2.4E6	4.5E3	2.4E6
Cs-134	8.7E4	8.4E8	1.3E5	8.4E8	1.4E5	8.4E8	1.0E5	8.4E8
Cs-136	1.7E4	1.9E7	2.1E4	1.9E7	2.4E4	1.9E7	1.8E4	1.9E7
Cs-137	7.5E4	1.3E9	1.0E5	1.3E9	1.0E5	1.3E9	7.7E4	1.3E9
Ba-140	6.9E3	2.5E6	9.1E3	2.5E6	2.8E4	2.5E6	2.7E4	2.5E6
Ce-141	2.7E3	1.7E6	7.0E3	1.7E6	1.6E4	1.7E6	1.5E4	1.7E6
Ce-144	1.8E4	8.6E6	4.8E4	8.6E6	1.1E5	8.6E6	1.0E5	8.6E6
I -131	1.8E6	2.1E6	2.0E6	2.1E6	1.8E6	2.1E6	1.5E6	2.1E6
I -133	4.4E5	3.0E5	4.7E5	3.0E5	3.6E5	3.0E5	2.7E7	3.0E5
I -135	8.6E4	3.1E5	9.8E4	3.1E5	7.7E4	3.1E5	5.5E4	3.1E5
UN-ID	7.7E3	9.2E7	1.4E4	9.2E7	1.6E4	9.2E7	1.3E4	9.2E7

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-16

DOSE PARAMETER R_i FOR SECTOR G

Pathway = Hwy Patrol Weigh Station Distance = 2.2 miles
X/Q = 1.8E-7 sec/m³ D/Q = 7.1E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	2.9E2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	7.6E2	1.1E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	1.8E4	3.2E8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	7.2E3	7.8E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	8.7E7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	6.5E4	4.9E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	6.9E4	4.9E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.3E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	3.4E4	5.7E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	3.1E7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	8.3E3	4.5E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.6E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	3.3E4	3.4E7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.4E5	2.3E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	5.0E4	4.7E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	2.7E4	3.1E6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.6E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	2.7E6	3.9E6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	4.9E5	5.6E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	5.8E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	1.7E8

Inhalation Pathway, units = $\frac{mrem/yr}{\mu Ci/m^3}$

Food & Ground Pathway, units = $\frac{(m^2)(mrem/yr)}{\mu Ci/sec}$

TABLE 2-16

DOSE PARAMETER R_i FOR SECTOR G

Pathway = Sheep (Meat) Distance = 3.1 miles
X/Q = 1.0E-7 sec/m³ D/Q = 3.8E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	1.5E0	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E3	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	-0-	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	-0-	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	-0-	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	-0-	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.4E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

2.0 RADIOACTIVE GASEOUS EFFLUENTS (Continued)

2.8 DOSE

2.8.1 Specification

Applicability: At all times.

Objective: Maintain the dose due to the release of radioactive materials within specified limits.

Specification:

A. The annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC, due to releases of radioactivity and to radiation, from uranium fuel cycle sources shall be limited to ≤ 25 mrem to the total body or any organ (except the thyroid which shall be limited to ≤ 75 mrem).

B. Action:

1. With the calculated dose from the release of radioactive materials in liquid or gaseous effluents exceeding twice the limits of Specifications 1.2.1.A, 2.2.1.A or 2.3.1.A, calculations should be made to determine whether the above limits of Specification 2.8.1.A have been exceeded. If such is the case, prepare and submit to the Commission within 30 days pursuant to Technical Specification 6.9.2, a Special Report that defines the corrective action to be taken to reduce subsequent releases, to prevent recurrence of exceeding the above limits and includes the schedule for achieving conformance with the above limits. The Special Report, as defined in 10 CFR Part 20.405c, shall include an analysis that estimates the radiation exposure (dose) to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, including all effluent pathways and direct radiation, for the calendar year that includes the release(s) covered by this report. It shall also describe levels of radiation and concentrations of radioactive material involved, and the cause of the exposure levels or concentrations. If the estimated dose(s) exceeds the above limits, and if the release condition resulting in violation of 40 CFR Part 190 has not already been corrected, the Special Report shall include a request for a variance in accordance with the provisions of 40 CFR Part 190. Submittal of the report is considered a timely request, and a variance is granted until staff action on the request is complete.

2.0 RADIOACTIVE GASEOUS EFFLUENTS (Continued)

2.8 DOSE

2.8.2 Specification

Applicability: At all times.

Objective: To verify the doses due to liquid and gaseous effluents are maintained as low as is reasonably achievable.

Specification: Cumulative dose contributions from liquid and gaseous effluents shall be determined in accordance with Specifications 1.2.1.A, 2.2.1.A, and 2.3.1.A and in accordance with Sections 1.5, 2.7.1, and 2.7.2.

2.0 RADIOACTIVE GASEOUS EFFLUENTS (Continued)

2.9 TOTAL DOSE CALCULATIONS

2.9.1 Total Dose to Most Likely Member of the Public

The total annual dose or total dose commitment to any member of the public, due to releases of radioactivity and to radiation, from uranium fuel cycle sources within 5 miles of the Site is calculated using the following expressions. This methodology is used to meet the dose limitations of 40 CFR 190 per twelve consecutive months. The transportation of radioactive material is excluded from the dose calculations.

The Annual Total Dose is determined monthly for maximum organ (gas & liquid), whole body (gas & liquid) and thyroid (gas & liquid) to verify that the Site total (Units 1, 2 and 3) is less than or equal to 25 mrem, 25 mrem and 75 mrem respectively.

2.9.1 Total Dose to Most Likely Member of the Public (Continued)

.1 Annual Total Organ Dose D_{TOT} (organ)

$$\overset{*}{D}_{TOT}(\text{organ}) = \sum_{l=1}^{12} \sum_{j=1}^{2/3} \left[D_{jl}(OG) + D_{jl}(OL) + D_{jl}^{H^3}(OG) \right] \qquad (2\text{-}20)$$

j = Units 1, 2 and 3
l = months 1 - 12**

*NOTE: $D_{jl}^{H^3}(OG) = 0$ for bone

**All to be summed over the most recent 12 months.

where:

$$D_{jl}(OG) = K \sum_{i=1}^{n} C_{il} R_{ik} W_k ; \qquad (2\text{-}21)$$

i = each isotope in specific organ category

$K = 3.1688E\text{-}2 \ \frac{\text{year-}\mu Ci}{\text{sec-Ci}}$

n = Number of isotopes in the specified organ category

C_{il} = Total particulate gas curies released for the month

$R_{ik}W_k$ = Controlling location factors from ODCM Tables 2-5, Units 1 and 2/3

$D_{jl}(OL)$ = Liquid organ dose for the specified organ in mrem for the month. [Reference ODCM Unit 1 (1-13), Units 2/3 (1-19)]

$D_{jl}^{H^3}(OG)$ = Gas organ dose form tritium in mrem for the month. (Note: H^3 bone contribution = 0)

2.9.1.2 Annual Total Whole Body Dose $(D_{TOT}(WB))$

$$D_{TOT}(WB) = \sum_{l=1}^{12} \sum_{j=1}^{2/3} \left[D_{jl}(WBL) + D_{jl}^{H^3}(OG) + 0.9\, D_{jl}(\gamma) \right] + D(Direct);$$

(2-22)

j = Units 1, 2 and 3
l = months 1 - 12*

*To be summed over the most recent 12 months.

where:

$D_{jl}(WBL)$ = Liquid whole body organ dose in mrem for the whole month. [Reference Unit 1 ODCM (1-13), ODCM Units 2/3 (1-19,)]

$D_{jl}^{H^3}(OG)$ = Gas organ dose from tritium in mrem for the month. (from (2-21))

$D_{jl}(\gamma)$ = Gamma air dose in mrad for the month. 0.9 converts mrad to mrem. [Reference Unit 1 ODCM (2-10), ODCM Units 2/3 (2-14)]

$$D(Direct) = \sum_{j=1}^{4} \left[\max[D(beach)_i] - \frac{\sum_{i=1}^{n} D(bkgd)_i}{n} \right] .0342$$

(2-23)

i = for all TLDs per quarter
j = for Quarters 1-4

2.9.1.2 Annual Total Whole Body Dose $D_{TOT}(WB)$ (Continued)

*Direct Radiation

The direct radiation levels are evaluated most recently using cadmium covered TLDs. The TLDs are placed at 59 locations around the site. The average dose from TLDs 5 to 50 miles from the site is used as background. These sites are subject to change.

The background is subtracted from the highest reading plant surrounding TLD. This value is the direct dose but must be prorated by the occupancy factor.

Example: Beach time of 300 hrs/yr or 8 hrs/yr landward occupancy.

.3 Annual Total Thyroid Dose $D_{TOT}(THYROID)$

$$D_{TOT}(THYROID) = \sum_{l=1}^{12} \sum_{j=1}^{2/3} \left[D_{jl}(OG) + D_{jl}(OL) \right] \qquad (2\text{-}24)$$

j = Units 1, 2 and 3
l = months 1 - 12*

*To be summed over the most recent 12 months.

where:

$D_{jl}(OG)$ = Thyroid organ dose from gaseous iodine for the month in mrem. (from 2-21)

$D_{jl}(OL)$ = Liquid thyroid organ dose for the month in mrem. [Reference Unit 1 ODCM (1-13), ODCM Units 2/3 (1-19)]

3.0 PROJECTED DOSES

3.1 Liquid Dose Projection

The methodology used for projecting a liquid dose for Specification 1.3.2 is as follows:

1. Determine the monthly total body and organ doses resulting from releases during the previous twelve months.

2. Projected Dose = Previous 12 months' dose divided by 12 for the total body and each organ.

3.2 Gaseous Dose Projection

The methodology used for projecting a gaseous dose for Specification 2.4.2 is as follows:

1. Determine the monthly gamma, beta and organ dose resulting from releases during the previous twelve months.

2. Projected Dose = Previous 12 months' dose divided by 12 for the gamma, beta and organ doses.

4.0 EQUIPMENT

4.1 RADIOACTIVE LIQUID EFFLUENT INSTRUMENTATION

4.1.1 Specification

Applicability: During releases via this pathway.

Objective: Monitor and control radioactive liquid effluent releases.

Specification:

A. The radioactive liquid effluent monitoring instrumentation channels shown in Table 4.1 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Specification 1.1.1 are not exceeded.

B. Action:

1. With a radioactive liquid effluent monitoring instrumentation channel alarm/trip setpoint less conservative than a value which will ensure that the limits of Specification 1.1.1 are met, without delay suspend the release of radioactive liquid effluents monitored by the affected channel or declare the channel inoperable, or change the setpoint so it is acceptably conservative.

2. With less than the minimum number of radioactive liquid effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 4-1. If the inoperable instruments remain inoperable for greater than 30 days, explain in the next Semiannual Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner.

Table 4-1

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT		MINIMUM CHANNELS OPERABLE	ACTION
1.	Gross Radioactive Monitors Providing Automatic Termination of Release		
a.	Liquid Radwaste Effluent Line (R-1218)	(1)	16
b.	Steam Generator Blowdown[a] Effluent Line (R-1216)	(1)	17
c.	Turbine Building Sumps Effluent Line (Reheater Pit Sump) (R-2100)	(1)	18
d.	Yard Sump (R-2101)	(1)	18
e.	Component Cooling Water System[b] (R-1217)	(1)	19
2.	Flow Rate Measurement Devices		
a.	Liquid Radwaste Effluent Line (FE-16, FE-18)	(1)	20
b.	Circulating Water Outfall*		
c.	Steam Generator Blowdown Effluent* Line		

---

* Pump status, valve turns or calculations are utilized to estimate flow.

(a) Secondary coolant samples and activity analysis performed in accordance with T.S. 4.1, Table 4.1.2.

(b) Closed loop systems. Monitor closes vent valve to isolate surge tank.

TABLE 4-1
(Continued)

TABLE NOTATION

ACTION 16 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases may continue provided that prior to initiating a release:

1. At least two separate samples which can be taken by a single person are analyzed in accordance with Specification 1.1.2, and;

2. At least two technically qualified persons verify the release rate calculations and discharge valving.

ACTION 17 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue, provided grab samples are analyzed for gross radioactivity (beta or gamma) at a lower limit of detection of at least 10^{-7} microcurie/ml;

1. At least once per 12 hours when the specific activity of the secondary coolant is > 0.01 uCi/gram DOSE EQUIVALENT I-131.

2. At least once per 24 hours when the specific activity of the secondary coolant is $\leq$ 0.01 uCi/gram DOSE EQUIVALENT I-131.

ACTION 18 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided that, at least once per 12 hours, grab samples are collected and analyzed for gross radioactivity (beta or gamma) at a lower limit of detection of at least 10^{-7} microcurie/ml.

ACTION 19 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, determine if there is leakage from the Component Cooling Water System to the Salt Water Cooling System. If leakage exists, sample the Component Cooling Water System to estimate the activity being released via the Salt Water Cooling System at least once per 24 hours for gross activity (beta or gamma) at a lower limit of detection of at least 10^{-7} microcurie/ml.

ACTION 20 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided the flow rate is estimated at least once per 4 hours during actual releases. Pump performance curves generated in-situ may be used to estimate flow.

4.0 **EQUIPMENT** (Continued)

4.1 RADIOACTIVE LIQUID EFFLUENT INSTRUMENTATION

4.1.2 Specification

Applicability: During releases via this pathway.

Objective: To specify the minimum frequency and type of surveillance to be applied to the radioactive liquid instrumentation.

Specification:

A. The setpoints shall be determined in accordance with Section 1.4.

B. Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and CHANNEL TEST operations at the frequencies shown in Table 4-2.

Table 4-2

RADIOACTIVE LIQUID EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL TEST
1. Gross Beta or Gamma Radioactivity Monitoring Providing Alarm and Automatic Isolation				
a. Liquid Radwaste Effluents Line (R-1218)	D	P	R(3)	Q(1)
b. Steam Generator Blowdown Effluent Line (R-1216)	D	M	R(3)	Q(1)
c. Turbine Building Sumps Effluent Line (Reheater Pit Sump R-2100*)	D	M	R(3)	Q(1)
d. Yard Sump (R-2101*)	D	M	R(3)	Q(1)
e. Component Cooling Water System (R-1217)	D	M	R(3)	Q(1)
2. Flow Rate Monitors				
Liquid Radwaste Effluent Line (FE 16 and FE 18)	D(4)	N/A	R	N/A

*Does not provide control room alarm annunciation when the instrument controls are set in the "not operate" mode.

TABLE 4-2
(Continued)

TABLE NOTATION

(1) The CHANNEL TEST also demonstrates the following:

1. Automatic isolation of this pathway and control room alarm annunciation occurs when the instrument indicates measured levels above the alarm/trip setpoint.

2. Control Room alarm annunciation when the instrument controls are not set in the operate mode.

(3) The initial CHANNEL CALIBRATION shall be performed using one or more of the reference standards certified by the National Bureau of Standards or using standards that have been obtained from the suppliers that participate in measurement assurance activities with NBS. These standards shall permit calibrating the system over its intended range of energy and measurement range. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration shall be used. (Operating plants may substitute previously established calibration procedures for this requirement.)

(4) CHANNEL CHECK shall consist of verifying indication of flow during periods of release. CHANNEL CHECK shall be made at least once daily on any day in which continuous, periodic, or batch releases are made.

4.0 **EQUIPMENT** (Continued)

4.2 RADIOACTIVE GASEOUS PROCESS AND EFFLUENT INSTRUMENTATION

4.2.1 Specification

Applicability: During releases via this pathway.

Objective: Monitor and control radioactive gaseous releases.

Specification:

A. The radioactive gaseous process and effluent monitoring instrumentation channels show in Table 4.3 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Specification 2.1.1 are not exceeded.

B. ACTION

1. With a radioactive gaseous process or effluent monitoring instrumentation channel alarm/trip setpoint less conservative than a value which will ensure that the limits of 2.1.1 are met, without delay suspend the release of radioactive gaseous effluents monitored by the affected channel, or declare the channel inoperable, or change the setpoint so it is acceptably conservative.

2. With less than the minimum number of radioactive gaseous process or effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 4-3. If the inoperable instruments remain inoperable for greater than 30 days, explain in the next Semiannual Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner.

Table 4-3

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT		MINIMUM CHANNELS OPERABLE	ACTION
1.	Stack Monitoring System[1]		
a.	Gross Activity Monitors - Providing Alarm (R-1214 or (R-1219[2], 1220 and 1221))	(1)	21
b.	Noble Gas Activity Monitor (R-1219[2] or 1212[3] or 1254*)	(1)	22
c.	Iodine Sampler Cartridge (R-1221 or 1254*)	(1)	23
d.	Particulate Sample Filter (R-1211 or 1220 or 1254*)	(1)	23
e.	Stack Fan Flow Indication (R-1254*)	(1)	24
f.	Sampler Flow Rate Measuring Device	(1)	24

---

1. Includes the following subsystems:
   a. Spent Fuel Building Ventilation, Auxiliary Building Ventilation, and Waste Gas Treatment (CVI) Building Ventilation System.
   b. Containment Monitoring System.
   c. Air Ejector System.

2. Provides for auto-termination of release from the Waste Gas Holdup System.

3. Provides for auto-termination of containment purge.

* Does not perform any isolation function. Does not provide control room alarm annunciation when the instrument controls are set in the "not operation" mode.

TABLE 4-3

(Continued)

TABLE NOTATION

ACTION 21 With the number of channels OPERABLE less than the Minimum Channels OPERABLE requirement and Instrument 1b inoperable the contents of a waste gas decay tank may be released to the environment provided that prior to initiating the release:

1. At least two separate samples which can be taken by a single person of the tank's contents are analyzed; and

2. At least two technically qualified persons verify the release rate calculations and discharge valve lineup.

All other effluent releases via this pathway may continue provided grab samples are taken at least once per 12 hours and these samples are analyzed for gross activity within 24 hours.

ACTION 22 With the number of channels OPERABLE less than the Minimum Channels OPERABLE requirement and Instrument 1a inoperable, effluent releases via this pathway may continue, provided grab samples are taken at least once per 12 hours and these samples are analyzed for gross activity within 24 hours.

ACTION 23 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via the affected pathway may continue, provided samples are continuously collected with auxiliary sampling equipment as required in Table 2-1.

ACTION 24 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided the flowrate is estimated at least once per 8 hours.

4.0 **EQUIPMENT** (Continued)

4.2.2 Specification

Applicability: During releases via this pathway.

Objective: To specify the minimum frequency and type of surveillance to be applied to the radioactive gaseous monitoring instrumentation.

Specification:

A. The setpoints shall be determined in accordance with Section 2.5.

B. Each radioactive gaseous process or effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and CHANNEL TEST operations at the frequencies shown in Table 4-4.

Table 4-4

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

INSTRUMENT		CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL TEST
1.	Stack Monitoring System				
a.	Gross Activity Monitor (R-1214**)	D	M	R(2)	Q
b.	Noble Gas Activity Monitor (R-1219, 1212, 1254*)	D	M	R(2)	Q(1)
c.	Iodine Sampler Cartridge (R-1221, 1254*)	W	N/A	N/A	N/A
d.	Particulate Sampler Filter (R-1211, 1220, 1254*)	W	N/A	N/A	N/A
e.	Stack Fan Flow Indication (R-1254*)	D	N/A	Q	Q
f.	Sampler Flow Rate Measuring Device	D	N/A	R	N/A

* Does not perform any isolation function. Does not provide control room alarm annunciation when the instrument controls are set in the "not operate" mode.

** Alarm only, does not perform any isolation function.

Table 4-4
(Continued)

TABLE NOTATION

(1) The CHANNEL TEST also demonstrates the following:

1. Automatic isolation of this pathway and control room alarm annunciation occurs when the instrument indicates measured levels above the alarm/trip setpoint.

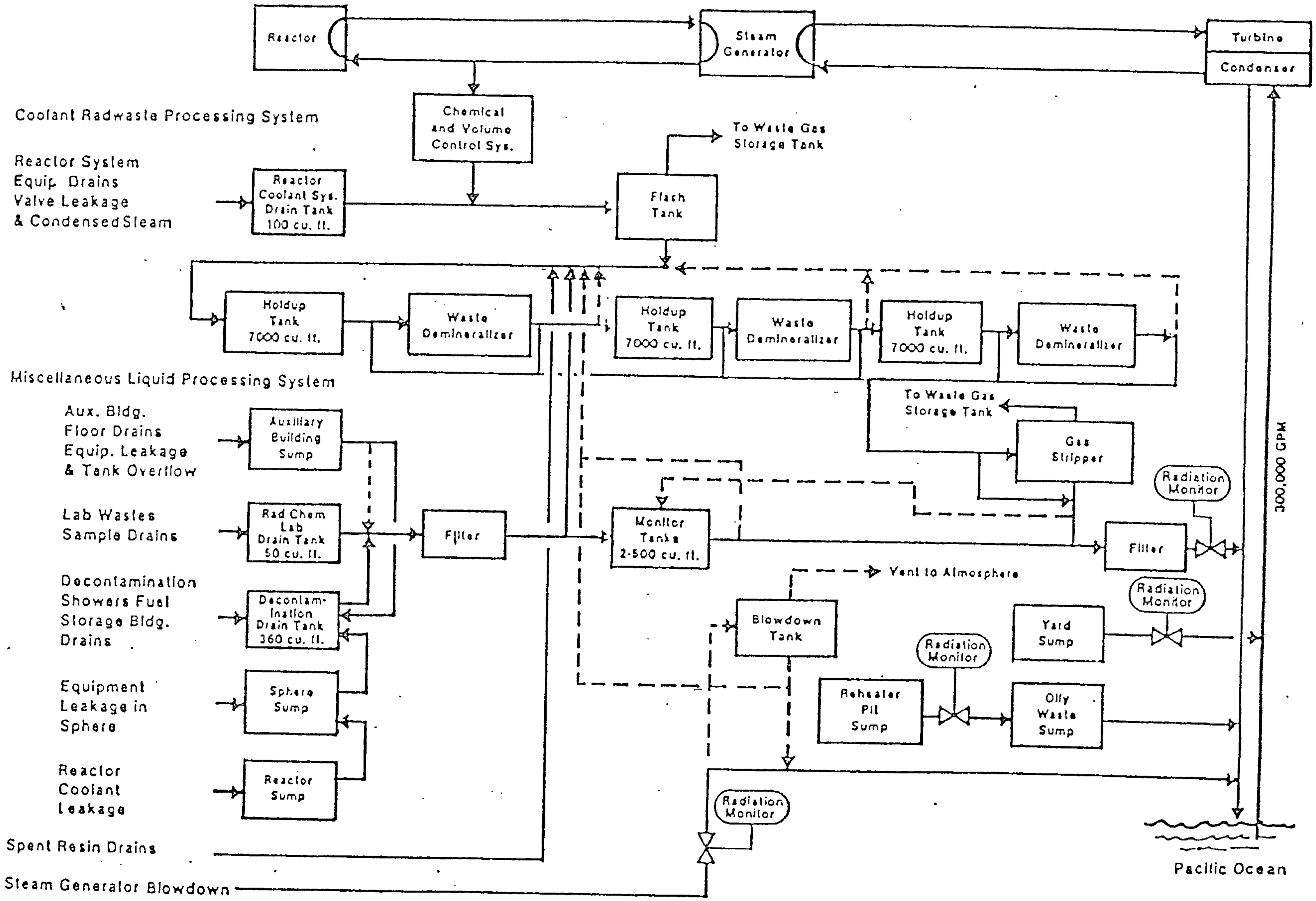
2. Control room alarm annunciation when the instrument controls are not set in the operate mode.

(2) The initial CHANNEL CALIBRATION shall be performed using one or more of the reference standards certified by the National Bureau of Standards or using standards that have been obtained from suppliers that participate in measurement assurance activities with NBS. These standards shall permit calibrating the system over its intended range of energy and measurement range. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration shall be used. (Operating plants may substitute previously established calibration procedures for this requirement.)

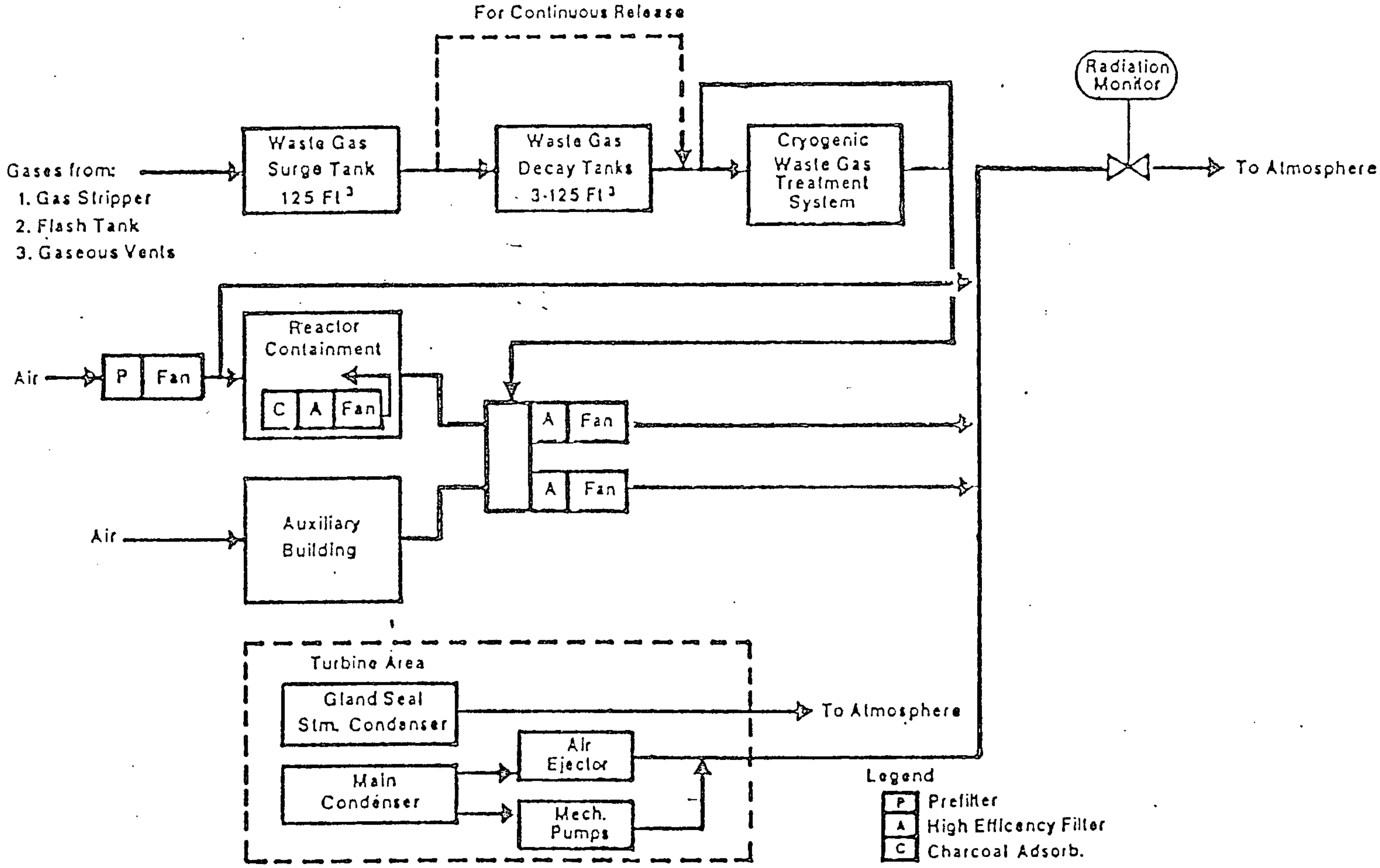
4.0 EQUIPMENT (Continued)

4.3 OPERABILITY OF RADIOACTIVE WASTE EQUIPMENT

The flow diagrams defining the treatment paths and the components of the radioactive liquid, gaseous and solid waste management systems are shown in Figures 4-5 thru 4-7.



Liquid Waste-Discharge System
Figure 4-5



Containment, Auxiliary Building and Turbine Area Ventilation System

Radioactive Gaseous-Waste System
Figure 4-6

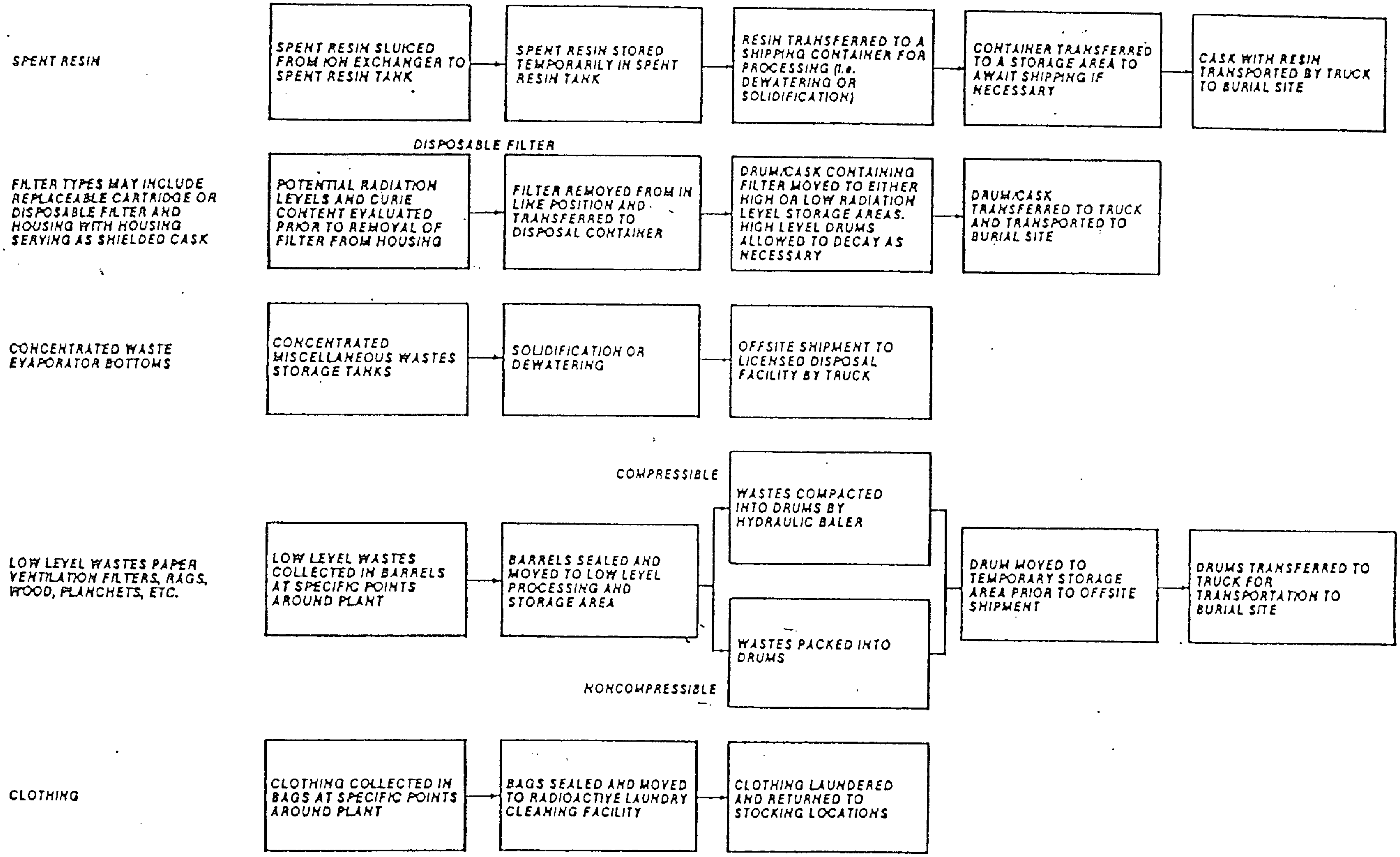


FIGURE 4-7 SOLID WASTE HANDLING

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING

5.1 MONITORING PROGRAM

5.1.1 Specification

APPLICABILITY: At all times.

OBJECTIVE: Monitor exposure pathways for radiation and radioactive material.

SPECIFICATION:

A. The radiological environmental monitoring program shall be conducted as specified in Table 5-1.

B. ACTION:

1. With the radiological environmental monitoring program not being conducted as specified in Table 5-1, prepare and submit to the Commission, in the Annual Radiological Operating Report (See Section 5.4), a description of the reasons for not conducting the program as required and the plans for preventing a recurrence.

2. With the level of radioactivity as the result of plant effluents in an environmental sampling medium exceeding the reporting levels of Table 5-1 when averaged over any calendar quarter, prepare and submit to the Commission within 30 days from the end of the affected calendar quarter a Special Report pursuant to Technical Specification 6.9.2. When more than one of the radionuclides in Table 5-1 are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{concentration (1)}}{\text{reporting level (1)}} + \frac{\text{(concentration (2)}}{\text{reporting level (2)}} + \ldots \geq 1.0$$

When radionuclides other than those in Table 5-1 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose to a MEMBER OF THE PUBLIC is equal to or greater than the calendar year limits of Specifications 1.2.1, 2.2.1, and 2.3.1. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such an event, the condition shall be reported and described in the Annual Radiological Environmental Operating Report.

5.1.1.3 With fresh leafy vegetable samples or fleshy vegetable samples unavailable from one or more of the sample locations required by Table 5-1, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report which identifies the cause of the unavailability of samples and identifies locations for obtaining replacement samples. The locations from which samples were unavailable may then be deleted from those required by Table 5-1, provided the locations from which the replacement samples were obtained are added to the environmental monitoring program as replacement.

TABLE 5-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples and Sample Locations[a]	Sampling and Collection Frequency[a]	Type and Frequency of Analyses
1. AIRBORNE Radioiodine and Particulates	Samples from at least 5 locations 3 samples from offsite locations (in different sectors) of the highest calculated annual average ground level D/Q. 1 sample from the vicinity of a community having the highest calculated annual average ground level D/Q. 1 sample from a control location 15-30 km (10-20 miles) distant and in the least prevalent wind direction[c]	Continuous operation of sampler with sample collection as required by dust loading, but at least once per 7 days.[d]	Radioiodine cartridge. Analyze at least once per 7 days for I-131. Particulate sampler. Analyze for gross beta radioactivity $\geq$ 24 hours following filter change. Perform gamma isotopic[b] analysis on each sample when gross beta activity is $\geq$ 10 times the yearly mean of control samples. Perform gamma isotopic analysis on composite (by location) sample at least once per 92 days.
2. DIRECT RADIATION[e]	At least 30 locations including an inner ring of stations in the general area of the SITE BOUNDARY and an outer ring approximately in the 4 to 5 mile range from the site with a station in each sector of each ring. The balance of the stations are in special interest areas such as population centers, nearby residences, schools, and in 2 or 3 areas to serve as control stations.	At least once per 92 days.	Gamma dose. At least once per 92 days.

TABLE 5-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples and Sample Locations[a]	Sampling and Collection Frequency[a]	Type and Frequency of Analyses
3. WATERBORNE			
a. Ocean	4 locations	At least once per month and composited quarterly	Gamma isotopic analysis of each monthly sample. Tritium analysis of composite sample at least once per 92 days.
b. Drinking	2 locations	Monthly at each location.	Gamma isotopic and tritium analyses of each sample.
c. Sediment	4 locations from Shoreline	At least once per 184 days.	Gamma isotopic analysis of each sample.
d. Ocean	5 locations Bottom Sediments	At least once per 184 days.	Gamma isotopic analysis of each sample.

TABLE 5-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples and Sample Locations[a]	Sampling and Collection Frequency[a]	Type and Frequency of Analyses
4. INGESTION			
a. Nonmigratory Marine Animals	3 locations	One sample from each group (listed below) will be collected in season, or at least once per 184 days if not seasonal. Groups to be sampled: 1. Fish - 2 adult species such as flatfish, bass, perch, or sheephead. 2. Crustacea - such as crab or lobster. 3. Mollusks - such as limpets, clams or seahares.	Gamma isotopic analysis of each edible portions.
b. Local Crops	2 locations	Representative vegetables, normally 1 leafy and 1 fleshy collected at harvest time. At least 2 vegetables collected semiannually from each location.	Gamma isotopic analysis on edible portions semiannually and I-131 analysis for leafy crops.

TABLE 5-1 (Continued)

TABLE NOTATION

a. Sample locations are indicated in Figure 5-1.

b. Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.

c. The purpose of this sample is to obtain background information. If it is not practical to establish control locations in accordance with the distance and wind direction criteria, other sites which provide valid background data may be substituted.

d. Canisters for the collection of radioiodine in air are subject to channeling. These devices should be carefully checked before operation in the field or several should be mounted in series to prevent loss of iodine.

e. Regulatory Guide 4.13 provides minimum acceptable performance criteria for thermoluminescence dosimetry (TLD) systems used for environmental monitoring. One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. For the purpose of this table, a thermoluminescent dosimeter may be considered to be one phosphor and two or more phosphors in a packet may be considered as two or more dosimeters. Film badges should not be used for measuring direct radiation.

TABLE 5-2

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Reporting Levels

Analysis	Water (pCi/l)	Airborne Particulate or Gases (pCi/m^3)	Marine Animals (pCi/Kg, wet)	Local Crops (pCi/Kg, wet)
H-3	2×10^4 (a)			
Mn-54	1×10^3		3×10^4	
Fe-59	4×10^2		1×10^4	
Co-58	1×10^3		3×10^4	
Co-60	3×10^2		1×10^4	
Zn-65	3×10^2		2×10^3	
Zr-Nb-95	4×10^2			
I-131	2	0.9		1×10^2
Cs-134	30	10	1×10^3	1×10^3
Cs-137	50	20	2×10^3	2×10^3
Ba-La-140	2×10^2			

(a) For drinking water samples. This is 40 CFR Part 141 value.

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING (Continued)

5.1 MONITORING PROGRAM (Continued)

5.1.2 Specification

APPLICABILITY: At all times.

OBJECTIVE: Ensure required actions of the radiological monitoring program are being performed.

SPECIFICATION: The radiological environmental monitoring samples shall be collected pursuant to Table 5-1 from the locations given in Tables 5-4 and 5-5 and Figure 5-1, and shall be analyzed pursuant to the requirements of Tables 5-1 and 5-3.

TABLE 5-3

MAXIMUM VALUES FOR THE LOWER LIMITS OF DETECTION (LLD)[a,c]

Analysis	Water (pCi/l)	Airborne Particulate or Gases (pCi/m³)	Marine Animals (pCi/Kg, wet)	Local Crops (pCi/Kg, wet)	Sediment (pCi/kg, dry)
Gross beta	4	1×10^{-2}			
H-3	2000				
Mn-54	15		130		
Fe-59	30		260		
Co-58, 60	15		130		
Zn-65	30		260		
Zr-95	30				
Nb-95	15				
I-131	1[b]	7×10^{-2}		60	
Cs-134	15	5×10^{-2}	130	60	150
Cs-137	18	6×10^{-2}	150	80	180
Ba-140	60				
La-140	15				

TABLE 5-3 (Continued)

TABLE NOTATION

a. The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66\ s_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

where:

LLD is the "a priori" lower limit of detection as defined above (as picocurie per unit mass or volume),

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute),

E is the counting efficiency (as counts per transformation),

V is the sample size (in units of mass or volume),

2.22 is the number of transformations per minute per picocurie,

Y is the fractional radiochemical yield (when applicable),

λ is the radioactive decay constant for the particular radionuclide, and

Δt is the elapsed time between sample collection (or end of the sample collection period) and time of counting (for environmental samples, not plant effluents samples).

The value of s_b used in the calculation of the LLD for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. In calculating the LLD for a radionuclide determined by gamma-ray spectrometry, the background shall include the typical contributions of other radionuclides normally present in the samples (e.g., potassium -40 in milk samples). Typical values of E, V, Y and Δt shall be used in the calculations.

TABLE 5-3 (Continued)

TABLE NOTATION

It should be recognized that the LLD is defined as an *a priori* (before the fact) limit representing the capability of the measurement system and not as *a posteriori* (after the fact) limit for a particular measurement.*

b. LLD for drinking water.

c. Other peaks which are measurable and identifiable, together with the radionuclides in Table 5-3, shall be identified and reported.

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*For a more complete discussion of the LLD, and other detection limits, see the following:

(1) HASL Procedures Manual, HASL-300 (revised annually).
(2) Currie, L. A., "Limits for Qualitative Detection and Quantitative Determination - Application to Radiochemistry" Anal. Chem. 40, 586-93 (1968).
(3) Hartwell, J. K., "Detection Limits for Radioisotopic Counting Techniques," Atlantic Richfield Hanford Company Report ARH-2537 (June 22, 1972).

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING (Continued)

5.2 LAND USE CENSUS

5.2.1 Specification

APPLICABILITY: At all times.

OBJECTIVE: Monitor the UNRESTRICTED AREAS surrounding the site for potential changes to the radiological monitoring program as necessary.

SPECIFICATION:

A. A land use census shall be conducted and shall identify the location of the nearest milk animal, the nearest residence and the nearest garden* of greater than 500 square feet producing fresh leafy vegetables in each of the 16 meteorological sections within a distance of five miles.

B. ACTION:

1. With the land use census identifying a location(s) which yields a calculated dose or dose commitment greater than the values currently being calculated in Specification 2.3.1, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report which identifies the new locations. Identify the new locations in the next Semiannual Radioactive Effluent Release Report.

2. With a land use census identifying a location(s) which yields a calculated dose or dose commitment via the same exposure pathway 20 percent greater than at a location from which samples are currently being obtained in accordance with Section 5.1.1 prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report which identifies the new locations. The new location shall be added to the radiological environmental monitoring program within 30 days. The sampling location, excluding the control station location, having the lowest calculated dose or dose commitment via the same exposure pathway may be deleted from this monitoring program after October 31, of the year in which this land use census was conducted.

*Broad leaf vegetation sampling may be performed at the SITE BOUNDARY in the direction section with the highest D/Q in lieu of the garden census.

5.2.2 Specification

APPLICABILITY: At all times.

OBJECTIVE: Perform the land use census to ensure the monitoring program is appropriate for the surrounding areas.

SPECIFICATION: The land use census shall be conducted at least once per 12 months between the date of June 1 and October 1 using that information which will provide the best results, such as by a door-to-door survey, aerial survey, or by consulting local agricultural authorities.

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING (Continued)

5.3 INTERLABORATORY COMPARISON PROGRAM

5.3.1 Specification

APPLICABILITY: At all times.

OBJECTIVE: To ensure laboratory analysis of radiological environmental monitoring samples is correct and accurate.

SPECIFICATION: A. Analyses shall be performed on radioactive materials supplied as part of an Interlaboratory Comparison Program which has been approved by the Commission.

B. ACTION:

1. With analyses not being performed as required above, report the corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Operating Report. (Section 5.4)

5.3.2 Specification

APPLICABILITY: At all times.

OBJECTIVE: To ensure laboratory analysis of radiological environmental monitoring samples is correct and accurate.

SPECIFICATION: A summary of the results obtained as part of the Interlaboratory Comparison Program and in accordance with the ODCM shall be included in the Annual Radiological Environmental Operating Report. (Section 5.4)

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING (Continued)

5.4 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT*

5.4.1 Routine radiological environmental operating reports covering the operation of the unit during the previous calendar year shall be submitted prior to May 1 of each year.

5.4.2 The annual radiological environmental operating reports shall include summaries, interpretations, and an analysis of trends of the results of the radiological environmental surveillance activities for the report period, including a comparison with preoperational studies, operational controls (as appropriate), and previous environmental surveillance reports and an assessment of the observed impacts of the plant operation on the environment. The reports shall also include the results of land use censuses required by Specification 5.2.1. If harmful effects or evidence of irreversible damage are detected by the monitoring, the report shall provide an analysis of the problem and a planned course of action to alleviate the problem.

The annual radiological environmental operating reports shall include summarized and tabulated results, in the format of Regulatory Guide 4.8, December 1975, of all radiological environmental samples taken during the report period. In the event that some results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report.

The reports shall also include the following: a summary description of the radiological environmental monitoring program; a map for all sampling locations keyed to a table giving distances and directions from the site reference point; and the results of licensee participation in the Interlaboratory Comparison Program, required by Specification 3.18.3.

(Note: Information which may be required by Specifications 5.1.1, 5.1.2, 5.3.2 and Section 6.4.18 should be included.

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* A single submittal may be made for a multiple unit station. The submittal should combine those sections that are common to all units at the station; however, for units with separate radwaste systems, the submittal shall specify the releases of radioactive material from each unit.

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING (Continued)

5.5 SAMPLE LOCATIONS

The Radiological Environmental Monitoring Sample Locations are identified in Figure 5-1. These sample locations are described in Tables 5-4 and 5-5 and indicates the distance in miles and the direction, determined from degrees true north, from the center of the Units 2 and 3 building complex. Table 5-6 gives the sector and direction designation for the Radiological Environmental Monitoring Sample Location Map, Figure 5-1.

* If a milk producing dairy animal is discovered within the 5 mile radius of the Emergency Planning Zone (EPZ) during the annual land use census, a monthly sampling analysis of the milk will commence.

TABLE 5-4

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

TYPE OF SAMPLE AND SAMPLING LOCATION***		DISTANCE* (miles)	DIRECTION*
Direct Radiation			
1	City of San Clemente (SDG&E Offices)	5.6	NW
2	Camp San Mateo (MCB, Camp Pendleton)	3.5	N
3	Camp San Onofre (MCB, Camp Pendleton)	2.6	NE
4	Camp Horno (MCB, Camp Pendleton)	4.5	E
5	Camp Las Pulgas (MCB, Camp Pendleton)	8.5	E
6	Old Route 101 (East-Southeast)	3.0	ESE
7	Old Route 101 (East-Northeast)	0.5	ENE
8	Noncommissioned Officers Beach Club	1.5	NW
9	Basilone Road/I-5 Freeway Offramp	2.0	NW
10	Bluff (Adjacent to PIC #1)	0.7	WNW
11	Former Visitor's Center	0.3**	NW
12	South Edge of Switchyard	0.2**	E
13	Southeast Site boundary (Bluff)	0.4**	SE
14	Huntington Beach Generating Station	37	NW
15	Southeast Site Boundary (Office Building)	0.2**	SE
16	East Southeast Site Boundary	0.4**	ESE
17	Transit Dose	-	-
18	Transit Dose	-	-
19	San Clemente Highlands	5.0	NNW
20	San Clemente Pier	5.3	NW
21	Concordia Elementary School - San Clemente	3.5	NW
22	Former Coast Guard Station - San Mateo Paint	2.7	WNW
23	San Clemente General Hospital	8.2	NW
24	San Clemente High School	6.0	NW

* Distance (miles) and Direction (sector) are measured relative to Units 2 and 3 midpoint. Direction is determined from degrees true north.

** Distances are within the Units 2 and 3 Site Boundary (0.4 mile in all sectors) and not required by Technical Specification.

*** MCB - Marine Corps Base PIC - Pressurized Ion Chamber

TABLE 5-4

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

TYPE OF SAMPLE AND SAMPLING LOCATION***		DISTANCE* (miles)	DIRECTION*
Direct Radiation (Continued)			
25	Convalescent Home - San Clemente	8.0	NW
26	Dana Hills High School	11.0	NW
27	U.S. Post Office - Dana Point	10.6	NW
28	Doheny Fire Station - Capistrano Beach	9.5	NW
29	San Juan Capistrano Fire Station	10.8	NW
30	Laguna Beach Fire Station	17.5	NW
31	Aurora Park-Mission Viejo	18.7	NNW
32	Santa Ana Police Department	32.0	NW
33	Camp Talega (MCB, Camp Pendleton)	5.7	N
34	San Onofre School (MCB, Camp Pendleton)	1.9	NW
35	Range 312 (MCB, Camp Pendleton)	4.7	NNE
36	Range 208C (MCB, Camp Pendleton)	4.2	NE
37	Laguna Niguel Fire Station	14.2	NW
38	San Onofre State Beach Park	3.3	SE
39	Basilone Road Trailer Park (MCB, Camp Pendleton)	1.4	NNW
40	SCE Training Center - Mesa (Adjacent to PIC #3)	0.7	NNW
41	Old Route 101 - East	0.4	E
42	Horno Canyon (MCB, Camp Pendleton)	4.7	E
43	Edson Range (MCB, Camp Pendleton)	10.6	SE
44	Fallbrook Fire Station	18.0	E
45	Interstate 5 Weigh Station	2.0	ESE
46	San Onofre State Beach Park	1.0	SE
47	Camp Las Flores (MCB, Camp Pendleton)	8.6	SE
48	Mainside (MCB, Camp Pendleton)	15.0	ESE

* Distance (miles) and Direction (sector) are measured relative to Units 2 and 3 midpoint. Direction is determined from degrees true north.

** Distances are within the Units 2 and 3 Site Boundary (0.4 mile in all sectors) and not required by Technical Specification.

*** MCB - Marine Corps Base PIC - Pressurized Ion Chamber

TABLE 5-4

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

TYPE OF SAMPLE AND SAMPLING LOCATION***		DISTANCE* (miles)	DIRECTION*
Direct Radiation (Continued)			
49	Camp Chappo (MCB, Camp Pendleton)	12.8	ESE
50	Oceanside Fire Station	15.5	SE
51	Carlsbad Fire Station	18.6	SE
52	Vista Fire Station	21	ESE
53	San Diego County Operations Center	45	SE
54	Escondido Fire Station	32	ESE
55	San Onofre State Beach (Unit 1, West Southwest)	0.2**	WSW
56	San Onofre State Beach (Unit 1, Southwest)	0.1**	SW
57	San Onofre State Beach (Unit 2)	0.1**	SSW
58	San Onofre State Beach (Unit 3)	0.1**	S
59	SONGS Meteorological Tower	0.3**	WNW
60	Transit Control Storage Area	-	-
61	Mesa - East Boundary (Adjacent to PIC #4)	0.7	N
62	MCB - Camp Pendleton (Adjacent to PIC #5)	0.6	NNE
63	MCB - Camp Pendleton (Adjacent to PIC #6)	0.6	NE
64	MCB - Camp Pendleton (Adjacent to PIC #7)	0.5	ENE
65	MCB - Camp Pendleton (Adjacent to PIC #8)	0.7	E
66	San Onofre State Beach (Adjacent to PIC #9)	0.6	ESE
67	Former SONGS Evaporation Pond (Adjacent to PIC #2)	0.6	NW
68	Range 210C (MCB, Camp Pendleton)	4.3	ENE
99	Transit Dose	-	-

* Distance (miles) and Direction (sector) are measured relative to Units 2 and 3 midpoint. Direction is determined from degrees true north.

** Distances are within the Units 2 and 3 Site Boundary (0.4 mile in all sectors) and not required by Technical Specification.

*** MCB - Marine Corps Base PIC - Pressurized Ion Chamber

TABLE 5-4

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

TYPE OF SAMPLE AND SAMPLING LOCATION		DISTANCE* (miles)	DIRECTION*
Airborne			
1	City of San Clemente (City Hall)	5.5	NW
2	Camp San Onofre (Camp Pendleton)	1.8	NE
3	Huntington Beach Generating Station	37.0	NW
5	Units 2 and 3 Switchyard	0.13**	NNE
6	SONGS Meteorological Tower	0.3**	WNW
9	State Beach Park	0.6	ESE
10	Bluff	0.7	WNW
11	Mesa EOF	0.7	NNW
12	Former SONGS Evaporation Pond	0.6	NW
13	Marine Corps Base (Camp Pendleton East)	0.7	E
Soil Samples			
1	Camp San Onofre	2.5	NE
2	Old Route 101 - East Southeast	3.0	ESE
3	Basilone Road/I-5 Freeway Offramp	2.0	NW
4	Huntington Beach Generating Station	37.0	NW
5	Former Visitor's Center	0.2**	NNW
Ocean Water			
A	Station Discharge Outfall - Unit 1	0.5	SSW
B	Outfall - Unit 2	0.7	SW
C	Outfall - Unit 3	0.7	SW
D	Newport Beach	30.0	NW

* Distance (miles) and Direction (sector) are measured relative to Units 2 and 3 midpoint. Direction is determined from degrees true north.

** Distances are within the Units 2 and 3 Site boundary (0.4 mile in all sectors) and not required by Technical Specification.

TABLE 5-4

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

	TYPE OF SAMPLE AND SAMPLING LOCATION	DISTANCE* (miles)	DIRECTION*
Drinking Water			
1	Tri-Cities Municipal Water District Reservoir	8.7	NW
2	San Clemente Golf Course Well	3.5	NNW
3	Huntington Beach	37.0	NW
Shoreline Sediment (Beach Sand)			
1	San Onofre State Beach (0.6 mile Southeast)	0.6	SE
2	San Onofre Surfing Beach	0.9	NW
3	San Onofre State Beach (3.1 miles Southeast)	3.1	SE
4	Newport Beach (North End)	30.0	NW
Local Crops			
1	San Mateo Canyon (San Clemente Canyon)	2.6	NW
2	Southeast of Oceanside	22.0	SE
3	San Clemente Resident with Garden	4.1	NW

* Distance (miles) and Direction (sector) are measured relative to Units 2 and 3 midpoint. Direction is determined from degrees true north.

TABLE 5-4

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

TYPE OF SAMPLE AND SAMPLING LOCATION		DISTANCE* (miles)	DIRECTION*
Non-Migratory Marine Animals			
A	Unit 1 Outfall	0.6	WSW
B	Units 2 and 3 Outfall	0.7	SSW
C	Newport Beach	30.0	NW
Kelp			
A	San Onofre Kelp Bed	1.5	S
B	San Mateo Kelp Bed	3.5	WNW
C	Barn Kelp Bed	6.6	SSE
D	Newport Beach	30.0	NW
Ocean Bottom Sediments			
A	Unit 1 Outfall (0.5 mile West)	0.5	W
B	Unit 1 Outfall (0.6 mile West)	0.6	W
C	Unit 2 Outfall	0.8	SSW
D	Unit 3 Outfall	0.9	S
E	Newport Beach	30.0	NW

* Distance (miles) and Direction (sector) are measured relative to Units 2 and 3 midpoint. Direction is determined from degrees true north.

TABLE 5-5

PIC - RADIOLOGICAL ENVIRONMENTAL MONITORING LOCATIONS
SONGS 1

PRESSURIZED ION CHAMBERS		Theta (Degrees)*	DISTANCE* Meters	miles	DIRECTION/SECTOR*	
S1	San Onofre Beach	298°	1070	0.7	WNW	P
S2	SONGS Former Evap. Pnd	313°	890	0.6	NW	Q
S3	Japanese Mesa	340°	1150	0.7	NNW	R
S4	MCB - Camp Pendleton	3°	1120	0.7	N	A
S5	MCB - Camp Pendleton	19°	1050	0.6	NNE	B
S6	MCB - Camp Pendleton	46°	940	0.6	NE	C
S7	MCB - Camp Pendleton	70°	870	0.5	ENE	D
S8	MCB - Camp Pendleton	98°	1120	0.7	E	E
S9	San Onofre State Beach	121°	940	0.6	ESE	F

* Distance (meters/miles) and Direction (sector) are measured relative to Units 2 and 3 midpoint. Theta direction is determined from degrees true north.

TABLE 5-6

SECTOR AND DIRECTION DESIGNATION FOR RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATION MAP

DEGREES TRUE NORTH FROM SONGS 2 AND 3 MID-POINT			NOMENCLATURE	
Sector Limit	Center Line	Sector Limit	22.5° Sector*	Direction
348.75	0 & 360	11.25	A	N
11.25	22.5	33.75	B	NNE
33.75	45.0	56.25	C	NE
56.25	67.5	78.75	D	ENE
78.75	90.0	101.25	E	E
101.25	112.0	123.75	F	ESE
123.75	135.0	146.25	G	SE
146.25	157.0	168.75	H	SSE
168.75	180.0	191.25	J	S
191.25	202.5	213.75	K	SSW
213.75	225.0	236.25	L	SW
236.25	247.5	258.75	M	WSW
258.75	270.0	281.15	N	W
281.25	292.5	303.75	P	WNW
303.75	315.0	326.25	Q	NW
326.25	337.5	348.75	R	NNW

* Distance (miles) and Direction (sector) are measured relative to Units 2 and 3 midpoint. Direction is determined from degrees true North.

3108c.man

SOUTHERN CALIFORNIA EDISON COMPANY

COMPARATIVE EARNINGS STATEMENT — THIRD QUARTER, 1963

DOCKET NO. 50-206

Submitted as a Part of Gould's Testimony 11-19-63 (Counsel)

October 31, 1963

PDR File Copy

RECEIVED NOV 13 1963 U.S. Atomic Energy Commission Division of Licensing & Regulation

Docket No. 50-206
Exhibit No. 4

(In Thousands of Dollars)

	3 Months Ended September 30 1963	3 Months Ended September 30 1962	12 Months Ended September 30 1963	12 Months Ended September 30 1962
OPERATING REVENUES				
Domestic	$ 32,449	$ 30,420	$134,969	$126,176
Agricultural	5,933	5,794	14,996	14,491
Commercial	22,891	20,734	86,904	80,348
Industrial	22,860	20,847	88,296	86,575
Public Authorities	7,260	7,128	31,682	30,215
Railways and Sales for Resale	4,246	5,094	16,767	14,957
Miscellaneous	275	329	1,156	1,051
Total Operating Revenues	95,914	90,346	374,770	353,813
OPERATING EXPENSES AND TAXES				
Operation—				
Cost of Fuel	17,173	16,571	65,529	65,573
Purchased Power	277	278	1,075	998
Other Operation	14,464	13,691	58,538	54,373
Total Operation	31,914	30,540	125,142	120,944
Maintenance	6,140	4,908	23,097	21,122
Provision for Depreciation	11,775	9,501	49,719	37,616
Provision for Federal Taxes on Income	8,140	11,025	27,920	38,740
Income Taxes Deferred—Accelerated Amortization	1,419	1,525	5,783	6,207
Other Taxes	13,255	12,256	51,110	46,851
Total Operating Expenses and Taxes	72,643	69,755	282,771	271,480
NET OPERATING INCOME	23,271	20,591	91,999	82,333
Net Non-Operating Income	342	305	885	691
Gross Income	23,613	20,896	92,884	83,024
Interest and Other Deductions	7,440	6,143	28,936	24,091
NET INCOME	16,173	14,753	63,948	58,933
Preferred Dividends	1,445	1,433	5,745	5,925
Preference Dividends	—	43	113	271
Balance	14,728	13,277	58,090	52,737
Common Dividends	8,494	7,664	32,172	29,350
Earnings Retained for Use in Business	$ 6,234	$ 5,613	$ 25,918	$ 23,387
Earned per Share on Common Stock Outstanding	$ .45	$ .41	$1.78	$1.64

(This information is not given in connection with any sale or offer to sell, or purchase or offer to purchase any security.)

STOCKHOLDERS' LETTER

THIRD QUARTER, 1963

Southern California Edison Company

Los Angeles 53, California

To All Stockholders:

RECORD GROWTH IN METERS

Electric meters were added to Edison lines at a record pace during the first nine months of this year. The 75,000 meters added in the first three quarters already exceed the number installed for the full year 1962.

Projecting this increase through the fourth quarter, it is anticipated that a record number of more than 95,000 meters will be added to our lines during 1963. This is a significant advance over the previous high of 87,000 meter additions which occurred in 1955.

Although construction of single family residences has maintained a moderate level of growth, a sharp upturn in multiple unit homebuilding has been the principal factor contributing to this unprecedented increase in meters.

POPULATION TREND

In relating home construction to population growth, statistical surveys indicate that the number of people being added per new dwelling unit has decreased from the historical average of about one unit for every three people to one unit for every 1.8 persons added to the population. As a result, population gains in the Company's service territory should contribute to greater increases in meters and customers than in the past. This "smaller-family" trend may also be an important factor in influencing the shift to multiple unit construction now being experienced in our service territory.

Southern California continues to lead the nation in population growth. Since the 1960 census, population of the 14 southern-most counties of California has increased 13 per cent—more than twice the 5.1 per cent gain reported for the nation. The influx of population into this territory continues to stem largely from net in-migration, which currently accounts for 60 per cent of the total population growth. As in-migration declines as a percentage of the total population increase, natural increases (excess of births over deaths) are expected to play more important roles in the population growth of Southern California.

ELECTRIC LIVING GAINS

Of further importance to the Company's growth, in addition to meters and population, is the success of our Medallion Home Program. In the last nine months 52 per cent of the total new housing market contracts signed met the requirements of either Gold or Bronze Medallion standards. This is a substantial improvement over the 15 per cent portion of the market that electric living could claim when the Medallion Home Program was started in 1958. Impact of the program on our operations, of course, can be directly translated into increased kilowatt-hour usage per domestic customer. We have recently established a Marketing Department to coordinate this program as well as to gain and hold the initiative and leadership in all of the various marketing areas of our operation.

RESULTS OF OPERATIONS

Earnings per share for the nine months ended September 1963, were $1.35, as compared with $1.26 for the same period last year. For the twelve months ended September 1963, per share earnings were $1.78, as compared with $1.64 for the same period last year.

PROPOSED MERGER

The Company and California Electric Power Company on May 16, 1963, entered into an Agreement of Merger with the Company to be the surviving corporation. After the last of the required regulatory approvals was obtained, the Board of Directors on October 2, 1963, called a special meeting of stockholders to be held November 21, 1963, and fixed the record date for such meeting at October 11, 1963. The Company's proxy statement setting forth pertinent information relating to the merger has already been distributed and stockholders are now in the process of returning their proxies.

Harold Quinton

CHAIRMAN OF THE BOARD