AEP INDIANA MICHIGAN POWER

DONALD C. COOK NUCLEAR PLANT

PLANT MANAGER PROCEDURE COVER SHEET

Instruction No.	12 PMP 6010 OSD.001
Revision No.	7

TITLE OFF-SITE DOSE CALCULATION MANUAL

SCOPE OF REVISION Marginal markings were not used. Biennial review. Incorporated new 10CFR20 requirements. Incorporated Change Sheet 1. Deleted redundant Attachment. Made grammatical and editorial changes to more accurately reflect wording in current technical specifications for Generic Letter 89-01.

SIGNATURES	REVISION NUMBER			
* * * * * *	Revision 7			
PREPARED BY				
QUALITY ASSURANCE SUPERINTENDENT APPROVAL				
PLANT NUCLEAR SAFETY COMMITTEE				
PLANT MANAGER APPROVAL				
APPROVAL DATE				
EFFECTIVE DATE				

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INDIANA MICHIGAN POWER COMPANY
DONALD C. COOK NUCLEAR PLANT

OFF-SITE DOSE CALCULATION MANUAL

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INDIANA MICHIGAN POWER COMPANY
DONALD C. COOK NUCLEAR PLANT

OFF-SITE DOSE CALCULATION MANUAL

1.0 OBJECTIVE

The Off-Site Dose Calculation Manual (ODCM) is a supporting document to the Radiological Effluent Technical Specifications (RETS), as defined in NUREG-0472. The ODCM contains the methodology and parameters to be used in the calculation of off site doses due to radioactive liquid and gaseous effluents and in the calculation of liquid and gaseous monitoring instrumentation alarm/trip setpoints. The ODCM provides flow diagrams detailing the treatment path and the major components of the radioactive liquid and gaseous waste management systems. The ODCM also presents a map of the radiological environmental monitoring sample locations and the meteorological model used to estimate the atmospheric dispersion and deposition parameters. The ODCM specifically addresses the design characteristics of the Donald C. Cook Nuclear Plant based on the flow diagrams contained on the "OP Drawings" and plant "System Description" documents.

1.1 The Radiation Protection Department and the Radiological Support Section are responsible for implementation of the Off-Site Dose Calculation Manual. The Radiological Support Section conducts periodic reviews and updates of the ODCM. Any change will be reviewed and approved by the Radiological Support Section Manager.

2.0 REFERENCES

2.1 10CFR20, Standards for Protection Against Radiation.

2.2 10CFR50, Domestic Licensing of Production and Utilization Facilities.

2.3 PMI 6010, Radiation Protection Plan

2.4 NUREG-0472

2.5 NUREG-0133

2.6 Regulatory Guide 1.109.

2.7 Regulatory Guide 1.111.

2.8 Regulatory Guide 1.113.

2.9 Final Safety Analysis Report (FSAR).

2.10 Technical Specifications, Appendix A, Sections 6.8.1.e and 6.15, Offsite Dose Calculation Manual.

2.11 Final Environmental Statement D. C. Cook Nuclear Plant, August 1973.

2.12 NUREG-0017

2.13 Correspondence: D. Noble to W. MacRae, "Referenced Efficiencies for RRS-1001", July 21, 1989.

2.14 ODCM Setpoints for Liquid Effluent Monitors (Bases),ENGR 107-04 8112.1 Environs Rad Monitor. System.

2.15 Radiological Support Section Calculation RS-C-0202, July 31, 1989.

2.16 Radiological Support Section Calculation RS-C-0106, March 19, 1987.

2.17 "Implementation of Programmatic Controls for Radiological Effluent Technical Specifications in the Administrative Controls Section of the Technical Specifications and the Relocation of Procedural Details of RETS to the Offsite Dose Calculation Manual or to the Process Control Program (Generic Letter 89-01)", United States Nuclear Regulatory Commission, January 31,1989.

2.18 12 THP 6010 RPP.601 Preparation of the Annual Radioactive Effluent Release Report.

3.0 LIST OF ATTACHMENTS

3.1 Site Specific Parameters for the MIDAS Program

3.2 Radioactive Liquid Effluent Monitoring Instrumentation (Table 3.3-12)

3.3 Radioactive Liquid Effluent Monitoring Instrumentation Surveillance Requirements (Table 4.3-8)

3.4 Radioactive Gaseous Effluent Monitoring Instrumentation (Table 3.3-13)

3.5 Radioactive Gaseous Effluent Monitoring Instrumentation Surveillance Requirements (Table 4.9-3)

4.0 DETAILS

4.1 Calculation of Offsite Doses

4.1.1 Gaseous Effluent Releases

The calculation of doses from effluent releases is performed by the program MIDAS (Meteorological Information and Dose Assessment System). The site specific parameters associated with MIDAS are shown in Attachment 3.1 for the following subprograms:

MIDER
MIDEX
MIDEL
MIDEG
MIDEN

The subprogram used to enter and edit gaseous release data is called MD1EQ (EQ). The data entered in EQ can be used to calculate the accumulation of dose to individual receptors based on hourly meteorology and release data. The air dose from this data is calculated via the XDAIR subprogram in MIDAS. It computes air dose results for use in Regulatory Guide 1.21 reports and Appendix I calculations based on routine releases.

The formula used for the calculation of the air dose is taken from Reg. Guide 1.109:

$$D_{\gamma,\ \beta,\ air} = \chi/Q \sum[(M_i \text{ or } N_i) \times Q_i \times t \times 3.17E^{-8}]$$

$D_{\gamma,\ \beta,\ air}$ = the gamma or beta air dose in mRad to an individual receptor.

χ/Q = the annual average or real time atmospheric dispersion factor, sec/m^3

M_i = the gamma air dose factor, $\frac{mRad - m^3}{sec - \mu Ci}$, from Attachment 3.18

N_i = the beta air dose factor, $\frac{mRad - m^3}{sec - \mu Ci}$ from Attachment 3.18

Q_i = the release of radionuclide, i, in $\mu Ci/sec$

t = duration of the release in seconds

$3.17E^{-8}$ = inverse number of seconds/year, years/second.

The value for the χ/Q is determined using equations 3 and 9 of Reg. Guide 1.111 as shown below:

$$\chi/Q_{ga} = \frac{2.03}{\overline{u_{a_g}} * x * \Sigma_g} * T_f$$

where:

$$\Sigma_g = \text{minimum of } \sqrt{\sigma_{z_g}^2 + \frac{H_c^2}{2\pi}} \text{ or } \Sigma_g = \sqrt{3}\sigma_{z_g}$$

x = distance downwind of the source, meters. This information is found in parameter 5 of MIDEX.

u_{a_g} = *wind speed for ground release, meters/second.*

σ_{y_g} *and* σ_{z_g} *are dispersion coeffients taken from RG* 1.109

H_c = building height from parameter 28 of MIDER.

T_f = terrain factor (= 1 for Cook Nuclear Plant) because we consider all our releases to be ground level (see parameter #5 in MIDEX).

The dose due to gaseous releases (other than the air dose) is calculated by the MIDAS subprogram GASPRO. GASPRO computes the accumulation of dose to individual receptors based on hourly meteorology and release data. Calculations consider the effect of each important isotope for each pathway, organ, age group, distance, and direction.

Calculations are based on the environmental pathways-to-man models in RG 1.109. The program considers 7 pathways, 8 organs, and 4 age groups in 16 direction sectors. The distances used are taken from the MIDEG file.

The equation used to calculate the dose in mRem is:

Total Body Plume Pathway (mRem)

$$Dose\ (mRem) = 3.17E^{4} \sum\ (Q_i * \chi/Q * S_f * DFB_i * t)$$

where:

$3.17E^{4}$ = conversion factor, $\frac{\rho Ci - year}{Ci - sec}$

S_f = shielding factor that accounts for the dose reduction due to shielding provided by residential structures during occupancy (maximum exposed individual = 0.7 per Table E-15 of RG 1.109)

DFB_i = the whole body dose factor from Table B-1 of Regulatory Guide 1.109.

Q_i = the release rate of radionuclide i, in Curies/second

χ/Q = the annual average or real time atmospheric dispersion factor, sec/m^3.

t = duration of release, in seconds

Skin Plume Pathway (mRem)

$$Dose\ (mRem) = 3.17E^{4} \times 1.11 \times S_f \times t \times \frac{\chi}{Q} \times [\Sigma(Q_i \times DF_i^{\gamma}) + \Sigma(Q_i \times DFS_i)]$$

Where:

$3.17E^4$ = conversion factor, $\frac{\rho Ci - year}{Ci - sec}$

1.11 = conversion factor, tissue to air, $\frac{mRem}{mRad}$

Q_i = release rate of radionuclide i, in Curies/year.

χ/Q = the annual average OR real time atmospheric dispersion factor, in sec/m^3.

S_f = shielding factor, that accounts for dose reduction due to shielding provided by residential structures during occupancy, 0.7 per Table E-15, RG 1.109.

t = duration of release, seconds

DF_i^{γ} = the gamma air dose factor for a uniform semi-infinite cloud of radionuclide i, in mRad $-m^3/\rho Ci - yr$ from Table B-1, RG 1.109.

DFS_i = the beta skin dose factor for a semi-infinite cloud of radionuclide i, in mRem-$m^3/\rho Ci-yr$ from Table B-1, RG 1.109.

Radionuclide and Radioactive Particulate Doses

The dose, in D_{IP} in mRem, to an individual from radionuclides, other than noble gases, with half-lives greater than 8 days in gaseous effluents released to unrestricted areas will be determined as follows:

$$D_{IP} = 3.17E^{-8} \Sigma(R_i \times W \times Q_{ic})$$

where:

R_i = the most restrictive dose factor for each identified radionuclide i, in m^2 mRem/yr per μCi/sec (for food and ground pathways) or mRem/yr per $\mu Ci/m^3$ (for inhalation pathway), for the appropriate pathway.

For sectors with existing pathways within 5 miles of the site, use the values of R_i for these real pathways, otherwise use pathways distance of 5 miles. See Attachment 3.1, page 22 of 27 for the maximum R_i values for the most controlling age group for selected radionuclides. R_i values were generated by computer code PARTS, see NUREG-0133, Appendix D.

W = the annual average or real time atmospheric dispersion parameters for estimating doses to an individual at the worst case location, and where W is further defined as:

W_{in} = $\overline{\chi/Q}$ for the inhalation pathway, in sec/m^3.

W_{fg} = $\overline{D/Q}$ for the food and ground pathways in $1/m^2$

Q_{ic} = the release of those radioiodines, radioactive materials in particulate form and radionuclides other than noble gases with half-lives greater than eight (8) day, in μCi.

$3.17E^{-8}$ = inverse number of seconds in a year, years/second.

In addition to the above routines, the QUICKG routine of the MIDAS system is used to provide data used in the monthly reports because of its simplicity compared to the process described above. The QUICKG routine is based on NUREG 0133 methodology instead of the RG 1.109 methodology.

The equations used are as follows:

Gamma Radiation Dose (GD) - ground release

$$GD = 3.17E^{-8}(M_i * \chi/Q * Q_i)$$

taken from NUREG 0133, Section 5.3.1(a).

Beta Radiation Dose (BD) - ground release

$$BD = 3.17E^{-8}(N_i * \chi/Q * Q_i)$$

This calculation is made for each pathway. The maximum computed dose at any receptor for each pathway is selected. These are summed together to get the dose to compare to the limits. Only the maximum of the cow milk or goat milk pathway (not both) is included in the total.

where:

M_i = air dose factor due to gamma emissions for each noble gas radionuclide, i. These factors are listed in Attachment 3.18, parameter 4 of MIDEN and are taken from Table B-1 of RG 1.109

N_i = air dose factor due to beta emissions for each noble gas radionuclide, i. These factors are listed in Attachment 3.18, parameter 4 of MIDEN and are taken from Table B-1 of RG 1.109.

χ/Q= the average annual or real time relative concentration, sec/m^3 for vent releases. These factors are taken from parameter 9 of MIDEN or Attachment 3.16.

Q_i = The amount of noble gas radionuclide released, μCi/sec. Calculated via the MD1EQ/MD1AG pathway from plant release data sheets.

STEAM GENERATOR BLOWDOWN SYSTEM (START UP FLASH TANK VENT)

The amount of radioiodine and other radionuclides that are released via the start up flash tank and it's vent are calculated through actual sample results while the start up flash tank is in service.

The following calculation is performed to determine the amount of curies released through this pathway.

$$Curies = \frac{\mu Ci}{ml} \times GPM \times time\ on\ flash\ tank\ (\text{min}) \times 3.785E^{-3}$$

The flow rate is determined from the blowdown valve position chart recorder and the time on the start up tank is determined from the control room logs. Chemistry department performs the sampling and analysis of the samples.

This data is provided to the MIDAS computer and a dose calculation is performed to ensure compliance with Technical Specification 3/4.11.2.3 dose limits. MIDAS uses the formulas given in section 4.1.2 to calculate these doses to the public.

NOTE

THIS SECTION PROVIDES THE MINIMUM REQUIREMENTS TO BE FOLLOWED AT COOK PLANT. THIS WOULD BE USED IF ACTUAL SAMPLE DATA WAS NOT AVAILABLE EACH TIME THE START UP FLASH TANK WAS IN SERVICE.

Release rate of radioiodine via the Start Up Flash Tank must comply with Technical Specification 3/4.11.2.3.

The radioiodine release rate must be determined in accordance with the following equation every 31 day period whenever the specific activity of the secondary coolant system is greater than 0.01 uCi/gram dose equivalent I-131.

If the specific activity of the secondary coolant system is less than 0.01 uCi/gram dose equivalent I-131, the release rate must be determined once every six months.

Q_y = (Ci) (IPF) (R_{sgb})

Where:

Q_y = The release rate of I-131 from the steam generator flash tank vent, in uCi/sec.

Ci = the concentration (uCi/cc) of I-131 in the secondary coolant averaged over a period not exceeding seven days.

IPF = the iodine partition factor for the Start Up Flash Tank, 0.05, in accordance with NUREG-0017.

R_{sgb} = the steam generator blowdown rate to the start up flash tank, in cc/sec.

The calculated release rate shall be assumed to be the release rate until the next determination and used in the monthly dose projections to ensure compliance with Technical Specification 3/4.11.2.3. The release rate calculations shall be reported in the annual effluent report.

Steam Generators are sparged, sampled and drained as batches early in outages to facilitate cooldown for entry into the steam generator. This is repeated prior to startup to improve steam generator chemistry for the startup.

4.1.2 Liquid Effluent Releases

The calculation of doses from liquid effluent releases is also performed by the MIDAS program. The subprogram used to enter and edit liquid release data is called MD1EB (EB).

To calculate the individual doses (in mRem), the program DS1LI (LD) is used. It computes the individual dose for up to 5 receptors for 14 liquid pathways due to release of radioactive liquid effluents. The pathways to be used can be selected using the MIDEL program by changing the values given in parameter 1. Cook Nuclear Plant uses 3 pathways: potable water, shoreline, and aquatic foods (fresh water sport fishing).

The equations used are taken from RG 1.109 Appendix A. They are as follows:

Potable Water

$$R_{apj} = 1100 \frac{U_{ap}}{M_p F\, 2.23E^{-3}} \sum_i Q_i D_{aipj} e^{-\lambda_i t_p}$$

where:

R_{apj} = the total annual dose to organ j to individuals of age groups a from all of the nuclides i in pathway p, in mRem/year.

U_{ap} = a usage factor that specifies the exposure time or intake rate for an individual of age group "a" associated with pathway "p". Given in #29-84 of parameter 4 in MIDEL and R.G. 1.109 Table E-5.

M_p = the dilution factor at the point of exposure (or the point of withdrawal of drinking water or point of harvest of aquatic food). Given in parameter 5 of MIDEL as 2.6.

F = the dilution water flow rate in gpm

$2.23E^{-3}$ = conversion factor, $\frac{ft^3 - m}{sec - g}$

Q_i = the release rate of nuclide i for the time period of the run input via MIDEB, Curies/year

D_{aipj} = the dose factor, specific to a given age group a, radionuclide i, pathway p, and organ j, which can be used to calculate the radiation dose from an intake of a radionuclide, in mRem/pCi. The values are taken from tables E-11 through E-14 of RG 1.109 and are located within the MIDAS code

λ_i = the radioactive decay constant for radionuclide i, in hours

t_p = the average transit time required for nuclides to reach the point of exposure, 12 hours. For internal dose, t_p is the total elapsed time between release of the nuclides and ingestion of food or water, in hours. Given as #25 of parameter 4 in MIDEL.

Aquatic Foods

$$R_{apj} = 1100 \frac{U_{ap}}{M_p F\ 2.23E^{-3}} \sum_i Q_i B_{ip} D_{aipj} e^{-\lambda_i t_p}$$

where:

B_{ip} = the equilibrium bioaccumulation factor for nuclide i in pathway p, expressed as the ratio of the concentration in biota (in pCi/kg) to the radionuclide concentration in water (in pCi/liter) in liters/kg. The factors are located within the MIDAS code and are taken from Table A-1 of RG 1.109

t_p = the average transit time required for nuclides to reach the point of exposure, 24 hours. For internal dose, t_p is the total elapsed between release of the nuclides and ingestion of food or water, in hours. Given as #26 of parameter 4 in MIDEL.

M_p = the dilution factor at the point of exposure, 1.0 for Aquatic Foods.

Shoreline Deposits

$$R_{apj} = 110{,}000 \frac{U_{ap} W}{M_p F\ 2.23E^{-3}} \sum_i Q_i T_i D_{aipj} [e^{-\lambda_i t_p}] * [1 - e^{-\lambda_i t_b}]$$

where:

W = the shoreline width factor. Given as an input when running the program as 0.3 based on Table A-2 in RG 1.109

T_i = the radioactive half-life of the nuclide, i, in days

t_b = the period of time for which sediment or soil is exposed to the contaminated water, $1.31E^{+5}$ hours. Given in MIDEL as item 6 of parameter 4.

t_p = the average transit time required for nuclides to reach the point of exposure, 0 hours. Given as #28 of parameter 4 in MIDEL.

The program MIDAS uses the following plant specific parameters which are inputted by the operator.

Irrigation rate = 0.0
Fraction of time on pasture = 0.0
Fraction of feed on pasture = 0.0
Shore width factor = 0.3
(from Reg. Guide 1.109, Table A-2)

The results of DS1LI are printed in LDRPT (LP). These results are used in the monthly report on liquid releases.

In addition, the program DOSUM (DM) is used to search the results files of DS1LI to find the maximum liquid pathway individual doses. The highest exposures are then printed in a one page summary table. Each line is compared with the appropriate dose limit. The table printed provides a concise summary of off site environmental dose calculations for inclusion in Regulatory Guide 1.21 reports.

4.2 Limits of Operation and Surveillances of the Effluent Release Points

4.2.1 Radioactive Liquid Effluent Monitoring Instrumentation (3/4.3.3.9)

4.2.1.1 The radioactive liquid effluent monitoring instrumentation channels shown in Attachment 3.2 shall be operable with their alarm/trip setpoints set to ensure that the limits of section 4.2.3.1 are not exceeded.

4.2.1.2 The applicability of each channel is shown in Attachment 3.2.

4.2.1.3 With a radioactive liquid effluent monitoring instrumentation channel alarm/trip setpoint less conservative than a value which will ensure that the limits of section 4.2.3.1 are met, without delay suspend the release of radioactive liquid effluents monitored by the affected channel, and reset or declare the monitor inoperable.

4.2.1.4 With one or more radioactive liquid effluent monitoring instrumentation channels inoperable, take the applicable action shown in Attachment 3.2.

4.2.1.5 The provision of the Technical Specifications 3.0.3 and 3.0.4 are not applicable.

4.2.1.6 The setpoints shall be determined in accordance with the methodology as described in section 4.3.1. The setpoints shall be recorded.

4.2.1.7 Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated operable by performance of the channel check, source check, channel calibration and channel functional test at the frequencies shown in Attachment 3.3.

4.2.2 Radioactive Gaseous Effluent Monitoring Instrumentation (3/4.3.3.10)

4.2.2.1 The radioactive gaseous process and effluent monitoring instrumentation channels shown in Attachment 3.4 shall be operable with their alarm/trip setpoints set to ensure that the limits of section 4.2.4.1 are not exceeded.

4.2.2.2 The applicability of each channel is shown in Attachment 3.4.

4.2.2.3 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 section 4.2.4.1 are met, without delay suspend the release of radioactive gaseous effluents monitored by the affected channel, and reset or declare the channel inoperable.

4.2.2.4 With less than the minimum number of radioactive gaseous effluent monitoring instrumentation channels operable, take the action shown in Attachment 3.4.

4.2.2.5 The provisions of the Technical Specifications 3.0.3 and 3.0.4 are not applicable.

4.2.2.6 The setpoints shall be determined in accordance with the methodology as described in section 4.3.2. The setpoint shall be recorded. This surveillance requirement does not apply to the Waste Gas Holdup System Hydrogen and Oxygen Monitors, as their setpoints are not addressed in this document.

4.2.2.7 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 FUNCTIONAL TEST operations at the frequencies shown in Attachment 3.5.

4.2.3.2.3 With releases from the Turbine Room Sump exceeding the above limits, perform a dose projection due to liquid releases to UNRESTRICTED AREAS to determine if the limits of Section 4.2.3.3.1 of the ODCM have been exceeded. If the dose limits are exceeded, follow the direction of the action statements following Section 4.2.3.3.3.

4.2.3.2.4 The provisions of Technical Specifications 3.0.3 and 3.0.4 are not applicable.

4.2.3.2.5 Radioactive liquid wastes shall be sampled and analyzed according to the sampling and analysis program of Attachment 3.6.

4.2.3.2.6 The results of radioactive analysis shall be used in accordance with the methods of this document to assure that all concentrations at the point of release are maintained within the limits as stated above.

4.2.3.3 Dose (3/4.11.1.2)

4.2.3.3.1 The dose or dose commitment to an individual from radioactive material in liquid effluents released to unrestricted areas (see Technical Specifications Figure 5.1-3) shall be limited during any calendar quarter to ≤ 1.5 mRem to the total body and to ≤ 5 mRem to any organ, and during any calendar year to ≤ 3 mRem to the total body and to ≤ 10 mRem to any organ.

4.2.3.3.2 These limits are applicable at all times.

4.2.3.3.3 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 which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions taken to reduce the releases and the proposed corrective actions taken to assure that subsequent releases will be within the above limits. This Special Report shall also include (1) the results of radiological analyses of the drinking water source, and (2) the radiological impacts on finished drinking water supplies with regard to the requirements of 40 CFR 141, Safe Drinking Water Act. (Applicable only if drinking water supply is taken from the receiving water body.)

4.2.3.3.4 The provisions of Technical Specifications 3.0.3 and 3.0.4 are not applicable.

4.2.3.3.5 Cumulative dose contributions from liquid effluents shall be determined in accordance with this document at least once per 31 days. Dose may be projected based on estimates from previous monthly projections and current or future plant conditions.

4.2.3.4 Liquid Radwaste Treatment System (3/4.11.1.3)

4.2.3.4.1 The liquid radwaste treatment system shall be used to reduce the radioactive materials in liquid wastes prior to their discharge when the projected doses due to the liquid effluent from the site (see Technical Specifications Figure 5.1-3) when averaged over 31 days, would exceed 0.06 mRem to the total body or 0.2 mRem to any organ.

4.2.3.4.2 This section is applicable at all times.

4.2.3.4.3 With radioactive liquid waste being discharged without treatment and in excess of the above limits, in lieu of any other report required by Technical Specification 6.9.1, prepare and submit to the Commission within 30 days pursuant to Technical Specification 6.9.2 a Special Report which includes the following information:

(1) Identification of the inoperable equipment or subsystems and the reason for inoperability,

(2) Action(s) taken to restore the inoperable equipment to operable status, and

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

4.2.3.4.4 The provisions of Technical Specifications 3.0.3 and 3.0.4 are not applicable.

4.2.3.4.5 Doses due to liquid releases to UNRESTRICTED AREAS shall be projected at least once per 31 days, in accordance with this document, whenever liquid releases are being made without being processed by the liquid radwaste treatment system.

4.2.4 Gaseous Effluents

4.2.4.1 Dose Rate (3.11.2.1)

4.2.4.1.1 The dose rate due to radioactive materials released in gaseous effluents from the site (Technical Specification Figure 5.1-3) shall be limited to ≤ 500 mRem/yr to the total body and ≤ 3000 mRem/yr to the skin for noble gases. The dose rate due to all radioiodines and for all radioactive materials in particulate form and radionuclides (other than noble gases) with half-lives greater than 8 days shall be limited to ≤1500 mRem/yr to any organ.

4.2.4.1.2 This section is applicable at all times.

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

4.2.4.1.4 The dose rate due to noble gases in gaseous effluents shall be determined to be within the above limits in accordance with the methods and procedures described in this document.

4.2.4.1.5 The dose rate due to radioactive materials, other than noble gases, in gaseous effluents shall be determined to be within the above limits in accordance with the methods and procedures of this document by obtaining representative samples and performing analyses in accordance with the sampling and analysis program in Attachment 3.7.

4.2.4.2 Dose - Noble Gases (3/4.11.2.2)

4.2.4.2.1 The air dose in unrestricted areas due to noble gases released in gaseous effluents shall be limited during any calendar quarter, to ≤ 5 mRad for gamma radiation and ≤ 10 mRad for beta radiation and during any calendar year, to ≤ 10 mRad for gamma radiation and ≤ 20 mRad for beta radiation.

4.2.4.2.2 This section is applicable at all times.

4.2.4.2.3 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 which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be within the above limits.

4.2.4.2.4 The provisions of Technical Specification 3.0.3 and 3.0.4 are not applicable.

4.2.4.2.5 Cumulative dose contributions for the total time period shall be determined in accordance with this document at least once every 31 days.

4.2.4.3 Dose - Iodine-131, Iodine-133, Tritium, and Radioactive Material in Particulate Form (3/4.11.2.3)

4.2.4.3.1 The dose to a MEMBER OF THE PUBLIC from radioiodine, radioactive materials in particulate form, and radionuclides other than noble gases with half-lives greater than 8 days in gaseous effluents released to unrestricted areas (site boundary) shall be limited to the following:

(a) During any calendar quarter to less than or equal to 7.5 mRem to any organ,

(b) During any calendar year to less than or equal to 15 mRem to any organ, and

(c) Less than 0.1% of the limits of (a) and (b) above as a result of burning contaminated oil.

4.2.4.3.2 This section is applicable at all times.

4.2.4.3.3 With the calculated dose from the release of radioiodines, radioactive materials in particulate form, or radionuclides other than 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 which identifies the cause(s) for exceeding the limit and defines the corrective actions taken to assure that subsequent releases will be within the above limits.

4.2.4.3.4 The provisions of Technical Specification 3.0.3 and 3.0.4 are not applicable.

4.2.4.3.5 Cumulative dose contributions for the total time period shall be determined in accordance with this document at least once every 31 days.

4.2.4.4 Gaseous Radwaste Treatment (3/4.11.2.4)

4.2.4.4.1 The gaseous radwaste treatment system and the ventilation exhaust treatment syst2em shall be used to reduce radioactive materials in gaseous wastes prior to their discharge when projected gaseous effluent air doses due to gaseous effluent releases to unrestricted areas (see Technical Specifications Figure 5.1-3) when averaged over 31 days, would exceed 0.2 mRad for gamma radiation and 0.4 mRad for beta radiation. 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 to unrestricted areas (see Technical Specifications Figure 5.1-3) when averaged over 31 days would exceed 0.3 mRem to any organ.

4.2.4.4.2 This section is applicable at all times.

4.2.4.4.3 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) Identification of the inoperable equipment or subsystems and the reasons for inoperability.
(b) Action(s) taken to restore the inoperable equipment to operable status.

4.2.4.4.4 The provisions of Technical Specification 3.0.3 and 3.0.4 are not applicable.

4.2.4.4.5 Doses due to gaseous releases to UNRESTRICTED AREAS shall be projected at least once per 31 days in accordance with this document, whenever the gaseous waste treatment system or ventilation exhaust treatment system is not operational.

4.2.5 Radioactive Effluents - Total Dose (3/4.11.4)

4.2.5.1 The dose or dose commitment to a real individual from all uranium fuel cycle sources is limited to ≤ 25 mRem to the total body or any organ (except the thyroid, which is limited to ≤ 75 mRem) over a period of 12 consecutive months.

4.2.5.2 This section is applicable at all times.

4.2.5.3 With the calculated doses from the release of radioactive materials in liquid or gaseous effluents exceeding twice the limits of sections 4.2.3.3, 4.2.4.2 or 4.2.4.3, in lieu of any other report required by Technical Specification 6.9.2, prepare and submit a Special Report to the Director, Nuclear Reactor Regulation, U. S. Nuclear Regulatory Commission, Washington D. C. 20555, within 30 days, which defines the corrective action to be taken to reduce subsequent releases to prevent recurrence of exceeding the limits above. This Special Report shall include an analyses which estimates the radiation exposure (dose) to a member of the public from uranium fuel cycle sources (including all effluent pathways and direct radiation) for a 12 consecutive month period that includes the release(s) covered by this report. If the estimated dose(s) exceeds the limits above, and if the release condition resulting in violation of 40 CFR 190 has not already been corrected, the special report shall include a request for a variance in accordance with the provisions of 40 CFR 190 and including the specified information of paragraph 190.11(b). Submittal of the report is considered a timely request, and a variance is granted until staff action on the request is complete. The variance only relates to the limits of 40 CFR 190, and does not apply in any way to the requirements for dose limitation of 10 CFR part 20, as addressed in other sections of this section.

4.2.5.4 The provisions of Technical Specification 3.0.3 and 3.0.4 are not applicable.

4.2.5.5 Cumulative dose contributions from liquid and gaseous effluents shall be determined in accordance with this document (including Sections 4.2.3.3, 4.2.4.2 and 4.2.4.3).

4.3 Calculation of Alarm/Trip Setpoints

The alarm and trip setpoints are to provide monitoring, indication and control of liquid and gaseous effluents. The setpoints are used in conjunction with sampling programs to assure that the releases are kept within the limits of 10CFR20 Appendix B Table II. Setpoints shall be established for liquid and gaseous monitors. Depending on the monitor function, it would be a continuous or batch monitor. The different types of monitors are subject to different setpoint methodologies.

One variable used in the setpoint calculations is the multiple release point factor (MRP). The MRP is a factor used such that when all the releases are integrated, the applicable LIMIT value will not be violated. The MRP is determined such that the sum of the MRP's for that effluent type (liquid or gaseous) is less than or equal to 1. The value of the MRP is arbitrary, and it should be assigned based on operational performance. The values of the MRP's for each liquid release point are given in Attachments 3.8.

4.3.1 Liquid Monitors

Liquid monitor setpoints shall be established for each monitor of the liquid effluent release systems. A schematic of the liquid effluent release systems is attached as Attachment 3.9. A list of the Plant Liquid Effluent Parameters is in Attachment 3.10 The exact details of each system design and operation can be found in the system descriptions. The setpoints are intended to help keep releases within the limits of 10CFR20 Appendix B, Table II, Column 2. Setpoints shall be determined using one of two different methodologies, either the batch methodology or the continuous methodology.

4.3.1.1 Liquid Batch Monitor Setpoint Methodology

There is only one monitor used on the liquid batch release system. That monitor is used on the liquid waste discharge system, and it is identified as RRS-1000. The function of the monitor is to act as a check on the sampling program. The sampling program determines the nuclides and concentrations of those nuclides prior to release. The discharge flow rates and dilution flow rates are then adjusted to keep the release within the limits of 10CFR20. Based on the concentrations of nuclides in the release the count rate on the monitor can be predicted. The high alarm setpoint is then set at 1.5 times the predicted value up to the maximum setpoint of the system.

The radioactive concentration of each batch of radioactive liquid waste to be discharged is determined prior to each release by sampling and analysis in accordance with Attachment 3.6.

The flow rates are determined in order to keep the release within the requirements of 10CFR20 Appendix B, Table II, Column 2. The equation to calculate the flow rates is:

$$\left[\Sigma \frac{C_i}{LIMIT_i}\right] * \frac{f}{MRP} \leq F + f$$

Where:

C_i = the concentration of nuclide i.

$LIMIT_i$ = the 10CFR20 Appendix B, Table II, Column 2 limit of nuclide i.

f = the effluent flow rate in GPM (Attachment 3.10).

F = the dilution water flow rate as estimated prior to release. The dilution flow rate is a multiple of 230,000 GPM depending on the number of circulation pumps in operation.

MRP = the multiple release point factor. A factor such that when all the release points are operating at one time the limits of 10CFR20 will not be exceeded.

This equation shall be true during the batch release. Before the release is started, the maximum effluent flow rate and the minimum dilution flow rate should be substituted for f and F, respectively. If the equation is true, the release can proceed with those flow rates as the limits of operation. If the equation is not true, the effluent flow rate can be reduced or the dilution flow rate can be increased to make the equation true. This equation may be rearranged to solve for the maximum effluent release flow rate (f).

The setpoint is used as a quality check on the sampling program. The setpoint is used to stop the effluent flow when the monitor reading is greater than the predicted value from the sampling program. The predicted value is generated by converting the effluent concentration for each nuclide to counts per unit of time as per Attachment 3.11. The sum of all the counts per unit of time is the predicted count rate. The predicted count rate is then multiplied by 1.5 to determine the high alarm setpoint.

4.3.1.2 Liquid Continuous Monitor Setpoint Methodology

There are eight monitors used as continuous liquid release monitors. These monitors are used in the steam generator blowdown, blowdown treatment and essential service water systems.

The monitors are identified as:

- o R-19 for the steam generator blowdown for both units.
- o R-24 for the blowdown treatment system for both units.
- o R-20 for the east ESW system for each unit.
- o R-28 for the west ESW system for each unit.

The function of the monitors is to assure that releases are kept within the limits of 10CFR20 Appendix B, Table II.

The monitors on the steam generator blowdown and blowdown treatment systems have trip functions associated with their setpoints. The essential service water monitors are equipped with an alarm function only and monitor effluent in the event the Containment Spray Heat Exchangers are used.

The setpoint for the continuous monitors is:

$$S_p \leq \frac{LIMIT * F * MRP}{f}$$

where:

S_p = the setpoint of the monitor

LIMIT = the calculated limit of 1.5×10^{-5} based on a historical average of nuclides or the lowest limit from 10CFR20 Appendix B Table II, Column 2 of a known possible nuclide in the effluent stream.

f = the effluent flow rate in GPM. For routine operation, the setpoint should be calculated using the maximum effluent flow rate (Attachment 3.10).

F = the dilution water flow rate as estimated prior to release. The dilution flow rate is a multiple of 230,000 GPM depending on the number of circulation pumps in operation. For routine operation, the setpoint should be calculated using the minimum dilution flow rate of 230,000 GPM.

MRP = the multiple release point factor. A factor such that when all the release points are operating at one time the limits of 10CFR20 will not be exceeded. (Attachment 3.8)

The list of known nuclides for the LIMIT factor in the above equation is given in Attachment 3.11. The list was generated from historical data of nuclides released from the plant, and is verified periodically and updated when needed. The setpoint value is converted from μCi/ml to CPM using the attached efficiency curves for each monitor, Attachments 3.12 and 3.13, or by multiplying the concentration by the efficiency of the monitor.

4.3.2 Gaseous Monitors

For the purpose of implementing sections 4.2.2 and 4.2.4.1, the alarm setpoints for gaseous effluents released into unrestricted areas will be established using the following methodology. In addition, the above sections do not apply to instantaneous alarm and trip setpoints for integrating radiation monitors sampling radioiodines, radioactive materials in particulate form and radionuclides other than noble gases. A schematic of the gaseous effluent release systems is presented in Attachment 3.14. Attachment 3.15 presents the effluent flow rate parameter.

4.3.2.1 Plant Unit Vent

The gaseous effluents discharged from the plant vent will be monitored by the plant vent radiation monitor low range noble gas channel [Tag No. VRS-1505 (Unit 1), VRS-2505 (Unit 2)] to assure that alarms and trip actions (isolation of gaseous release) will occur prior to exceeding the Technical Specifications noted above. The alarm setpoint values will be established using the following equation:

$$S_p = \frac{(SF)\,(MRP)\,(DL_j)}{F_p\,\overline{\chi/Q}\,\sum_i (W_i * DCF_{ij})}$$

where:

S_p = the maximum setpoint of the monitor in μCi/cc for release point p, based on the most limiting organ.

SF = an administrative operation safety factor, $\leq$ 1.0.

MRP = a weighed multiple release point factor ($\leq$ 1.0), such that when all site gaseous releases are integrated, the applicable dose will not be exceeded based on the release rate of each effluent point. The MRP will be based on the ratio of the release rate or the volumetric flow rate of each effluent point to the total respective flow rate value of the plant and will be consistent with past operational experience. The MRP is computed as follows:

1) compute the average release rate, Q_p, (or the volumetric flow rate, f_p) from each release point p.

2) compute ΣQ_p (or Σf_p) for all release points.

3) ratio $Q_p/\Sigma Q_p$ (or $f_p/\Sigma f_p$) for each release point. This ratio is the MRP for that specific release point.

4) repeat 1) through 3) for each of the site's eight gaseous release points.

F_p = the maximum volumetric flow rate of release point p, at the time of the release in cc/sec. The maximum Unit Vent flow rate, by design, is 139,600 cfm for Unit 1 and 103,500 for Unit 2.

DL_j = dose rate limit to organ j in an unrestricted area (mRem/yr).

Based on continuous releases, the dose rate limits, DL_j, from section 4.2.4.1, are as follows:

Total Body	$\leq$ 500 mRem/year
Skin	$\leq$ 3000 mRem/year
Any Organ	$\leq$ 1500 mRem/year

$\overline{\chi/Q}$ = the annual average relative concentration in the applicable sector or area, in sec/m^3 (see Attachment 3.16). The χ/Q values will be re-evaluated on an annual basis. The re-evaluation will include determination of the worst sector. If the new worst sector χ/Q value is less than the previous year worst χ/Q value, no change is required.

Otherwise, the Offsite Dose Calculation Manual will be modified accordingly. (see Attachment 3.17)

W_i = weighted factor for the radionuclide:

$$W_i = \frac{C_i}{\sum_k C_k}$$

where C_i = concentration of radionuclide i, and k has the range of all identified radionuclides in that release pathway. For batch releases, this value may be set to one (1) for conservatism.

DCF_{ij} = dose conversion factor which is used to relate radiation dose to organ j, from exposure to radionuclide i in mRem/yr per $\mu Ci/m^3$. See equations below.

The dose conversion factor, DCF_{ij}, is dependent upon the organ of concern.

For the whole body:

$$DCF_{ij} = K_i$$

where:

K_i = whole body dose factor due to gamma emissions for each identified noble gas radionuclide in mRem/yr per $\mu Ci/m^3$. See Attachment 3.18

For the skin:

$$DCF_{ij} = L_i + 1.1M_i$$

where:

L_i = skin dose factor due to beta emissions for each identified noble gas radionuclide, in mRem/yr per $\mu Ci/m^3$. See Attachment 3.18

1.1 = the ratio of tissue to air absorption coefficient over the energy range of photons of interest. This ratio converts dose (mRad) to dose equivalent (mRem).

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide in mRad/yr per $\mu Ci/m^3$. See Attachment 3.18.

For the thyroid, via inhalation:

$$DCF_{ij} = P_i$$

where:

P_i = the dose parameter, for radionuclides other than noble gas, for the inhalation pathway in mRem/yr per $\mu Ci/m^3$. See Attachment 3.18

The plant vent radiation monitor low range noble gas channel setpoint, S_p, will be set such that the dose rate in unrestricted areas to the whole body, skin and thyroid (or any other organ), whichever is most limiting, will be less than or equal to 500 mRem/yr, 3000 mRem/yr, and 1500 mRem/yr respectively. The thyroid dose is limited to the inhalation pathway only. The plant vent radiation monitor low range noble gas setpoint, S_p, will be recomputed whenever gaseous releases from the Containment and gas decay tanks are discharged through the plant vent to determine the most limiting organ. The setpoint, S_p, may be established at a lower value than the lowest computed value via the setpoint equation.

At certain times, it may be desirable to increase the setpoint, if the vent flow rate is decreased. This may be accomplished in one of two ways.

$$\frac{\textit{Max Concentration } (\mu Ci/cc) \times \textit{Max. Flowrate } (cfm)}{\textit{New Max. Concentration } (\mu Ci/cc)}$$

= New Max. Flow rate in cfm

or

$$\frac{\textit{Max Concentration } (\mu Ci/cc) \times \textit{Max. Flowrate } (cfm)}{\textit{New Max. Flowrate } (cfm)}$$

= New Max. Concentration in $\mu Ci/cc$

4.3.2.2 Waste Gas System Decay Tanks

The gaseous effluents discharged from the Waste Gas System will be monitored by the vent stack monitors VRS-1505 and VRS-2505.

Due to a high radiation alarm, an automatic termination of the release from the waste gas system will be initiated from the plant vent radiation monitor low range noble gas channel (VRS-1505 or VRS-2505). Therefore, for any gaseous release configuration, which includes normal operation and waste gas system gaseous discharges, the alarm setpoint of the plant vent radiation monitor will be recomputed to determine the most limiting organ based on all gaseous effluent source terms.

4.3.2.3 Containment Purge and Exhaust System

The gaseous effluents discharged by the Containment Purge and Exhaust Systems and Instrumentation Room Purge and Exhaust System will be monitored by the plant vent radiation monitor noble gas channels (VRS-1505 for Unit 1, VRS-2505 for Unit 2); and alarms and trip actions will occur prior to exceeding the limits in sections 4.2.2 and 4.2.4.1.

For the Containment System, a continuous air sample from the Containment atmosphere is drawn through a closed, sealed system to the radiation monitors (Tag No. ERS-1300/1400 for Unit 1 and ERS-2300/2400 for Unit 2). The sample is then returned to Containment. Grab sample analysis is performed for a Containment purge before release.

The Upper Containment area is monitored by normal range area gamma monitors (Tag No. VRS-1101/1201 for Unit 1 and VRS-2101/2201 for Unit 2), which also give Purge and Exhaust Isolation Trip signals upon actuation of their high alarm.

For the Containment Pressure Relief System, no sample is routinely taken.

The Containment airborne and area monitors, upon actuation of their high alarm, will automatically initiate closure of the Containment and Instrument Room purge supply and exhaust duct valves and Containment pressure relief system valves. Complete trip of all isolation control devices requires high alarm of one of the two Train A monitors (ERS-1300/2300 or VRS-1101/2101) and one of the two Train B monitors (ERS-1400/2400 or VRS-1201/2201).

4.3.2.4 Steam Jet Air Ejector System (SJAE)

The gaseous effluents from the Steam Jet Air Ejector System discharged to the environment are continuously monitored by radiation monitor (Tag No. SRA-1900 for Unit 1 and SRA-2900 for Unit 2). The monitor will alarm prior to exceeding the limits of sections 4.2.2 and 4.2.4.1. The alarm setpoint for the Condenser Air Ejector System monitor will be based on the maximum air ejector exhaust flow rate, (Attachment 3.17). The alarm setpoint value will be established using the following equations:

$$S_{SJAE} = \frac{(SF)\,(MRP)\,(DL_j)}{F_p\,\overline{\chi/Q}\,\sum_i (W_i * DCF_{ij})}$$

where:

S_{SJAE} = the maximum setpoint, based on the most limiting organ, in μCi/cc

and where the other terms are as previously defined.

4.3.2.5 **Gland Seal Condenser Exhaust**

The gaseous effluents from the Gland Seal Condenser Exhaust discharged to the environment are continuously monitored by radiation monitor (Tag No. SRA-1800 for Unit 1 and SRA-2800 for Unit 2). The radiation monitor will alarm prior to exceeding the limits of sections 4.2.2. and 4.2.4.1. The alarm setpoint for the GSCE monitor will be based on the maximum condenser exhaust flow rate (1260 CFM Unit 1, 2754 CFM each for the two Unit 2 vents). The alarm setpoint value will be established using the following equation:

$$S_{GSCE} = \frac{(SF)\,(MRP)\,(DL_j)}{F_p\,\overline{\chi/Q}\,\sum_i (W_i * DCF_{ij})}$$

where:

S_{GSCE} = the maximum setpoint, based on the most limiting organ, in μCi/cc

and where the other terms are as previously defined.

4.3.2.6 Emergency Gaseous Setpoint Methodology

Each of the routine gaseous release paths can also indicate off-normal release concentrations. If this would occur, the setpoint methodology for gaseous monitors would determine setpoints to alarm or trip and indicate an off-normal occurrence. The mid and high range setpoints should be used to indicate when the effluent concentrations are possibly exceeding limits that may contribute to a dose in excess of predetermined limits as outlined in the Emergency Plan. There are four classifications of accidents. They are Unusual Event, Alert, Site Area Emergency and General Emergency. The last two classifications have dose limits of 50 mRem/hr and 250 mRem/hr associated with them. The mid and high range setpoints should be set to respond at these levels. The high range setpoints for the Unit Vent monitors, VRS-1509 and VRS-2509, will use the setpoints calculated in the Radiological Support Section Calculation RS-C-0106. The PORV monitor is a single channel, and it is an emergency monitor. To show when an event with radioactive releases occurred the setpoint should be set to the value for a General Emergency, 250 mRem/hr.

The equation used to determine the setpoint is then:

$$S_p = \frac{DR}{F * \overline{\chi/Q} * DCF}$$

where:

S_p = the alarm/setpoint of the monitor, μCi/cc.

DR = the dose rate associated with the setpoint either 50 mRem/hr or 250 mRem/hr.

F = the maximum flow rate for this effluent point in m^3/sec. To convert CFM to m^3/sec, multiply the flow rate in CFM by 4.71×10^{-4}.

$\overline{\chi/Q}$ = The historical annual average relative concentration (sec/m3) based on meteorological data summarized in Attachment 3.16 as recommended in Regulatory Guide 1.111

DCF = the dose conversion factor. The conversion factor for the PORV monitors is 64,000 (Ref. 2.15). The conversion factor for the other mid and high range monitors is 622,000 (Ref. 2.15).

4.4 Radioactive Effluents Total Dose

The cumulative dose contributions from liquid and gaseous effluents will be determined by summing the cumulative doses as derived in Sections 4.2.3.3, 4.2.4.2 and 4.2.4.3 of this procedure. Dose contribution from direct radiation exposure will be based on the results of the direct radiation monitoring devices located at the environmental monitoring stations. See NUREG-0133, Section 3.8.

4.5 Radiological Environmental Monitoring Program

4.5.1 Purpose of the Radiological Environmental Monitoring Program

The purpose of the REMP is to establish baseline radiation and radioactivity concentrations in the environs prior to reactor operations, to monitor critical environmental exposure pathways, and to determine the radiological impact, if any, caused by the operation of the Donald C. Cook Nuclear Plant upon the local environment.

The first purpose of the Radiological Environmental Monitoring Program was completed prior to the initial operation of either of the two nuclear units at the Cook Plant Site. The second and third purposes of the REMP are an on-going operation and as such various environmental media and exposure pathways are examined. The various pathways and sample media which are used are delineated in Attachment 3.19, Radiological Environmental Monitoring Program. Included is a list of the sample media, analysis required, collection locations, and frequency requirements for both collection and analysis. Attachment 3.19 defines the scope of the Radiological Environmental Monitoring Program for the Donald C. Cook Nuclear Plant.

4.5.2 Conduct of the Radiological Environmental Monitoring Program

Sample collection and analysis for the Radiological Environmental Monitoring Program shall be conducted in accordance with Attachment 3.19, Radiological Environmental Monitoring Program, Attachment 3.20, Maximum Values for Lower Limits of Detection, and Attachment 3.21, Reporting Levels for Radioactive Concentrations in Environmental Samples. These are applicable at all times. The on-site monitoring locations are shown on Attachment 3.22, while the off-site monitoring locations are shown on Attachment 3.23

4.5.2.1 Each surveillance requirement shall be performed within the specified time interval in Attachment 3.19 with a maximum allowable extension not to exceed 25% of the surveillance interval.

4.5.2.2 If an environmental sample cannot be collected in accordance with Attachment 3.19, a description of the reasons for deviation and the actions taken to prevent a reoccurrence shall be submitted as part of the Annual Environmental Operating Report.

Deviations from the required sampling schedule are permitted if specimens are unobtainable due to hazardous conditions, seasonal unavailability, or to malfunction of automatic sampling equipment. If the deviation from the required sampling schedule is due to the malfunction of automatic sampling equipment, every effort shall be made to complete the corrective action prior to the end of the next sampling period.

4.5.2.3 If a radionuclide is detected in any sample medium exceeding the limit established in Attachment 3.21, Reporting Levels for Radioactivity Concentrations, or if more than one radionuclide is detected in any sample medium and the Total Fractional Level (TFL), when averaged over the calendar quarter is greater than or equal to 1, based on the following formula:

$$TFL = \frac{C_{(1)}}{L_{(1)}} + \frac{C_{(2)}}{L_{(2)}} + \ldots \geq 1$$

Where:

$C_{(1)}$ = Concentration of 1st detected nuclide

$C_{(2)}$ = Concentration of 2nd detected nuclide

$L_{(1)}$ = Reporting Level of 1st nuclide from Attachment 3.21

$L_{(2)}$ = Reporting Level of 2nd nuclide from Attachment 3.21

And, the activity is the result of plant effluents, then a special report shall be submitted to the Commission within 30 days following the receipt of the applicable analysis results, which includes an evaluation of any release conditions, environmental factors or other aspects which may have contributed to the identified levels. If the radioactivity was not a result of plant effluents, the results shall be described in the Annual Environmental Operating Report.

If radionuclides other than those specified in Attachment 3.21 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose to an individual is equal to or greater than the calendar year limits specified in Steps 4.2.3.3.1, 4.2.4.2.1 and 4.2.4.3.1.b.

4.5.2.4 If a currently sampled milk farm location becomes unavailable, a special milk farm survey, for that sector, shall be conducted within 15 days

4.5.2.4.1 If the unavailable location was an indicator farm, an alternate sample location may be established in the same sector within 8 miles of the Plant if one is available.

4.5.2.4.2 If the unavailable location was a background farm, an alternate sample location may be established within 20 miles of the plant in any sector if one is available.

4.5.2.4.3 If a replacement farm is unobtainable and the total number of indicator farms is less than three or the background farms is less than one, then a special report shall be prepared and submitted to the Commission within 30 days. Vegetation sampling shall be performed in lieu of milk sampling in that sector.

4.5.2.4.4 The provisions of Technical Specifications 3.03 and 3.04 are not applicable.

4.5.3 Annual Land Use Census

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 10 land covering meteorological sectors within a distance of five miles.

In lieu of the garden census, broad leaf vegetation sampling may be performed at the site boundary in the direction sector having the highest average *deposition factor (D/Q) value*.

This land use census shall be conducted annually between the dates of June 1 and October 1 by door-to-door survey, aerial survey, or by consulting local agricultural authorities.

4.5.3.1 With a land use census identifying a location(s) which yields a calculated dose or dose commitment greater than the values currently being calculated in of this document, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report which identifies the new location(s).

4.5.3.2 With a land use census identifying a location(s) which yields a calculated dose or dose commitment (via the same exposure pathway) 20 percent or greater than at a location from which samples are currently being obtained in accordance with section 4.5.2, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a special report which identifies the new location. This new location shall be added to the Radiological Environmental Monitoring Program within 30 days, if possible. The sampling 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.

4.5.3.3 The provisions of Technical Specifications 3.03 and 3.04 are not applicable.

4.5.4 Interlaboratory Comparison Program

In order to comply with Regulatory Guide 4.15, the analytical vendor shall participate in both an Interlaboratory Comparison Program, approved by the Commission for radioactive materials, and a plant controlled Blind Duplicate Sample Program. Program results and identified deficiencies shall be addressed in the Annual Environmental Operating Report.

4.5.4.1 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.

4.5.4.2 The provisions of Technical Specifications 3.03 and 3.04 are not applicable.

4.6 Steam Generator Storage Facility Groundwater Radiological Monitoring Program

4.6.1 Purpose of the Steam Generator Storage Facility Groundwater Radiological Monitoring Program

The purpose of the temporary on-site Steam Generator Storage Facility Radiological Monitoring Program is to establish baseline radiological data for the groundwater surrounding the facility prior to the storage of the Unit 2 Steam Generator Lower Assemblies. Thereafter, the purpose is to monitor the ground water through observation wells with locations as shown in Attachment 3.24, to determine the radiological impact, if any, caused by the use of the Storage Facility.

4.6.2 Conduct of the Steam Generator Storage Facility Groundwater Radiological Monitoring Program

Groundwater samples shall be collected and analyzed in accordance with Attachment 3.25, Steam Generator Storage Facility Radiological Monitoring Program. The values from Attachment 3.20, Maximum Values for Lower Limits of Detection, and Attachment 3.21, Reporting Levels for Radioactive Concentrations in Environmental Samples shall apply.

4.7 Meteorological Model

Three towers are used to determine the meteorological conditions at Cook Nuclear Plant. One of the towers is located at the Lake Michigan shoreline to determine the meteorological parameters associated with unmodified shoreline air. The data is accumulated by microprocessors at the tower sites and transferred to the central computer every 15 minutes.

The central computer uses the MIDAS program to provide atmospheric dispersion and deposition parameters. The meteorological model used is based on guidance provided in Regulatory Guide 1.111 for routine releases. All calculations use the Gaussian plume model.

4.8 Reporting Requirements

4.8.1 Annual Radiological Environmental Operating Report

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.

The annual radiological environmental operating reports shall include summaries, interpretations, and statistical evaluation 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 the land use censuses required by Section 4.5.3. 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 Attachment 3.21 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 include the following: a summary description of the radiological environmental monitoring program including sampling methods for each sample type, size and physical characteristics of each sample type, sample preparation methods, analytical methods, and measuring equipment used; a map of all sample locations keyed to a table giving distances and directions from one reactor; the result of the land use census required by Section 4.5.3; and the results of participation in the Interlaboratory Comparison Program required by section 4.5.4.

4.8.2 Annual Radiological Effluent Release Report

Routine radioactive effluent release reports covering the operation of the unit during the previous 12 months of operation shall submitted within 90 days after January 1 of each year.

The radioactive effluent release reports shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the units as outlined in Regulatory Guide 1.21, "Measuring, Evaluating and Reporting in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water Cooled Nuclear Power Plants," with data summarized on a quarterly basis following the format of Appendix B, thereof.

The radioactive effluent release report to be submitted 90 days after January 1 of each year shall include a quarterly summary of hourly meteorological data collected during the reporting period. This summary may be in the form of an hour-by-hour listing of wind speed, wind direction, atmospheric stability, and precipitation (if measured) on magnetic tape, or in the form of joint frequency distributions of wind speed, wind direction and atmospheric stability. The report submitted 90 days after January 1 shall include an assessment of the radiation doses due to the radioactive liquid and gaseous effluents released from the unit or station during the previous calendar year. These reports shall include an assessment of the radiation doses from radioactive liquid and gaseous effluents to members of the public due to their activities inside the site boundary during the reporting period. All assumptions used in making these assessments (i.e., specific activity, exposure time and location) shall be included in these reports. The meteorological conditions concurrent with the time of release of radioactive materials in gaseous effluents (as determined by sampling frequency and measurement) shall be used for determining the gaseous pathway doses. The assessment of radiation doses shall be performed in accordance with this procedure.

The radioactive effluent release report to be submitted 90 days after January 1 of each year shall also include an assessment of radiation doses to the likely most exposed member of the public from reactor releases and other nearby uranium fuel cycle sources (including doses from primary effluent pathways and direct radiation) for the previous 12 consecutive months to show conformance with 40 CFR 190, Environmental Radiation Protection Standards for Nuclear Power Operation. Acceptable Methods for calculating the dose contribution from liquid and gaseous effluents are given in Regulatory Guide 1.109, Rev. 1.

The radioactive effluent release report shall include the following information for each type of solid waste shipped offsite during the report period:

a. Volume (cubic meters),

b. Total curie quantity (specify whether determined by measurement or estimate),

c. Principle radionuclides (specify whether determined by measurement or estimate),

d. Type of waste (e.g., spent resin, compacted dry waste, evaporator bottoms),

e. Type of container (e.g., LSA, type A, Type B, Large Quantity), and

f. Solidification agent (e.g., cement).

The radioactive effluent release report shall include unplanned releases from the site to unrestricted areas of radioactive materials in gaseous and liquid effluent on a quarterly basis.

The radioactive effluent release reports shall include any change to this procedure made during the reporting period.

4.9 Reporting/Management Review

4.9.1 Any changes to this procedure must be incorporated in the annual effluent report.

4.9.2 This procedure must be updated when the Radiation Monitoring System, its instruments, or the specifications of instruments are changed.

4.9.3 This procedure must be reviewed or revised as appropriate based on the results of the land use census and Environmental Radiological Monitoring Program.

4.9.4 Any changes to this procedure must be evaluated for potential impact on other related Radiation Protection Section Procedures and changes to these procedures must be considered.

4.9.5 This procedure shall be reviewed during the first quarter of each year and updated if necessary. The part of this procedure that shall be reviewed is Attachment 3.16. The review will be documented using Attachment 3.17.

5.0 Effective Date

Sections 4.2 and 4.5 shall become effective when the Technical Specification submittal made per Generic Letter 89-01 are approved by the NRC. All the other sections will be effective upon approval of the procedure.

MIDER

PARAMETER	REL GND	PT-1 ELEV	REL GND	PT-2 ELEV	REL GND	PT-3 ELEV	REL GND	PT-4 ELEV
1- ROUTINE REL PT SEL(0=NO,1=YES)		1		1		0		0
2- EMER. REL PT SEL (0=NO,1=YES)		1		1		1		1
3- WAKE SPLIT(0=G,1=E,2=SPLIT, 3=HALITSKY WAKE SPLIT--		0		0		0		0
4- SPEED SENSOR (PRI)	1	1	1	1	1	1	4	0
5- SPEED SENSOR (SEC)	3	3	3	3	3	3	1	0
6- SPEED SENSOR (FC)	2	2	2	2	2	2	3	3
7- DIRECTION SENSOR (PRI)	1	1	1	1	1	1	1	1
8- DIRECTION SENSOR (SEC)	2	2	2	2	2	2	2	2
9- DIRECTION SENSOR (FC)	3	3	3	3	3	3	3	3
10- DELTA TEMP SENSOR (PRI)	1	1	1	1	1	1	1	1
11- DELTA TEMP SENSOR (SEC)	0	0	0	0	0	0	0	0
12- DELTA TEMP SENSOR (FC)	0	0	0	0	0	0	0	0
13- Y STAB SEL (1=SIGTH,2=DT)	2	2	2	2	2	2	2	2
14- Z STAB SEL (1=SIGTH,2=DT)	2	2	2	2	2	2	2	2
15- SIGTH/DT FAILOVER(0=NO,1=YES)	1	1	1	1	1	1	1	1
16- AMBIENT TEMP SENSOR (PRI)	1	1	1	1	1	1	1	1
17- AMBIENT TEMP SENSOR (SEC)	3	3	3	3	3	3	3	3
18- AMBIENT TEMP SENSOR (FC)	4	4	4	4	4	4	4	4
19- DEW POINT SENSOR (PRI)	2	2	2	2	2	2	2	2
20- DEW POINT SENSOR (SEC)	5	5	5	5	5	5	5	5
21- DELTA HT,FEET, FOR DT(PRI)	164	164	164	164	164	164	164	164
22- DELTA HT,FEET, FOR DT(SEC)	0	0	0	0	0	0	0	0
23- DELTA HT,FEET, FOR DT (FC)	0	0	0	0	0	0	0	0
24- HT,FEET, OF SPD SENS (PRI)	33	33	33	33	33	33	33	33
25- HT,FEET, OF SPD SENS (SEC)	33	33	33	33	33	33	33	33
26- HT,FEET, OF SPD SENS (FC)	197	197	197	197	197	197	33	33
27- REFERENCE HEIGHT(FEET)	33	33	33	33	33	33	33	33
28- BUILDING HEIGHT (FEET)	162	0	162	0	162	0	162	0
29- BUILDING WAKE COEF.(CA)	1000	0	1000	0	1000	0	1000	0
30- BLDG AREA FOR VIRT SOURCE	2000	0	2000	0	2000	0	2000	0
31- STACK OR VENT HT (FEET)	0	0	0	0	0	0	0	0
32- TEMP CORR. COEF.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33- STACK EXIT VELOCITY(M/S)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34- STACK OR VENT DIA(METERS)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35- RELEASE PT LOCATION	PLT	VENT	B					
	DX	DY	DX	DY	DX	DY	DX	DY
36- DX,DY(METERS)E,N SITE CENT	0	0	0	0	0	0	0	0
37- HEAT FLUX (CAL/SEC)		0.0		0.0		0.0		0.0
38- SAFETY VALVE EXIT VEL(M/S)		0.0		0.0		0.0		0.0
39- SAFETY VALVE EXIT DIA(M)		0.000		0.000		0.000		0.000
40- SAFETY VALVE EXIT TEMP(F)		0.0		0.0		0.0		0.0

MIDEX

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1- SPEED AT CALM(M/S)                          0.3
2- Y DIFFUSION 1=SIGMA THETA,2=PASQUILL         2
3- Z DIFFUSION 1=SIGMA THETA,2=PASQUILL         2
4- SPEED EXPONENTS FOR 7 STAB.
   (1)=  0.25 (2)=  0.25 (3)=  0.25 (4)=  0.33 (5)=  0.50
   (6)=  0.50 (7)=  0.50
5- DISTANCES FOR χ/Q(10)
( 1)=    594. ( 2)=   2416. ( 3)=   4020. ( 4)=   5630.
( 5)=   7240. ( 6)=  12067. ( 7)=  24135. ( 8)=  40225.
( 9)=  56315. (10)=  80500.
6- DISTANCE FROM PLANT TO SITE BOUNDARY
( 1)N  =  651.  ( 2)NNE=   617. ( 3)NE =   789. ( 4)ENE=  1497.
( 5)E  =  1274. ( 6)ESE=   972. ( 7)SE =   629. ( 8)SSE=   594.
( 9)S  =   594. (10)SSW=   629. (11)SW =  8045. (12)WSW=  8045.
(13)W  =  8045. (14)WNW=  8045. (15)NW =  8045. (16)NNW=  8045.
7- PLUME RISE SELECTOR (0=NO PLUME RISE, 1=BRIGGS JET PLUME RISE) 0
     USE NO PLUME RISE FOR HALITSKY WAKE PROCESSING
8- INDEX FOR STORING WAKE SPLIT (1,2,3, OR 4)  4
9- GRAZING START      (MODYHRMN)  1 1 1 0
10- GRAZING END       (MODYHRMN)  123124 0
11- LIMIT(MREM) FOR PLUME DOSES (ORGANS 1-8)
      5.00    5.00    5.00    5.00    5.00    5.00    5.00   15.00
12- LIMIT(MREM) FOR NON-PLUME DOSES (ORGANS 1-8)
     15.00   15.00   15.00   15.00   15.00   15.00   15.00   15.00
13- DEFAULT SPEED DAY VALUE (MPHX10)     80
14- DEFAULT SPEED NIGHT VALUE (MPHX10)    50
15- DEFAULT DIR DAY NOT USED      0
16- DEFAULT DIR NIGHT NOT USED     0
17- DEFAULT DT DAY VALUE (DEG F X10)    -10
18- DEFAULT DT NIGHT VALUE (DEG F X 10)     0
19- DEFAULT AMB. TEMP DAY VALUE (DEG F X 10)   520
20- DEFAULT AMB. TEMP NIGHT VALUE (DEG F X 10)   380
21- PASQUILL TABLE SPEED GP. VS. LAPSE GP.
     LAPSE              SPEED GROUP
     GROUP               1-5
         IIIIIIIIIIIIIIIIIIIIIIIIIIIII
       1 I   1    1    1    1    1   I
       2 I   2    2    2    2    2   I
       3 I   3    3    3    3    3   I
       4 I   4    4    4    4    4   I
       5 I   5    5    5    5    5   I
       6 I   6    6    6    6    6   I
       7 I   7    7    7    7    7   I
         IIIIIIIIIIIIIIIIIIIIIIIIIIIII
```

22- WIND ROSE PERCENTS, WINDS FROM 1-16 GPS, N-NNW

4.000	5.000	4.000	4.000	6.000	7.000	7.000	6.000
7.000	7.000	9.000	10.000	8.000	5.000	7.000	4.000

23- GASEOUS 10CFR20 LIMITS

H3	C14	AR41	KR83M	KR85M
1.0E-07	3.0E-09	1.0E-08	5.0E-05	1.0E-07
KR85	KR87	KR88	KR89	KR90
7.0E-07	2.0E-08	9.0E-09	3.0E-06	3.0E-06
XE131M	XE133M	XE133	XE135M	XE135
2.0E-06	6.0E-07	5.0E-07	4.0E-08	7.0E-08
XE137	XE138	CR51	MN54	FE59
3.0E-06	2.0E-08	3.0E-08	1.0E-09	5.0E-10
CO58	CO60	ZN65	SR89	SR90
1.0E-09	5.0E-11	4.0E-10	2.0E-10	6.0E-12
ZR95	SB124	CS134	CS136	CS137
4.0E-10	3.0E-10	2.0E-10	9.0E-10	2.0E-10
BA140	NB95	I135	I131	I133
2.0E-09	2.0E-09	6.0E-09	2.0E-10	1.0E-09

24- LIMIT (MREM) FOR DIFFERENT TYPES OF DOSES

1=LIQUID, TOTAL BODY	1.50
2=LIQUID, ANY OTHER ORGAN	5.00
3=NOBLE GAS AIR GAMMA	5.00
4=NOBLE GAS AIR BETA	10.00
5=NOBLE GAS SKIN	15.00
6=IODINE AND PARTICULATE ORGAN	7.50
7=NOBLE GAS TOTAL BODY	5.00

25- TEN DISTANCES USED FOR CLOSE-IN CALCULATIONS IN XDCALC

(1)=	0.	(2)=	0.	(3)=	0.	(4)=	0.
(5)=	0.	(6)=	0.	(7)=	0.	(8)=	0.
(9)=	0.	(10)=	0.				

26- THREE EAL LEVELS FOR WHOLE BODY GASEOUS EFFLUENTS (MREM/HR)
(1) NO EMERGENCY LE 2.00 (2) ALERT LE 50.00
(3) SITE EMERGENCY LE 250.00 (4) GENERAL EMERGENCY GT 250.00
ALL OVER GENERAL EMERGENCY

27- THREE EAL LEVELS FOR THYROID GASEOUS EFFLUENTS (MREM/HR)
(1) NO EMERGENCY LE 2.00 (2) ALERT LE 250.00
(3) SITE EMERGENCY LE 1250.00 (4) GENERAL EMERGENCY GT 1250.00
ALL OVER GENERAL EMERGENCY

28- SEVEN LAPSE GROUPS(DEG F/100 FT)
(1) = -1.0424 (2) = -0.9333 (3) = -0.8230
(4) = -0.2740 (5) = 0.8230 (6) = 2.1950
(7) = 99.9900

29- SEVEN SIGMA THETA GROUPS(DEG.)
(1) = 2.1 (2) = 3.8 (3) = 7.5
(4) = 12.5 (5) = 17.5 (6) = 22.5
(7) = 60.0

30- DOSE REPORT UNITS(0 = REM/HR , 1 = MREM/HR) 1

31- TEMPERATURE PROCESSING SWITCH(0=DEG F,1=DEG C) 0

32- THYROID DOSE TYPE
0=ADULT DOSE FACTORS (TID 14844)
1=CHILD DOSE FACTORS (REG 1.109) 0
33- PROCESS MILK THYROID OR BONE DOSE(0= MILKTHY DOSE, 1= BONE DOSE) 0
34- INCLUDE I132,I134,I135 AS KR88 IN GAMMA CALCS(0=NO, 1=YES) 1
35- RAD MONITOR PROMPT (0=PROMPT ALL MON.1= SELECT MONITORS) 1
36- RAD MON. FLOW RATE PROMPT (0=USE DEFAULT,1=PROMPT FOR NEW RATE) 1
37- RAD MONITOR CORRECTION FACTOR (0=USE DEFAULT,1=PROMPT FOR NEW VALUE) 1
38- CONFIDENCE LEVEL PROCESSING (0=OFF,1=ON) 0
39- WIND SPEEDS FOR DETERMINING CONFIDENCE LEVEL

GROUND RELEASE

SENSOR	CONFIDENCE LEVEL	VALUE	
WIND SPEED	LOW	LESS THAN	0.00 MPH
	MEDIUM	LESS THAN	0.00 MPH
	HIGH	ALL OTHER SPEEDS	

ELEVATED RELEASE

SENSOR	CONFIDENCE LEVEL	VALUE	
WIND SPEED	LOW	LESS THAN	0.00 MPH
	MEDIUM	LESS THAN	0.00 MPH
	HIGH	ALL OTHER SPEEDS	

40- WIND DIRECTION (FROM) FOR DETERMINING CONFIDENCE LEVEL

GROUND RELEASE
SENSITIVE DIRECTIONS (=1)
CONFIDENCE LEVELS

	N	NNE	ENE	NE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
LOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEDIUM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ELEVATED RELEASE
SENSITIVE DIRECTIONS (=1)
CONFIDENCE LEVELS

	N	NNE	ENE	NE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
LOW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEDIUM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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41- THIS SITE USES THE LAKE BREEZE MODEL                    1
    (0=NONE,1=YES)
42- PROMPTED USER IN PLUME SEGMENT MODEL FOR OPTION
    TO USE LAKE BREEZE MODEL(0=NO,1=YES)                    1
43- WORKSPACE DRILL SCENARIO SWITCH
    (0=NORMAL MET. DATA USED, 1=DRILL SITE(USE PERSISTENCE))    0
44- POWER LEVEL (MWTH)                  0.00
45- TIMES OF DOME MONITOR READINGS-HRS(1-10)
  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
46- DOSE RATIO DOME MONITOR READINGS-REM/HR (1-10)
  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
  0.00E+00  0.00E+00  0.00E+00  0.00E+00  0.00E+00
47- CONTAINMENT VOLUME (CU.FT)      0.00E+00
48- REACTOR COOLANT SYSTEM VOLUME (GAL)    0.00E+00
49- CONTAINMENT RELEASE POINT(1-4)       4
50- REACTOR COOLANT SYSTEM(RCS) RELEASE POINT(1-4) 0
51- NORMAL INVENTORY RELEASE VALUE-CI/MWTH (1-8)
       KR88      XE133     XE135     I131
     0.00E+00 0.00E+00 0.00E+00 0.00E+00
       I133      CS134     CS137     CE144
     0.00E+00 0.00E+00 0.00E+00 0.00E+00
52- NUMBER OF WIND SPIDER RINGS, 10 MILE MAP (MAX 15)     1
53- VALUE OF WIND SPIDER RINGS (MILES), 10 MILE MAP
   ( 1)= 10    ( 2)=  0    ( 3)=  0    ( 4)=  0    ( 5)=  0
   ( 6)=  0    ( 7)=  0    ( 8)=  0    ( 9)=  0    (10)=  0
   (11)=  0    (12)=  0    (13)=  0    (14)=  0    (15)=  0
54- NUMBER OF WIND SPIDER RINGS, 50 MILE MAP (MAX 15)     1
55- VALUE OF WIND SPIDER RINGS (MILES), 50 MILE MAP
   ( 1)=  5    ( 2)= 10    ( 3)= 15    ( 4)= 20    ( 5)= 25
   ( 6)= 30    ( 7)= 35    ( 8)= 40    ( 9)= 45    (10)= 50
   (11)= 55    (12)= 60    (13)= 65    (14)= 70    (15)= 75
56- LABEL MAP SECTORS (0=NO, 1=YES)     1
57- SIXTEEN MAP SECTOR LABELS (WINDS FROM)
( 1)N  = N     ( 2)NNE= NNE   ( 3)NE = NE    ( 4)ENE= ENE
( 5)E  = E     ( 6)ESE= ESE   ( 7)SE = SE    ( 8)SSE= SSE
( 9)S  = S     (10)SSW= SSW   (11)SW = SW    (12)WSW= WSW
(13)W  = W     (14)WNW= WNW   (15)NW = NW    (16)NNW= NNW
58- ACCIDENT W.BODY AND THYROID ADJUSTMENT FACTOR SWITCH (0-1)   0
59- PROMPT FOR LINE PRINTER OR TERMINAL NON-STOP PRINT           1
    (0=NO, 1=YES)
60- FINITE GAMMA PLUME DOSE SWITCH FOR MODEL 4                   1
   (0=SECTOR AVERAGE,1=CENTERLINE)
61- CONSIDER DURATION IN PAG CALCULATION (0=YES,1=NO)            0
62- ENVIRONMENTAL IODINE DOSE FACTORS FOR GASEOUS EFFLUENTS  0000
                  (0=REGULAR, 1=ORGANIC)
63- USE EDITTED SHORT RELEASE CLASS A CONTOUR VALUES(1=YES, 0=NO)   0
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64- BETA AND GAMMA DOSE SHORT RELEASE CLASS A CONTOUR VALUES(REM/HR)

0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00			

THYROID DOSE SHORT RELEASE CLASS A CONTOUR VALUES(REM/HR)

0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00			

BONE DOSE SHORT RELEASE CLASS A CONTOUR VALUES(REM/HR)

0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00			

65 - # OF HRS. TO GO BACK FROM CURRENT TIME FOR AUTOMATIC EMERGENCY= 2
66- MULTI-PLUME PLOT SWITCH (0= FROM SOURCE OUT ,1= THE REVERSE) 0
67-RELEASE POINTS FOR UNMONITORED RELEASE OPTION 10(GROUND/STACK) 1,1
68-RELEASE OPTION 10 "MONITOR" NAME FOR UNMONITORED RELEASE Field te

MIDEL

PARAMETER NUMBER 1

LIQUID PATHWAY SELECTORS BY RECEPTORS (1-5)
0= OFF
1= ON

RECEPTOR	PATHWAY													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PARAMETER NUMBER 2

LIQUID RELEASE POINT SELECTORS
0= OFF
1= ON

SELECTOR:	1	2	3	4
STATUS:	1	1	0	1

PARAMETER NUMBER 3

LIQUID ISOTOPE NAMES

1	H3
2	C14
3	NA24
4	P32
5	CR51
6	MN54
7	MN56
8	FE55
9	FE59
10	CO58
11	CO60
12	NI63
13	NI65
14	CU64
15	ZN65
16	ZN69
17	BR83
18	BR84
19	BR85

20	RB86
21	RB88
22	RB89
23	SR89
24	SR90
25	SR91
26	SR92
27	Y90
28	Y91M
29	Y91
30	Y92
31	Y93
32	ZR95
33	ZR97
34	NB95
35	MO99
36	TC99M
37	TC101
38	RU103
39	RU105
40	RU106
41	AG110M
42	TE125M
43	TE127M
44	CO57
45	TE129M
46	TE129
47	SB124
48	SB125
49	TE132
50	I130
51	I131
52	I132
53	I133
54	I134
55	I135
56	CS134
57	CS136
58	CS137
59	CS138
60	BA139
61	BA140
62	BA141
63	BA142
64	LA140
65	LA142
66	CE141
67	CE143

68 CE144
69 PR143
70 PR144
71 ND147
72 W187
73 NP239
74 UNIDEN
75 GALPHA

PARAMETER NUMBER 4

LIQUID INGESTION RATES, ETC.
1 FG FRACTION OF PRODUCE FROM LOCAL GARDEN :
7.600E-01
2 FL FRACTION OF LEAFY VEG FROM LOCAL GARDEN :
1.000E+00
3 P AREAL SOIL DENSITY IN PLOW LAYER (KG/M**2) :
2.400E+02
4 RRET FRACTION OF ACTIVITY RETAINED ON SPRAYED VEGETATION :
2.500E-01
5 SFMXI SHIELDING FACTOR FOR RESIDENTIAL STRUCTURES :
7.000E-01
6 TB PERIOD OF BUILDUP OF ACTIVITY IN SOIL (HR) :
1.310E+05
7 TEMLK PERIOD OF PASTURE GRASS EXPOSURE TO ACTIVITY (HR) :
7.200E+02
8 TEVEG PERIOD OF CROP EXPOSURE TO ACTIVITY (HR) :
1.440E+03
9 TWHLD HOLDING TIME IN ANIMAL DRINKING WATER POND (HR) :
0.000E+00
10 THPA DELAY TIME FOR INGESTION OF GRASS BY ANIMALS (HR) :
0.000E+00
11 THSA DELAY TIME FOR INGESTION OF STORED FEED BY ANIMALS (HR) :
2.160E+03
12 THLM DELAY TIME FOR INGESTION OF LEAF VEG BY MAN (HR) :
2.400E+01
13 THOM DELAY TIME FOR INGESTION OF OTHER VEG BY MAN (HR) :
1.440E+03
14 TFMXI TRANSPORT TIME MILK-MAN (HR) :
4.800E+01
15 TS TIME BETWEEN SLAUGHTER AND CONSUMPTION OF MEAT ANIMAL (HR) :
4.800E+02
16 YVGRS GRASS YIELD, WET WT (KG/M**2) :
7.000E-01
17 YVVEG OTHER VEGETATION YIELD, WET WT (KG/M**2) :
2.000E+00

18 DKW WEATHERING RATE CONSTANT FOR ACTIVITY ON VEGETATION (1./HR) :
2.100E-03
19 QFC MILK COW FEED CONSUMPTION RATE (KG/DAY WET) :
5.000E+01
20 QFG GOAT FEED CONSUMPTION RATE (KG/DAY WET) :
6.000E+00
21 QFB BEEF CATTLE FEED CONSUMPTION RATE (KG/DAY WET) :
5.000E+01
22 QAC MILK COW WATER CONSUMPTION RATE (L/DAY) :
6.000E+01
23 QAG GOAT WATER CONSUMPTION RATE (L/DAY) :
8.000E+00
24 QAB BEEF CATTLE WATER CONSUMPTION RATE (L/DAY) :
5.000E+01
25 TPMXIW ENVTL TRANSIT TIME FOR WATER INGESTION (HR) :
1.200E+01
26 TPMXIF ENVTL TRANSIT TIME FOR FISH INGESTION (HR) :
2.400E+01
27 TPMXII ENVTL TRANSIT TIME FOR INVERTEBRATE INGESTION (HR) :
2.400E+01
28 TPMXIS ENVTL TRANSIT TIME FOR SHORE EXPOSURE (HR) :
0.000E+00
29 USE(1,01) WATER INGESTION (L/YR) ADULT :
7.300E+02
30 USE(2,01) WATER INGESTION (L/YR) TEEN :
5.100E+02
31 USE(3,01) WATER INGESTION (L/YR) CHILD :
5.100E+02
32 USE(4,01) WATER INGESTION (L/YR) INFANT :
3.300E+02
33 USE(1,02) SHORE EXPOSURE (HR/YR) ADULT :
1.200E+01
34 USE(2,02) SHORE EXPOSURE (HR/YR) TEEN :
6.700E+01
35 USE(3,02) SHORE EXPOSURE (HR/YR) CHILD :
1.400E+01
36 USE(4,02) SHORE EXPOSURE (HR/YR) INFANT :
0.000E+00
37 USE(1,03) FRESH WATER SPORT FISH INGESTION (KG/YR) ADULT :
2.100E+01
38 USE(2,03) FRESH WATER SPORT FISH INGESTION (KG/YR) TEEN :
1.600E+01
39 USE(3,03) FRESH WATER SPORT FISH INGESTION (KG/YR) CHILD :
6.900E+00
40 USE(4,03) FRESH WATER SPORT FISH INGESTION (KG/YR) INFANT :
0.000E+00
41 USE(1,04) FRESH WATER COMMERCIAL FISH INGESTION (KG/YR) ADULT :
2.100E+01

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42 USE(2,04) FRESH WATER COMMERCIAL FISH INGESTION (KG/YR) TEEN    :
          1.600E+01
43 USE(3,04) FRESH WATER COMMERCIAL FISH INGESTION (KG/YR) CHILD   :
          6.900E+00
44 USE(4,04) FRESH WATER COMMERCIAL FISH INGESTION (KG/YR) INFANT  :
          0.000E+00
45 USE(1,05) FRESH WATER INVERTEBRATE INGESTION (KG/YR) ADULT      :
          5.000E+00
46 USE(2,05) FRESH WATER INVERTEBRATE INGESTION (KG/YR) TEEN       :
          3.800E+00
47 USE(3,05) FRESH WATER INVERTEBRATE INGESTION (KG/YR) CHILD      :
          1.700E+00
48 USE(4,05) FRESH WATER INVERTEBRATE INGESTION (KG/YR) INFANT     :
          0.000E+00
49 USE(1,06) SALT WATER SPORT FISH INGESTION (KG/YR) ADULT         :
          2.100E+01
50 USE(2,06) SALT WATER SPORT FISH INGESTION (KG/YR) TEEN          :
          1.600E+01
51 USE(3,06) SALT WATER SPORT FISH INGESTION (KG/YR) CHILD         :
          6.900E+00
52 USE(4,06) SALT WATER SPORT FISH INGESTION (KG/YR) INFANT        :
          0.000E+00
53 USE(1,07) SALT WATER COMMERCIAL FISH INGESTION (KG/YR) ADULT    :
          2.100E+01
54 USE(2,07) SALT WATER COMMERCIAL FISH INGESTION (KG/YR) TEEN     :
          1.600E+01
55 USE(3,07) SALT WATER COMMERCIAL FISH INGESTION (KG/YR) CHILD    :
          6.900E+00
56 USE(4,07) SALT WATER COMMERCIAL FISH INGESTION (KG/YR) INFANT   :
          0.000E+00
57 USE(1,08) SALT WATER INVERTEBRATE INGESTION (KG/YR) ADULT       :
          5.000E+00
58 USE(2,08) SALT WATER INVERTEBRATE INGESTION (KG/YR) TEEN        :
          3.800E+00
59 USE(3,08) SALT WATER INVERTEBRATE INGESTION (KG/YR) CHILD       :
          1.700E+00
60 USE(4,08) SALT WATER INVERTEBRATE INGESTION (KG/YR) INFANT      :
          0.000E+00
61 USE(1,09) IRRIGATED LEAFY VEGETABLE INGESTION (KG/YR) ADULT     :
          6.400E+01
62 USE(2,09) IRRIGATED LEAFY VEGETABLE INGESTION (KG/YR) TEEN      :
          4.200E+01
63 USE(3,09) IRRIGATED LEAFY VEGETABLE INGESTION (KG/YR) CHILD     :
          2.600E+01
64 USE(4,09) IRRIGATED LEAFY VEGETABLE INGESTION (KG/YR) INFANT    :
          0.000E+00
65 USE(1,10) IRRIGATED OTHER VEGETABLE INGESTION (KG/YR) ADULT     :
          5.200E+02
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66 USE(2,10) IRRIGATED OTHER VEGETABLE INGESTION (KG/YR) TEEN :
6.300E+02
67 USE(3,10) IRRIGATED OTHER VEGETABLE INGESTION (KG/YR) CHILD :
5.200E+02
68 USE(4,10) IRRIGATED OTHER VEGETABLE INGESTION (KG/YR) INFANT :
0.000E+00
69 USE(1,11) IRRIGATED ROOT VEGETABLE INGESTION (KG/YR) ADULT :
5.200E+02
70 USE(2,11) IRRIGATED ROOT VEGETABLE INGESTION (KG/YR) TEEN :
6.300E+02
71 USE(3,11) IRRIGATED ROOT VEGETABLE INGESTION (KG/YR) CHILD :
5.200E+02
72 USE(4,11) IRRIGATED ROOT VEGETABLE INGESTION (KG/YR) INFANT :
0.000E+00
73 USE(1,12) IRRIGATED COW MILK INGESTION (L/YR) ADULT :
3.100E+02
74 USE(2,12) IRRIGATED COW MILK INGESTION (L/YR) TEEN :
4.000E+02
75 USE(3,12) IRRIGATED COW MILK INGESTION (L/YR) CHILD :
3.300E+02
76 USE(4,12) IRRIGATED COW MILK INGESTION (L/YR) INFANT :
3.300E+02
77 USE(1,13) IRRIGATED GOAT MILK INGESTION (L/YR) ADULT :
3.100E+02
78 USE(2,13) IRRIGATED GOAT MILK INGESTION (L/YR) TEEN :
4.000E+02
79 USE(3,13) IRRIGATED GOAT MILK INGESTION (L/YR) CHILD :
3.300E+02
80 USE(4,13) IRRIGATED GOAT MILK INGESTION (L/YR) INFANT :
3.300E+02
81 USE(1,14) IRRIGATED BEEF INGESTION (KG/YR) ADULT :
1.100E+02
82 USE(2,14) IRRIGATED BEEF INGESTION (KG/YR) TEEN :
6.500E+01
83 USE(3,14) IRRIGATED BEEF INGESTION (KG/YR) CHILD :
4.100E+01
84 USE(4,14) IRRIGATED BEEF INGESTION (KG/YR) INFANT :
0.000E+00

PARAMETER NUMBER 5

MIXING RATIOS BY RELEASE POINT (1-4), AND RECEPTOR (1-5)
RECEPTOR 1
1 2.60E+00 2.60E+00 1.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00

2 2.60E+00 2.60E+00 1.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00

3 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00

4 2.60E+00 2.60E+00 1.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00

RECEPTOR 2

1 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00

2 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 1.00E+00 0.00E+00 0.00E+00 0.00E+00

3 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00

4 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00

RECEPTOR 3

1 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00

2 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00

3 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00

4 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00

RECEPTOR 4

1 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00

2 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00

3 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00

4 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00

RECEPTOR 5

1 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00

2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

PARAMETER 6: LIQUID EFFLUENT 10CFR20 LIMITS (MICRO-CI/ML)

H3	1.00E-03	C14	3.00E-05	NA24	5.00E-05
P32	9.00E-06	CR51	5.00E-04	MN54	3.00E-05
MN56	7.00E-05	FE55	1.00E-04	FE59	1.00E-05
CO58	2.00E-05	CO60	3.00E-06	NI63	1.00E-04
NI65	1.00E-04	CU64	2.00E-04	ZN65	5.00E-06
ZN69	8.00E-04	BR83	9.00E-04	BR84	4.00E-04
BR85	9.99E+02	RB86	7.00E-06	RB88	4.00E-04
RB89	9.00E-04	SR89	8.00E-06	SR90	5.00E-07
SR91	2.00E-05	SR92	4.00E-05	Y90	7.00E-06
Y91M	2.00E-03	Y91	8.00E-06	Y92	4.00E-05
Y93	2.00E-05	ZR95	2.00E-05	ZR97	9.00E-06
NB95	3.00E-05	MO99	2.00E-05	TC99M	1.00E-03
TC101	2.00E-03	RU103	3.00E-05	RU105	7.00E-05
RU106	3.00E-06	AG110M	6.00E-06	TE125M	2.00E-05
TE127M	9.00E-06	CO57	6.00E-05	TE129M	7.00E-06
TE129	4.00E-04	SB124	7.00E-06	SB125	3.00E-05
TE132	9.00E-06	I130	2.00E-05	I131	1.00E-06
I132	1.00E-04	I133	7.00E-06	I134	4.00E-04
I135	3.00E-05	CS134	9.00E-07	CS136	6.00E-06
CS137	1.00E-06	CS138	4.00E-04	BA139	2.00E-04
BA140	8.00E-06	BA141	3.00E-04	BA142	7.00E-04
LA140	9.00E-06	LA142	1.00E-04	CE141	3.00E-05
CE143	2.00E-05	CE144	3.00E-06	PR143	2.00E-05
PR144	6.00E-04	ND147	2.00E-05	W187	3.00E-05
NP239	2.00E-05				

MIDEG

ALL DIRECTIONS ARE TOWARD RECEPTOR FROM RELEASE POINT

GAS DOSE RECEPTOR TABLE FOR DIRECTION TOWARD N

DIST(M)	FOR	PATH-1	PLUME/GR/I	659.	0.	0.	0.	0.
DIST(M)	FOR	PATH-3	VEGET	8045.	0.	0.	0.	0.
DIST(M)	FOR	PATH-4	MEAT	8045.	0.	0.	0.	0.
DIST(M)	FOR	PATH-5	COW	3556.	0.	0.	0.	0.
DIST(M)	FOR	PATH-6	GOAT	3556.	0.	0.	0.	0.

GAS DOSE RECEPTOR TABLE FOR DIRECTION TOWARD NNE

DIST(M)	FOR	PATH-1	PLUME/GR/I	660.	0.	0.	0.	0.
DIST(M)	FOR	PATH-3	VEGET	814.	0.	0.	0.	0.
DIST(M)	FOR	PATH-4	MEAT	7725.	0.	0.	0.	0.
DIST(M)	FOR	PATH-5	COW	3556.	0.	0.	0.	0.
DIST(M)	FOR	PATH-6	GOAT	3556.	0.	0.	0.	0.

GAS DOSE RECEPTOR TABLE FOR DIRECTION TOWARD NE

DIST(M)	FOR	PATH-1	PLUME/GR/I	943.	0.	0.	0.	0.
DIST(M)	FOR	PATH-3	VEGET	1052.	0.	0.	0.	0.
DIST(M)	FOR	PATH-4	MEAT	7725.	0.	0.	0.	0.
DIST(M)	FOR	PATH-5	COW	3556.	0.	0.	0.	0.
DIST(M)	FOR	PATH-6	GOAT	3556.	0.	0.	0.	0.

GAS DOSE RECEPTOR TABLE FOR DIRECTION TOWARD ENE

DIST(M)	FOR	PATH-1	PLUME/GR/I	1747.	0.	0.	0.	0.
DIST(M)	FOR	PATH-3	VEGET	1852.	0.	0.	0.	0.
DIST(M)	FOR	PATH-4	MEAT	3862.	0.	0.	0.	0.
DIST(M)	FOR	PATH-5	COW	3556.	0.	0.	0.	0.
DIST(M)	FOR	PATH-6	GOAT	3556.	0.	0.	0.	0.

GAS DOSE RECEPTOR TABLE FOR DIRECTION TOWARD E

DIST(M)	FOR	PATH-1	PLUME/GR/I	1716.	0.	0.	0.	0.
DIST(M)	FOR	PATH-3	VEGET	1705.	0.	0.	0.	0.
DIST(M)	FOR	PATH-4	MEAT	6810.	0.	0.	0.	0.
DIST(M)	FOR	PATH-5	COW	3556.	0.	0.	0.	0.
DIST(M)	FOR	PATH-6	GOAT	3556.	0.	0.	0.	0.

GAS DOSE RECEPTOR TABLE FOR DIRECTION TOWARD ESE

DIST(M)	FOR	PATH-1	PLUME/GR/I	1643.	0.	0.	0.	0.
DIST(M)	FOR	PATH-3	VEGET	1628.	0.	0.	0.	0.
DIST(M)	FOR	PATH-4	MEAT	2434.	0.	0.	0.	0.
DIST(M)	FOR	PATH-5	COW	3556.	0.	0.	0.	0.
DIST(M)	FOR	PATH-6	GOAT	3556.	0.	0.	0.	0.

GAS DOSE RECEPTOR TABLE FOR DIRECTION TOWARD SE

DIST(M)	FOR PATH-1	PLUME/GR/I	1136.	0.	0.	0.	0.
DIST(M)	FOR PATH-3	VEGET	914.	0.	0.	0.	0.
DIST(M)	FOR PATH-4	MEAT	4354.	0.	0.	0.	0.
DIST(M)	FOR PATH-5	COW	3556.	0.	0.	0.	0.
DIST(M)	FOR PATH-6	GOAT	3556.	0.	0.	0.	0.

GAS DOSE RECEPTOR TABLE FOR DIRECTION TOWARD SSE

DIST(M)	FOR PATH-1	PLUME/GR/I	1507.	0.	0.	0.	0.
DIST(M)	FOR PATH-3	VEGET	1093.	0.	0.	0.	0.
DIST(M)	FOR PATH-4	MEAT	1093.	0.	0.	0.	0.
DIST(M)	FOR PATH-5	COW	3556.	0.	0.	0.	0.
DIST(M)	FOR PATH-6	GOAT	3556.	0.	0.	0.	0.

GAS DOSE RECEPTOR TABLE FOR DIRECTION TOWARD S

DIST(M)	FOR PATH-1	PLUME/GR/I	1026.	0.	0.	0.	0.
DIST(M)	FOR PATH-3	VEGET	863.	0.	0.	0.	0.
DIST(M)	FOR PATH-4	MEAT	6115.	0.	0.	0.	0.
DIST(M)	FOR PATH-5	COW	3556.	0.	0.	0.	0.
DIST(M)	FOR PATH-6	GOAT	3556.	0.	0.	0.	0.

GAS DOSE RECEPTOR TABLE FOR DIRECTION TOWARD SSW

DIST(M)	FOR PATH-1	PLUME/GR/I	942.	0.	0.	0.	0.
DIST(M)	FOR PATH-3	VEGET	770.	0.	0.	0.	0.
DIST(M)	FOR PATH-4	MEAT	8045.	0.	0.	0.	0.
DIST(M)	FOR PATH-5	COW	3556.	0.	0.	0.	0.
DIST(M)	FOR PATH-6	GOAT	3556.	0.	0.	0.	0.

GAS DOSE RECEPTOR TABLE FOR DIRECTION TOWARD SW

DIST(M)	FOR PATH-1	PLUME/GR/I	8045.	0.	0.	0.	0.
DIST(M)	FOR PATH-3	VEGET	8045.	0.	0.	0.	0.
DIST(M)	FOR PATH-4	MEAT	8045.	0.	0.	0.	0.
DIST(M)	FOR PATH-5	COW	8045.	0.	0.	0.	0.
DIST(M)	FOR PATH-6	GOAT	8045.	0.	0.	0.	0.

GAS DOSE RECEPTOR TABLE FOR DIRECTION TOWARD WSW

DIST(M)	FOR PATH-1	PLUME/GR/I	8045.	0.	0.	0.	0.
DIST(M)	FOR PATH-3	VEGET	8045.	0.	0.	0.	0.
DIST(M)	FOR PATH-4	MEAT	8045.	0.	0.	0.	0.
DIST(M)	FOR PATH-5	COW	8045.	0.	0.	0.	0.
DIST(M)	FOR PATH-6	GOAT	8045.	0.	0.	0.	0.

GAS DOSE RECEPTOR TABLE FOR DIRECTION TOWARD W

DIST(M)	FOR PATH-1	PLUME/GR/I	8045.	0.	0.	0.	0.
DIST(M)	FOR PATH-3	VEGET	8045.	0.	0.	0.	0.
DIST(M)	FOR PATH-4	MEAT	8045.	0.	0.	0.	0.
DIST(M)	FOR PATH-5	COW	8045.	0.	0.	0.	0.
DIST(M)	FOR PATH-6	GOAT	8045.	0.	0.	0.	0.

GAS DOSE RECEPTOR TABLE FOR DIRECTION TOWARD WNW

DIST(M)	FOR	PATH-1	PLUME/GR/I	8045.	0.	0.	0.	0.
DIST(M)	FOR	PATH-3	VEGET	8045.	0.	0.	0.	0.
DIST(M)	FOR	PATH-4	MEAT	8045.	0.	0.	0.	0.
DIST(M)	FOR	PATH-5	COW	8045.	0.	0.	0.	0.
DIST(M)	FOR	PATH-6	GOAT	8045.	0.	0.	0.	0.

GAS DOSE RECEPTOR TABLE FOR DIRECTION TOWARD NW

DIST(M)	FOR	PATH-1	PLUME/GR/I	8045.	0.	0.	0.	0.
DIST(M)	FOR	PATH-3	VEGET	8045.	0.	0.	0.	0.
DIST(M)	FOR	PATH-4	MEAT	8045.	0.	0.	0.	0.
DIST(M)	FOR	PATH-5	COW	8045.	0.	0.	0.	0.
DIST(M)	FOR	PATH-6	GOAT	8045.	0.	0.	0.	0.

GAS DOSE RECEPTOR TABLE FOR DIRECTION TOWARD NNW

DIST(M)	FOR	PATH-1	PLUME/GR/I	8045.	0.	0.	0.	0.
DIST(M)	FOR	PATH-3	VEGET	8045.	0.	0.	0.	0.
DIST(M)	FOR	PATH-4	MEAT	8045.	0.	0.	0.	0.
DIST(M)	FOR	PATH-5	COW	8045.	0.	0.	0.	0.
DIST(M)	FOR	PATH-6	GOAT	8045.	0.	0.	0.	0.

DIST. FOR PATHWAYS 1,2, AND 7 ARE THE SAME-(RESIDENCE LOC)

MIDEN

DOSE FACTOR AND DISPERSION PARAMETER EDIT OPTIONS:	NUREG 0133 NOTATION
[1] NOBLE GAS TOTAL BODY DOSE FACTORS FOR GAMMA RADIATION - GROUND RELEASE. (MREM/YR PER UCI/M3)	K
[2] NOBLE GAS IMMERSION SKIN DOSE FACTORS FOR BETA RADIATION (MREM/YR PER UCI/M3)	L
[3] NOBLE GAS DOSE FACTORS FOR GAMMA RADIATION - ELEVATED PLUME (MRAD/YR PER UCI/SEC)	B
[4] NOBLE GAS AIR DOSE FACTORS FOR GAMMA RADIATION (MRAD/YR PER UCI/M3)	M
[5] INHALATION DOSE FACTORS FOR RADIONUCLIDES OTHER THAN NOBLE GASES (MREM/YR PER UCI/M3) AND FOR FOOD AND GROUND PLANE PATHWAYS (M2*MREM/YR PER UCI/SEC) FOR THE CRITICAL ORGAN AND MOST RESTRICTIVE AGE GROUP	P
[6] NOBLE GAS AIR DOSE FACTORS FOR BETA RADIATION (MRAD/YR PER UCI/M3)	N
[7] INGESTION DOSE FACTORS FROM RADIOIODINES, RADIOACTIVE PARTICULATES AND RADIONUCLIDES (OTHER THAN NOBLE GASES) WITH HALF-LIVES GREATER THAN 8 DAYS (M2*MREM/YR PER UCI/SEC) FOR THE CRITICAL ORGAN AND MOST RESTRICTIVE AGE GROUP	R
[8] ANNUAL AVERAGED RELATIVE CONCENTRATION (SEC/M3) (ELEVATED)	χ/Q(S)
[9] ANNUAL AVERAGED RELATIVE CONCENTRATION (SEC/M3) (GROUND)	χ/Q(V)
[10] ANNUAL AVERAGED DEPOSITION PARAMETER (1/M2) (ELEVATED)	W(S)
[11] ANNUAL AVERAGED DEPOSITION PARAMETER (1/M2) (GROUND)	W(V)

LISTING FOR K

ISOTOPE	VALUE
AR41	8.840E+03
KR83M	7.560E-02
KR85M	1.170E+03
KR85	1.610E+01
KR87	5.920E+03
KR88	1.470E+04
KR89	1.660E+04
KR90	1.560E+04
XE131M	9.150E+01
XE133M	2.510E+02
XE133	2.940E+02
XE135M	3.120E+03
XE135	1.810E+03
XE137	1.420E+03
XE138	8.830E+03

LISTING FOR L

ISOTOPE	VALUE
AR41	2.690E+03
KR83M	0.000E+00
KR85M	1.460E+03
KR85	1.340E+03
KR87	9.730E+03
KR88	2.370E+03
KR89	1.010E+04
KR90	7.290E+03
XE131M	4.760E+02
XE133M	9.940E+02
XE133	3.060E+02
XE135M	7.110E+02
XE135	1.860E+03
XE137	1.220E+04
XE138	4.130E+03

LISTING FOR L
(NOTE: ELEVATED RELEASES ARE NOT CONSIDERED AT COOK NUCLEAR PLANT)

DISTANCE

DIRECTION (WIND FROM)	594.	2416.	4020.	5630.	7240.
N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NNE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ENE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ESE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SSE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SSW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WSW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
W	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WNW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NNW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

DISTANCE

DIRECTION (WIND FROM)	12067.	24135.	40225.	56315.	80500.
N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NNE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ENE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ESE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SSE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SSW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WSW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
W	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WNW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NNW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

LISTING FOR M

ISOTOPE	VALUE
AR41	9.300E+03
KR83M	1.930E+01
KR85M	1.230E+03
KR85	1.720E+01
KR87	6.170E+03
KR88	1.520E+04
KR89	1.730E+04
KR90	1.630E+04
XE131M	1.560E+02
XE133M	3.270E+02
XE133	3.530E+02
XE135M	3.360E+03
XE135	1.920E+03
XE137	1.510E+03
XE138	9.210E+03

LISTING FOR P

	PATHWAY	
ISOTOPE	GROUND AND FOOD	INHALATION
H3	2.4E+03	6.5E+02
C14	2.4E+09	2.7E+04
CR51	1.2E+07	1.3E+04
MN54	1.1E+09	1.0E+06
FE59	7.9E+08	1.0E+06
CO58	5.9E+08	7.8E+05
CO60	4.6E+09	4.5E+06
ZN65	2.0E+10	6.5E+05
SR89	1.3E+10	2.0E+06
SR90	1.2E+11	4.1E+07
ZR95	3.5E+08	1.8E+06
SB124	0.0E+00	0.0E+00
CS134	7.2E+10	7.0E+05
CS136	6.1E+09	1.4E+05
CS137	6.3E+10	6.1E+05
BA140	2.4E+08	1.6E+06
CE141	3.4E+07	5.2E+05
CE144	2.0E+08	9.8E+06
I131	1.1E+12	1.5E+07
I133	9.8E+09	3.6E+06
I132	1.8E+06	1.7E+05

I134	6.4E+05	4.5E+04
I135	2.4E+07	7.0E+05
MO99	3.2E+08	1.4E+05
NB95	4.1E+08	4.8E+05
SR85	0.0E+00	0.0E+00

LISTING FOR N

ISOTOPE	VALUE
AR41	3.280E+03
KR83M	2.880E+02
KR85M	1.970E+03
KR85	1.950E+03
KR87	1.030E+04
KR88	2.930E+03
KR89	1.060E+04
KR90	7.830E+03
XE131M	1.110E+03
XE133M	1.480E+03
XE133	1.050E+03
XE135M	7.390E+02
XE135	2.460E+03
XE137	1.270E+04
XE138	4.750E+03

LISTING FOR R

	PATHWAY					
ISOTOPE	GROUND	VEGETABLE	MEAT	COW MILK	GOAT MILK	INHALATION
H3	0.0E+00	4.0E+03	3.2E+02	2.4E+03	4.9E+03	1.3E+03
C14	0.0E+00	3.5E+06	5.8E+05	3.2E+06	3.2E+06	3.6E+04
CR51	4.7E+06	1.2E+07	1.6E+06	7.5E+06	9.0E+05	3.3E+03
MN54	1.4E+09	9.4E+08	2.2E+07	3.1E+07	3.7E+06	7.7E+04
FE59	2.7E+08	9.7E+08	1.8E+09	3.4E+08	4.4E+06	1.9E+05
CO58	3.8E+08	6.1E+08	3.1E+08	9.1E+07	1.1E+07	1.1E+05
CO60	2.2E+10	3.2E+09	1.1E+09	2.9E+08	3.4E+07	2.8E+05
ZN65	7.5E+08	2.7E+09	1.0E+09	1.7E+10	2.1E+09	1.3E+05
SR89	2.2E+04	3.5E+10	2.6E+08	1.1E+10	2.2E+10	6.0E+05
SR90	0.0E+00	1.4E+12	1.0E+10	1.0E+11	2.1E+11	1.1E+08
ZR95	2.5E+08	1.2E+09	1.6E+09	1.0E+06	1.2E+05	1.5E+05
SB124	6.0E+08	3.0E+09	4.7E+08	7.8E+08	9.3E+07	4.1E+05
CS134	6.8E+09	2.6E+10	1.2E+09	5.4E+10	1.6E+11	1.1E+06
CS136	1.5E+08	2.2E+08	4.5E+07	5.5E+09	1.7E+10	1.9E+05

CS137	1.0E+10	2.4E+10	1.0E+09	4.9E+10	1.5E+11	8.5E+05
BA140	2.1E+07	2.8E+08	5.7E+07	2.3E+08	2.8E+07	2.3E+05
CE141	1.4E+07	5.3E+08	3.2E+07	1.5E+07	1.8E+06	1.3E+05
CE144	7.0E+07	1.3E+10	3.9E+08	1.3E+08	1.6E+07	8.6E+05
I131	1.7E+07	4.8E+10	5.4E+09	1.0E+12	1.2E+12	1.6E+07
I133	2.4E+06	8.1E+08	1.3E+02	9.6E+09	1.2E+10	3.8E+06
I132	1.2E+06	7.6E+03	0.0E+00	1.4E+02	1.6E+02	1.1E+06
I134	4.5E+05	6.4E-03	0.0E+00	9.4E-10	1.1E-01	5.1E+04
I135	2.5E+06	1.4E+12	6.7E-15	2.0E+07	2.4E+07	7.9E+05
MO99	4.0E+06	1.7E+07	2.4E+05	3.1E+08	3.7E+07	4.1E+02
NB95	1.4E+08	4.7E+08	6.8E+09	2.9E+08	3.5E+07	1.0E+05
SR85	1.2E+05	3.5E+10	4.1E+08	1.1E+10	2.2E+10	6.0E+05

LISTING FOR χ/Q(S)

DISTANCE

DIRECTION (WIND FROM)	594.	2416.	4020.	5630.	7240.
N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NNE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ENE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ESE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SSE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SSW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WSW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
W	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WNW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NNW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

DISTANCE

DIRECTION (WIND FROM)	12067.	24135.	40225.	56315.	80500.
N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NNE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ENE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

ESE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SSE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SSW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WSW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
W	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WNW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NNW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

LISTING FOR $\chi/Q(V)$

DISTANCE

DIRECTION (WIND FROM)	594.	2416.	4020.	5630.	7240.
N	3.66E-06	4.26E-07	2.02E-07	1.21E-07	8.47E-08
NNE	2.51E-06	3.03E-07	1.46E-07	8.78E-08	6.19E-08
NE	3.19E-06	3.78E-07	1.84E-07	1.11E-07	7.90E-08
ENE	4.26E-06	4.83E-07	2.44E-07	1.52E-07	1.08E-07
E	5.66E-06	6.18E-07	3.17E-07	1.99E-07	1.43E-07
ESE	6.39E-06	6.94E-07	3.59E-07	2.27E-07	1.64E-07
SE	8.43E-06	9.15E-07	4.71E-07	2.96E-07	2.13E-07
SSE	9.66E-06	1.06E-06	5.45E-07	3.42E-07	2.46E-07
S	1.09E-05	1.26E-06	6.27E-07	3.87E-07	2.76E-07
SSW	5.17E-06	6.10E-07	2.97E-07	1.80E-07	1.28E-07
SW	3.66E-06	4.26E-07	2.03E-07	1.22E-07	8.61E-08
WSW	2.54E-06	2.75E-07	1.32E-07	7.93E-08	5.61E-08
W	3.15E-06	3.57E-07	1.71E-07	1.03E-07	7.28E-08
WNW	3.26E-06	3.86E-07	1.82E-07	1.08E-07	7.57E-08
NW	2.64E-06	3.03E-07	1.42E-07	8.44E-08	5.91E-08
NNW	3.66E-06	4.20E-07	1.98E-07	1.18E-07	8.24E-08

DISTANCE

DIRECTION (WIND FROM)	12067.	24135.	40225.	56315.	80500.
N	4.24E-08	1.65E-08	8.22E-09	5.26E-09	3.31E-09
NNE	3.13E-08	1.24E-08	6.17E-09	3.96E-09	2.50E-09
NE	4.04E-08	1.62E-08	8.07E-09	5.18E-09	3.29E-09
ENE	5.59E-08	2.28E-08	1.15E-08	7.39E-09	4.75E-09
E	7.46E-08	3.08E-08	1.55E-08	9.98E-09	6.45E-09
ESE	8.54E-08	3.54E-08	1.79E-08	1.15E-08	7.44E-09

SE	1.11E-07	4.61E-08	2.32E-08	1.50E-08	9.66E-09
SSE	1.28E-07	5.28E-08	2.66E-08	1.71E-08	1.11E-08
S	1.42E-07	5.77E-08	2.90E-08	1.87E-08	1.19E-08
SSW	6.49E-08	2.59E-08	1.29E-08	8.28E-09	5.25E-09
SW	4.33E-08	1.71E-08	8.49E-09	5.44E-09	3.44E-09
WSW	2.84E-08	1.13E-08	5.64E-09	3.62E-09	2.31E-09
W	3.68E-08	1.46E-08	7.26E-09	4.66E-09	2.95E-09
WNW	3.79E-08	1.47E-08	7.29E-09	4.66E-09	2.92E-09
NW	2.94E-08	1.14E-08	5.64E-09	3.60E-09	2.25E-09
NNW	4.10E-08	1.59E-08	7.86E-09	5.02E-09	3.15E-09

LISTING FOR W(S)

DISTANCE

DIRECTION (WIND FROM)	594.	2416.	4020.	5630.	7240.
N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NNE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ENE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ESE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SSE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SSW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WSW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
W	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WNW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NNW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

DISTANCE

DIRECTION (WIND FROM)	12067.	24135.	40225.	56315.	80500.
N	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NNE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ENE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ESE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

SE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SSE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SSW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WSW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
W	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
WNW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NNW	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

LISTING FOR W(V)

DISTANCE

DIRECTION (WIND FROM)	594.	2416.	4020.	5630.	7240.
N	2.25E-08	2.18E-09	9.87E-10	5.18E-10	3.30E-10
NNE	9.87E-09	9.53E-09	4.32E-10	2.27E-10	1.45E-10
NE	1.26E-08	1.22E-09	5.53E-10	2.90E-10	1.85E-10
ENE	1.27E-08	1.22E-09	5.55E-10	2.91E-10	1.86E-10
E	1.39E-08	1.34E-09	6.07E-10	3.18E-10	2.03E-10
ESE	1.22E-08	1.18E-09	5.36E-10	2.81E-10	1.79E-10
SE	1.67E-08	1.62E-09	7.33E-10	3.85E-10	2.45E-10
SSE	2.42E-08	2.33E-09	1.06E-09	5.55E-10	3.54E-10
S	4.41E-08	4.26E-09	1.93E-09	1.01E-09	6.46E-10
SSW	2.97E-08	2.87E-09	1.30E-09	6.83E-10	4.35E-10
SW	2.51E-08	2.42E-09	1.10E-09	5.76E-10	3.68E-10
WSW	2.00E-08	1.93E-09	8.74E-09	4.58E-10	2.92E-10
W	1.98E-08	1.92E-09	8.69E-10	4.56E-10	2.91E-10
WNW	1.83E-08	1.77E-09	8.01E-10	4.20E-10	2.68E-10
NW	1.74E-08	1.68E-09	7.60E-10	3.99E-10	2.55E-10
NNW	2.30E-08	2.22E-09	1.01E-09	5.28E-10	3.37E-10

DISTANCE

DIRECTION (WIND FROM)	12067.	24135.	40225.	56315.	80500.
N	1.38E-10	4.49E-11	1.65E-11	8.83E-12	4.43E-12
NNE	6.04E-11	1.97E-11	7.24E-12	3.86E-12	1.94E-12
NE	7.74E-11	2.52E-11	9.27E-12	4.95E-12	2.48E-12
ENE	7.76E-11	2.53E-11	9.30E-12	4.96E-12	2.49E-12
E	8.48E-11	2.76E-11	1.02E-11	5.43E-12	2.72E-12
ESE	7.49E-11	2.44E-11	8.98E-12	4.79E-12	2.40E-12
SE	1.02E-10	3.34E-11	1.23E-11	6.56E-12	3.29E-12

SSE	1.48E-10	4.82E-11	1.77E-11	9.47E-12	4.75E-12
S	2.70E-10	8.79E-11	3.24E-11	1.73E-11	8.66E-12
SSW	1.82E-10	5.92E-11	2.18E-11	1.16E-11	5.84E-12
SW	1.54E-10	5.00E-11	1.84E-11	9.83E-12	4.93E-12
WSW	1.22E-10	3.98E-11	1.46E-11	7.82E-12	3.92E-12
W	1.21E-10	3.96E-11	1.46E-11	7.77E-12	3.90E-12
WNW	1.12E-10	3.65E-11	1.34E-11	7.16E-12	3.59E-12
NW	1.06E-10	3.46E-11	1.27E-11	6.80E-12	3.41E-12
NNW	1.41E-10	4.58E-11	1.69E-11	9.00E-12	4.52E-12

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

Instrument	Minimum Channels Operable	Applicability	Action
1. Gross Radioactivity Monitors Providing Automatic Release Termination			
a. Liquid Radwaste Effluent Line (RRS-1001)	(1)#	At times of release	1
b. Steam Generator Blowdown Line (R-19)	(1)	At times of release	2
c. Steam Generator Blowdown Treatment Effluent (R-24)	(1)	At times of release	2
2. Gross Radioactivity Monitors Not Providing Automatic Release Termination			
a. Service Water System Effluent Line (R-20, R-28)	(1) per train	At all times	3
3. Continuous Composite Sampler Flow Monitor			
a. Turbine Building Sump Effluent Line	(1)	At all times	3
4. Flow Rate Measurement Devices			
a. Liquid Radwaste Line (RFI-285)	(1)	At times of release	4
b. Discharge Pipes*	(1)	At all times	NA
c. Steam Generator Blowdown Treatment Effluent (DFI-352)	(1)	At times of release	4

* Pump curves and valve settings may be utilized to estimate flow; in such cases, Action Statement 4 is not applicable.
\# OPERABILITY of RSS-1001 includes OPERABILITY of flow switch RFS-1010, which is an attendant instrument as defined by Specification 1.6.

TABLE NOTATION

Action 1 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases may be resumed for up to 30 days, provided that prior to initiating a release:

1. At least two independent samples are analyzed in accordance with Section 4.2.3.1 and;
2. At least two technically qualified members of the Facility Staff independently verify the discharge valving. Otherwise, suspend release of radioactive effluents via this pathway.

Action 2 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 30 days provided grab samples are analyzed for gross radioactivity (beta or gamma) at a limit of detection of at least 10^{-7} µci/gram:

1. At least once per 8 hours when the specific activity of the secondary coolant is >0.01 µci/gram DOSE EQUIVALENT I-131.
2. At least once per 24 hours when the specific activity of the secondary coolant is <0.01 µci/gram DOSE EQUIVALENT I-131.

Action 3 With the number of channels OPERABLE less than the required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 30 days provided that at least once per 8 hours, grab samples are collected and analyzed for gross radioactivity (beta or gamma) at a lower limit of detection of at least 10^{-7} µci/ml.

Action 4 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 30 days provided the flow rate is estimated at least once per 4 hours during actual releases.

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Instrument	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST
1. Gross Beta or Gamma Radioactivity Monitors Providing Alarm and Automatic Isolation				
a. Liquid Radwaste Effluent Line (RRS-1001)	D*	P	R(3)	Q(5)
b. Steam Generator Blowdown Effluent Line	D*	M	R(3)	Q(1)
c. Steam Generator Blowdown Treatment Effluent Line	D*	M	R(3)	Q(1)
2. Gross Beta or Gamma Radioactivity Monitors Providing Alarm But Not Isolation				
a. Service Water System Effluent Line	D	M	R(3)	Q(2)
3. Continuous Composite Samplers				
a. Turbine Building Sump Effluent Line	D	N/A	N/A	N/A
4. Flow Rate Monitors				
a. Liquid Radwaste Effluent	D(4)*	N/A	R	Q
b. Steam Generator Blowdown Treatment Line	D(4)*	N/A	N/A	N/A

* During releases via this pathway

TABLE NOTATION

(1) The CHANNEL FUNCTIONAL TEST shall also demonstrate that automatic isolation of this pathway and control room alarm annunciation occurs if any of the following conditions exists:

1. Instrument indicates measured levels above the alarm/trip setpoint.
** 2. Circuit failure.*
** 3. Instrument indicates a downscale failure.*
** 4. Instrument control not set in operating mode.*

(2) The CHANNEL FUNCTIONAL TEST shall also demonstrate that control room alarm annunciation occurs if any of the following conditions exists:

1. Instrument indicates measured levels above the alarm setpoint.
** 2. Circuit failure.
** 3. Instrument indicate a downscale failure.
** 4. Instrument controls not set in operating mode.

(3) The initial CHANNEL CALIBRATION shall be performed using one or more sources with traceability back to the National Bureau of Standards. These sources 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 may be used.

(4) CHANNEL CHECK shall consist of verifying indication of flow during periods of release. CHANNEL CHECK shall be made at least once per 24 hours on days on which continuous, periodic or batch releases are made.

(5) The CHANNEL FUNCTIONAL TEST shall also demonstrate that automatic isolation of this pathway and control room alarm annunciation occurs if any of the following conditions exists:

1. Instrument indicates measured levels above the alarm/trip setpoint.
** 2. Circuit failure.***
** 3. Instrument indicates a downscale failure.***
** 4. Instrument control not set in operating mode.***
** 5. Loss of sample flow.

* Instrument indicates, but does not provide for automatic isolation.
** As equipment becomes operational. *** Instrument indicates, but does not necessarily cause automatic isolation, no credit is taken for the automatic isolation on such occurrences.

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Instrument (Instrument #)	Minimum Channels Operable	Applicability	Action
1. Condenser Evacuation System			
a. Noble Gas Activity	(1)	****	6
Monitor (SRA-1905/2905)	(1)	****	5
b. Flow Rate Monitor (SFR-401, 2-MR-054 and/or SFR-1910/2910)	(1)	****	5
2. Unit Vent. Auxiliary Building Ventilation System			
a. Noble Gas Activity Monitor (VRS-1505/2505)	(1)	*	6
b. Iodine Sampler Cartridge for VRA-1503/2503	(1)	*	8
c. Particulate Sampler Filter for VRA-1501/2501	(1)	*	8
d. Effluent System Flow Rate Measuring Device (VFR-315, MR-054 and/or VFR-1510/2510)	(1)	*	5
	(1)	*	5
e. Sampler Flow Rate Measuring Device (VFS-1521/2521)	(1)	*	5
3. Containment Purge System			
a. Aux. Building Vent. System Noble Gas Activity Monitor (VRS-1505/2505)	(1)	****[1]	7
b. Aux. Building Vent. System Particulate Sampler for VRA-1501/2501	(1)	****[1]	8
4. Waste Gas Holdup System			
a. Noble Gas Activity Alarm and Termination of Gas Decay Tank Releases (VRS-1505/2505)	(1)	****[2]	9
5. Gland Seal Exhaust			
a. Noble Gas Activity Monitor (SRA-1805/2805)	(1)	****	6
b. Flow Rate Monitor (SFR-201, MR-054 or SFR-1810/2810)	(1)	****	5
	(1)	****	5

* At all times
**** During releases via this pathway

1 For purge purposes only. See Attachment 3.4 (Items 2a, 4a) and Attachment 3.5 (Items 2a, 4a) for other requirements associated with this instrument.

2 For gas decay tank releases only, see Item 2 (Unit Vent, Auxiliary Building Ventilation System) for additional requirements.

TABLE NOTATIONS

Action 5 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 30 days provided the flow rate is estimated at least once per 4 hours.

Action 6 With the number of channels OPERABLE less required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 30 days provided grab samples are taken at least once per 8 hours and these samples are analyzed for gross activity within 24 hours.

Action 7 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirements, immediately suspend PURGING of radioactive effluents via this pathway.

Action 8 With the number of channels OPERABLE less than require by the Minimum Channels OPERABLE requirement, effluent releases via the affected pathway may continue for up to 30 days provided samples required for weekly analysis are continuously collected with auxiliary sampling equipment as required in Attachment 3.7.

Action 9 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, the contents of the tank(s) may be released to the environment for up to 14 days provided that prior to initiating the release:

a. At least two independent samples of the tank's contents are analyzed and,
b. At least two technically qualified members of the Facility Staff independently verify the release rate calculations and discharge valve lineups; otherwise, suspend release of radioactive effluents via this pathway.

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Instrument	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST
1. Condenser Evacuation System				
a. Noble Gas Activity Monitor (SRA-1905/2905)	D**	M	R(2)	Q(1)
b. System Effluent Flow Rate (SFR-401, MR-054, SRA-1910/2910)	D**	NA	R	Q
2. Auxiliary Building Ventilation System				
a. Noble Gas Activity Monitor (VRS-1505/2505)	D*	M	R(2)	Q(1)
b. Iodine Sampler (For VRS-1503/2503)	W*	NA	NA	NA
c. Particulate Sampler (For VRS-1501/2501)	W*	NA	NA	NA
d. System Effluent Flow Rate Measurement Device (VFR-315, (MR-054, VRS-1510/2510)	D*	NA	R	Q
e. Sampler Flow Rate Measuring Device (VFS-1521/2521)	D*	NA	R	Q
3. Containment Purge System				
a. Aux. Building Vent. System Noble Gas Activity Monitor (VRS-1505/2505)	D**	P	R(2)	Q(1)
b. Aux. Building Vent. System Particulate Sampler (For VRS-1501/2501)	W**	NA	NA	NA

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

Instrument	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST
4. Waste Gas Holdup System				
a. Noble Gas Activity Monitor Providing Alarm & Termination of Gas Decay Tank Releases (VRS-1505/2505)	P**	P	R(2)	Q(5)
5. Gland Seal Exhaust				
a. Noble Gas Activity (SRA-1805/2805)	D**	M	R(2)	Q(1)
b. System Effluent Flow Rate (SFR-201, MR-054, SRA-1810/2810)	D**	NA	R	Q

* At all times
** During releases via this pathway

TABLE NOTATIONS

1) The CHANNEL FUNCTIONAL TEST shall also demonstrate that control room alarm annunciation occurs if any of the following conditions exists:

    1. Instrument indicates measured levels above the alarm setpoint.
    **2. Circuit failure.
    **3. Instrument indicates a downscale failure.
    **4. Instrument controls not set in operate mode.

2) The initial CHANNEL CALIBRATION shall be performed using one or more sources with traceability back to the National Bureau of Standards. These sources 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 may be used.

3) The CHANNEL CALIBRATION shall include the use of standard gas samples containing a nominal:

    1. One volume percent hydrogen, balance nitrogen, and
    2. Four volume percent hydrogen, balance nitrogen.

4) The CHANNEL CALIBRATION shall include the use of standard gas samples containing a nominal:

    1. One volume percent oxygen, balance nitrogen, and
    2. Four volume percent oxygen, balance nitrogen.

5) The CHANNEL CALIBRATION TEST shall also demonstrate that automatic isolation of this pathway and control room alarm annunciation occurs if any of the following conditions exists:

    1. Instrument indicates measured levels above the alarm/trip setpoint.
    **2. Circuit failure.*
    **3. Instrument indicates a downscale failure.*
    **4. Instrument controls not set in operate mode.*

* Instrument indicates, but does not provide automatic isolation.
** As equipment becomes operational.

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

LIQUID RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) (µci/ml)[a]
A. Batch Waste Release Tanks[c]	P Each Batch	P Each Batch	Principal Gamma Emitters[e]	$5x10^{-7}$
			I-131	$1x10^{-6}$
	P One Batch/M	M	Dissolved and Entrained Gases (Gamma Emitters)	$1x10^{-5}$
	P Each Batch	M Composite[b]	H-3	$1x10^{-5}$
			Gross Alpha	$1x10^{-7}$
	P Each Batch	Q Composite	Sr-89, Sr-90	$5x10^{-8}$
			Fe-55	$1x10^{-6}$
B. Plant Continuous Releases[d]	Daily	W Composite[b]	Principal Gamma Emitters[e]	$5x10^{-7}$
			I-131	$1x10^{-6}$
	M Grab Sample	M	Dissolved and Entrained Gases (Gamma Emitters)	$1x10^{-5}$
	Daily	M Composite[b]	H-3	$1x10^{-5}$
			Gross Alpha	$1x10^{-7}$
	Daily	Q Composite[b]	Sr-89, Sr-90	$5x10^{-8}$
			Fe-55	$1x10^{-6}$

TABLE NOTATION

a. The lower limit of detection (LLD) is defined in Table Notation a. of Attachment 3.21.

b. A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.

c. A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analysis, each batch shall be isolated and recirculated to ensure thorough mixing.

d. A continuous release is the discharge of liquid of a non-discrete volume; e.g. form a volume of system that has an input flow during the continuous release.

e. The principal gamma emitters for which the LLD specification applies exclusively are 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 which are measurable and identifiable, together with the above nuclides, shall also be identified and reported.

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

Gaseous Release Type	Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (μCi/ml)[a]
a. Waste Gas Storage Tank	P Each Tank Grab Sample	P Each Tank	Principal Gamma Emitters[e]	$1x10^{-4}$
b. Containment Purge	P Each Purge Grab Sample[b]	P Each Purge[b]	Principal Gamma Emitters[e]	$1x10^{-4}$
			H-3	$1X10^{-6}$
c. Condenser Evacuation System and Gland Seal Exhaust*	W Grab Sample[b]	M[b] Particulate Sample	Principle Gamma Emitters[e]	$1x10^{-4}$
		M[b]	H-3	$1x10^{-6}$
		M[b] Iodine Adsorbing/ Media	I-131	$1x10^{-12}$
	Continuous[d]	Noble Gas Monitor	Noble Gases	$1x10^{-6}$
d. Auxiliary Building Vent	Continuous[d]	W[c] Iodine Adsorbing/ Media	I-131	$1x10^{-12}$
	Continuous[d]	W[c] Particulate Sample	Principal Gamma Emitters[e]	$1x10^{-11}$
	Continuous[d]	M Composite Particulate Sample	Gross Alpha	$1x10^{-11}$
	Continuous[d]	M Composite	H-3	$1x10^{-6}$
	Continuous[d]	Q Composite Particulate Sample	Sr-89, Sr-90	$1x10^{-11}$
	Continuous[d]	Noble Gas Monitor	Noble Gases	$1x10^{-6}$

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

Gaseous Release Type	Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (μci/ml)[a]
e. Incinerated Oil[f]	P Each Batch[g]	P Each Batch[g]	Principle Gamma Emitters	5×10^{-7}

Table Notation

a. The lower limit of detection (LLD) is defined in Table Notation a. of Attachment 3.21.

b. Analyses shall be also be performed following any operational occurrence which has altered the mixture of radionuclides as indicated by RCS analysis. (i.e., start-up)

c. Samples shall be changed at lease once per 7 days and analyses shall be completed within 48 hours after changing. Analyses shall also be performed at least once per 24 hours for 7 days following each shutdown, startup or similar operational occurrence which lead to significant increases or decreases in radioiodine in the Reactor Coolant System. When samples collected for 24 hours and analyzed, the corresponding LLD's may be increased by a factor of 10.

d. 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 Sections 4.2.4.1, 4.2.4.2, and 4.2.4.3 of this document.

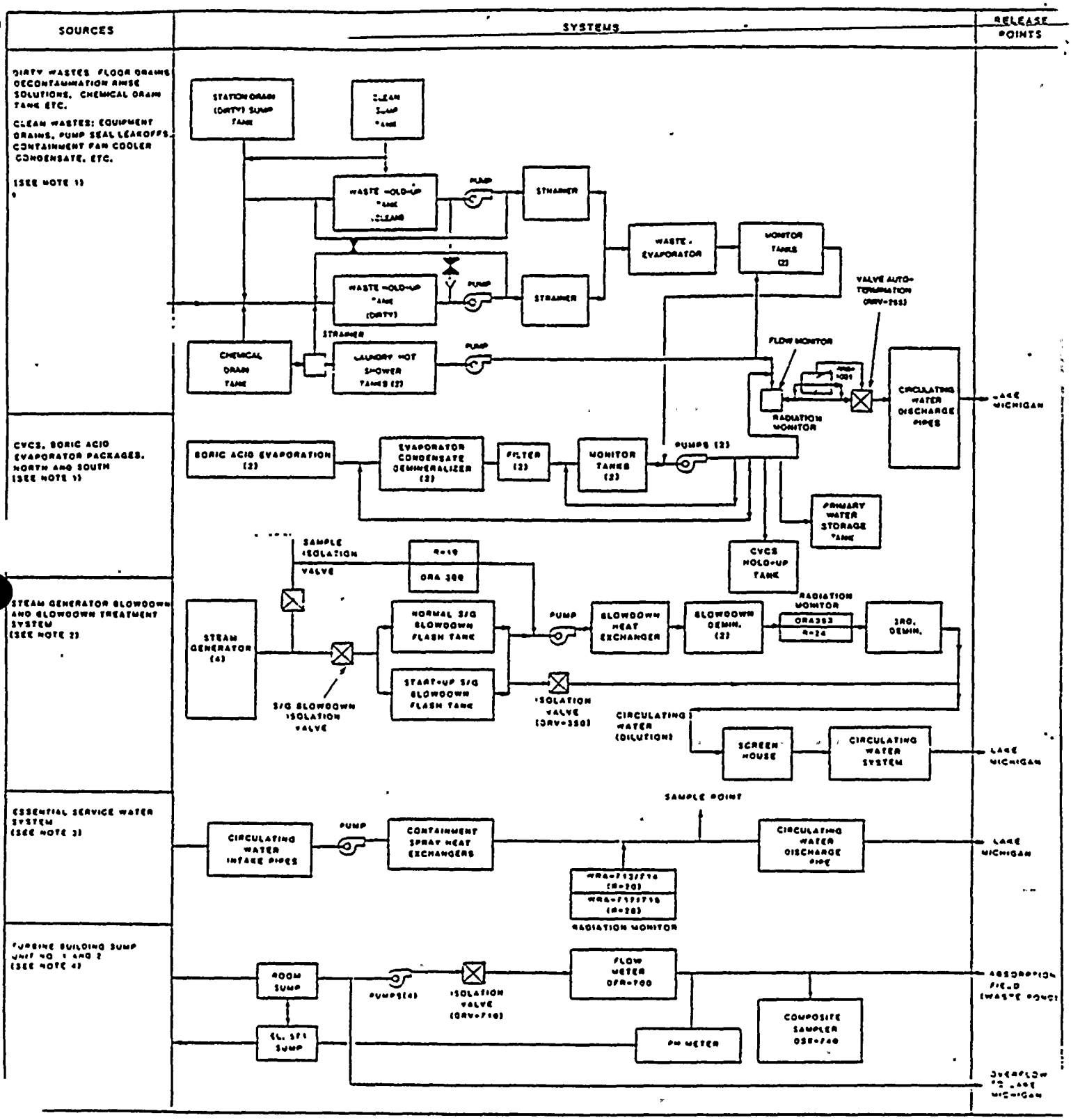
e. The principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133M, Xe-135 and Xe-138 for gaseous emissions and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Cd-141 and Ce-144 for particulate emissions. This list 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.

f. Releases from incinerated oil are discharged through the Auxiliary Boiler System. Releases shall be accounted for based on pre-release grab sample data.

g. Samples of waste oil to be incinerated shall be collected from the container in which the waste oil is stored (e.g., waste oil storage tanks, 55 gal. drums) prior to transfer to the Auxiliary Boiler System and shall be representative of container contents.

Multiple Releae Point Factors for Liquid Release Points

Monitor Description	Monitor Number	MRP
SG Blowdown U1	1R-19	0.35
SG Blowdown U2	2R-19	0.35
Liquid Waste Discharge Both Units	RRS-1001	0.30



Liquid Effluent System

NOTES

NOTE 1: Drawings: OP-12-5119, -5123B, -5133, -5134, -5138, -5138A, -1-5661, -2-5661, -5104F.

System Descriptions: SD-DCC-CH113, -NE101, -HP119. Engineering Control Procedure ECP-12-R2-08.

NOTE 2: Drawings: OP-12-5105, -5105B, -5141, -5141A, -5119, -5125, -1-5661, -2-5661, -5104F.

System Descriptions: SD-DCC-CH114, -NE101, -HP119.

NOTE 3: Drawings: OP-12-5113, -5119, -1-5661, -2-5661.

System Descriptions: SD-DCC-HP102, -HP119, NE101.

NOTE 4: Drawings: OP-12-5125, -5125A, -12-5160.

System Descriptions: SD-DCC-CH117.

USE THE MOST CURRENT DRAWING AND SYSTEM DESCRIPTIONS

PLANT LIQUID EFFLUENT PARAMETERS

SYSTEM	COMPONENTS TANKS	COMPONENTS PUMPS	CAPACITY (EACH)	FLOW RATE (EACH)
I Waste Disposal System				
+ Chemical Drain Tank	1	1	600 GAL.	20 GPM
+ Laundry & Hot Shower Tanks	2	1	600 GAL.	20 GPM
+ Monitor Tanks	4	2	21,600 GAL.	150 GPM
+ Waste Holdup Tanks	2		25,000 GAL.	
+ Waste Evaporators	3			30 GPM
+ Waste Evaporator Condensate Tanks	2	2	6,450 GAL.	150 GPM
II Steam Generator Blowdown and Blowdown Treatment Systems				
+ Start-up Flash Tank (Vented)	1		1,800 GAL.	350 GPM
+ Normal Flash Tank (Not Vented)	1		525 GAL.	100 GPM
+ Blowdown Treatment System	1			60 GPM
III Essential Service Water System				
+ Water Pumps	4			10,000 GPM
+ Containment Spray Heat Exchanger Outlet	4			3,300 GPM
IV Circulating Water Pumps	3 (Unit 1) 4 (Unit 2)			230,000 GPM*

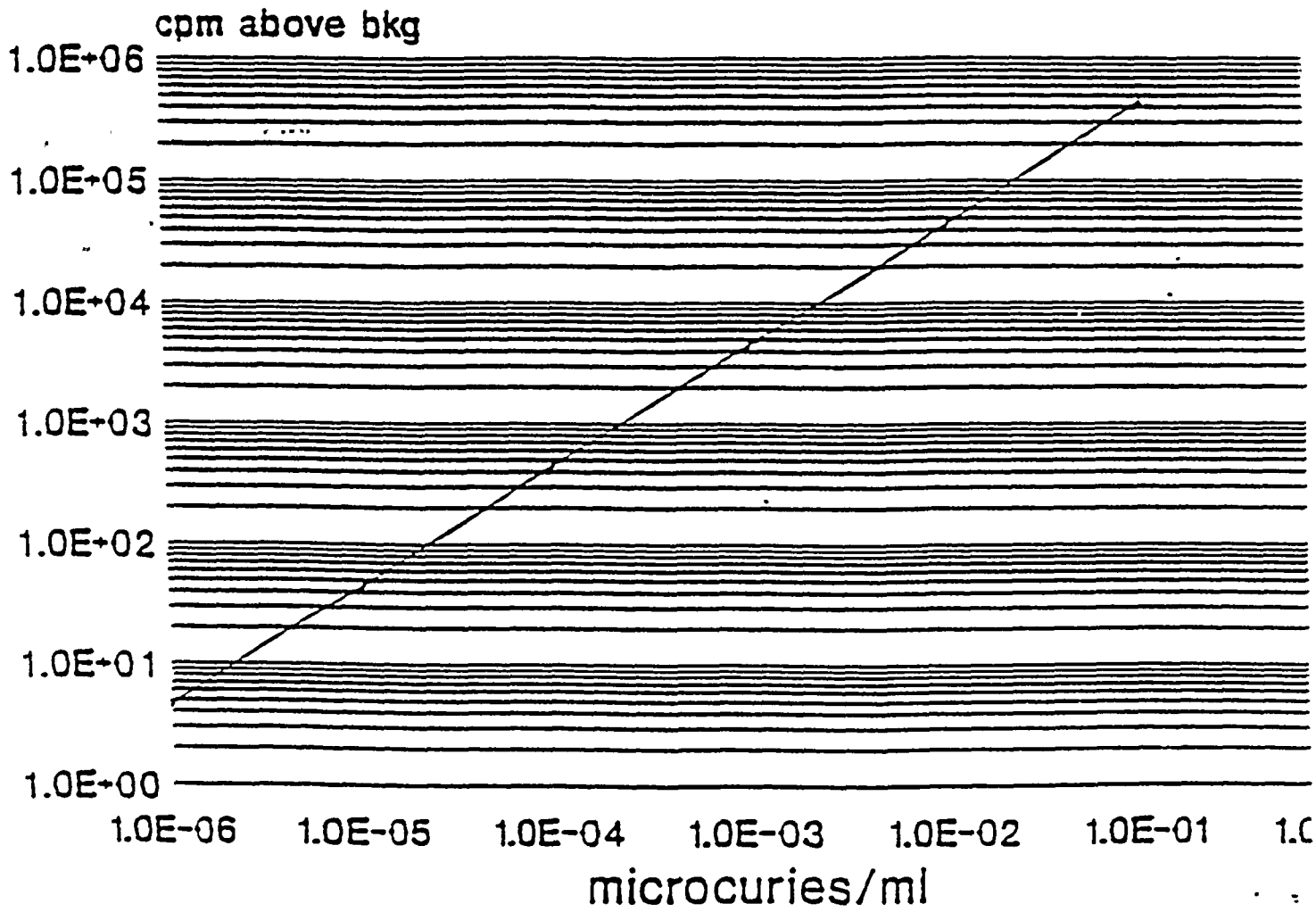
*Nominal Values

VOLUMETRIC DETECTION EFFICIENCIES OF PRINCIPLE GAMMA EMITTING RADIONUCLIDES

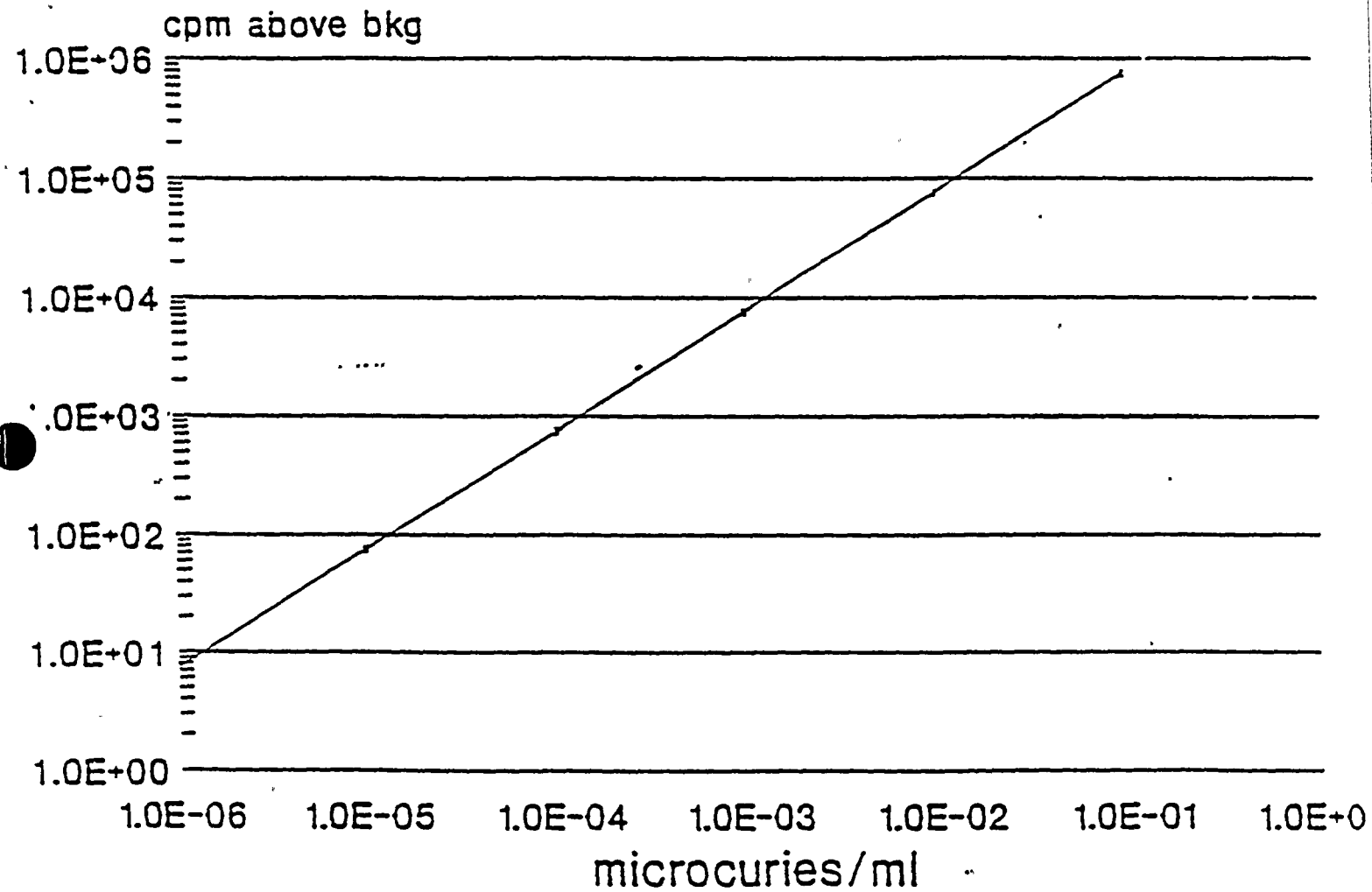
NUCLIDE	EFFICIENCY (cpm/μCi/cc)
I-131	3.78E7
Cs-137	3.0 E7
Cs-134	7.9 E7
Co-60	5.75E7
Co-58	4.60E7
Cr-51	3.60E6
Mn-54	3.30E7
Zn-65	1.58E7
Ag-110M	9.92E7
Ba-133	4.85E7
Ba-140	1.92E7
Cd-109	9.60E5
Ce-139	3.27E7
Ce-141	1.92E8
Ce-144	4.82E6
Co-57	3.80E7
Cs-136	1.07E8
Fe-59	2.82E7
Sb-124	5.92E7
I-133	3.40E7
I-134	7.22E7
I-135	3.95E7
Mo-99	8.67E6
Na-24	4.45E7
Nb-95	3.27E7
Nb-97	3.50E8
Rb-89	5.00E7
Ru-103	3.47E7
Ru-106	1.22E7
Sb-122	2.55E7
Sb-125	3.15E7
Sn-113	7.32E5
Sr-85	3.70E7
Sr-89	2.87E3
Sr-92	3.67E7
Tc-99M	3.60E7
Y-88	5.25E7
Zr-95	3.37E7
Zr-97	3.10E7
Kr-85	1.56E5
Kr-85M	3.52E7
Kr-88	4.10E7
Xe-131M	8.15E5
Xe-133	7.77E6
Xe-133M	5.75E6
Xe-135	3.82E7

Steam Generator Blowdowi

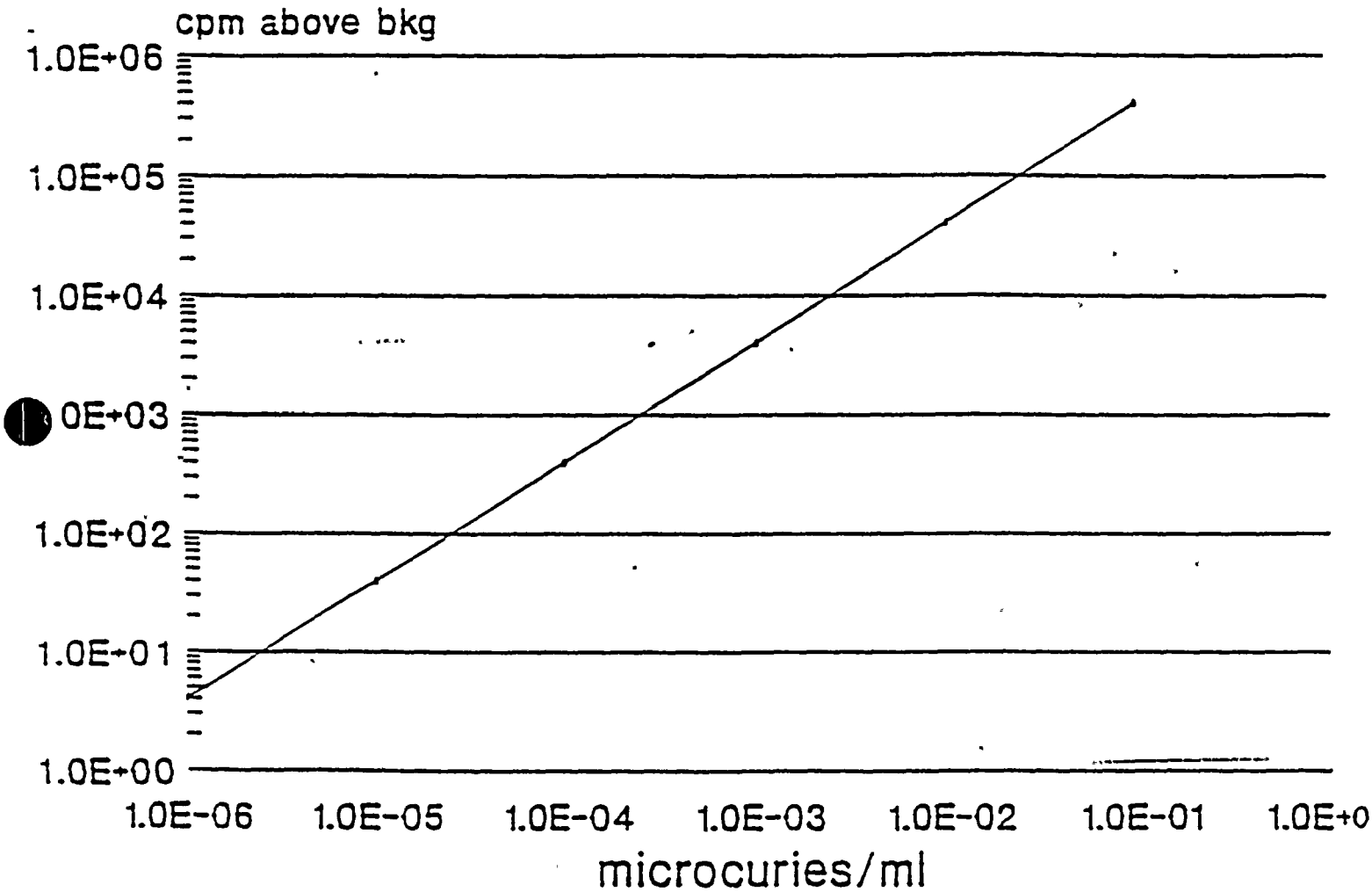
R-19



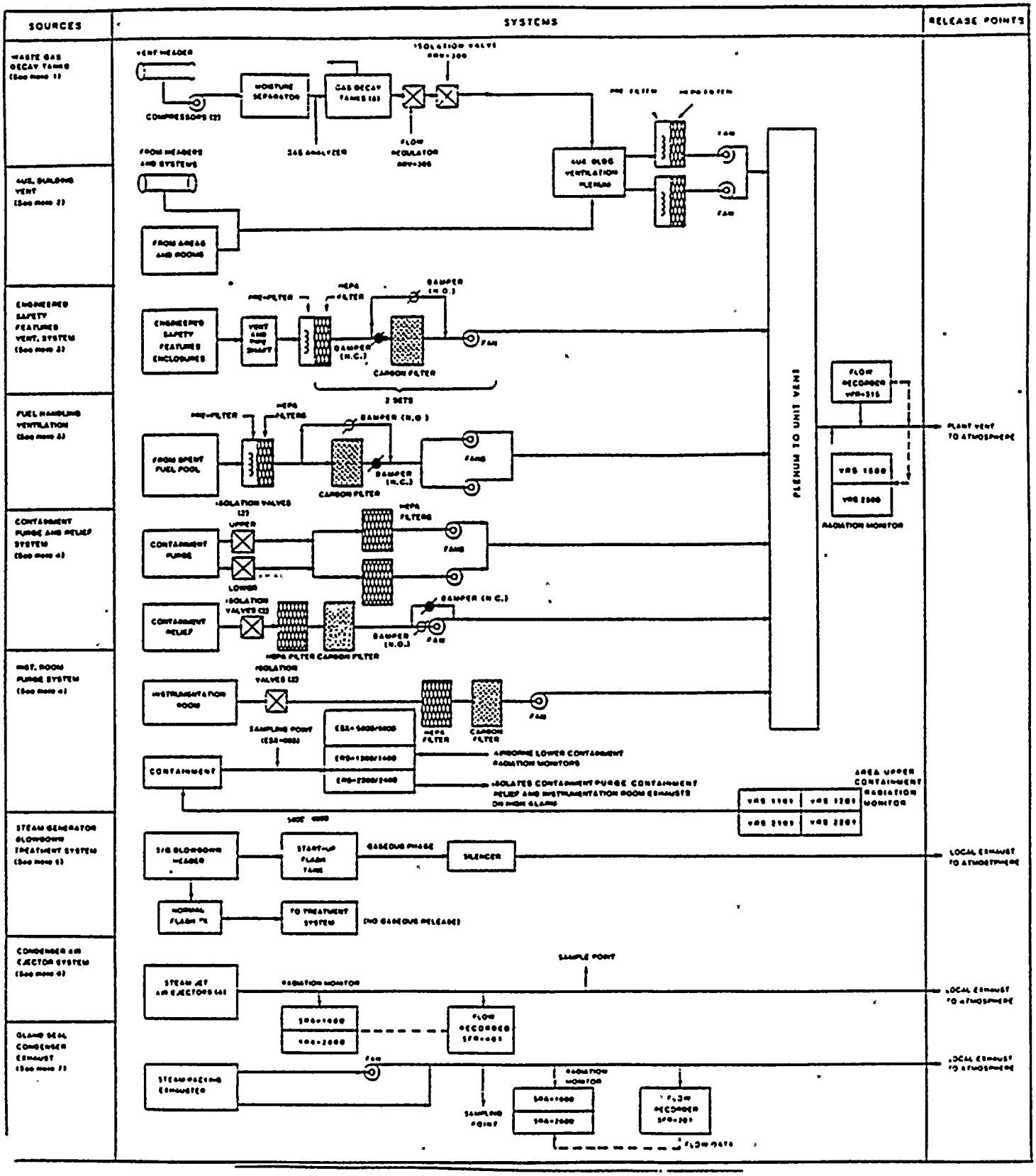
S/G Blowdown Treatment
R-24



ESW Monitors
R-20, R-28



RMS



Gaseous Effluent System

NOTES

NOTE 1: Drawings: OP-12-5119, -5123B, -5133, -5134, -5138, -5138A, 1-5661, -2-5661.

System Descriptions: SD-DCC-CH113, -NE101, -HP119.

NOTE 2: Drawings: OP-12-5105, -5105B, -5141, -5141A, -5119, -5125, -1-5661, -2-5661.

System Descriptions: SD-DCC-CH114, -NE101, -HP119.

NOTE 3: Drawings: OP-12-5113, -5119, -1-5661, -2-5661.

System Descriptions: SD-DCC-HP102, -HP119, NE101.

NOTE 4: Drawings: OP-12-5125, -5125A, -12-5160.

System Descriptions: SD-DCC-CH117.

USE THE MOST CURRENT DRAWING AND SYSTEM DESCRIPTIONS

PLANT GASEOUS EFFLUENT PARAMETERS

	SYSTEM	UNIT	EXHAUST FLOW RATE (CFM)	CAPACITY
I	PLANT UNIT VENT:	UNIT 1 UNIT 2	139,600 103,500	
	WASTE GAS DECAY TANKS	UNIT 1	125	4082 FT^3 @100 psig (8 tanks total)
	+AUXILIARY BUILDING EXHAUST	UNIT 1 UNIT 2	72,600 64,500	
	+ENG. SAFETY FEATURES VENT	UNIT 1&2	25,000	
	+FUEL HANDLING AREA VENT SYSTEM	UNIT 1	30,000	
	+CONTAINMENT PURGE SYSTEM	UNIT 1&2	12,000	
	+CONTAINMENT PRESSURE RELIEF SYSTEM	UNIT 1&2	1,000	
	+INSTRUMENT ROOM PURGE SYSTEM	UNIT 1&2	1,000	
II	CONDENSER AIR EJECTOR SYSTEM			2 Release Points - One for Each Unit
	NORMAL STEAM JET AIR EJECTORS	UNIT 1&2	230	
	START UP STEAM JET AIR EJECTORS	UNIT 1&2	3,600	
III	TURBINE SEALS SYSTEM	UNIT 1 UNIT 2	1,260 5,508	2 Release Points for Unit 2
IV	START UP FLASH TANK VENT	UNIT 1 UNIT 2	1,536 1,536	

$\overline{\chi/Q}$ GROUND AVERAGE (sec/m^2)

01JAN92 - 31DEC92
DISTANCE (METERS)

DIRECTION (WIND TO)	594.	2416.	4020.	5630.	7240.
S	3.75e-6	4.41e-7	2.06e-7	1.21e-7	8.48e-8
SSW	2.54e-6	3.06e-7	1.46e-7	8.79e-8	6.19e-8
SW	4.56e-6	5.31e-7	2.65e-7	1.64e-7	1.16e-7
WSW	7.42e-6	8.14e-7	4.17e-7	2.62e-7	1.88e-7
W	7.33e-6	8.16e-7	4.14e-7	2.59e-7	1.86e-7
WNW	6.36e-6	7.16e-7	3.60e-7	2.24e-7	1.60e-7
NW	9.10e-6	9.75e-7	5.03e-7	3.17e-7	2.29e-7
NNW	1.13e-5	1.24e-6	6.40e-7	4.04e-7	2.91e-7
N	1.04e-5	1.19e-6	5.97e-7	3.70e-7	2.65e-7
NNE	4.52e-6	5.40e-7	2.61e-7	1.58e-7	1.11e-7
NE	3.14e-6	3.55e-7	1.70e-7	1.02e-7	7.18e-8
ENE	3.16e-6	3.46e-7	1.68e-7	1.02e-7	7.25e-8
E	2.44e-6	2.69e-7	1.27e-7	7.61e-8	5.34e-8
ESE	2.38e-6	2.72e-7	1.27e-7	7.55e-8	5.27e-8
SE	2.29e-6	2.53e-7	1.20e-7	7.25e-8	5.08e-8
SSE	2.73e-6	2.99e-7	1.39e-7	8.19e-8	5.73e-8

DISTANCE

DIRECTION (WIND TO)	12067	24135	40225	56315	80500
S	4.22e-8	1.63e-8	8.06e-9	5.14e-9	3.22e-9
SSW	3.11e-8	1.22e-8	6.06e-9	3.88e-9	2.44e-9
SW	5.94e-8	2.40e-8	1.21e-8	7.78e-9	4.97e-9
WSW	9.78e-8	4.03e-8	2.03e-8	1.31e-8	8.44e-9
W	9.61e-8	3.94e-8	1.99e-8	1.28e-8	8.25e-9
WNW	8.29e-8	3.39e-8	1.70e-8	1.10e-8	7.04e-9
NW	1.20e-7	4.95e-8	2.50e-8	1.60e-8	1.04e-8
NNW	1.52e-7	6.30e-8	3.19e-8	2.06e-8	1.33e-8
N	1.37e-7	5.56e-8	2.80e-8	1.80e-8	1.15e-8
NNE	5.66e-8	2.25e-8	1.12e-8	7.19e-9	4.56e-9
NE	3.61e-8	1.42e-8	7.10e-9	4.55e-9	2.88e-9
ENE	3.69e-8	1.47e-8	7.38e-9	4.74e-9	3.02e-9
E	2.67e-8	1.04e-8	5.16e-9	3.29e-9	2.07e-9
ESE	2.60e-8	1.00e-8	4.93e-9	3.14e-9	1.96e-9
SE	2.53e-8	9.87e-9	4.92e-9	3.16e-9	1.99e-9
SSE	2.84e-8	1.09e-8	5.40e-9	3.45e-9	2.16e-9

DIRECTION - SECTOR

N = A	E = E	S = J	W = N
NNE = B	ESE = F	SSW = K	WNW = P
E = C	E = G	SW = L	NW = Q
ENE = D	SSE = H	WSW = M	NNW = R.

Current $\overline{\chi/Q}$ = 1.13e-5 sec/m^2 in Sector R

D/Q DEPOSITION ($1/m^2$)

01JAN92 - 31DEC92

DIRECTION (WIND TO)	DISTANCE (METERS) 594.	2416.	4020.	5630.	7240.
S	2.54e-8	2.45e-9	1.11e-9	5.83e-10	3.72e-10
SSW	1.06e-8	1.02e-9	4.62e-10	2.42e-10	1.55e-10
SW	1.41e-8	1.36e-9	6.16e-10	3.23e-10	2.06e-10
WSW	1.74e-8	1.68e-9	7.62e-10	4.00e-10	2.55e-10
W	2.01e-8	1.94e-9	8.82e-10	4.63e-10	2.95e-10
WNW	1.78e-8	1.72e-9	7.78e-10	4.08e-10	2.60e-10
NW	1.69e-8	1.63e-9	7.39e-10	3.88e-10	2.47e-10
NNW	2.25e-8	2.17e-9	9.86e-10	5.17e-10	3.30e-10
N	3.70e-8	3.57e-9	1.62e-9	8.50e-10	5.42e-10
NNE	2.45e-8	2.37e-9	1.07e-9	5.64e-10	3.60e-10
NE	2.37e-8	2.29e-9	1.04e-9	5.45e-10	3.48e-10
ENE	2.25e-8	2.17e-9	9.86e-10	5.17e-10	3.30e-10
E	1.87e-8	1.80e-9	8.17e-10	4.29e-10	2.73e-10
ESE	1.59e-8	1.53e-9	6.95e-10	3.65e-10	2.33e-10
SE	1.46e-8	1.41e-9	6.39e-10	3.35e-10	2.14e-10
SSE	2.05e-8	1.98e-9	8.96e-10	4.70e-10	3.00e-10

DIRECTION (WIND TO)	DISTANCE 12067	24135	40225	56315	80500
S	1.55e-10	5.05e-11	1.86e-11	9.93e-12	4.98e-12
SSW	6.46e-11	2.10e-11	7.74e-12	4.13e-12	2.07e-12
SW	8.61e-11	2.80e-11	1.03e-11	5.51e-12	2.76e-12
WSW	1.07e-10	3.47e-11	1.28e-11	6.82e-12	3.42e-12
W	1.23e-10	4.01e-11	1.48e-11	7.89e-12	3.96e-12
WNW	1.09e-10	3.54e-11	1.30e-11	6.96e-12	3.49e-12
NW	1.03e-10	3.36e-11	1.24e-11	6.61e-12	3.32e-12
NNW	1.38e-10	4.49e-11	1.65e-11	8.82e-12	4.42e-12
N	2.26e-10	7.37e-11	2.71e-11	1.45e-11	7.27e-12
NNE	1.50e-10	4.89e-11	1.80e-11	9.61e-12	4.82e-12
NE	1.45e-10	4.73e-11	1.74e-11	9.29e-12	4.66e-12
ENE	1.38e-10	4.49e-11	1.65e-11	8.82e-12	4.42e-12
E	1.14e-10	3.72e-11	1.37e-11	7.31e-12	3.67e-12
ESE	9.72e-11	3.17e-11	1.17e-11	6.22e-12	3.12e-12
SE	8.93e-11	2.91e-11	1.07e-11	5.71e-12	2.87e-12
SSE	1.25e-10	4.08e-11	1.50e-11	8.02e-12	4.02e-12

DIRECTION - SECTOR

N = A	E = E	S = J	W = N
NNE = B	ESE = F	SSW = K	WNW = P
E = C	E = G	SW = L	NW = Q
ENE = D	SSE = H	WSW = M	NNW = R

Current D/Q = 3.70E-08 $1/m^2$ in Sector A

ANNUAL EVALUATION OF $\overline{\chi/Q}$ AND $\overline{D/Q}$ VALUES FOR ALL SECTORS

1. Received annual update of $\overline{\chi/Q}$ and $\overline{D/Q}$ values.

_____
Signature

_____
R.P. Department
(print name, title)

2. Worst $\overline{\chi/Q}$ and $\overline{D/Q}$ value and sector determined. PMP 6010 OSD.001 has been updated.

_____
Signature

_____
R.P. Department
(print name, title)

3. Approved and verified by:

_____
Signature

_____
R.P. Department
(print name, title)

DOSE FACTORS FOR NOBLE GASES AND DAUGHTERS*

RADIONUCLIDE	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-83m	7.56E-02	--	1.93E+01	2.88E+02
Kr-85m	1.17E+03	1.46E+03	1.23E+03	1.97E+03
Kr-85	1.61E+01	1.34E+03	1.72E+01	1.95E+03
Kr-87	5.92E+03	9.73E+03	6.17E+03	1.03E+04
Kr-88	1.47E+04	2.37E+03	1.52E+04	2.93E+03
Kr-89	1.66E+04	1.01E+04	1.73E+04	1.06E+04
Kr-90	1.56E+04	7.29E+03	1.63E+04	7.83E+03
Xe-131m	9.15E+01	4.76E+02	1.56E+02	1.11E+03
Xe-133m	2.51E+02	9.94E+02	3.27E+02	1.48E+03
Xe-133	2.94E+02	3.06E+02	3.53E+02	1.05E+03
Xe-135m	3.12E+03	7.11E+02	3.36E+03	7.39E+02
Xe-135	1.81E+03	1.86E+03	1.92E+03	2.46E+03
Xe-137	1.42E+03	1.22E+04	1.51E+03	1.27E+04
Xe-138	8.83E+03	4.13E+03	9.21E+03	4.75E+03
Ar-41	8.84E+03	2.69E+03	9.30E+03	3.28E+03

*The listed dose factors are for radionuclides that may be detected in gaseous effluents, from R.G. 1.109, Table B.1.

DOSE PARAMETERS FOR RADIOIODINES AND RADIOACTIVE PARTICULATE, GASEOUS EFFLUENTS*

RADIONUCLIDE	P_i INHALATION PATHWAY (mRem/yr per µCi/m³)	P_i FOOD & GROUND PATHWAYS (m² . mRem/yr per µCi/sec)	RADIONUCLIDE	P_i INHALATION PATHWAY (mRem/yr per µCi/m³)	P_i FOOD & GROUND PATHWAYS (m² . mRem/yr per µCi/sec)
H-3	6.47E+02	2.40E+03	Rb-88	5.57E+02	4.74E+04
C-14	2.65E+04	2.38E+09	Rb-89	3.21E+02	1.76E+05
Na-24	1.06E+04	3.28E+07	Sr-89	2.03E+06	1.28E+10
P-32	2.03E+06	1.63E+11	Sr-90	4.09E+07	1.24E+11
Cr-51	1.28E+04	1.15E+07	Sr-91	7.34E+04	3.41E+06
Mn-54	1.00E+06	1.14E+09	Sr-92	1.40E+05	1.11E+06
Mn-56	7.17E+04	1.29E+06	Y-90	2.69E+05	9.64E+05
Fe-55	8.69E+04	1.38E+08	Y-91m	2.79E+03	1.44E+05
Fe-59	1.02E+06	7.89E+08	Y-91	2.45E+06	6.86E+06
Co-58	7.77E+05	5.89E+08	Y-92	1.27E+05	2.59E+05
Co-60	4.51E+06	4.62E+09	Y-93	1.67E+05	2.80E+05
Ni-63	3.39E+05	3.56E+10	Zr-95	1.75E+06	3.45E+08
Ni-65	5.01E+04	4.43E+05	Zr-97	1.40E+05	4.29E+06
Cu-64	1.50E+04	4.75E+06	Nb-95	4.79E+05	4.06E+08
Zn-65	6.47E+05	2.01E+10	Mo-99	1.35E+05	3.23E+08
Zn-69	1.32E+04	3.01E-09	Tc-99m	2.03E+03	2.81E+05
Rb-86	1.90E+05	2.27E+10	Tc-101	8.44E+02	2.92E+04
Te-131m	1.99E+05	3.48E+07	Ru-103	5.52E+05	1.55E+08
Te-131	8.22E+03	4.18E+04	Ru-105	4.84E+04	9.12E+05
Te-132	3.40E+05	7.26E+07	Ru-106	1.16E+07	3.02E+08
I-130	1.60E+06	8.99E+08	Ag-110m	3.67E+06	1.80E+10
I-131	1.48E+07	1.07E+12	Te-125m	4.47E+05	1.56E+08
I-132	1.69E+05	1.79E+06	Te-127m	1.31E+06	1.06E+09
I-133	3.56E+06	9.78E+09	Te-127	2.44E+04	1.53E+05
I-134	4.45E+04	6.40E+05	Te-129m	1.68E+06	1.45E+09
I-135	6.96E+05	2.40E+07	Te-129	2.63E+04	3.76E+04
Cs-134	7.03E+05	7.21E+10	Ce-143	1.16E+05	4.88E+06
Cs-136	1.35E+05	6.13E+09	Ce-144	9.84E+06	1.95E+08
Cs-137	6.12E+05	6.25E+10	Pr-143	4.33E+05	7.98E+05
Cs-138	8.76E+02	5.15E+05	Pr-144	4.28E+03	2.63E+03
Ba-139	5.10E+04	1.52E+05	Nd-147	3.22E+05	1.26E+07
Ba-140	1.60E+06	2.75E+08	W-187	3.96E+04	5.90E+06
Ba-141	4.75E+03	5.98E+04	Np-239	5.95E+04	2.55E+06
Ba-142	1.55E+03	6.43E+04			
La-140	1.68E+05	2.77E+07			
La-142	5.95E+04	1.09E+06			
Ce-141	5.17E+05	3.35E+07			

*If Sr-90 analysis is performed, use P_i given in Ru-106 for unidentified components.

If Sr-90 and Ru-106 analyses are performed, use P_i given in I-131 for unidentified components.

If Sr-90, Ru-106 and I-131 analyses are performed, use P_i given in P-32 for unidentified components.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SAMPLE STATIONS, SAMPLE TYPES, AND SAMPLE FREQUENCIES

SAMPLE STATION	DESCRIPTION/LOCATION	SAMPLE TYPE	SAMPLE FREQUENCY	ANALYSIS TYPE	ANALYSIS FREQUENCY
ONSITE AIRBORNE AND DIRECT RADIATION (TLD) STATIONS					
ONS-1 (A-1)	1945 ft @ 18° from Plant Axis	Airborne Particulate	Weekly	Gross beta	Weekly
			Weekly	Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine	Weekly	I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
ONS-2 (A-2)	2338 ft @ 48° from Plant Axis	Airborne Particulate	Weekly	Gross Beta	Weekly
			Weekly	Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine	Weekly	I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
ONS-3 (A-3)	2407 ft @ 90° from Plant Axis	Airborne Particulate	Weekly	Gross Beta	Weekly
			Weekly	Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine	Weekly	I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
ONS-4 (A-4)	1852 ft. @ 118° from Plant Axis	Airborne Particulate	Weekly	Gross Beta	Weekly
			Weekly	Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine	Weekly	I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
ONS-5 (A-5)	1895 ft @ 189° from Plant Axis	Airborne Particulate	Weekly	Gross Beta	Weekly
			Weekly	Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine	Weekly	I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
ONS-6 (A-6)	1917 ft @ 210° from Plant Axis	Airborne Particulate	Weekly	Gross Beta	Weekly
			Weekly	Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine	Weekly	I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
ONS-7 (A-7)	2103 ft @ 36° from Plant Axis	TLD	Quarterly	Direct Radiation	Quarterly
ONS-8 (A-8)	2208 ft @ 82° from Plant Axis	TLD	Quarterly	Direct Radiation	Quarterly
ONS-9 (A-9)	1368 ft @ 149° from Plant Axis	TLD	Quarterly	Direct Radiation	Quarterly
ONS-10 (A-10)	1390 ft @ 127° from Plant Axis	TLD	Quarterly	Direct Radiation	Quarterly
ONS-11 (A-11)	1969 ft @ 11° from Plant Axis	TLD	Quarterly	Direct Radiation	Quarterly
ONS-12 (A-12)	2292 ft @ 63° from Plant Axis	TLD	Quarterly	Direct Radiation	Quarterly
CONTROL AIRBORNE AND DIRECT RADIATION (TLD) STATIONS					
NBF	16.0 miles SSW New Buffalo, MI	Airborne Particulate	Weekly	Gross Beta	Weekly
			Weekly	Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine	Weekly	I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
SBN	24.0 miles SE South Bend, IN	Airborne Particulate	Weekly	Gross Beta	Weekly
			Weekly	Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine	Weekly	I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
OOW	24.3 miles ENE Oowagiac, MI	Airborne Particulate	Weekly	Gross Beta	Weekly
			Weekly	Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine	Weekly	I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
COL	18.9 miles NNE Coloma, MI	Airborne Particulate	Weekly	Gross Beta	Weekly
			Weekly	Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine	Weekly	I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SAMPLE STATIONS, SAMPLE TYPES, AND SAMPLE FREQUENCIES

SAMPLE STATION	DESCRIPTION/LOCATION	SAMPLE TYPE	SAMPLE FREQUENCY	ANALYSIS TYPE	ANALYSIS FREQUENCY
OFFSITE AIRBORNE AND DIRECT RADIATION (TLD) STATIONS					
OFS-1	4.5 miles NE, Pole #8294-44	TLD	Quarterly	Direct Radiation	Quarterly
OFS-2	3.6 miles, NE, Stevensville Substation	TLD	Quarterly	Direct Radiation	Quarterly
OFS-3	5.1 miles NE, Pole #8296-13	TLD	Quarterly	Direct Radiation	Quarterly
OFS-4	4.1 miles, E, Pole #8350-72	TLD	Quarterly	Direct Radiation	Quarterly
OFS-5	4.2 miles ESE, Pole #8387-32	TLD	Quarterly	Direct Radiation	Quarterly
OFS-6	4.9 miles SE, Pole #8426-70	TLD	Quarterly	Direct Radiation	Quarterly
OFS-7	2.5 miles S, Bridgman Substation	TLD	Quarterly	Direct Radiation	Quarterly
OFS-8	4.0 miles S, Pole #8424-20	TLD	Quarterly	Direct Radiation	Quarterly
OFS-9	4.4 miles ESE, Pole #8369-214	TLD	Quarterly	Direct Radiation	Quarterly
OFS-10	3.8 miles S, Pole #8422-152	TLD	Quarterly	Direct Radiation	Quarterly
OFS-11	3.8 miles S, Pole #8423-12	TLD	Quarterly	Direct Radiation	Quarterly
GROUNDWATER (WELL WATER) SAMPLE STATIONS					
W-1	1969 ft @ 11° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic Tritium	Quarterly Quarterly
W-2	2292 ft @ 63° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic Tritium	Quarterly Quarterly
W-3	3279 ft @ 107° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic Tritium	Quarterly Quarterly
W-4	418 ft @ 301° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic Tritium	Quarterly Quarterly
W-5	404 ft @ 290° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic Tritium	Quarterly Quarterly
W-6	424 ft @ 273° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic Tritium	Quarterly Quarterly
W-7	1895 ft @ 189° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic Tritium	Quarterly Quarterly
W-8	1208 ft @ 48° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic Tritium	Quarterly Quarterly
W-9	1523 ft @ 22° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic Tritium	Quarterly Quarterly
W-10	4305 ft @ 133° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic Tritium	Quarterly Quarterly
W-11	3308 ft @ 157° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic Tritium	Quarterly Quarterly
W-12	2678 ft @ 168° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic Tritium	Quarterly Quarterly
W-13	2153 ft @ 189° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic Tritium	Quarterly Quarterly
DRINKING WATER					
STJ	St. Joseph Public Intake Sta. 9 mi.NE	Drinking water	Daily	Gross Beta Gamma Isotopic I-131 Tritium	14 day Comp. 14 day Comp. 14 day Comp. Quart. Comp.
LTW	Lake Twp. Public Intake Sta. 0.4 mi.S	Drinking water	Daily	Gross Beta Gamma Isotopic I-131 Tritium	14 day Comp. 14 day Comp. 14 day Comp. Quart. Comp.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SAMPLE STATIONS, SAMPLE TYPES, AND SAMPLE FREQUENCIES

SAMPLE STATION	DESCRIPTION/LOCATION	SAMPLE TYPE	SAMPLE FREQUENCY	ANALYSIS TYPE	ANALYSIS FREQUENCY
SURFACE WATER					
L1	Condenser Circulating Water Intake	Surface Water	Daily	Gamma Isotopic Tritium	Month. Comp. Quart. Comp.
L2	Plant Site Boundary - South 0.3 mi. south of Plant Centerline	Surface Water	Daily	Gamma Isotopic Tritium	Month. Comp. Quart. Comp.
L3	Plant Site Boundary - North 0.2 mi. north of Plant Centerline	Surface Water	Daily	Gamma Isotopic Tritium	Month. Comp. Quart. Comp.
L4	Shoreline 0.1 mi. South of Plant Intakes	Surface Water	Daily	Gamma Isotopic Tritium	Month. Comp. Quart. Comp.
L5	Shoreline 0.1 mi. North of Plant Intakes	Surface Water	Daily	Gamma Isotopic Tritium	Month. Comp. Quart. Comp.
SEDIMENT					
L2	Plant Site Boundary - South 0.3 mi. south of Plant Centerline	Sediment	Semi-Ann.	Gamma Isotopic	Semi-Annual.
L3	Plant Site Boundary - North 0.2 mi. north of Plant Centerline	Sediment	Semi-Ann.	Gamma Isotopic	Semi-Annual.
L4	Shoreline 0.1 mi South of Plant Intakes	Sediment	Semi-Ann.	Gamma Isotopic	Semi-Annual.
L5	Shoreline 0.1 mi North of Plant Intakes	Sediment	Semi-Ann.	Gamma Isotopic	Semi-Annual.
INGESTION - MILK	Indicator Farms				
Totzke Farm	5.1 miles ENE, Baroda	Milk	Once every 15 days	I-131 Gamma Isotopic	per sample per sample
Schuler Farm	4.1 miles SE, Baroda	Milk	Once every 15 days	I-131 Gamma Isotopic	per sample per sample
Warmbein Farm	7.7 mi. S, Three Oaks	Milk	Once every 15 days	I-131 Gamma Isotopic	per sample per sample
Freehling Farm	7.0 mi. SE, Buchanan	Milk	Once every 15 days	I-131 Gamma Isotopic	per sample per sample
INGESTION - MILK	Background Farms				
Livinghouse Farm	20 miles S, La Porte, IN	Milk	Once every 15 days	I-131 Gamma Isotopic	per sample per sample
Wyant Farm	20.7 miles E, Dowagiac	Milk	Once every 15 days	I-131 Gamma Isotopic	per sample per sample
INGESTION - FISH					
ONS-N	0.3 mile N, Lake Michigan	Fish	2/year.	Gamma Isotopic	per sample
ONS-S	0.4 mile S, Lake Michigan	Fish	2/year.	Gamma Isotopic	per sample
OFS-N	3.5 mile N, Lake Michigan	Fish	2/year.	Gamma Isotopic	per sample
OFS-S	5.0 mile S, Lake Michigan	Fish	2/year.	Gamma Isotopic	per sample

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SAMPLE STATIONS, SAMPLE TYPES, AND SAMPLE FREQUENCIES

SAMPLE STATION	DESCRIPTION/LOCATION	SAMPLE TYPE	SAMPLE FREQUENCY	ANALYSIS TYPE	ANALYSIS FREQUENCY
INGESTION - FOOD PRODUCTS					
On Site	Nearest sample to Plant in the highest D/Q land sector.	Grapes	At time of harvest	Gamma Isotopic	At time of harvest
		Broad leaf vegetation	At time of harvest	Gamma Isotopic	At time of harvest
Off Site	In a land sector containing grapes, approximately 20 miles from the plant, and 180 degrees from the sector with the highest D/Q.	Grapes	At time of harvest	Gamma Isotopic	At time of harvest

Composite samples of Drinking and Surface water shall be collected at least daily. Particulate sample filters should be analyzed for gross beta activity 24 or more hours following filter removal. This will allow for radon and thoron daughter decay. If gross beta activity in air or water is greater than 10 times the yearly mean of control samples for any medium, gamma isotopic analysis should be performed on the individual samples.

If at least three indicator milk samples and one background milk sample cannot be obtained, then three indicator broad leaf samples will be collected at different locations, within eight miles of the plant, in the land sector with the highest D/Q (refers to the highest annual average D/Q). Also one background broad leaf sample will be collected approximately twenty miles from the plant in a land sector 180 degrees from the land sector with the highest D/Q.

Please note the following definitions: Weekly --> at least once per every seven (7) days
Monthly --> at least once per every thirty-one (31) days
Quarterly --> at least once per every ninety-two (92) days
Semi-annually --> at least once every one hundred eight-four (184) days

MAXIMUM VALUES FOR THE LOWER LIMITS OF DETECTION

Radionuclide	Food Product pCi/Kg wet	Water pCi/l	Milk pCi/l	Air Filter pCi/m^3	Fish pCi/Kg wet	Sediment pCi/Kg dry
Gross Beta		4*		0.01		
H-3		2000	60			
Ba-140		60	60			
La-140		15	15			
Cs-134	60	15	15	0.06	130	150
Cs-137	60	18	18	0.06	150	180
Zr-95		30				
Nb-95		15				
Mn-54		15			130	
Fe-59		30			260	
Zn-65		30			260	
Co-58		15			130	
Co-60		15			130	
I-131	60	1	1	0.07		

* LLD for drinking water

NOTES

A. The Lower Limit of Detection (LLD) is defined as the smallest concentration of radioactive material in sample that will be detected with 95% probability and 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation), the lLD is given by the equation:

$$LLD = \frac{4.66 \times S}{E \times V \times 2.22 \times Y \times e^{(-\lambda \times \Delta t)}}$$

where LLD is the a priori lower limit of detection as defined above as pCi per unit mass or volume.

S is the standard deviation of the background counting rate or of the counting of a blank sample as appropriate as counts per minute. The value of S used in the calculation of the LLD for the detection system shall be based on the actual observed variance of the background 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 spectroscopy, the background shall include the typical contributions of other radionuclides normally present in the samples (i. e. K-40 in milk samples). Analysis performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidably small sample sizes, the presence of interfering radionuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors will be identified and describes in the Annual Radiological Environmental Operating Report.

E is the counting efficiency of the detection equipment as counts per transformation (i. e. disintegration)

V is the sample size in appropriate mass or volume units

2.22 is the conversion factor from picoCuries (pCi) to transformations (disintegrations) per minute

Y is the fractional radiochemical yield as appropriate

λ is the radioactive decay constant for the particular radionuclide

Δt is the elapsed time between sample collection (or end of sample collection period) and time of counting.

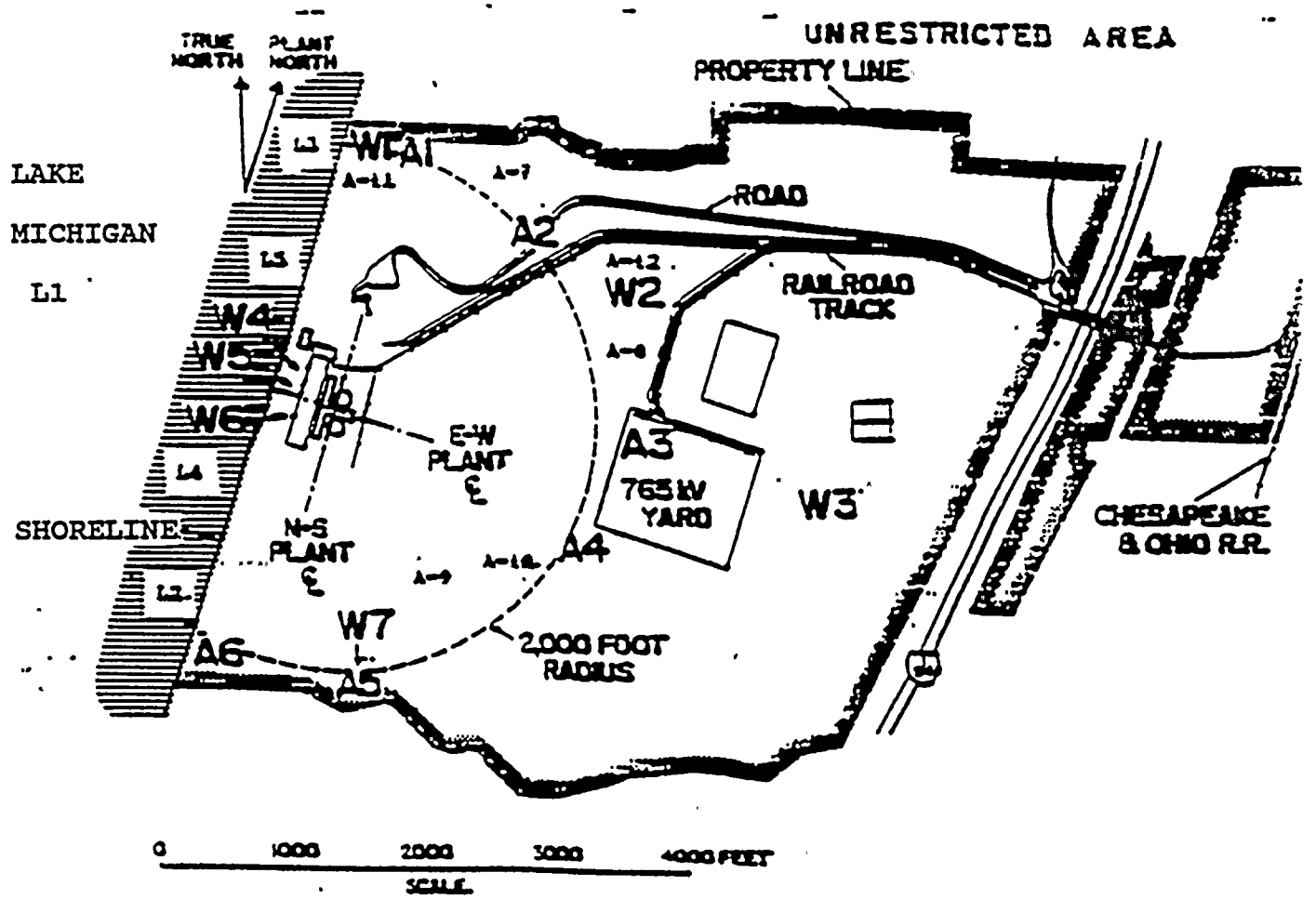
B. The LLDs given in ATTACHMENT 3.21 are for drinking water.

C. Other peaks which are measurable and identifiable, together with the radionuclides listed in ATTACHMENT 3.21, shall be identified and reported.

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATION IN ENVIRONMENTAL SAMPLES

Radionuclide	Food Product pCi/Kg wet	Water pCi/l	Milk pCi/l	Air Filter pCi/m^3	Fish pCi/Kg wet
H-3		20000			
Ba-140		200	300		
La-140		200	300		
Cs-134	1000	30	60	10.00	1000
Cs-137	2000	50	70	20.00	2000
Zr-95		400			
Nb-95		400			
Mn-54		1000			30000
Fe-59		400			10000
Zn-65		300			20000
Co-58		300			10000
Co-60		1000			30000
I-131	100	2	3	0.90	

PLANT SITE TLD, AIR AND WATER SAMPLING STATIONS.



A Air, TLD Stations

W Well Water Sample Stations

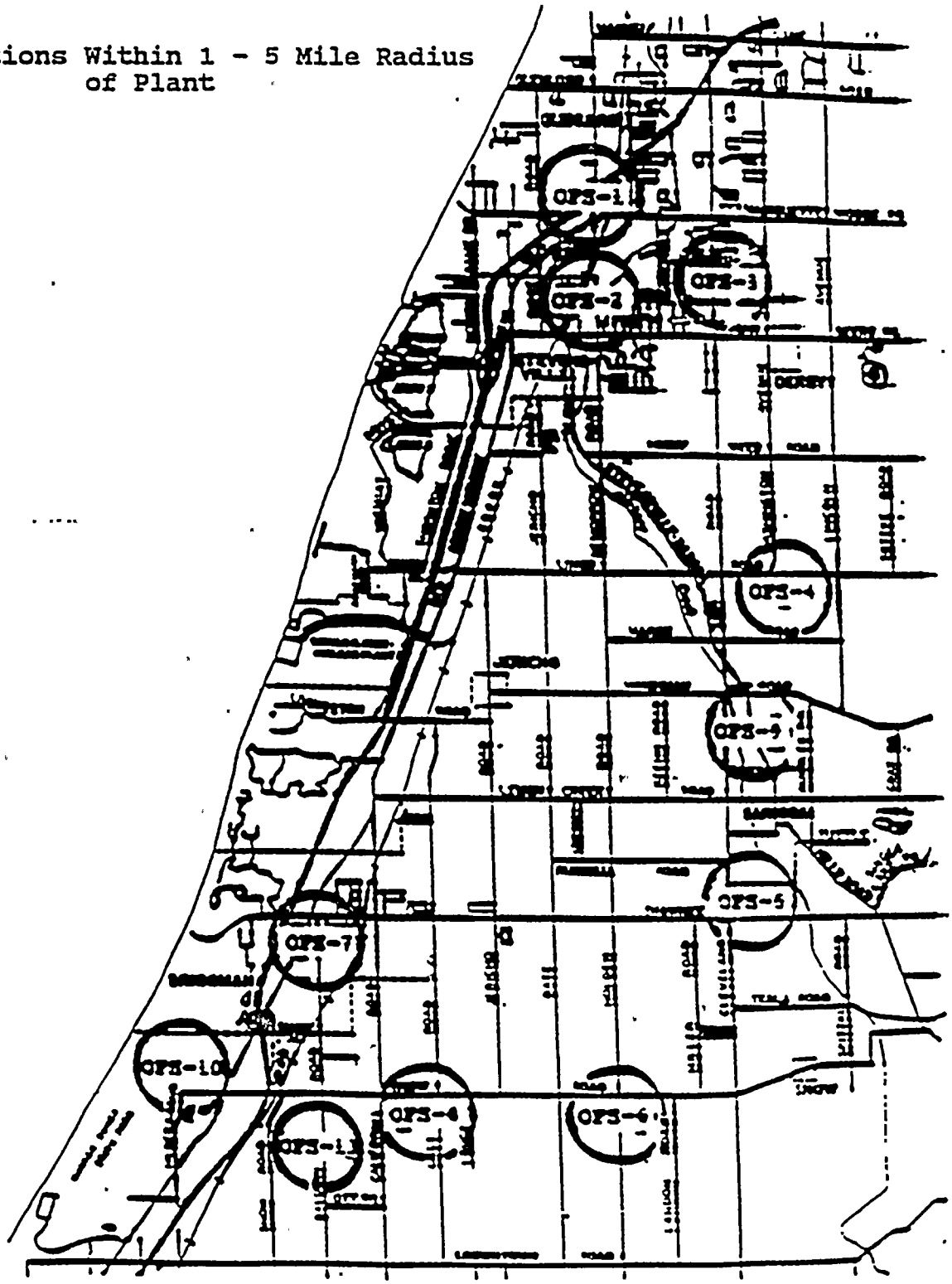
L Lake Water Sample Stations

NOTE

Stations A7 through A12 are TLD Stations only

Station L2, L3, L4 and L5 are also sediment sample stations.

TLD Stations Within 1 - 5 Mile Radius of Plant

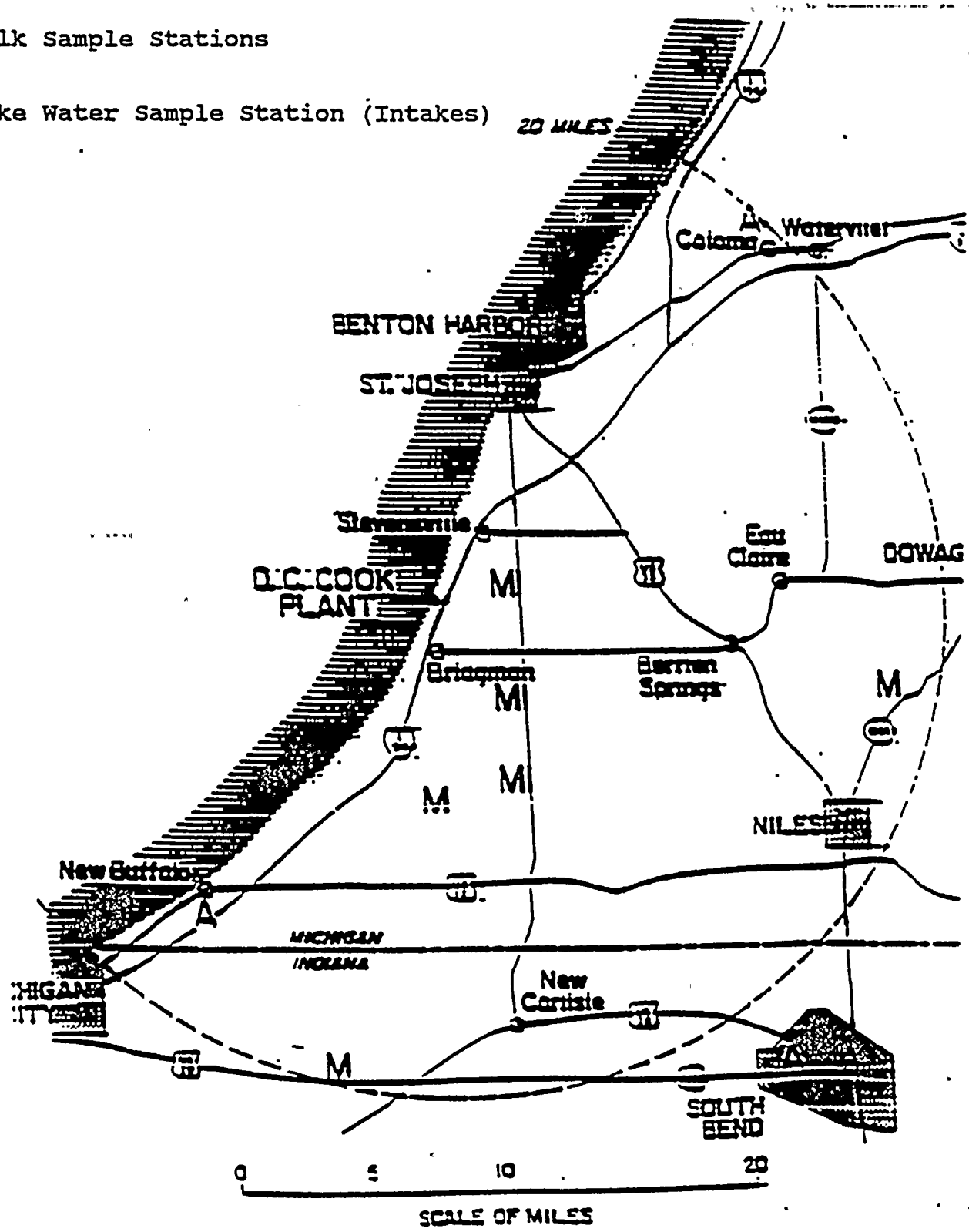


TLD, Air, Intake and Milk Sample Stations within 20 miles of Cook Plant

A - Control Air and TLD Stations

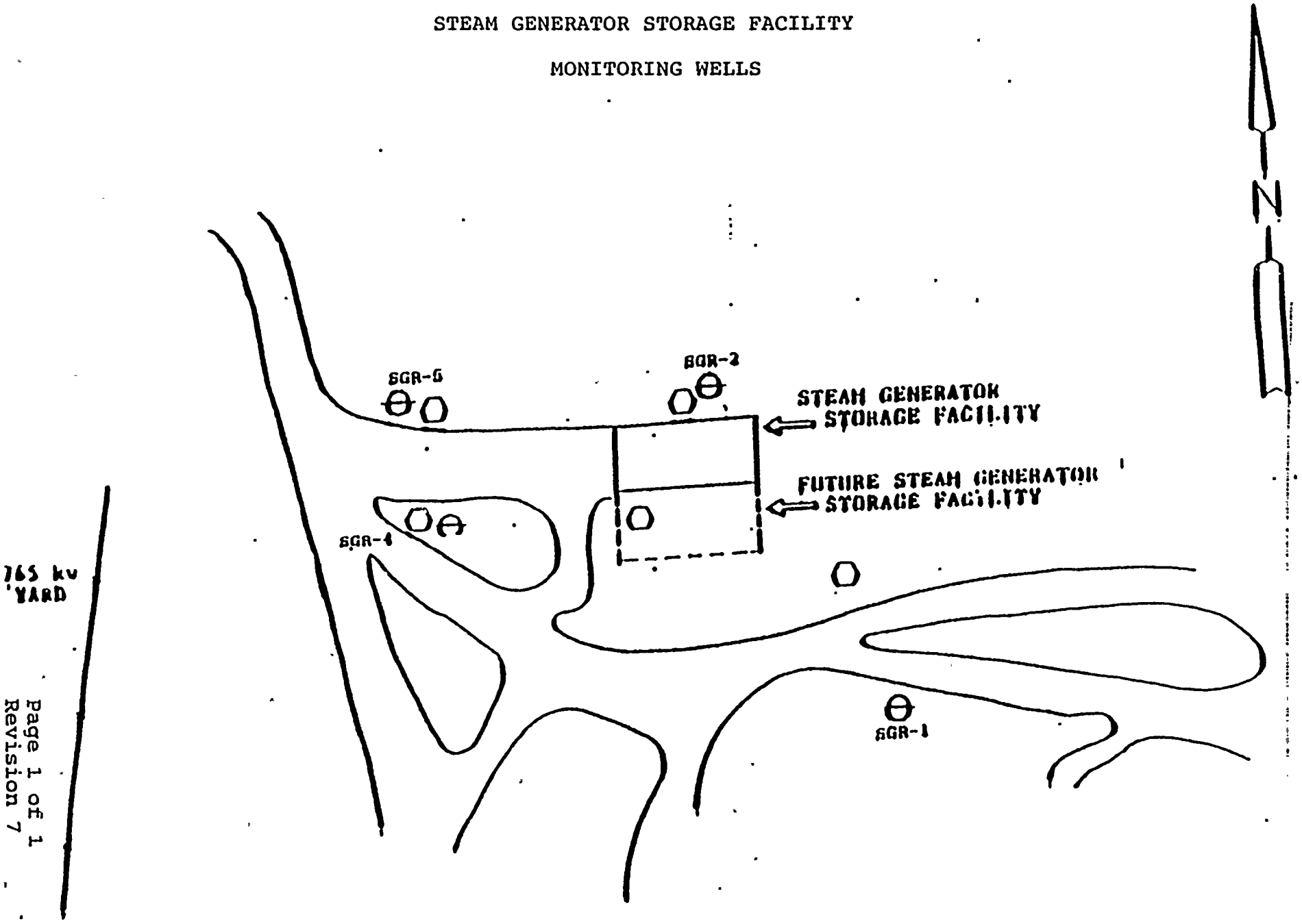
M - Milk Sample Stations

L - Lake Water Sample Station (Intakes)



STEAM GENERATOR STORAGE FACILITY

MONITORING WELLS



Φ Monitoring Wells - Monitoring Well #SGR-3 Was Not Drilled

STEAM GENERATOR STORAGE FACILITY RADIOLOGICAL MONITORING PROGRAM

SAMPLE STATIONS, SAMPLE TYPES, AND SAMPLE FREQUENCIES

SAMPLE STATION	DESCRIPTION/LOCATION	SAMPLE TYPE	SAMPLE FREQUENCY	ANALYSIS TYPE	ANALYSIS FREQUENCY
SGRP-1	0.8 mi @ 95° from Plant Axis	Groundwater	Quarterly	Gross Alpha	Quarterly
				Gross Beta	Quarterly
				Gamma Isotopic	Quarterly
SGRP-2	0.7 mi @ 92° from Plant Axis	Groundwater	Quarterly	Gross Alpha	Quarterly
				Gross Beta	Quarterly
				Gamma Isotopic	Quarterly
SGRP-4	0.7 mi @ 93° from Plant Axis	Groundwater	Quarterly	Gross Alpha	Quarterly
				Gross Beta	Quarterly
				Gamma Isotopic	Quarterly
SGRP-5	0.7 mi @ 92° from Plant Axis	Groundwater	Quarterly	Gross Alpha	Quarterly
				Gross Beta	Quarterly
				Gamma Isotopic	Quarterly