OFF-SITE DOSE CALCULATION MANUAL CHANGES

The Off-Site Dose Calculation Manual, PMP-6010-OSD-001, was revised during this 2019 reporting period. The new revision (#26) was a major revision supporting the Radiation Monitor Replacement projects, and went into effect on April 24, 2019. This revision is a transition document covering both the older monitors and the new replacements. It is anticipated that a new revision will occur in 2020 with the completion of the project to clear out the old equipment references. Revision 26 has been attached.

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Signature Comments

The only thing I found was step3.3.1.a.5 has "Error! Reference source not found., Error! Reference source not found."

Page 33, Step 3.3.2 b.1, should read vent stack noble gas channels to consistent with step 3.3.2 c.1 on page 34. Ensure the Att. 3.23 Map copies correctly
Comments provided to the procedure writer.

OFF-SITE DOSE CALCULATION MANUAL

Information		
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SUPPLEMENTS

1 PURPOSE AND SCOPE

- The Off-Site Dose Calculation Manual (ODCM) is the top tier document for the Radiological Environmental Monitoring Program (REMP), the Radioactive Effluent Controls Program (RECP), contains criteria pertaining to the previous Radiological Effluent Technical Specifications (RETS) as defined in NUREG-0472, and fully implements the requirements of Technical Specification 5.5.3, Radioactive Effluent Controls Program.

- The ODCM contains the methodologies 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 presents maps of the 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.

NOTE: Revision 26 of this document covers a transition of Radiation Monitoring System (RMS) equipment. Sections and attachments will have guidance for both the currently installed equipment and the pending Mirion replacement equipment, so users will need to verify the plant equipment status and select the appropriate guidance for that particular installed equipment. Mirion guidance will have the Mirion name or equipment ID attached.

2 DEFINITIONS AND ABBREVIATIONS

Term:	Meaning:
S or shiftly	At least once per 12 hours
D or daily	At least once per 24 hours
W or weekly	At least once per 7 days
M or monthly	At least once per 31 days
Q or quarterly	At least once per 92 days
SA or semi-annually	At least once per 184 days
R	At least once per 549 days.
S/U	Prior to each reactor startup
P	Completed prior to each release
B	At least once per 24 months
Sampling evolution	Process of changing filters or obtaining grab samples

Member(s) of Public	All persons who are not occupationally associated with the plant. Does not include employees of the utility, its contractors or its vendors. Also excluded from this category are persons who enter the site to service equipment or to make deliveries. This category does include persons who use portions of the site for recreational, occupational or other purposes not associated with the plant.
Purge/purging	The controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner that replacement air or gas is required to purify the confinement.
Source check	The qualitative assessment of Channel response when the Channel sensor is exposed to a radioactive source.
Total Fractional Level (TFL)	Total Fractional Level is defined as: $$TFL = \frac{C_{(1)}}{L_{(1)}} + \frac{C_{(2)}}{L_{(2)}} + \ldots \geq 1$$ 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, Reporting Levels for Radioactivity Concentrations in Environmental Samples. $L_{(2)}$ = Reporting Level of 2nd nuclide from Attachment 3.21, Reporting Levels for Radioactivity Concentrations in Environmental Samples.
Venting	Controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner that replacement air or gas is not provided or required. Vent, used in system names, does not imply a venting process.

3 DETAILS

3.1 Calculation of Off-Site Doses

3.1.1 Gaseous Effluent Releases

a. The computer program MIDAS (Meteorological Information and Dose Assessment System) performs the calculation of doses from effluent releases. The site-specific parameters associated with MIDAS reside in the following subprograms:

- MIDER
- MIDEX
- MIDEL
- MIDEG
- MIDEN

b. 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 land based 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 Reg. Guide 1.21 reports and 10 CFR 50 Appendix I calculations based on routine releases.

c. The formula used for the calculation of the air dose is generated from site specific parameters and Reg. Guide 1.109 (Eq 7):

$$D_\gamma, D_\beta\, air = \frac{\overline{\chi}}{Q} * \Sigma[(M_i\, or\, N_i) * Q_i * 3.17E-8]$$

Where:

D_γ , D_β air = the gamma or beta air dose in mrad/yr to an individual receptor

$\overline{\chi / Q}$ = the annual average or real time atmospheric dispersion factor over land, sec/m^3 from Attachment 3.16, 10 Year Average of 1995-2004 Data

M_i = the gamma air dose factor, mrad m^3 / yr μCi, from Attachment 3.18, Dose Factors

N_i = the beta air dose factor, mrad m^3 / yr μCi, from Attachment 3.18, Dose Factors

Q_i = the release rate of radionuclide, "i", in μCi/yr. Quantities are determined utilizing typical concentration times volumes equations that are documented in 12-THP-6010-RPP-601, Preparation of the Annual Radioactive Effluent Release Report.

3.17E-8 = number of years in a second (years/second).

d. The value for the ground average $\overline{\chi / Q}$ for each sector is calculated using equations shown below. Formula used for the calculation is generated from parameters contained in MIDAS Technical Manual, XDCALC (Eq 2).

$$\overline{\chi/Q} = \frac{2.03}{\bar{u}_{m_g} * x * \Sigma_g} * T_f$$

Where:

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

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

$\bar{u}_{m_g}$ = wind speed for ground release, (meters/second)

σ_{z_g} = vertical dispersion coefficient for ground release, (meters), (Reg. Guide 1.111 Fig.1)

H_c = building height (meters) from parameter 28 of MIDER. (Containment Building = 49.4 meters)

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

2.03 = $\sqrt{2 \div \pi} \div 0.393\ radians\ (22.5°)$

e. 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 radionuclide for each pathway, organ, age group, distance and direction.

f. Calculations are based on the environmental pathways-to-man models in Reg. Guide 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.

g. The formulas used for the following calculations are generated from site specific parameters and Reg. Guide 1.109:

1. Total Body Plume Pathway (Eq 10)

$$Dose\,(mrem/year) = 3.17E\text{-}8 * \sum (Q_i * \overline{\chi/Q} * S_f * DFB_i)$$

Where:

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 Reg. Guide 1.109)

DFB_i = the whole body dose factor from Table B-1 of Reg. Guide 1.109, mrem - m^3 per μCi - yr. See Attachment 3.18, Dose Factors.

Q_i = the release rate of radionuclide "i", in μCi/yr

2. Skin Plume Pathway (Eq 11)

$$Dose\,(mrem/yr) = 3.17E\text{-}8 * S_f * \frac{\overline{\chi}}{Q} * [\sum(Q_i * 1.11 * DF_i^{\gamma}) + \sum(Q_i * DFS_i)]$$

Where:

1.11 = conversion factor, tissue to air, mrem/mrad

DF_i^{γ} = the gamma air dose factor for a uniform semi-infinite cloud of radionuclide "i", in mrad m^3/μCi yr from Table B-1, Reg. Guide 1.109. See Attachment 3.18, Dose Factors.

DFS_i = the beta skin dose factor for a semi-infinite cloud of radionuclide "i", in mrem m^3/μCi yr from Table B-1, Reg. Guide 1.109. See Attachment 3.18, Dose Factors.

3. Radionuclide and Radioactive Particulate Doses (Eq 13 & 14)

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

$$D_{IP}\,(mrem/year) = 3.17E - 8 * \Sigma(R_i * W * Q_{ic})$$

Where:

R_i = the most restrictive dose factor for each identified radionuclide "i", in m^2 mrem sec / yr μCi (for food and ground pathways) or mrem m^3 / yr μCi (for inhalation pathway), for the appropriate pathway

For sectors with existing pathways within five miles of the site, use the values of R_i for these real pathways, otherwise use pathways distance of five miles. See Attachment 3.1, Dose Factors for Various Pathways, 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

-OR-

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

Q_{ic} = the release rate of those radioiodines, radioactive materials in particulate form and radionuclides other than noble gases with half-lives greater than eight days, in μCi/yr

h. 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.

i. In addition to the above routines, the QUICKG routine of the MIDAS system may be used to provide data used in the monthly reports due to its ability to use annual average meteorological data rather than real time data, thus shortening the run time involved.

j. Carbon-14 (C-14) supplemental information

1. The quantity of C-14 released to the environment may be estimated by use of a C-14 source term scaling factor based on power generation (Ref. RG 1.21, Revision 2). A recent study recommends a source term scaling factor of approximately 9.0 to 9.8 Curies/GWe-yr for a Westinghouse Pressurized Water Reactor (Ref. EPRI 1021106 "Estimation of Carbon-14 in Nuclear Plant Gaseous Effluents" December 23, 2010). For this method, a scaling factor of 9.4 Curies/GWe-yr shall be used.

2. C-14 releases from PWRs occur primarily as a mix of organic carbon (methane) and inorganic carbon (carbon dioxide). For this method, an average organic fraction of 80% with the remaining 20% being assumed as carbon dioxide shall be used.

3. Dose is calculated utilizing the methodology prescribed in RG 1.109 Appendix C, with the vegetation dose being the most predominant. Adjustments for growing seasons, percentage of C-14 generated assumed released from the reactor coolant in gaseous form via batch releases, seasonal $\overline{\chi / Q}$, and other industry methodologies being considered by the NRC may be applied as desired should their acceptance of these methods occur.

k. Steam Generator Blowdown System (Start Up Flash Tank Vent)

1. The amount of radioiodine and other radionuclides that are released via the startup flash tank and its vent are calculated through actual sample results while the startup flash tank is in service.

2. The following calculation is performed to determine the amount of curies released through this pathway. (Plant established formula.)

$$Curies = \frac{\mu Ci}{ml} * GPM * time\ on\ flashtank\,(\min) * 3.785E\text{-}3$$

Where: 3.785E-3 = conversion factor, ml Ci/μCi gal.

3. The flow rate is determined from the blowdown valve position and the time on the startup flash tank, or using installed plant blowdown flow instrumentation. Chemistry Department performs the sampling and analysis of the samples.

4. This data is provided to the MIDAS computer and dose calculations (liquid and gas) are performed to ensure compliance with Subsection 3.2, Limits of Operation and Surveillances of the Effluent Release Points, dose limits. MIDAS uses the formulas given in step 3.1.2, Liquid Effluent Releases, to calculate doses to members of the public.

NOTE:	This section provides the minimum requirements to be followed at Donald C. Cook Nuclear Plant. This would be used if actual sample data was not available each time the startup flash tank was in service.

5. 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 μCi/g dose equivalent I-131.

6. **IF** the specific activity of the secondary coolant system is less than 0.01 μCi/g dose equivalent I-131, **THEN** the release rate must be determined once every six months. Use the following plant established equation:

$$Q_y = Ci * \quad IPF * \quad R_{sgb}$$

Where:

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

Ci = the concentration (μCi/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

Rsgb = the steam generator blowdown rate to the startup flash tank, in cc/sec

7. Use the calculated release rate in monthly dose projections until the next determination to ensure compliance with Subsection 3.2, Limits of Operation and Surveillances of the Effluent Release Points, dose limits. Report the release rate calculations in the Annual Radioactive Effluent Release Report.

3.1.2 Liquid Effluent Releases

a. 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).

b. To calculate the individual dose (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 can be selected using the MIDEL program and changing the values in parameter 1. D.C. Cook Nuclear Plant uses 3 pathways: potable water, shoreline, and aquatic foods (fresh water sport fishing).

c. Steam Generators are typically sparged, sampled, and drained as batches usually early in outages to facilitate cooldown for entry into the steam generator. This is also typically repeated prior to startup to improve steam generator chemistry for the startup. The sample stream, if being routed to the operating unit blowdown, is classified as a continuous release for quantification purposes to maintain uniformity with this defined pathway.

d. The equations used are generated from site specific data and Reg. Guide 1.109. They are as follows:

1. Potable Water (Eq 1)

$$R_{apj} = 1100 * \frac{U_{ap}}{M_P * F * 2.23E-3} * \sum_i Q_i * D_{aipj} e^{-\lambda_i t_P}$$

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

1100 = conversion factor, yr ft^3 ρCi / Ci sec L

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 Reg. Guide 1.109 Table E-5. See Attachment 3.1, Dose Factors for Various Pathways.

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 circulation water system water flow rate, in gpm, is used for evaluating dose via these pathways as dilution flow

2.23E-3 = conversion factor, ft^3 min / sec gal

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/ρCi. These values are taken from tables E-11 through E-14 of Reg. Guide 1.109 and are located within the MIDAS code.

λ_i = the radioactive decay constant for radionuclide "i", in $hours^{-1}$

t_p = the average transit time required for nuclides to reach the point of exposure, 12 hours. This allows for nuclide transport through the water purification plant and the water distribution system. 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. (t_p = 12 hours)

2. Aquatic Foods (Eq 2)

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

Where:

B_{ip} = the equilibrium bioaccumulation factor for nuclide "i" in pathway "p", expressed as ρCi L / kg ρCi. The factors are located within the MIDAS code and are taken from Table A-1 of Reg. Guide 1.109. See Attachment 3.1, Dose Factors for Various Pathways.

t_p = the average transit time required for nuclides to reach the point of exposure, 24 hours. This allows for decay during transit through the food chain, as well as during food preparation. Given as #26 of parameter 4 in MIDEL. (t_p = 24 hours)

M_p = the dilution factor at the point of exposure, 1.0 for Aquatic Foods. Given in parameter 5 of MIDEL as 1.0.

3. Shoreline Deposits (Eq 3)

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

Where:

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

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

D_{aipj} = the dose factor for standing on contaminated ground, in mrem m^2 / hr ρCi. The values are taken from table E-6 of Reg. Guide 1.109 and are located within the MIDAS code. See Attachment 3.1, Dose Factors for Various Pathways.

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.

110,000 = conversion factor yr ft^3 ρCi / Ci sec m^2 day, this accounts for proportionality constant in the sediment radioactivity model

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.

e. The MIDAS program uses the following plant specific parameters, which are entered by the operator.

1. Irrigation rate = 0
2. Fraction of time on pasture = 0
3. Fraction of feed on pasture = 0
4. Shore width factor = 0.3 (from Reg. Guide 1.109, Table A-2)

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

g. 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 summary table. Each line is compared with the appropriate dose limit. The table provides a concise summary of off-site environmental dose calculations for inclusion in Annual Radioactive Effluent Release Reports, required by Reg. Guide 1.21.

NOTE: The performance of each surveillance requirement must be within the specified time interval with a maximum allowable extension not to exceed 25% of the specified surveillance interval.

3.2 Limits of Operation and Surveillances of the Effluent Release Points

3.2.1 Radioactive Liquid Effluent Monitoring Instrumentation

a. The radioactive liquid effluent monitoring instrumentation channels shown in Attachment 3.2, Radioactive Liquid Effluent Monitoring Instruments, are operable with their alarm/trip setpoints set to ensure that the limits of step 3.2.3a, Concentration Excluding Releases via the Turbine Room Sump (TRS) Discharge, are not exceeded.

b. The applicability of each channel is shown in Attachment 3.2, Radioactive Liquid Effluent Monitoring Instruments.

c. With a radioactive liquid effluent monitoring instrumentation channel alarm/trip setpoint less conservative than a value which will ensure the limits of step 3.2.3a, Concentration Excluding Releases via the Turbine Room Sump (TRS) Discharge, are met without delay, suspend the release of radioactive liquid effluents monitored by the affected channel and reset or declare the monitor inoperable.

d. With less than the minimum number of radioactive liquid effluent monitoring instrumentation channels operable, take the applicable action shown in Attachment 3.2, Radioactive Liquid Effluent Monitoring Instruments, with a maximum allowable extension not to exceed 25% of the surveillance interval, excluding the initial performance.

e. Determine the setpoints in accordance with the methodology described in step 3.3.1, Liquid Monitors. Record the setpoints.

f. Demonstrate each radioactive liquid effluent monitoring instrumentation channel is operable by performing the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION and CHANNEL OPERATIONAL TEST at the frequencies shown in Attachment 3.3, Radioactive Liquid Effluent Monitoring Instrumentation Surveillance Requirements.

BASES - LIQUID

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in liquid effluents during actual or potential releases. The alarm/trip setpoints for these instruments shall be calculated in accordance with NRC approved methods in the ODCM to ensure the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria specified in Section 11.3 of the Final Safety Analysis Report for the Donald C. Cook Nuclear Plant. Due to the location of the ESW monitors, outlet line of containment spray heat exchanger (typically out of service), weekly sampling is required of the ESW system for radioactivity. This is necessary to ensure monitoring of a CCW to ESW system leak. [Ref 5.2.1hh]

3.2.2 Radioactive Gaseous Effluent Monitoring Instrumentation

a. The radioactive gaseous process and effluent monitoring instrumentation channels shown in Attachment 3.4, Radioactive Gaseous Effluent Monitoring Instrumentation, are operable with their alarm/trip setpoints set to ensure that the limits of step 3.2.4a, Dose Rate, are not exceeded.

b. The applicability of each channel is shown in Attachment 3.4, Radioactive Gaseous Effluent Monitoring Instrumentation.

c. 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 step 3.2.4a, Dose Rate, are met, without delay, suspend the release of radioactive gaseous effluents monitored by the affected channel and reset or declare the channel inoperable.

d. With less than the minimum number of radioactive gaseous effluent monitoring instrumentation channels operable, take the action shown in Attachment 3.4, Radioactive Gaseous Effluent Monitoring Instrumentation, with a maximum allowable extension not to exceed 25% of the surveillance interval, excluding the initial performance.

NOTE:	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.

e. Determine the setpoints in accordance with the methodology as described in step 3.3.2, Gaseous Monitors. Record the setpoints.

f. Demonstrate each radioactive gaseous process or effluent monitoring instrumentation channel is operable by performing the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and CHANNEL OPERATIONAL TEST operations at the frequencies shown in Attachment 3.5, Radioactive Gaseous Effluent Monitoring Instrumentation Surveillance Requirements.

BASES - GASEOUS

The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases. The alarm/trip setpoints for these instruments shall be calculated in accordance with NRC approved methods in the ODCM to ensure the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria specified in Section 11.3 of the Final Safety Analysis Report for the Donald C. Cook Nuclear Plant.

3.2.3 Liquid Effluents

a. Concentration Excluding Releases via the Turbine Room Sump (TRS) Discharge

1. Limit the concentration of radioactive material released via the Batch Release Tanks or Plant Continuous Releases (excluding only TRS discharge to the Absorption Pond) to unrestricted areas to the concentrations in 10 CFR 20, Appendix B, Table 2, Column 2, for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, limit the concentration to 2E-4 μCi/ml total activity.

2. With the concentration of radioactive material released from the site via the Batch Release Tanks or Plant Continuous Releases (other than the TRS to the Absorption Pond) exceeding the above limits, without delay restore the concentration to within the above limits.

3. Sample and analyze radioactive liquid wastes according to the sampling and analysis program of Attachment 3.6, Radioactive Liquid Waste Sampling and Analysis Program.

4. Use the results of radioactive analysis in accordance with the methods of this document to assure that all concentrations at the point of release are maintained within limits.

b. Concentration of Releases from the TRS Discharge

1. Limit releases via the TRS discharge to the on-site Absorption Pond to the concentrations specified in 10 CFR 20, Appendix B, Table 2, Column 2. For dissolved or entrained noble gases, limit the concentration to 2E-4 μCi/ml total activity.

2. With releases from the TRS exceeding the above limits, perform a dose projection due to liquid releases to UNRESTRICTED AREAS to determine if the limits of step 3.2.3c.1 have been exceeded. If the dose limits have been exceeded, follow the directions in step 3.2.3c.2, as applicable.

3. Sample and analyze radioactive liquid wastes according to the program in Attachment 3.6, Radioactive Liquid Waste Sampling and Analysis Program.

4. Use the results of radioactive analysis in accordance with the methods of this document to assure that all concentrations at the point of release are maintained within the limits stated above.

c. Dose

1. Limit the dose or dose commitment to an individual from radioactive material in liquid effluents released to unrestricted areas during any calendar quarter to ≤ 1.5 mrem/unit to the total body and to ≤ 5 mrem/unit to any organ, and during any calendar year to ≤ 3 mrem/unit to the total body and to ≤ 10 mrem/unit to any organ.

2. With the calculated release of radioactive materials in liquid effluents exceeding ten times any of the limits in Steps 3.2.3a or 3.2.3b, or exceeding 3.2.3c.1 above, prepare and submit a Written Report, pursuant to 10 CFR 20.2203, within 30 days after learning of the event. This report must describe the extent of exposure of individuals to radiation and radioactive material, including, as appropriate:

   a) Estimate of each individual's dose. This is to include the radiological impacts on finished drinking water supplies with regard to the requirements of 40 CFR 141, Safe Drinking Water Act (applicable due to Lake Township water treatment facility),
   b) Levels of radiation and concentration of radioactive material involved,
   c) Cause of elevated exposures, dose rates or concentrations, **-AND-**
   d) Corrective steps taken or planned to ensure against recurrence, including schedule for achieving conformance with applicable limits.

   These reports must be formatted in accordance with PMP-7030-001-002, Licensee Event Reports, Special and Routine Reports, even though this is not an LER.

3. Determine cumulative and projected dose contributions from liquid effluents 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.

d. Liquid Radwaste Treatment System

1. Use the liquid radwaste treatment system to reduce the radioactive materials in liquid wastes prior to their discharge when the projected doses due to the liquid effluent from the site when averaged over 31 days, would exceed 0.12 mrem (0.06 mrem/unit x 2 units) to the total body or 0.4 mrem (0.2 mrem/unit x 2 units) to any organ.

2. Project doses due to liquid releases to UNRESTRICTED AREAS at least once per 31 days, in accordance with this document.

e. During times of primary to secondary leakage, the use of the startup flash tank should be minimized to reduce the release of curies from the secondary system and to maintain the dose to the public ALARA.

Drainage of high conductivity water (Component Cooling Water and ice melt water containing sodium tetraborate) shall be evaluated to decide whether it should be drained to waste (small volumes only), the Turbine Room Sump (low activity water only) or routed without demineralization processing to a monitor tank for release. This is necessary in order to minimize the detrimental effect that high conductivity water has on the radioactive wastewater demineralization system. The standard concentration and volume equation can be utilized to determine the impact on each method and is given here. The units for concentration and volume need to be consistent across the equation:

$$(C_i)(V_i) + (C_a)(V_a) = (C_t)(V_t)$$

Where:

C_i = the initial concentration of the system being added to
V_i = the initial volume of the system being added to
C_a = the concentration of the water that is being added to the system
V_a = the volume of the water that is being added to the system
C_t = the final concentration of the system after the addition
V_t = the final volume of the system after the addition

The intent is to keep the:

- WDS below 500 μmhos/cc.
- TRS below 1E-5 μC/cc.
- Monitor Tank release ALARA to members of the public.

Wastewater leakage into the liquid waste disposal system will be monitored routinely. In the event the leak rate is determined to be over two gallons per minute (the assumed plant design leakage based on the original 2 gpm waste evaporator), increased scrutiny will be placed on locating in-leakage, timeliness of job order activities, and/or activities causing increased production of waste water.

BASES – CONCENTRATION

This specification is provided to ensure the concentration of radioactive materials released in liquid waste effluents from the site to unrestricted areas will be less than the concentration levels specified in 10 CFR Part 20, Appendix B, Table 2. This limitation provides additional assurance that the levels of radioactive materials in bodies of water outside the site will not result in exposures greater than 1) the Section II.A design objectives of Appendix I, 10 CFR Part 50, to an individual and 2) the limits of 10 CFR Part 20. The concentration limit for noble gasses is based upon the assumption that Xe-135 is the controlling radionuclide and its Effluent Concentration Unit in air (submersion) was converted to an equivalent concentration in water using the methods described in the International Commission on Radiological Protection (ICRP) Publication 2.

DOSE

This specification is provided to implement the requirements of Sections II.A, III.A, and IV.A of Appendix I, 10 CFR Part 50. The dose limits implement the guides set forth in Section II.A of Appendix I. The ACTION statements provide the required operating flexibility and at the same time, implement the guides set forth in Section IV.A of Appendix I to assure the releases of radioactive material in liquid effluents will be kept "as low as is reasonably achievable". Also, for fresh water sites with drinking water supplies which can be potentially affected by plant operations, there is reasonable assurance that the operation of the facility will not result in radionuclide concentrations in the finished drinking water that are in excess of the requirements of 40 CFR 141. The dose calculations in the ODCM implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The equations specified in the ODCM for calculating the doses due to the actual release rates of radioactive materials in liquid effluents, will be consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", Revision 1, October 1977, and Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I", April 1977. NUREG-0133 provides methods for dose calculations consistent with Regulatory Guide 1.109 and 1.113.

This specification applies to the release of liquid effluents from each reactor at the site. The liquid effluents from the shared system are proportioned among the units sharing the system.

. LIQUID WASTE TREATMENT

The operability of the liquid radwaste treatment system ensures that this system will be available for use whenever liquid effluents require treatment prior to release to the environment. The requirements that the appropriate portions of this system be used when specified provide assurance that the releases of radioactive materials in liquid effluents will be kept "as low as is reasonably achievable". This specification implements the requirements of 10 CFR Part 50.36a, General Design Criteria Section 11.1 of the Final Safety Analysis Report for the Donald C. Cook Nuclear Plant, and design objective Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the liquid radwaste treatment system were specified as a suitable fraction of the dose design objectives set forth in Section II.A of Appendix I, 10 CFR Part 50, for liquid effluents.

3.2.4 Gaseous Effluents

a. Dose Rate

1. Limit the dose rate due to radioactive materials released in gaseous effluents from the site to ≤ 500 mrem/yr to the total body and ≤ 3000 mrem/yr to the skin for noble gases. Limit 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 eight days to ≤ 1500 mrem/yr to any organ.

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

3. Determine the dose rate due to noble gases in gaseous effluents to be within the above limits in accordance with the methods and procedures described in this document.

4. Determine the dose rate due to radioactive materials, other than noble gases, in gaseous effluents 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, Radioactive Gaseous Waste Sampling and Analysis Program.

b. Dose - Noble Gases

1. Limit the air dose in unrestricted areas due to noble gases released in gaseous effluents during any calendar quarter, to ≤ 5 mrad/unit for gamma radiation and ≤ 10 mrad/unit for beta radiation and during any calendar year, to ≤ 10 mrad/unit for gamma radiation and ≤ 20 mrad/unit for beta radiation.

2. With the calculated air dose from radioactive noble gases in gaseous effluents exceeding any of the above limits, prepare and submit a Written Report, pursuant to 10 CFR 20.2203 and addressed in step 3.2.3c.2, within 30 days after learning of the event.

3. Determine cumulative and projected dose contributions for the total time period in accordance with this document at least once every 31 days.

c. Dose – Iodine-131, Iodine-133, Tritium, and Radioactive Material in Particulate Form

1. Limit 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 eight days in gaseous effluents released to unrestricted areas (site boundary) to the following:

   a) During any calendar quarter to less than or equal to 7.5 mrem/unit to any organ

   b) During any calendar year to less than or equal to 15 mrem/unit to any organ.

2. 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 a Written Report, pursuant to 10 CFR 20.2203 and addressed in step 3.2.3c.2, within 30 days after learning of the event.

3. Determine cumulative and projected dose contributions for the total time period in accordance with this document at least once every 31 days.

d. Gaseous Radwaste Treatment

1. The UFSAR (Updated Final Safety Analysis Report) states that radioactive waste gas should be held for 45 days of decay time.

2. Use the gaseous radwaste treatment system and the ventilation exhaust treatment system 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 when averaged over 31 days, would exceed 0.4 mrad (0.2 mrad/unit x 2 units) for gamma radiation and 0.8 mrad (0.4 mrad/unit x 2 units) for beta radiation. Use the ventilation exhaust treatment system to reduce radioactive materials in gaseous waste prior to their discharge when the projected doses due to gaseous effluent releases to unrestricted areas when averaged over 31 days would exceed 0.3 mrem/unit to any organ.

3. Project doses due to gaseous releases to UNRESTRICTED AREAS at least once per 31 days in accordance with this document.

BASES -- GASEOUS EFFLUENTS

This specification provides reasonable assurance that radioactive material discharged in gaseous effluents will not result in the exposure of a Member of the Public in an unrestricted area, either at or beyond the site boundary in excess of the design objectives of appendix I to 10 CFR 50. This specification is provided to ensure that gaseous effluents from all units on the site will be appropriately controlled. It provides operational flexibility for releasing gaseous effluents to satisfy the Section II.A and II.C design objectives of appendix I to 10 CFR 50. For individuals who may at times be within the site boundary, the occupancy of the individual will be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the site boundary. The specified instantaneous release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to an individual at or beyond the site boundary to ≤ 500 mrem/yr to the total body or to ≤ 3000 mrem/yr to the skin. These instantaneous release rate limits also restrict, at all times, the corresponding thyroid dose rate above background to a child via the inhalation pathway to ≤ 1500 mrem/yr. Limitations on the dose rate resulting from radioactive material released in gaseous effluents to areas beyond the site boundary conforming to the doses associated with 10 CFR 20, Appendix B, Table 2, Column 1.

This specification applies to the release of gaseous effluents from all reactors at the site. The gaseous effluents from the shared system are proportioned among the units sharing that system.

DOSE, NOBLE GASES

This specification is provided to implement the requirements of Sections II.B, III.A, and IV.A of Appendix I, 10 CFR Part 50. The dose limits implement the guides set forth in Section II.B of Appendix I.

The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents will be kept “as low as is reasonably achievable”. The Surveillance Requirements implement the requirements in Section III.A of Appendix I that conform with the guides of Appendix I to be shown by calculational procedures based on models and data such that the actual exposure of an individual through the appropriate pathways is unlikely to be substantially underestimated. The dose calculations established in the ODCM for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents will be consistent with the methodology provided in Regulatory Guide 1.109, “Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I”, Revision 1, October 1977 and Regulatory Guide 1.111, “Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors”, Revision 1, July 1977. The ODCM equations provided for determining the air doses at the site boundary will be based upon the historical average atmospherical conditions. NUREG-0133 provides methods for dose calculations consistent with Regulatory Guides 1.109 and 1.111.

DOSE, RADIOIODINES, RADIOACTIVE MATERIAL IN PARTICULATE FORM, AND RADIONUCLIDES OTHER THAN NOBLE GASES

This specification is provided to implement the requirements of Sections II.C, III.A, and IV.A of Appendix I, 10 CFR Part 50. The dose limits are the guides set forth in Section II.C of Appendix I.

The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents will be kept "as low as is reasonably achievable". The ODCM calculational methods specified in the surveillance requirements implement the requirements in Section III.A of Appendix I that conform with the guides of Appendix I to be shown by calculational procedures based on models and data such that the actual exposure of an individual through the appropriate pathways is unlikely to be substantially underestimated. The ODCM calculational methods approved by the NRC for calculating the doses due to the actual release rates of the subject materials are required to be consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors", Revision 1, July 1977. These equations also provide the methodology for determining the actual doses based upon the historical average atmospheric conditions. The release rate specifications for radioiodines, radioactive material in particulate form, and radionuclides, other than noble gases, are dependent on the existing radionuclide pathways to man, in the unrestricted area. The pathways which are examined in the development of these calculations are: 1) individual inhalation of airborne radionuclides, 2) deposition of radionuclides onto green leafy vegetation with subsequent consumption by man, 3) deposition onto grassy areas where milk animals and meat producing animals graze with consumption of the milk and meat by man, and 4) deposition on the ground with subsequent exposure of man.

GASEOUS WASTE TREATMENT

The operability of the gaseous radwaste treatment system and the ventilation exhaust treatment systems ensures that the systems will be available for use whenever gaseous effluents require treatment prior to release to the environment. The requirement that the appropriate portions of these systems be used when specified provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable". This specification implements the requirements of 10 CFR Part 50.36a, General Design Criterion Section 11.1 of the Final Safety Analysis Report for the Donald C. Cook Nuclear Plant, and design objective Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the systems were specified as a suitable fraction of the guides forth in Sections II.B and II.C of Appendix I, 10 CFR Part 50, for gaseous effluents.

3.2.5 Radioactive Effluents - Total Dose

a. 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.

b. With the calculated doses from the release of radioactive materials in liquid or gaseous effluents exceeding twice the limits of steps 3.2.3c (Dose), 3.2.4b (Dose - Noble Gases), or 3.2.4c (Dose – Iodine-131, Iodine-133, Tritium, and Radioactive Material in Particulate Form) during any calendar quarter, perform the following:

- Investigate and identify the causes for such release rates;
- Define and initiate a program for corrective action;
- Report these actions to the NRC within 30 days from the end of the quarter during which the release occurred.

IF the estimated dose(s) exceeds the limits above, and **IF** the release condition resulting in violation has not already been corrected prior to violation of 40 CFR 190, **THEN** include in the report 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 50, as addressed in other sections of this document.

c. Determine cumulative dose contributions from liquid and gaseous effluents in accordance with this document (including steps 3.2.3c [Dose], 3.2.4b [Dose - Noble Gases], or 3.2.4c [Dose – Iodine-131, Iodine-133, Tritium, and Radioactive Material in Particulate Form]).

BASES -- TOTAL DOSE

This specification is provided to meet the dose limitations of 40 CFR 190. The specification requires the preparation and submittal of a Special Report whenever the calculated doses from plant radioactive effluents exceed twice the design objective doses of Appendix I. For sites containing up to 4 reactors, it is highly unlikely that the resultant dose to a member of the public will exceed the dose limits of 40 CFR 190 if the individual reactors remain within the reporting requirement level. The Special Report will describe a course of action, which should result in the limitations of dose to a member of the public for 12 consecutive months to within the 40 CFR 190 limits. For the purposes of the Special Report, it may be assumed that the dose commitment to any member of the public from other uranium fuel cycle sources is negligible with the exception that dose contributions from other nuclear fuel cycle facilities at the same site or within a radius of 5 miles must be considered. If the dose to any member of the public is estimated to exceed the requirements of 40 CFR 190, the Special Report with a request for a variance (provided the release conditions resulting in violation of 40 CFR 190 have not already been corrected, in accordance with the provision of 40 CFR 190.11), is considered to be a timely request and fulfills the requirements of 40 CFR 190 until NRC staff action is completed. An individual is not considered a member of the public during any period in which he/she is engaged in carrying out any operation, which is part of the nuclear fuel cycle.

3.3 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 10 CFR 20, Appendix B, Table 2. Establish setpoints 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 setpoint calculations is the multiple release point (MRP) factor. The MRP is a factor used such that when all the releases are integrated, the applicable LIMIT value will not be exceeded. 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 Attachment 3.8, Multiple Release Point Factors for Release Points.

The Site stance on instrument uncertainty is taken from HPPOS-223, Consideration of Measurement Uncertainty When Measuring Radiation Levels Approaching Regulatory Limits, which states the NRC position is the result of a valid measurement obtained by a method, which provides a reasonable demonstration of compliance. This value should be accepted and the uncertainty in that measured value need not be considered.

3.3.1 Liquid Monitors

Establish liquid monitor setpoints for each monitor of the liquid effluent release systems. A schematic of the liquid effluent release systems is shown as Attachment 3.9, Liquid Effluent Release Systems. A list of the Plant Liquid Effluent Parameters is in Attachment 3.10, Plant Liquid Effluent Parameters. The details of each system design and operation can be found in the system descriptions. The setpoints are intended to keep releases within the limits of 10 CFR 20, Appendix B, Table 2, Column 2. Determine setpoints using either the batch or the continuous methodology.

a. Liquid Batch Monitor Setpoint Methodology

1. There is only one monitor (two following the RMS upgrades) used on the Waste Disposal System for liquid batch releases. This monitor is identified as RRS-1000 (RRS-1001-A [primary] and RRS-1001-B [back-up] following upgrade). Steam Generator Blowdown radiation monitors also can be used to monitor batch releases while draining steam generators. The function of these monitors 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 and dilution flow rates are then adjusted to keep the release within the limits of 10 CFR 20. Based on the concentrations of nuclides in the release, the count rate on the monitor can be predicted. The high alarm setpoint can then be set above the predicted value up to the maximum setpoint of the system.

2. 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, Radioactive Liquid Waste Sampling and Analysis Program.

3. The allowable release flow rates are determined in order to keep the release concentrations within the requirements of 10 CFR 20, Appendix B, Table 2, Column 2. The equation to calculate the flow rate is from Addendum AA1 of NUREG-0133:

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

Where:

C_i = the concentration of nuclide "i" in μCi/ml

$LIMIT_i$ = the 10 CFR 20, Appendix B, Table 2, Column 2 limit of nuclide "i" in μCi/ml

f = the effluent flow rate in gpm (Attachment 3.10, Plant Liquid Effluent Parameters)

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 10 CFR 20 will not be exceeded.

4. This equation must be true during the batch release. Before the release is started, substitute the maximum effluent flow rate and the minimum dilution flow rate 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).

5. 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 gamma emitting radionuclide to counts per unit of time as per Attachment 3.11, Volumetric Detection Efficiencies for Principle Gamma Emitting Radionuclides for Eberline and Mirion Liquid Monitors, or Attachment 3.12, Counting Efficiency for R-19, 1/2-DRA-300, R-24, and 1/2-DRA-353. The sum of all the counts per unit of time is the predicted count rate. The predicted count rate can then be multiplied by a factor to determine the high alarm setpoint that will provide a high degree of conservatism and eliminate spurious alarms.

b. Liquid Continuous Monitor Setpoint Methodology

1. There are eight monitors used as potential continuous liquid release monitors. These monitors are used in the steam generator blowdown (SGBD), blowdown treatment (BDT), and essential service water (ESW) systems.

2. These Westinghouse monitors (R) are being replaced by Eberline monitors (DRS) and are identified as: (Mirion monitors [DRA] are replacing both Westinghouse and Eberline)

- R-19 or DRS 3100/4100 for SGBD (DRA-300 for SGBD)
- R-24 or DRS 3200/4200 for BDT (DRA-353 for BDT)

The function of these monitors is to assure that releases are kept within the concentration limits of 10 CFR 20, Appendix B, Table 2, Column 2, entering the unrestricted area following dilution.

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

4. The equation used to determine the setpoint for continuous monitors is from Addendum AA1 of NUREG-0133:

$$S_p \leq \frac{C * Eff * MRP * F * SF}{f}$$

Where:

S_p = setpoint of monitor (cpm)

C = 5E-7 μCi/ml, maximum effluent control limit from 10 CFR 20, Appendix B, Table 2, Column 2 of a known possible nuclide in effluent stream. (The limiting nuclide shall be evaluated annually by reviewing current nuclides against historical ones in order to determine if one with a more restrictive effluent concentration limit than Sr90 is found. The concentration limit shall be adjusted appropriately.)
-OR-
if a mixture is to be specified,

$$\frac{\sum C_i}{\sum \frac{C_i}{LIMIT_i}}$$

Eff = Efficiency, this information is located in Attachment 3.11, Volumetric Detection Efficiencies for Principle Gamma Emitting Radionuclides for Eberline and Mirion Liquid Monitors, through Attachment 3.13, Counting Efficiency for R-20, R-28, 1-WRA-713, 2-WRA-714, 1-WRA-717, and 2-WRA-718, for the specific monitors. For Eberline and Mirion monitors, the efficiency is nuclide specific and the calculation changes slightly to:

$$\frac{\sum (C_i * Eff_i)}{\sum \frac{C_i}{LIMIT_i}} \text{ replaces } C * Eff$$

MRP = multiple release point factor. A factor such that when all the release points are operating at one time the limits of 10 CFR 20 will not be exceeded (Attachment 3.8, Multiple Release Point Factors for Release Points). The MRP for ESW monitors is set to 1.

F = dilution water (circ water) flow rate in gpm obtained from Attachment 3.10, Plant Liquid Effluent Parameters. For routine operation, the setpoint should be calculated using the minimum dilution flow rate of 230,000 gpm.

SF = Safety Factor, 0.9.

f = applicable effluent release flow rate in gpm. For routine operation, the setpoint should be calculated using maximum effluent flow rate (Attachment 3.10, Plant Liquid Effluent Parameters).

3.3.2 Gaseous Monitors

For the purpose of implementing Step 3.2.2, Radioactive Gaseous Effluent Monitoring Instrumentation, and Substep 3.2.4a, Dose Rate, the alarm setpoints for gaseous effluents released into unrestricted areas will be established using the following methodology. In addition, the above steps 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, Gaseous Effluent Release Systems. Attachment 3.15, Plant Gaseous Effluent Parameters, presents the effluent flow rate parameter(s).

Gaseous effluent monitor high alarm setpoints will routinely be established at a fraction of the maximum allowable setpoint (typically 10% of the setpoint) for ALARA purposes. Alert alarms will normally be set to provide adequate indications of small changes in radiological conditions.

NOTE: **IF** the setpoint calculation methodology changes or the associated factors change for Unit Vent, Air Ejector and/or Gland Seal monitors, **THEN** initiate a review by Emergency Planning to ensure that the requirements of 10 CFR 50.54 (q) are maintained.

a. Plant Unit Vent

1. The gaseous effluents discharged from the plant vent will be monitored by the plant vent radiation monitor low (normal) range noble gas channel [Tag No. VRS-1505 (Unit 1), VRS-2505 (Unit 2)] (Mirion monitors VRS-1505A/ VRS-1505B for Unit 1 and VRS-2505A/ VRS-2505B for Unit 2) to assure that applicable alarms and trip actions (isolation of gaseous release) will occur prior to exceeding the limits in step 3.2.4, Gaseous Effluents. The alarm setpoint values will be established using the following unit analysis 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, less than 1.0

MRP = a weighted multiple release point factor (≤ 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 is an arbitrary value 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:

- Compute the average release rate, Q_p, (or the volumetric flow rate, f_p) from each release point p.
- Compute ΣQp (or Σfp) for all release points.
- Ratio Qp/ΣQp (or fp/Σfp) for each release point. This ratio is the MRP for that specific release point
- Repeat the above bullets 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 186,600 cfm for Unit 1 and 143,400 cfm 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 step 3.2.4a, Dose Rate, are as follows:

- Total Body ≤ 500 mrem/year
- Skin ≤ 3000 mrem/year
- Any Organ≤ 1500 mrem/year

$\overline{\chi / Q}$ = The worst case annual average relative concentration in the applicable sector or area, in sec/m^3 (see Attachment 3.16, 10 Year Average of 1995-2004 Data).

W_i = weighted factor for the radionuclide:

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

Where:

C_i = concentration of the most abundant radionuclide "i"

C_k = total concentration of all identified radionuclides in that release pathway. For batch releases, this value may be set to 1 for conservatism.

DCF_{ij} = dose conversion factor used to relate radiation dose to organ "j", from exposure to radionuclide "i" in mrem m^3 / yr μCi. See following equations.

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 m^3 / yr μCi. See Attachment 3.18, Dose Factors.

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 m^3 / yr μCi. See Attachment 3.18, Dose Factors.

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

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide in mrad m^3 / yr µCi. See Attachment 3.18, Dose Factors.

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 m^3 / yr µCi (and the food and ground path, as appropriate). See Attachment 3.18, Dose Factors.

2. The plant vent radiation monitor low (normal) range noble gas high alarm 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.

3. The thyroid dose is limited to the inhalation pathway only.

4. The plant vent radiation monitor low (normal) range noble gas setpoint, S_p, will be recomputed whenever gaseous releases like Containment Purge, Gas Decay Tanks and CVCS HUTs are discharged through the plant vent to determine the most limiting organ.

5. The high alarm setpoint, S_p, may be established at a lower value than the lowest computed value via the setpoint equation.

6. Containment Pressure Reliefs will not have a recomputed high alarm setpoint, but will use the normal high alarm setpoint due to their randomness and the time constraints involved in recomputation.

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

$$\frac{\text{Max } Conc\,(\mu Ci/cc) * \text{Max } Flowrate\,(cfm)}{New \text{ Max } Concentration\,(\mu Ci/cc)} = New \text{ Max } cfm$$

-OR-

$$\frac{\text{Max } Conc\,(\mu Ci/cc) * \text{Max } Flowrate\,(cfm)}{New \text{ Max } Flowrate\,(cfm)} = New \text{ Max } \mu Ci/cc$$

b. Waste Gas Storage Tanks

1. The gaseous effluents discharged from the Waste Gas System are monitored by the plant vent radiation monitor noble gas channels VRS-1505 and VRS-2505 (Mirion monitors VRS-1505A/ VRS-1505B for Unit 1 and VRS-2505A/ VRS-2505B for Unit 2).

2. In the event of 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 (normal) range noble gas channel (VRS-1505 or VRS-2505) (Mirion monitors VRS-1505A/ VRS-1505B for Unit 1 and VRS-2505A/ VRS-2505B for Unit 2) . 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.

   Chemical and Volume Control System Hold Up Tanks (CVCS HUT), containing high gaseous oxygen concentrations, may be released under the guidance of waste gas storage tank utilizing approved Operations' procedures.

3. It is normally prudent to allow 45 days of decay prior to releasing a Gas Decay Tank (GDT). There are extenuating, operational circumstances that may prevent this from occurring. Under these circumstances, such as high oxygen concentration creating a combustible atmosphere, it is prudent to waive the 45-day decay for safety's sake.

c. Containment Purge and Exhaust System

1. The gaseous effluents discharged by the Containment Purge and Exhaust Systems and Instrumentation Room Purge and Exhaust System are monitored by the plant vent radiation monitor noble gas channels (VRS-1505 for Unit 1, VRS-2505 for Unit 2) (Mirion monitors VRS-1505A/ VRS-1505B for Unit 1 and VRS-2505A/ VRS-2505B for Unit 2) ; and alarms and trip actions will occur prior to exceeding the limits in step 3.2.4a, Dose Rate.

2. 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). During purges, these monitor setpoints will give a Purge and Exhaust Isolation signal upon actuation of high alarm setpoints for particulate and noble gas channels. The sample is then returned to containment. Grab sample analysis is performed for a Containment purge before release.

3. 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.

4. For the Containment Pressure Relief System, no sample is routinely taken prior to release, but a sample is obtained twice per month.

5. 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).

d. Steam Jet Air Ejector System (SJAE)

1. 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 step 3.2.4a, Dose Rate. The alarm setpoint for the Condenser Air Ejector System monitor will be based on the maximum air ejector exhaust flow rate, (Attachment 3.15, Plant Gaseous Effluent Parameters). The alarm setpoint value will be established using the following unit analysis equation:

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

Where:

S_{SJAE} = the maximum setpoint, based on the most limiting organ, in μCi/cc and where the other terms are as previously defined

e. Gland Seal Condenser Exhaust

1. 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 step 3.2.4a, Dose Rate. The alarm setpoint for the GSCE monitor will be based on the maximum condenser exhaust flow rate (1260 CFM for Unit 1, 2754 CFM each for the two Unit 2 vents). The alarm setpoint value will be established using the following unit analysis 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

3.4 Radioactive Effluents Total Dose

3.4.1 The cumulative dose contributions from liquid and gaseous effluents will be determined by summing the cumulative doses as derived in steps 3.2.3c (Dose), 3.2.4b (Dose - Noble Gases), and 3.2.4c (Dose – Iodine-131, Iodine-133, Tritium, and Radioactive Material in Particulate Form) of this procedure. Dose contribution from direct radiation exposure will be based on the results of the direct radiation monitoring devices located at the REMP monitoring stations, and reflects direct dose both from the Dry Cask Storage Facility (ISFSI) licensed under Holtech International and both units of Cook. See NUREG-0133, section 3.8.

3.5 Radiological Environmental Monitoring Program (REMP)

3.5.1 Purpose of the REMP

a. The purpose of the REMP is to:

- Establish baseline radiation and radioactivity concentrations in the environs prior to reactor operations,

- Monitor critical environmental exposure pathways,
- Determine the radiological impact, if any, caused by the operation of the Donald C. Cook Nuclear Plant upon the local environment.
- Assist with fulfilling the requirements of the Groundwater Protection Initiative (GPI).

b. The first purpose of the REMP was completed prior to the initial operation of either of the two nuclear units at the Donald C. Cook Nuclear Plant Site. The remaining 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 used are delineated in Attachment 3.19, Radiological Environmental Monitoring Program Sample Stations, Sample Types, Sample Frequencies. Included is a list of the sample media, analysis required, sample stations, and frequency requirements for both collection and analysis. Attachment 3.19, Radiological Environmental Monitoring Program Sample Stations, Sample Types, Sample Frequencies, defines the scope of the REMP for the Donald C. Cook Nuclear Plant.

3.5.2 Conduct of the REMP [Ref. 5.2.1v]

a. Conduct sample collection and analysis for the REMP in accordance with Attachment 3.19, Radiological Environmental Monitoring Program Sample Stations, Sample Types, Sample Frequencies, Attachment 3.20, Maximum Values for Lower Limits of Detections A·B - REMP, and Attachment 3.21, Reporting Levels for Radioactivity Concentrations in Environmental Samples. These are applicable at all times. The on-site monitoring locations are shown on Attachment 3.22, On-Site Monitoring Location - REMP, and the off-site monitoring locations are shown on Attachment 3.23, Off-Site Monitoring Locations - REMP.

1. Perform each surveillance requirement within the specified time interval in Attachment 3.19, Radiological Environmental Monitoring Program Sample Stations, Sample Types, Sample Frequencies, with a maximum allowable extension not to exceed 25% of the surveillance interval.

2. If an environmental sample cannot be collected in accordance with step 3.5.2a, submit a description of the reasons for deviation and the actions taken to prevent a reoccurrence as part of the Annual Radiological Environmental Operating Report (AREOR).

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

NOTE:	Only one report per event is required.

NOTE:	Radioactivity from sources other than plant effluents do not require a Special Report.

4. **IF** any of the following conditions are identified:

   - A radionuclide associated with plant effluents is detected in any REMP sample medium AND its concentration exceeded the limits specified in Attachment 3.21, Reporting Levels for Radioactivity Concentrations in Environmental Samples,

   - More than one radionuclide associated with plant effluents is detected in any REMP sample medium AND the Total Fractional Level, when averaged over the calendar quarter, is greater than or equal to 1.

   THEN complete the following steps, as applicable:

   - Submit a Special Report to the Nuclear Regulatory Commission within 30 days.
   - Submit a Special Report to designated state and local organizations for groundwater or surface water media which could be used as drinking water.
   - Evaluate the following items for inclusion in Special Reports:

     1) Release conditions
     2) Environmental factors
     3) Corrective actions
     4) Additional factors which may have contributed to the identified levels

5. **WHEN** submission of a Special Report to designated state and local organizations is required, **THEN** perform the following:

   - Communicate event specific information to designated state and local organization personnel by the end of the next business day.
   - Document the notification using PMP-6090-PCP-100, Data Sheet 2, Part 4 Radioactive Liquid Spill Which May Impact Groundwater.
   - Forward a copy of the notification to the Environmental Department Manager.

6. **IF** a currently sampled milk farm location becomes unavailable, **THEN** conduct a special milk farm survey within 15 days.

   a) **IF** the unavailable location was an indicator farm, **THEN** an alternate sample location may be established within eight miles of the Donald C. Cook Nuclear Plant, if one is available.

   b) **IF** the unavailable location was a background farm, **THEN** an alternate sample location may be established greater than 15 but less than 25 miles of the Donald C. Cook Nuclear Plant in one of the less prevalent wind direction sectors, if one is available.

   c) **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** perform monthly vegetation sampling in lieu of milk sampling when vegetation is available.

BASES – RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

The REMP provides measurements of radiation and radioactive materials in those exposure pathways and for those radionuclides, which lead to the highest potential radiation exposures of individuals resulting from the station operation. Thereby, this monitoring program supplements the radiological effluent monitoring program by verifying the measurable concentration of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and modeling of the environmental exposure pathways. The initially specified REMP was effective for the first three years of commercial operation. Program changes may be initiated based on operational experience in accordance with the requirements of Technical Specification 5.5.1.c.

The detection capabilities, required by Attachment 3.20, Maximum Values for Lower Limits of Detections A'B - REMP, are the state-of-the-art for routine environmental measurements in industrial laboratories.

It should be recognized that the LLD is defined as a priori (before the fact) limit representing the capability of a measurement system and not as a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine analysis conditions. Occasionally, background fluctuations, unavoidably small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors will be identified and described in the Annual Radiological Environmental Operating Report.

3.5.3 Annual Land Use Census [Ref. 5.2.1v]

a. Conduct a land use census and 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 ten land sectors within a distance of five miles.

b. In lieu of the garden census, broad leaf vegetation sampling of at least three different kinds of vegetation (if available) may be performed as close to the site boundary as possible (within 5 miles) in each of two different direction sectors with the highest average deposition factor (D/Q) value.

c. Conduct this land use census annually between the dates of June 1 and October 1 by door-to-door survey, aerial survey, or by consulting local agricultural authorities.

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 this document, make appropriate changes to incorporate the new location(s) within 30 days, if possible.

BASES – LAND USE CENSUS

This is provided to ensure changes in the use of unrestricted areas are identified and modifications to the monitoring program are made, if required by the results of the census. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50. Restricting the census to gardens of greater than 500 square feet provides assurance that significant exposure pathways via leafy vegetables will be identified and monitored since a garden of this size is the minimum required to produce the quantity (26 kg/yr) of leafy vegetables assumed in Regulatory Guide 1.109 for consumption by a child. To determine this minimum garden size, the following assumptions were used: 1) that 20% of the garden was used for growing broad leaf vegetation (that is, similar to lettuce and cabbage), and 2) a vegetation yield of 2 kg/square meter.

3.5.4 Interlaboratory Comparison Program

a. In order to comply with Reg. Guides 4.1 and 4.15, the analytical vendor participates in an Interlaboratory Comparison Program, for radioactive materials. Address program results and identified deficiencies in the AREOR.

1. With analyses not being performed as required above, report the corrective actions taken to prevent a recurrence to the Commission in the AREOR.

BASES - INTERLABORATORY COMPARISON PROGRAM

The requirement for participation in an Interlaboratory Comparison Program is provided to ensure independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate the results are reasonably valid.

3.6 Meteorological Model

3.6.1 Three towers are used to determine the meteorological conditions at Donald C. 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 normally transferred to the central computer every 15 minutes.

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

3.7 Reporting Requirements

3.7.1 Annual Radiological Environmental Operating Report (AREOR)

a. Submit routine radiological environmental operating reports covering the operation of the units during the previous calendar year prior to May 15 of each year. [Ref 5.2.1j, TS 5.6.2]

b. Include in the AREOR:

- Summaries, interpretations, and statistical evaluation of the results of the radiological environmental surveillance activities for the reporting period.

- A comparison with pre-operational 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 results of the land use censuses required by step 3.5.3, Annual Land Use Census.

- If harmful effects or evidence of irreversible damage are detected by the monitoring, provide in the report an analysis of the problem and a planned course of action to alleviate the problem.

- Summarized and tabulated results of all radiological environmental samples taken during the reporting period. In the event that some results are not available for inclusion with the report, submit the report noting and explaining the reasons for the missing results. Submit the missing data as soon as possible in a supplementary report.

- A summary description of the REMP 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 results of participation in the Interlaboratory Comparison Program required by step 3.5.4, Interlaboratory Comparison Program.

- The results of non-REMP samples taken for informational purposes in support of non-program specific investigations, such as rainfall studies of tritium recapture for example.

3.7.2 Annual Radiological Effluent Release Report (ARERR)

a. Submit routine ARERR covering the operation of the unit during the previous 12 months of operation prior to May 1st of each year. [Ref 5.2.1j, TS 5.6.3]

b. Include in the ARERR a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the units as outlined in Reg. 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.

c. Submit in the ARERR prior to May 1st of each year and 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.

- 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.

- 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. Include all assumptions used in making these assessments (that is, specific activity, exposure time and location) in these reports.

- Use the meteorological conditions concurrent with the time of release of radioactive materials in gaseous effluents (as determined by sampling frequency and measurement) for determining the gaseous pathway doses.

- Inoperable radiation monitor periods exceeding 30 continuous days; explain causes of inoperability and actions taken to prevent reoccurrence.

d. Submit the ARERR [Ref. 5.2.1x] prior to May 1st of each year and 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 Reg. Guide 1.109, Rev.1.

e. Include in the ARERR the following information for each type of solid waste shipped off-site during the report period:

- Volume (cubic meters),

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

- Principle radionuclides (specify whether determined by measurement or estimate),
- Type of waste (example: spent resin, compacted dry waste, evaporator bottoms),
- Type of container (example: LSA, Type A, Type B, Large Quantity),
  -AND-
- Solidification agent (example: cement).

f. Include in the ARERR unplanned releases of radioactive materials in gaseous and liquid effluent from the site to unrestricted areas on a quarterly basis.

g. Include in the ARERR any change to this procedure made during the reporting period.

h. Due to the site having shared gaseous and liquid waste systems dose calculations will be performed on a per site bases using the per unit values. This is ALARA and will ensure compliance with 40 CFR 141, National Primary Drinking Water Regulations. Unit specific values are site values divided by two.

i. Include in the ARERR groundwater sample results taken that are in support of the Groundwater Protection Initiative (GPI) but are not part of the REMP.

3.8 10 CFR 50.75 (g) Implementation

3.8.1 Records of spills or other unusual occurrences involving the spread of contamination in and around the site. These records may be limited to instances when significant contamination remains after decontamination or when there is a reasonable likelihood that contaminants may have spread to inaccessible areas, as in the case of possible seepages.

3.8.2 These records shall include any known information or identification of involved nuclides, quantities, and concentrations.

3.8.3 This information is necessary to ensure all areas outside the radiological-restricted area are documented for surveying and remediation during decommissioning. There is a retention schedule item for 10 CFR 50.75(g) where this information is filed in Nuclear Documents Management to ensure all required areas are listed to prevent their omission.

3.9 Reporting/Management Review

3.9.1 Incorporate any changes to this procedure in the ARERR.

3.9.2 Update this procedure when required for changes made to the Radiation Monitoring System, its instruments, or the specifications of instruments.

3.9.3 Review or revise this procedure as appropriate based on the results of the land use census and REMP.

3.9.4 Consider any changes to this procedure for potential impact on other related Department Procedures.

3.9.5 Review the past year's meteorological data during the first quarter of each year and update the ODCM as necessary. Review Attachment 3.16, 10 Year Average of 1995-2004 Data, and document using Attachment 3.17, Annual Evaluation of $\overline{\chi/Q}$ **and** $\overline{D/Q}$ Values For All Sectors. The $\overline{\chi/Q}$ and $\overline{D/Q}$ values will be processed using ± 3 standard deviations of the data and evaluated against the 10 year annual average data. Documentation is done by completing Attachment 3.17, Annual Evaluation of $\overline{\chi/Q}$ **and** $\overline{D/Q}$ Values For All Sectors, and filed in accordance with the retention schedule.

4 FINAL CONDITIONS

4.1 None.

5 REFERENCES

5.1 Use References:

5.1.1 "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 Off-Site Dose Calculation Manual or to the Process Control Program (Generic Letter 89-01)", United States Nuclear Regulatory Commission, January 31, 1989

5.1.2 12-THP-6010-RPP-601, Preparation of the Annual Radioactive Effluent Release Report

5.1.3 12-THP-6010-RPP-639, Annual Radiological Environmental Operating Report (AREOR) Preparation And Submittal

5.1.4 PMP-6090-PCP-100, Spill Response- Oil, Polluting, Hazardous Materials, and Radioactive Spills

5.2 Writing References:

5.2.1 Source References:

a. 10 CFR 20, Standards for Protection Against Radiation

b. 10 CFR 50, Domestic Licensing of Production and Utilization Facilities

c. PMI-6010, Radiation Protection Plan

d. NUREG-0472

e. NUREG-1301

f. NUREG-0133

g. Regulatory Guide 1.109, non-listed parameters are taken from these data tables

h. Regulatory Guide 1.111

i. Regulatory Guide 1.113

j. Updated Final Safety Analysis Report (UFSAR)

k. Technical Specifications 5.4.1.e, 5.5.1.c, 5.5.3, 5.6.2, and 5.6.3

l. Final Environmental Statement Donald. C. Cook Nuclear Plant, August 1973

m. NUREG-0017

n. ODCM Setpoints for Liquid [and Gaseous] Effluent Monitors (Bases), ENGR 107-04 8112.1 Environs Rad Monitor System

o. HPPOS-223, Consideration of Measurement Uncertainty When Measuring Radiation Levels Approaching Regulatory Limits

p. Watts – Bar Jones (WBJ) Document, R-86-C-001, The Primary Calibration of Eberline Instrument Corporation SPING – 3/4 Low, Mid, and High Range Noble Gas Detectors

q. WBJ Document, R-86-C-003, The Primary Calibration of Eberline Instrument Corporation DAM-4 and Water Monitor

r. 40 CFR 190, Environmental Radiation Protection Standards for Nuclear Power Operations

s. NRC Commitment 6309 (N94083 dated 11/10/94)

t. NRC Commitment 1151

u. NRC Commitment 1217

v. NRC Commitment 3240

w. NRC Commitment 3850

x. NRC Commitment 4859

y. NRC Commitment 6442

z. NRC Commitment 3768

aa. DIT-B-00277-00, HVAC Systems Design Flows

bb. Regulatory Guide 1.21

cc. Regulatory Guide 4.1

dd. 1-2-V3-02-Calc #4, Unit Vent Sample Flow rate for isokinetic particulates and Iodine sampling

ee. HPS N13.30-1996, Appendix A Rationale for Methods of Determining Minimum Detectable Amount (MDA) and Minimum Testing Level (MDL

ff. DIT-B-01971-00, Dose Factors for Radioactive Particulate Gaseous Effluents Associated with the Child by the Inhalation Pathway

gg. DIT-B-01987-00, Ground Plane & Food Dose Factors P_i for Radioiodines and Radioactive Particulate Gaseous Effluents

hh. NRC Commitment 1010

ii. NEI 07-07 Groundwater Protection Initiative

jj. ANI 07-01 Potential for Unmonitored and Unplanned Off-Site Releases of Radioactive Material

kk. RD-16-03, Mirion MCNPX Analysis Report

5.2.2 General References

a. Cook Nuclear Plant Start-Up Flash Tank Flow Rate letter from D. L. Boston dated January 21, 1997

b. Letter from B.P. Lauzau, Venting of Middle CVCS Hold-Up Tank Directly to Unit Vent, May 1, 1992

c. AEP Design Information Transmittal on Aux Building Ventilation Systems

d. PMP-4030.EIS.001, Event-Initiated Surveillance Testing

e. Environmental Position Paper, Fe Impact on Release Rates, approved 3/14/00

f. Environmental Position Paper, Methodology Change from Sampling Secondary System Gaseous Effluents for Power Changes Exceeding 15% within 1 hr to Responding to Gaseous Alert Alarms, approved 4/4/00.

g. CR 02150078, RRS-1000 efficiency curve usage

h. Environmental Position Paper, Unit Vent Compensatory Sampling, approved 4/14/05

R_i Dose Factors

PATHWAY

Nuclide	Ground	Vegetable	Meat	Cow Milk	Goat Milk	Inhalation
H-3	0.0E+00	4.0E+03	3.3E+02	2.4E+03	4.9E+03	1.3E+03
C-14	0.0E+00	3.5E+06	5.3E+05	3.2E+06	3.2E+06	3.6E+04
Cr-51	5.4E+06	1.1E+07	1.5E+06	6.9E+06	8.3E+05	2.1E+04
Mn-54	1.6E+09	9.4E+08	2.1E+07	2.9E+07	3.5E+06	2.0E+06
Fe-59	3.2E+08	9.6E+08	1.7E+09	3.1E+08	4.0E+07	1.5E+06
Co-58	4.4E+08	6.0E+08	2.9E+08	8.4E+07	1.0E+07	1.3E+06
Co-60	2.5E+10	3.2E+09	1.0E+09	2.7E+08	3.2E+07	8.6E+06
Zn-65	8.5E+08	2.7E+09	9.5E+08	1.6E+10	1.9E+09	1.2E+06
Sr-89	2.5E+04	3.5E+10	3.8E+08	9.9E+09	2.1E+10	2.4E+06
Sr-90	0.0E+00	1.4E+12	9.6E+09	9.4E+10	2.0E+11	1.1E+08
Zr-95	2.9E+08	1.2E+09	1.5E+09	9.3E+05	1.1E+05	2.7E+06
Sb-124	6.9E+08	3.0E+09	4.4E+08	7.2E+08	8.6E+07	3.8E+06
I-131	1.0E+07	2.4E+10	2.5E+09	4.8E+11	5.8E+11	1.6E+07
I-133	1.5E+06	4.0E+08	6.0E+01	4.4E+09	5.3E+09	3.8E+06
Cs-134	7.9E+09	2.5E+10	1.1E+09	5.0E+10	1.5E+11	1.1E+06
Cs-136	1.7E+08	2.2E+08	4.2E+07	5.1E+09	1.5E+10	1.9E+05
Cs-137	1.2E+10	2.5E+10	1.0E+09	4.5E+10	1.4E+11	9.0E+05
Ba-140	2.3E+07	2.7E+08	5.2E+07	2.1E+08	2.6E+07	2.0E+06
Ce-141	1.5E+07	5.3E+08	3.0E+07	8.3E+07	1.0E+07	6.1E+05
Ce-144	7.9E+07	1.3E+10	3.6E+08	7.3E+08	8.7E+07	1.3E+07

Units for all except inhalation pathway are m^2 mr sec / yr μCi, inhalation pathway units are mr m^3 / yr μCi.

U_{ap} Values to be Used For the Maximum Exposed Individual

Pathway	Infant	Child	Teen	Adult
Fruits, vegetables and grain (kg/yr)	--	520	630	520
Leafy vegetables (kg/yr)	--	26	42	64
Milk (L/yr)	330	330	400	310
Meat and poultry (kg/yr)	--	41	65	110
Fish (kg/yr)	--	6.9	16	21
Drinking water (L/yr)	330	510	510	730
Shoreline recreation (hr/yr)	--	14	67	12
Inhalation (m^3/yr)	1400	3700	8000	8000

Table E-5 of Reg. Guide 1.109.

B_{ip} Factors for Aquatic Foods
ρCi l / kg ρCi

Element	Fish	Invertebrate
H	9.0E-1	9.0E-1
C	4.6E3	9.1E3
Na	1.0E2	2.0E2
P	1.0E5	2.0E4
Cr	2.0E2	2.0E3
Mn	4.0E2	9.0E4
Fe	1.0E2	3.2E3
Co	5.0E1	2.0E2
Ni	1.0E2	1.0E2
Cu	5.0E1	4.0E2
Zn	2.0E3	1.0E4
Br	4.2E2	3.3E2
Rb	2.0E3	1.0E3
Sr	3.0E1	1.0E2
Y	2.5E1	1.0E3
Zr	3.3E0	6.7E0
Nb	3.0E4	1.0E2
Mo	1.0E1	1.0E1
Tc	1.5E1	5.0E0
Ru	1.0E1	3.0E2
Rh	1.0E1	3.0E2
Te	4.0E2	6.1E3
I	1.5E1	5.0E0
Cs	2.0E3	1.0E3
Ba	4.0E0	2.0E2
La	2.5E1	1.0E3
Ce	1.0E0	1.0E3
Pr	2.5E1	1.0E3
Nd	2.5E1	1.0E3
W	1.2E3	1.0E1
Np	1.0E1	4.0E2

Table A-1 of Reg. Guide 1.109.

D_{aipj} External Dose Factors for Standing on Contaminated Ground
mrem m^2 / hr ρCi

Radionuclide	Total Body	Skin
H-3	0	0
C-14	0	0
Na-24	2.5E-8	2.9E-8
P-32	0	0
Cr-51	2.2E-10	2.6E-10
Mn-54	5.8E-9	6.8E-9
Mn-56	1.1E-8	1.3E-8
Fe-55	0	0
Fe-59	8.0E-9	9.4E-9
Co-58	7.0E-9	8.2E-9
Co-60	1.7E-8	2.0E-8
Ni-63	0	0
Ni-65	3.7E-9	4.3E-9
Cu-64	1.5E-9	1.7E-9
Zn-65	4.0E-9	4.6E-9
Zn-69	0	0
Br-83	6.4E-11	9.3E-11
Br-84	1.2E-8	1.4E-8
Br-85	0	0
Rb-86	6.3E-10	7.2E-10
Rb-88	3.5E-9	4.0E-9
Rb-89	1.5E-8	1.8E-8
Sr-89	5.6E-13	6.5E-13
Sr-91	7.1E-9	8.3E-9
Sr-92	9.0E-9	1.0E-8
Y-90	2.2E-12	2.6E-12
Y-91m	3.8E-9	4.4E-9
Y-91	2.4E-11	2.7E-11
Y-92	1.6E-9	1.9E-9
Y-93	5.7E-10	7.8E-10
Zr-95	5.0E-9	5.8E-9
Zr-97	5.5E-9	6.4E-9
Nb-95	5.1E-9	6.0E-9
Mo-99	1.9E-9	2.2E-9
Tc-99m	9.6E-10	1.1E-9
Tc-101	2.7E-9	3.0E-9
Ru-103	3.6E-9	4.2E-9
Ru-105	4.5E-9	5.1E-9
Ru-106	1.5E-9	1.8E-9
Ag-110m	1.8E-8	2.1E-8
Te-125m	3.5E-11	4.8E-11

Radionuclide	Total Body	Skin
Te-127m	1.1E-12	1.3E-12
Te-127	1.0E-11	1.1E-11
Te-129m	7.7E-10	9.0E-10
Te-129	7.1E-10	8.4E-10
Te-131m	8.4E-9	9.9E-9
Te-131	2.2E-9	2.6E-6
Te-132	1.7E-9	2.0E-9
I-130	1.4E-8	1.7E-8
I-131	2.8E-9	3.4E-9
I-132	1.7E-8	2.0E-8
I-133	3.7E-9	4.5E-9
I-134	1.6E-8	1.9E-8
I-135	1.2E-8	1.4E-8
Cs-134	1.2E-8	1.4E-8
Cs-136	1.5E-8	1.7E-8
Cs-137	4.2E-9	4.9E-9
Cs-138	2.1E-8	2.4E-8
Ba-139	2.4E-9	2.7E-9
Ba-140	2.1E-9	2.4E-9
Ba-141	4.3E-9	4.9E-9
Ba-142	7.9E-9	9.0E-9
La-140	1.5E-8	1.7E-8
La-142	1.5E-8	1.8E-8
Ce-141	5.5E-10	6.2E-10
Ce-143	2.2E-9	2.5E-9
Ce-144	3.2E-10	3.7E-10
Pr-143	0	0
Pr-144	2.0E-10	2.3E-10
Nd-147	1.0E-9	1.2E-9
W-187	3.1E-9	3.6E-9
Np-239	9.5E-10	1.1E-9

Table E-6 of Reg. Guide 1.109.

Attachment 3.2	Radioactive Liquid Effluent Monitoring Instruments	Pages: 54 - 56

INSTRUMENT	Minimum Channels Operable[a]	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, DRS 3/4100 +)	(1)#	At times of release**	2
c. Steam Generator Blowdown Treatment Effluent (R-24, DRS 3/4200 +)	(1)#	At times of release	2
d. Mirion Liquid Radwaste Effluent Line (RRS-1001-A, RRS-1001-B)	(1)#	At times of release	1
e. Mirion Steam Generator Blowdown Line (DRA-300)	(1)#	At times of release**	2
f. Mirion Steam Generator Blowdown Treatment Effluent (DRA-353)	(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
b. Mirion Service Water System Effluent Line (Unit 1:WRA-713, WRA-717) and (Unit 2: WRA-714, WRA-718)	(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
d. Individual Steam Generator sample flow to Blowdown radiation monitors alarm (DFA-310, 320, 330 and 340)	(1) per generator	At times of release	5

* Pump curves and valve settings may be utilized to estimate flow; in such cases, Action Statement 4 is not applicable. This is primarily in reference to start up flash tank flow.

\# OPERABILITY of RRS-1001 includes OPERABILITY of sample flow switch RFS-1010, which is an attendant instrument as defined in Technical Specification section 1.1, under the term Operable – Operability. This item is also applicable for all Eberline and Mirion liquid monitors (and their respective flow switches) listed here.

** Since these monitors can be used for either batch or continuous release the appropriate action statement of 1 or 2 should apply (that is, Action 1 if a steam generator drain is being performed in lieu of Action 2). It is possible, due to the steam generator sampling system lineup, that BOTH action statements are actually entered. This would be the case when sampling for steam generator draining requires duplicate samples while the sample system is lined up to discharge to the operating units blowdown system. In this case the steam generator drain samples can fulfill the sample requirement for Action 2 also. Action 2 would be exited when sampling was terminated.

\+ Westinghouse I and Eberline (DRS) monitors are being replaced by Mirion monitors. Either monitor can fulfill the operability requirement. Ensure surveillances are current for operability of the instrumentation prior to using it to satisfy applicability requirement.

a **IF** an RMS monitor is inoperable solely as the result of the loss of its control room alarm annunciation, **THEN** one of the following actions is acceptable to satisfy the ODCM action statement compensatory surveillance requirement:

1. Collect grab samples and conduct laboratory analyses per the specific monitor's action statement,

   -OR-

2. Collect local monitor readings at a frequency equal to or greater than (more frequently than) the action frequency.

IF the RMS monitor is inoperable for reasons other than the loss of control room annunciation, **THEN** the only acceptable action is taking grab samples and conducting laboratory analyses as the reading is equivalent to a grab sample when the monitor is functional.

TABLE NOTATION

Action 1 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases may continue, provided that prior to initiating a release:

1. At least two independent samples are analyzed in accordance with Step 3.2.3a 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 shift 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.

After 30 days, **IF** the channels are not OPERABLE, **THEN** continue releases with required grab samples provide a description of why the inoperability was not corrected in the next Annual Radiological Effluent release Report.

Action 3 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 that at least once per shift, 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. Since the Westinghouse ESW monitors (R-20 and R-28) and Mirion ESW monitors (WRA-713/717 U1 and WRA-714/718 U2) are only used for post LOCA leak detection and have no auto trip function associated with them, grab samples are only needed if the Containment Spray Heat Exchanger is in service. After 30 days, **IF** the channels are not OPERABLE, **THEN** continue releases with grab samples once per shift and provide a description of why the inoperability was not corrected in the next Annual Radiological Effluent release Report.

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. After 30 days, **IF** the channels are not OPERABLE, **THEN** continue releases with grab samples once per shift and provide a description of why the inoperability was not corrected in the next Annual Radiological Effluent release Report.

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 verified to be within the required band at least once per 4 hours during actual releases. After 30 days, **IF** the channels are not OPERABLE, **THEN** continue releases with grab samples once per shift and provide a description of why the inoperability was not corrected in the next Annual Radiological Effluent release Report. **IF** the flow cannot be obtained within the desired band, **THEN** declare the radiation monitor inoperable and enter the appropriate actions statement, Action 2.

Compensatory actions are governed by PMP-4030-EIS-001, Event-Initiated Surveillance Testing

Instrument	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL OPERATIONAL TEST
1. Gross Radioactivity Monitors Providing Automatic Release Termination				
a. Liquid Radwaste Effluent Line (RRS-1001)	D*	P	B(3)	Q(5)
b. Mirion Liquid Radwaste Effluent Line (RRS-1001-A, RRS-1001-B)	D*	P	B(3)	Q(5)
c. Steam Generator Blowdown Effluent Line	D*	M	B(3)	Q(1)
d. Steam Generator Blowdown Treatment Effluent Line	D*	M	B(3)	Q(1)
2. Gross Radioactivity Monitors Not Providing Automatic Release Termination				
a. Service Water System Effluent Line	D	M	B(3)	Q(2)
3. Continuous Composite Samplers				
a. Turbine Building Sump Effluent Line	D*	N/A	N/A	N/A
4. Flow Rate Measurement Devices				
a. Liquid Radwaste Effluent	D(4)*	N/A	B	Q
b. Steam Generator Blowdown Treatment Line	D(4)*	N/A	N/A	N/A

* During releases via this pathway. This is applicable to all surveillances for the appropriate monitor.

TABLE NOTATION

1. Demonstrate with the CHANNEL OPERATIONAL TEST 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 (Non-Mirion monitors only). *

2. Demonstrate with the CHANNEL OPERATIONAL TEST 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 operating mode.

3. Perform the initial CHANNEL CALIBRATION using one or more sources with traceability back to the National Institute of Standards and Technology (NIST). These sources 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. Verify indication of flow during periods of release with the CHANNEL CHECK. Perform the CHANNEL CHECK at least once per 24 hours on days on which continuous, periodic or batch releases are made.

5. Demonstrate with the CHANNEL OPERATIONAL TEST 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 (Non-Mirion monitors only).

* Instrument indicates, but does not provide for automatic isolation

** Instrument indicates, but does not necessarily cause automatic isolation. No credit is taken for the automatic isolation on such occurrences.

Operations currently performs the routine channel checks and source checks. Maintenance and Radiation Protection perform channel calibrations and channel operational tests. Chemistry performs the channel check on the continuous composite sampler. These responsibilities are subject to change without revision to this document.

Instrument (Instrument #)	Operable[1]	Minimum Channels Action	Action
1. Condenser Evacuation System			
a. Noble Gas Activity Monitor (SRA-1905/2905)	(1)	****	6
b. Flow Rate Monitor (SFR-401 and 1/2-MR-054) OR (SFR-401 and SRA-1910/2910) OR (SFR-402 and 1/2-MR-054)	(1)	****	5
c. Mirion Noble Gas Activity Monitor (SRA-1905-A/1905-B and SRA-2905-A/2905-B)	(1)	****	6
d. Mirion Flow Rate Monitor (SFR-401 and PPC/RadServe SJAE display point) OR (SFR-401 and SRA-1910/2910 local display) OR (SFR-402 and U1/U2 PPC/RadServe SJAE display point)	(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 and 1/2-MR-054) OR (VFR-315 and VFR-1510/2510)	(1)	*	5
e. Sampler Flow Rate Measuring Device (VFS-1521/2521)	(1)	*	5
f. Mirion Noble Gas Activity Monitor (VRS-1505-A/1505-B and VRS-2505-A/2505-B)	(1)	*	6
g. Mirion Effluent System Flow Rate Measuring Device (VFR-315 and U1/U2 PPC/RadServe VAB display point) OR (VFR-315 and VFR-1510/2510 local display)	(1)	*	5
h. Sampler Flow Rate Measuring Device (U1/U2 PPC/RadServe VAB display point) OR (VRS-1500/2500 local display)	(1)	*	5
3. Containment Purge and Containment Pressure Relief (Vent) **			
a. Containment Noble Gas Activity Monitor ERS-1305/1405 (ERS-2305/2405)	(1)	****[2, 3]	7
b. Containment Particulate Sampler Filter ERS-1301/1401 (ERS-2301/2401)	(1)	****	10

Instrument (Instrument #)	Operable[1]	Minimum Channels Action	Action
4. Waste Gas Holdup System and CVCS HUT (Batch releases)**			
a. Noble Gas Activity Alarm and Termination of Waste Gas Releases (VRS-1505/2505)	(1)	****4	9
b. Mirion Noble Gas Activity Alarm and Termination of Waste Gas Releases (VRS-1505-A/1505-B and VRS-2505-A/2505-B)	(1)	****4	9
5. Gland Seal Exhaust			
a. Noble Gas Activity Monitor (SRA-1805/2805)	(1)	****	6
b. Flow Rate Monitor (SFR-201 and 1/2-MR-54) OR (SFR-201 and SFR-1810/2810)	(1)	****	5
c. Mirion Flow Rate Monitor (SFR-201 and U1/U2 PPC/RadServe GSLO display point) OR (SFR-201 and SFR-1810/2810 local display)	(1)	****	5

* At all times

** Containment Purge and other identified gaseous batch releases can be released utilizing the same double sampling compensatory action requirements of action 9 identified here even if there is no termination function associated with it like that associated with the two specific tank types listed here.

**** During releases via this pathway

TABLE NOTATIONS

1. **IF** an RMS monitor is INOPERABLE solely as the result of the loss of its control room alarm annunciation, **THEN** one of the following actions is acceptable to satisfy the ODCM action statement compensatory surveillance requirement:

    1. Take grab samples and conduct laboratory analyses per the specific monitor's action statement,
    -OR-
    2. Take local monitor readings at a frequency equal to or greater than (more frequently than) the action frequency.

    IF the RMS monitor is inoperable for reasons other than the loss of control room annunciation, **THEN** the only acceptable action is taking grab samples and conducting laboratory analyses as the reading is equivalent to a grab sample when the monitor is functional.

    With the Mirion RMS Upgrades, it is intended that an OPERABLE instrument/channel listed in the ODCM has both an operable transmitter and an operable display point, which may be local to the skid or on the PPC/RadServe system. This is in addition to control room annunciation function, if applicable.

2. Consider releases as occurring "via this pathway" under the following conditions:

- The Containment Purge System is in operation and Containment Operability is applicable,
  -OR-
- The Containment Purge System is in operation and the 'Clean-up' batch release of the Containment air volume has not been fully completed.

IF neither of the above are applicable **AND** the unit is in Mode 5 or 6, **THEN** the containment purge system is acting as a ventilation system (an extension of the Auxiliary Building) and is covered by Item 2 of this Attachment. This is called 'Ventilation Mode'. 'Ventilate Mode' cannot be entered without performing a Clean-up batch release.

-OR-

- A Containment Pressure Relief (CPR) is being performed.

Once the 'Clean-up' batch release has been completed and 'Ventilation' mode of Purge has commenced – resultant return to 'Clean-up' mode can be made with no additional sampling requirements or paperwork – so long as either ERS-1305/2305 **OR** ERS-1405/2405 are operable. Containment particulate channels are not needed once the RCS has entered Mode 5 per Technical Specification 3.4.15.

3. For purge (including pressure relief) purposes only. Reference TS 3.3.6, Containment Purge Supply and Exhaust System Isolation Instrumentation and 3.4.15, RCS Leakage Detection Instrumentation for additional information.

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

ACTIONS

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. After 30 days, **IF** the channels are not OPERABLE, **THEN** continue releases with estimation of the flow rate once per 4 hours and provide a description of why the inoperability was not corrected in the next Annual Radiological Effluent Release Report.

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 shift and these samples are analyzed for gross activity within 24 hours. After 30 days, **IF** the channels are not OPERABLE, **THEN** continue releases with grab samples once per shift and provide a description of why the inoperability was not corrected in the next Annual Radiological Effluent release Report.

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

8. With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via the affected pathway may continue for up to 30 days provided samples required for weekly Iodine & Particulates analysis are continuously collected with auxiliary sampling equipment as required in Attachment 3.7, Radioactive Gaseous Waste Sampling and Analysis Program. After 30 days, **IF** the channels are not OPERABLE, **THEN** continue releases with sample collection by auxiliary sampling equipment and provide a description of why the inoperability was not corrected in the next Annual Radiological Effluent Release Report.

Sampling evolutions are not an interruption of a continuous release or sampling period.

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.

   After 14 days, **IF** the channels are not OPERABLE, **THEN** continue releases with sample collection by auxiliary sampling equipment and provide a description of why the inoperability was not corrected in the next Annual Radiological Effluent Release Report

10. Technical Specification 3.4.15, RCS Leakage Detection System Instrumentation.

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Instrument	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL OPERATIONAL TEST
1. Condenser Evacuation System	Alarm Only			
a. Noble Gas Activity Monitor (SRA-1905/2905)	D**	M	B(2)	Q(1)
b. System Effluent Flow Rate (SFR-401, SFR-402, MR-054, SRA-1910/2910)	D**	NA	B	Q
c. Mirion Noble Gas Activity Monitor (SRA-1905-A/ 1905-B, SRA-2905-A/ 2905-B)	D**	M	B(2)	Q(1)
d. Mirion System Effluent Flow Rate (SFR-401, SFR-402, U1/U2 PPC/RadServe SJAE display point , SRA-1910/2910)	D**	NA	B	Q
2. Auxiliary Building Unit Ventilation System	Alarm Only			
a. Noble Gas Activity Monitor (VRS-1505/2505)	D*	M	B(2)	Q(1)
b. Iodine Sampler (For VRA-1503/2503)	W*	NA	NA	NA
c. Particulate Sampler (For VRA-1501/2501)	W*	NA	NA	NA
d. System Effluent Flow Rate Measurement Device (VFR-315, MR-054, VRS-1510/2510)	D*	NA	B	Q
e. Sampler Flow Rate Measuring Device (VFS-1521/2521)	D*	N/A	B	Q
f. Mirion Noble Gas Activity Monitor (VRS-1505-A/ 1505-B and VRS-2505-A/ 2505-B)	D*	M	B(2)	Q(1)
g. Mirion System Effluent Flow Rate Measurement Device (VFR-315, U1/U2 PPC/RadServe VAB display point, VRS-1510/2510)	D*	NA	B	Q
h. Mirion Sampler Flow Rate Measuring Device (U1/U2 PPC/RadServe VAB display point or local display)	D*	N/A	B	Q

3. Containment Purge System and Containment Pressure Relief	Alarm and Trip			
a. Containment Noble Gas Activity Monitor (ERS-13/1405 and ERS-23/2405)	S	P	B(2)	Q
b. Containment Particulate Sampler (ERS-13/1401 and ERS-23/2401)	S	NA	B	Q
4. Waste Gas Holdup System Including CVCS HUT	Alarm and Trip			
a. Noble Gas Activity Monitor Providing Alarm and Termination (VRS-1505/2505)	P	P	B(2)	Q(3)
b. Mirion Noble Gas Activity Monitor Providing Alarm and Termination (VRS-1505-A/1505-B and VRS-2505-A/2505-B)	P	P	B(2)	Q(3)
5. Gland Seal Exhaust	Alarm Only			
a. Noble Gas Activity (SRA-1805/2805)	D**	M	B(2)	Q(1)
b. System Effluent Flow Rate (SFR-201, MR-054, SRA-1810/2810)	D**	NA	B	Q
c. System Effluent Flow Rate (SFR-201, U1/U2 PPC/RadServe VAB display point, SRA-1810/2810)	D**	NA	B	Q

* At all times

** During releases via this pathway. This is applicable to all surveillances for the appropriate monitor.

TABLE NOTATIONS

1. Demonstrate with the CHANNEL OPERATIONAL TEST 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. Perform the initial CHANNEL CALIBRATION using one or more sources with traceability back to the NIST. These sources 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. Demonstrate with the CHANNEL OPERATIONAL TEST 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.

Operations currently performs the routine channel checks, and source checks. Maintenance and Radiation Protection perform channel calibrations and channel operational tests. These responsibilities are subject to change without revision to this document.

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[Ref. 5.2.1t]

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 Each Batch	P Each Batch	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 [b]	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	$1x10^{-6}$

*During releases via this pathway

This table provides the minimum requirements for the liquid sampling program. If additional sampling is performed then those sample results can be used to quantify releases in lieu of composite data for a more accurate quantification. Examples of these samples are the 72 hour secondary coolant activity and Monitor Tank tritium samples.

TABLE NOTATION

a. The lower limit of detection (LLD) is defined in Table Notation A. of Attachment 3.20, Maximum Values for Lower Limits of Detections ^{A,}B - REMP

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, isolate and ensure thorough mixing (recirculate, sparge, etc) for each batch. Examples of these are Monitor Tank and Steam Generator Drains. Before a batch is released the tank is sampled and analyzed to determine that it can be released without exceeding federal standards.

d. A continuous release is the discharge of liquid of a non-discrete volume; e.g. from a volume of system that has an input flow during the continuous release. This type of release includes the Turbine Room Sump, Steam Generator Blowdown and the Steam Generator Sampling System.

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. Identify and report other peaks, which are measurable and identifiable, together with the above nuclides.

Gaseous Release Type	Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (μCi/cc) [a]
a. Waste Gas Storage Tanks and CVCS HUTs	**P** Each Tank Grab Sample	**P** Each Tank	Principal Gamma Emitters [d]	1×10^{-4}
			H-3	1×10^{-6}
b. Containment Purge	**P** Each Purge Grab Sample	**P** Each Purge	Principal Gamma Emitters [d]	1×10^{-4}
CPR (vent)**	Twice per Month	Twice per Month		
			H-3	1×10^{-6}
c. Condenser Evacuation System Gland Seal Exhaust* [i]	**W** or **M** Grab Sample	**M** Particulate Sample	Principal Gamma Emitters [d]	1×10^{-11}
		M	H-3	1×10^{-6}
		W [g] Noble Gas	Principle Gamma Emitters [d]	1×10^{-4}
		M Iodine Adsorbing Media	I-131	1×10^{-12}
	Continuous	**W** [g] Noble Gas Monitor	Noble Gases	1×10^{-6}
d. Auxiliary Building Unit Vent*	Continuous [c]	**W** [b] Iodine Adsorbing Media	I-131	1×10^{-12}
	Continuous [c]	**W** [b] Particulate Sample	Principal Gamma Emitters [d]	1×10^{-11}
	Continuous [c]	**M** Composite Particulate Sample	Gross Alpha	1×10^{-11}
	W Grab Sample	**W** [h] H-3 Sample	H-3	1×10^{-6}
		W [gj] Noble Gas	Principle Gamma Emitters [d]	1×10^{-4}
	Continuous [c]	**Q** Composite Particulate Sample	Sr-89, Sr-90	1×10^{-11}
	Continuous [c]	Noble Gas Monitor	Noble Gases	1×10^{-6}
e. Incinerated Oil [e]	**P** Each Batch [f]	**P** Each Batch [f]	Principal Gamma Emitters [d]	5×10^{-7}

*During releases via this pathway

**Only a twice per month sampling program for containment noble gases and H_3 is required

This table provides the minimum requirements for the gaseous sampling program. If additional sampling is performed then those sample results can be used to quantify releases in lieu of composite data for a more accurate quantification. Examples of these samples are verification or compensatory action sample results.

TABLE NOTATION

a. The lower limit of detection (LLD) is defined in Table Notation A. of Attachment 3.20, Maximum Values for Lower Limits of Detections A,B - REMP

b. Change samples at least once per 7 days and complete analyses within 48 hours after changing. Perform analyses at least once per 24 hours for 7 days following each shutdown, startup or THERMAL POWER change greater than 15% per hour of RATED THERMAL POWER. WHEN samples collected for 24 hours are analyzed, THEN the corresponding LLDs may be increased by a factor of 10. This requirement does not apply IF (1) analysis shows that DOSEQ I131 concentration in the RCS has not increased more than a factor of 3; and (2) the noble gas monitor shows that effluent activity has not increased more than a factor of 3. IF the daily sample requirement has been entered, THEN it can be exited early once both the radiation monitor reading and the RCS DOSEQ I131 levels have returned to within the factor of 3 of the pre-event 'normal'.[Ref. 5.2.1z]

c. Know the ratio of the sample flow rate to the sampled stream flow rate for the time period covered by each dose or dose rate calculation made in accordance with steps 3.2.4a, 3.2.4b, and 3.2.4c of this document.

   Sampling evolutions or momentary interruptions to maintain sampling capability are not an interruption of a continuous release or sampling period.

d. 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, Ce-141 and Ce-144 for particulate emissions. This list does not mean that only these nuclides are to be detected and reported. Identify and report other peaks, which are measurable and identifiable, together with the above nuclides.

e. Releases from incinerated oil are discharged through the Auxiliary Boiler System. Account for releases based on pre-release grab sample data.

f. Collect samples of waste oil to be incinerated from the container in which the waste oil is stored (example: waste oil storage tanks, 55 gal. drums) prior to transfer to the Auxiliary Boiler System. Ensure samples are representative of container contents.

g. Obtain and analyze a gas marinelli grab sample weekly for noble gases effluent quantification.

h. Take tritium grab samples at least once per 24 hours when the refueling cavity is flooded.

i. Grab sampling of the Gland Seal Exhaust pathway need not be performed if the RMS low range channel (SRA-1805/2805) (or Mirion normal range channel) readings are less than 1E-6 μC/cc. Attach the RMS daily averages in lieu of sampling. This is based on operating experience indicating no activity is detected in the Gland Seal Exhaust below this value. Compensatory sampling for out of service monitor is still required in the event 1805/2805 is inoperable.

j. Sampling and analysis shall also be performed following shutdown, startup or THERMAL POWER change exceeding 15% of RATED THERMAL POWER within a one hour period. This noble gas sample shall be performed within four hours of the event. Evaluation of the sample results, based on previous samples, will be performed to determine if any further sampling is necessary.

Liquid Factors		
Monitor Description	Monitor Number	MRP #
U 1 SG Blowdown	1-DRA-300, 1-DRA-353, 1R19/24, DRS 3100/3200*	0.35
U 2 SG Blowdown	2-DRA-300, 2-DRA-353, 2R19/24, DRS 4100/4200*	0.35
U 1 & 2 Liquid Waste Discharge	RRS-1001-A, RRS-1001-B, RRS-1000 (c)	0.30

Sources of radioactivity released from the Turbine Room Sump (TRS) typically originate from the secondary cycle which is already being monitored by instrumentation that utilizes multiple release point (MRP) factors. The MRP is an administrative value that is used to assist with maintaining releases ALARA. The TRS has no actual radiation monitor, but utilizes an automatic compositor for monitoring what has been released. The batch release path, through RRS-1000 (RRS-1001-A/B), is the predominant release path by several magnitudes. Tritium is the predominant radionuclide released from the site and the radiation monitors do not respond to this low energy beta emitter. Based on this information and the large degree of conservatism built into the radiation monitor setpoint methodology it does not appear to warrant further reduction for the TRS release path since its source is predominantly the secondary cycle which is adequately covered by this factor.

Gaseous Factors			
Monitor Description	Monitor Number	Flow Rate (cfm)	MRP #
Unit 1			
Unit Vent	VRS-1500	186,600	0.54
Gland Seal Vent	SRA-1800	1,260	0.00363
Steam Jet Air Ejector	SRA-1900	3,600 (b)	0.01
Start Up FT Vent		1,536	0.004
Total		192,996	
Unit 2			
Unit Vent	VRS-2500	143,400	0.41
Gland Seal Vent	SRA-2800	5,508 (a)	0.02
Steam Jet Air Ejector	SRA-2900	3,600 (b)	0.01
Start Up FT Vent		1,536	0.004
Total		154,044	

* Either Mirion monitors (DRA) or Westinghouse R-19, 24/ Eberline monitors (DRS) can be used for blowdown monitoring as the Mirion monitors are replacing both the Eberline monitors (DRS) and the Westinghouse I monitors.

\# Nominal Values

a Two release points of 2,754 cfm each are totaled for this value.

b This is the total design maximum of the Start Up Air Ejectors. This is a conservative value for unit 1.

c Either the Mirion (RRS-1001-A/B) or the current RRS-1000 monitor may be used for liquid waste discharges as the Mirion monitors replace RRS-1000 monitor.

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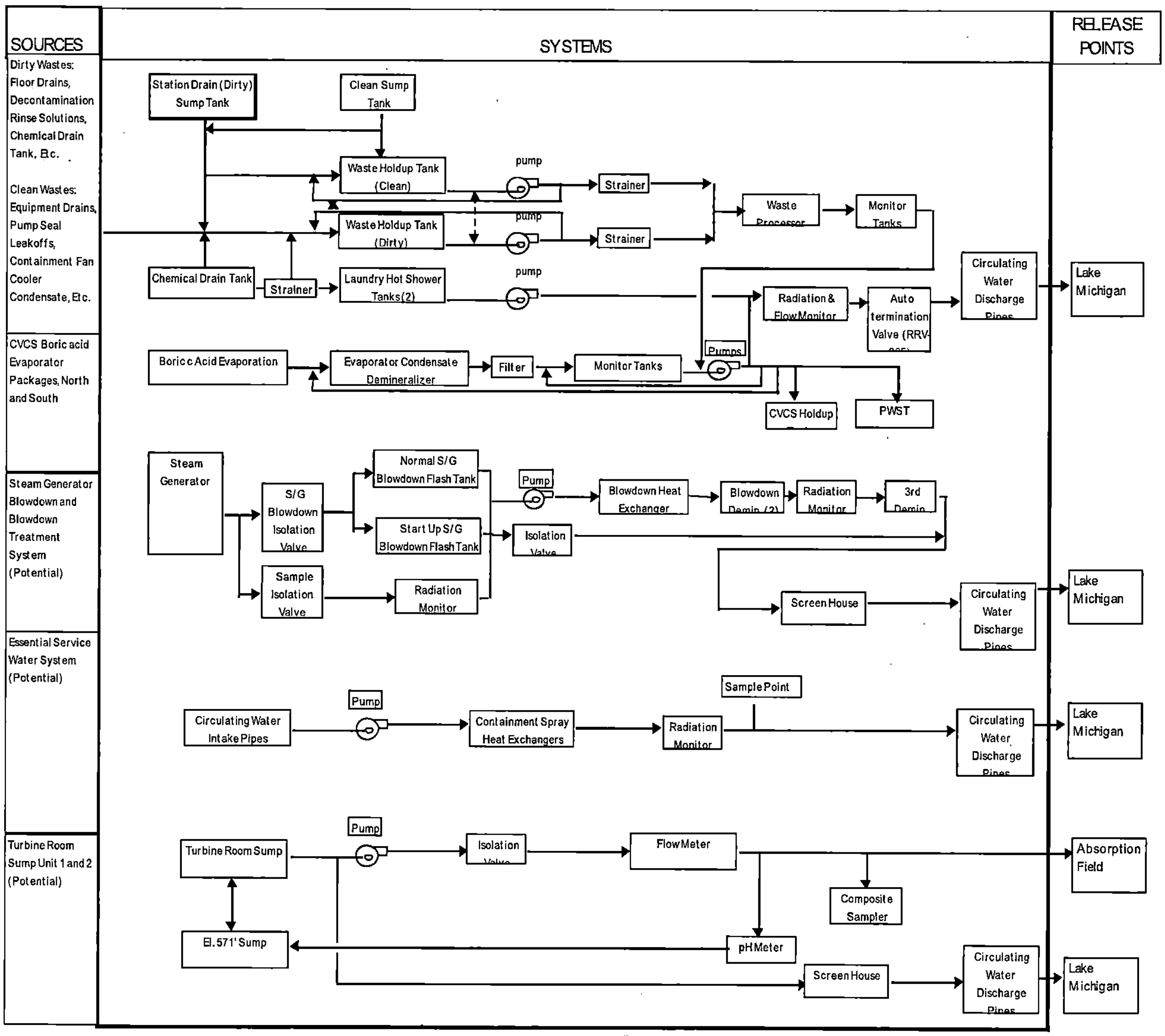


SOURCES
SYSTEMS
RELEASE POINTS
Dirty Wastes: Floor Drains, Decontamination Rinse Solutions, Chemical Drain Tank, Etc.
Clean Wastes: Equipment Drains, Pump Seal Leakoffs, Containment Fan Cooler Condensate, Etc.
CVCS Boric acid Evaporator Packages, North and South
Steam Generator Blowdown and Blowdown Treatment System (Potential)
Essential Service Water System (Potential)
Turbine Room Sump Unit 1 and 2 (Potential)
Station Drain (Dirty) Sump Tank
Clean Sump Tank
Waste Holdup Tank (Clean)
Waste Holdup Tank (Dirty)
pump
Strainer
Waste Processor
Monitor Tanks
Chemical Drain Tank
Strainer
Laundry Hot Shower Tanks(2)
Radiation & Flow Monitor
Auto termination Valve (RRV-
Circulating Water Discharge Pipes
Lake Michigan
Boric Acid Evaporation
Evaporator Condensate Demineralizer
Filter
Monitor Tanks
Pumps
CVCS Holdup
PWST
Steam Generator
S/G Blowdown Isolation Valve
Normal S/G Blowdown Flash Tank
Start Up S/G Blowdown Flash Tank
Sample Isolation Valve
Radiation Monitor
Pump
Isolation Valve
Blowdown Heat Exchanger
Blowdown Demin (2)
Radiation Monitor
3rd Demin
Screen House
Circulating Water Intake Pipes
Containment Spray Heat Exchangers
Sample Point
Turbine Room Sump
El. 571' Sump
Flow Meter
Composite Sampler
pH Meter
Absorption Field

SYSTEM	COMPONENTS		CAPACITY	FLOW RATE
	TANKS	PUMPS	(EACH)	(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.	580 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				
Unit 1		3		230,000 GPM
Unit 2		4		230,000 GPM

* Nominal Values

The 580 gpm value is calculated from the Estimated Steam Generator Blowdown Flow vs. DRV Valve Position letter prepared by M. J. O'Keefe, dated 9/27/93. This is 830 gpm times the 70% that remains as liquid while the other 30% flashes to steam and exhausts out the flash tank vent.

This includes the following monitors: RRS-1000, DRS 3100, DRS 3200, DRS 4100, and DRS 4200. [Ref. 5.2.1q]

NUCLIDE	EFFICIENCY (cpm/μCi/cc)
I-131	3.78 E7
Cs-137	3.00 E7
Cs-134	7.93 E7
Co-60	5.75 E7
Co-58	4.58 E7
Cr-51	3.60 E6
Mn-54	3.30 E7
Zn-65	1.58 E7
Ag-110M	9.93 E7
Ba-133	4.85 E7
Ba-140	1.92 E7
Cd-109	9.58 E5
Ce-139	3.28 E7
Ce-141	1.92 E8
Ce-144	4.83 E6
Co-57	3.80 E7
Cs-136	1.07 E8
Fe-59	2.83 E7
Sb-124	5.93 E7
I-133	3.40 E7
I-134	7.23 E7
I-135	3.95 E7
Mo-99	8.68 E6
Na-24	4.45 E7
Nb-95	3.28 E7
Nb-97	3.50 E7
Rb-89	5.00 E7
Ru-103	3.48 E7
Ru-106	1.23 E7
Sb-122	2.55 E7
Sb-125	3.15 E7
Sn-113	7.33 E5
Sr-85	3.70 E7
Sr-89	2.88 E3
Sr-92	3.67 E7
Tc-99M	3.60 E7
Y-88	5.25 E7
Zr-95	3.38 E7
Zr-97	3.10 E7
Kr-85	1.56 E5
Kr-85M	3.53 E7
Kr-88	4.10 E7
Xe-131M	8.15 E5
Xe-133	7.78 E6
Xe-133M	5.75 E6
Xe-135	3.83 E7

Mirion RRS-1001A/B

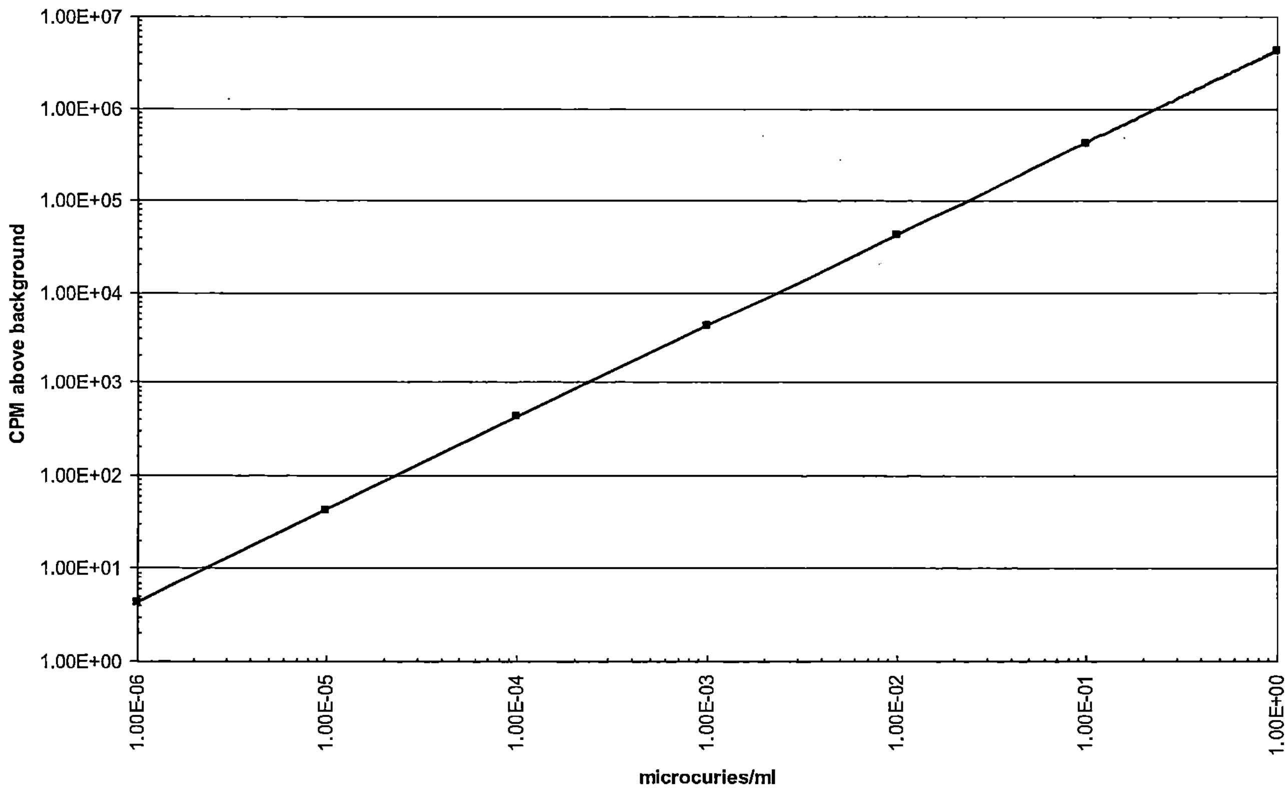
Nuclide	Detection efficiency {cps/(Bq/m3)}	Detection efficiency {cpm/(μCi/cc)}
Ag-108m	7.22E-04	1.60E+09
Ag-110m	8.45E-04	1.88E+09
Ba-137m	2.42E-04	5.37E+08
Ce-144	1.01E-05	2.24E+07
Co-57	6.78E-05	1.51E+08
Co-58	3.38E-04	7.50E+08
Co-60	4.99E-04	1.11E+09
Cr-51	2.47E-05	5.48E+07
Cs-134	5.92E-04	1.31E+09
Cs-137	2.27E-04	5.04E+08
Fe-55	9.91E-14	2.20E-01
Fe-59	2.62E-04	5.82E+08
I-131	2.50E-04	5.55E+08
I-133	2.71E-04	6.02E+08
In-113m	1.71E-04	3.80E+08
Kr-85	1.15E-06	2.55E+06
Mn-54	2.67E-04	5.93E+08
Mo-99	1.53E-04	3.40E+08
Na-24	4.23E-04	9.39E+08
Nb-95	2.66E-04	5.91E+08
Pr-144	5.93E-06	1.32E+07
Sb-122	2.02E-04	4.48E+08
Sb-124	4.75E-04	1.05E+09
Sb-125	2.23E-04	4.95E+08
Sn-113	1.75E-04	3.89E+08
Sn-117m	1.19E-04	2.64E+08
Tc-99m	9.10E-05	2.02E+08
Xe-131m	2.84E-06	6.30E+06
Xe-133	1.32E-07	2.93E+05
Xe-133m	2.19E-05	4.86E+07
Xe-135	2.08E-04	4.62E+08
Zn-65	1.33E-04	2.95E+08
Zr-95	2.66E-04	5.91E+08

Bq=Becquerel Note: 1 cps/(Bq/m3) = 2.22e+12 cpm/(μCi/cc)

Attachment 3.12	Counting Efficiency for R-19, 1/2-DRA-300, R-24, and 1/2-DRA-353	Pages: 76 - 79

Counting Efficiency Curve for R-19
Efficiency Factor = 4.2 E6 cpm/uCi/ml

(Based on empirical data taken during pre-operational testing with Cs-137)



Mirion 1/2-DRA-300 2π Shield

Nuclide	Detection efficiency {cps/(Bq/m3)}	Detection efficiency {cpm/(µCi/cc)}
Mn-54	3.99E-06	8.86E+06
Co-58	5.33E-06	1.18E+07
Co-60	7.46E-06	1.66E+07
Cs-137	3.72E-06	8.26E+06
I-131	4.68E-06	1.04E+07
I-132	1.20E-05	2.66E+07
I-133	4.45E-06	9.88E+06
I- 134	1.22E-05	2.71E+07
I-135D	1.08E-05	2.40E+07

(based on actual pre-installation counting performed with an iodine source term)

Bq= Becquerel

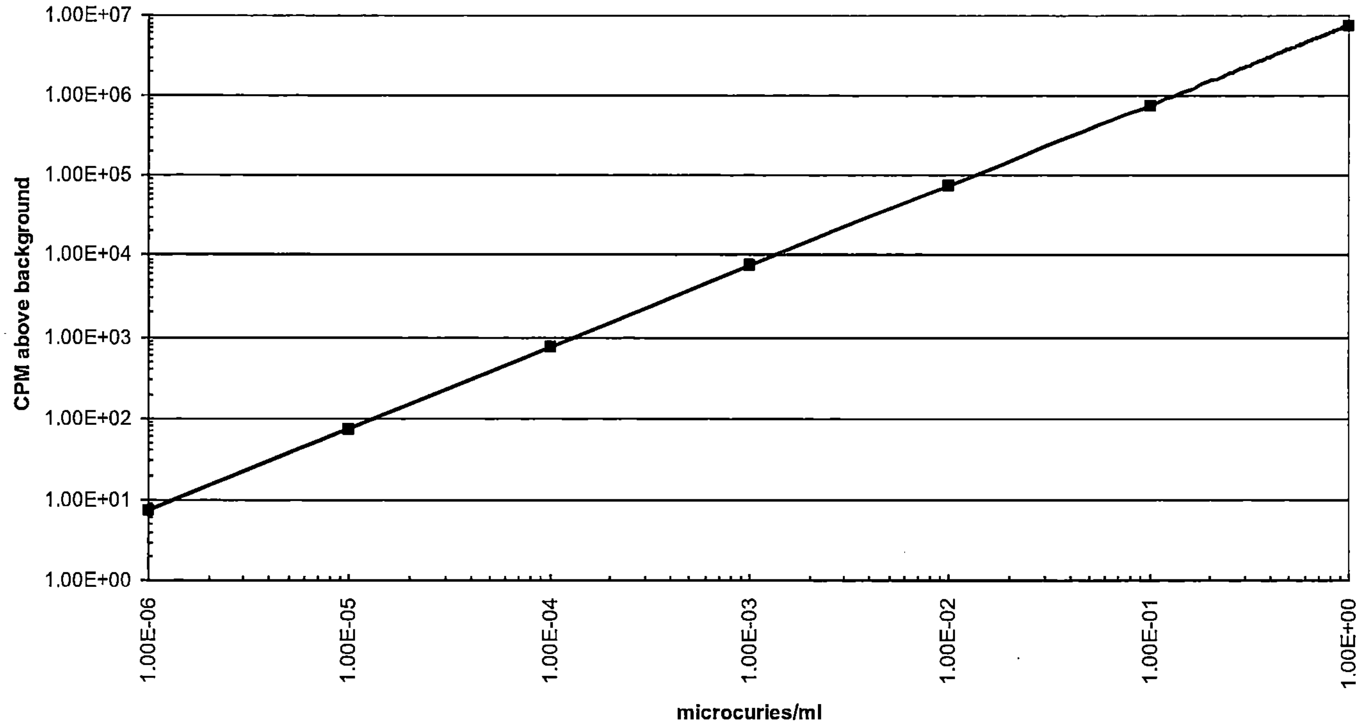
Note: 1 cps/(Bq/m3) = 2.22e+12 cpm/(μCi/cc)

2π Shield= shielding encompasses the detector but not the sample piping per design criteria

Mirion Detectors 1/2-DRA-300 replace the R-19 and DRS-3100/4100 detectors

Counting Efficiency Curve for R-24
Efficiency Factor = 7.5E6 cpm/uCi/ml

(Based on empirical data taken during pre-operational testing with Mn-54)



Mirion	1/2-DRA-353	2π Shield
Nuclide	Detection efficiency (cps/ (Bq/ m3))	Detection efficiency {cpm/(μCi/cc)}
Mn-54	1.33E-05	2.95E+07
Co-58	1.74E-05	3.86E+07
Co-60	2.56E-05	5.68E+07
Cs-137	1.13E-05	2.51E+07
I-131	1.13E-05	2.51E+07
I-132	3.69E-05	8.19E+07
I-133	1.30E-05	2.89E+07
I- 134	3.62E-05	8.04E+07
I-135D	2.89E-05	6.42E+07

(based on actual pre-installation counting performed with an iodine source term)

Bq= Becquerel

Note: 1 cps/(Bq/m3) = 2.22e+12 cpm/(μCi/cc)

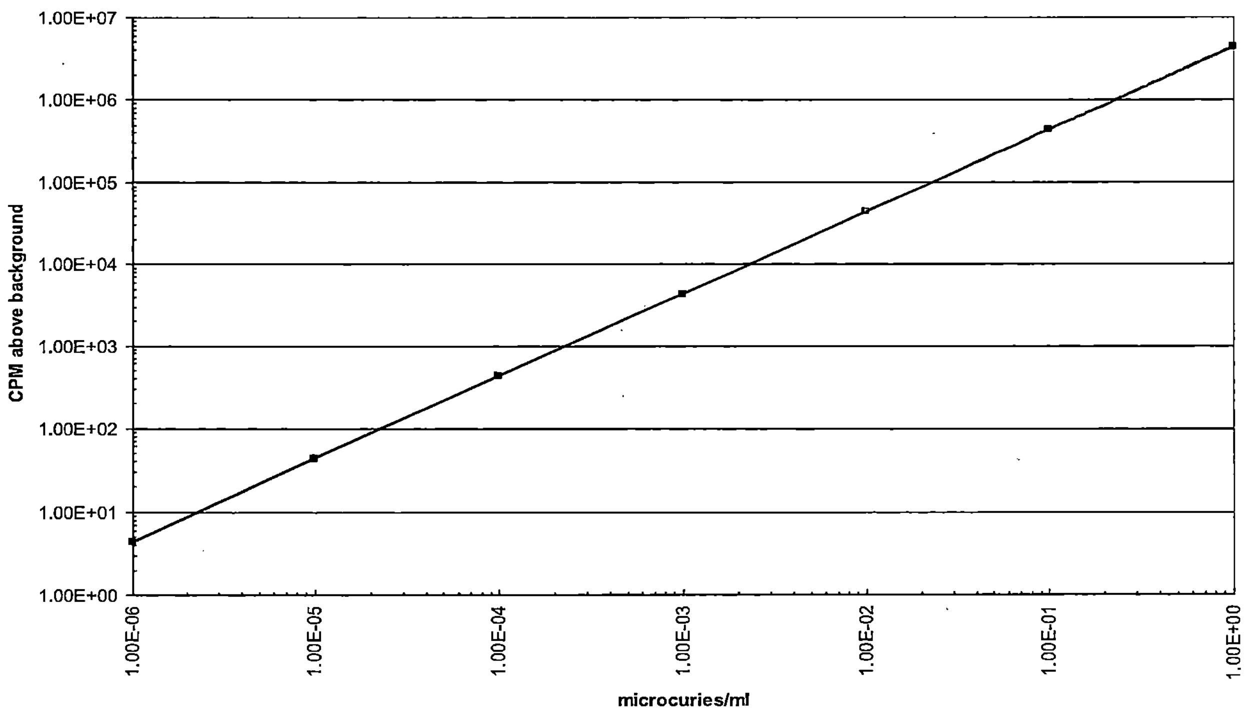
2π Shield= shielding encompasses the detector but not the sample piping per design criteria

Mirion Detectors 1/2-DRA-353 replace the R-24 and DRS-3200/4200 detectors

Counting Efficiency Curve for R-20 and R-28

Efficiency Factor = 4.3 E6 cpm/uCi/ml

(Based on empirical data taken during pre-operational testing with Co-58)



R-20 replacement

Mirion 1-WRA713, 2-WRA-714

Nuclide	Detection efficiency {cps/(Bq/m3)}	Detection efficiency {cpm/(µCi/cc)}
Am-241	4.81E-10	1.07E+03
Ba-137m	2.79E-06	6.19E+06
Ba-139	8.02E-07	1.78E+06
Ba-140	1.31E-06	2.91E+06
Ce-141	1.34E-06	2.97E+06
Ce-143	2.18E-06	4.84E+06
Ce-144	2.54E-07	5.64E+05
Cm-242	7.56E-11	1.68E+02
Cm-244	5.06E-11	1.12E+02
Cs-134	7.26E-06	1.61E+07
Cs-136	8.68E-06	1.93E+07
Cs-137	2.63E-06	5.84E+06
I-131	3.45E-06	7.66E+06
I-132	9.53E-06	2.12E+07
I-133	3.35E-06	7.44E+06
I-134	9.04E-06	2.01E+07
I-135D	8.02E-06	1.78E+07
Kr-85	1.39E-08	3.09E+04
Kr-85m	2.81E-06	6.24E+06
Kr-87	2.68E-06	5.95E+06

Mirion 1-WRA713, 2-WRA-714

Nuclide	Detection efficiency {cps/(Bq/m3)}	Detection efficiency {cpm/(µCi/cc)}
Kr-88	4.04E-06	8.97E+06
La-140	6.50E-06	1.44E+07
La-141	5.68E-08	1.26E+05
La-142	4.43E-06	9.83E+06
Mo-99	3.25E-06	7.22E+06
Nb-95	3.08E-06	6.84E+06
Nd-147	7.07E-07	1.57E+06
Np-239	1.90E-06	4.22E+06
Pr-143	3.78E-14	8.39E-02
Pr-144	7.41E-08	1.65E+05
Pu-238	6.62E-11	1.47E+02
Pu-239	4.97E-10	1.10E+03
Pu-240	6.93E-11	1.54E+02
Pu-241	1.18E-11	2.62E+01
Rb-86	2.56E-07	5.68E+05
Rh-103m	0.00E+00	0.00E+00
Rh-105	8.74E-07	1.94E+06
Rh-106	1.08E-06	2.40E+06
Ru-103	3.13E-06	6.95E+06
Ru-105	4.22E-06	9.37E+06
Sb-127	3.82E-06	8.48E+06

Mirion 1-WRA713, 2-WRA-714

Nuclide	Detection efficiency {cps/(Bq/m3)}	Detection efficiency {cpm/(µCi/cc)}
Sb-129	5.56E-06	1.23E+07
Sr-89	2.89E-10	6.42E+02
Sr-91	4.55E-06	1.01E+07
Sr-92	3.02E-06	6.70E+06
Tc-99m	2.37E-06	5.26E+06
Te-127	4.25E-08	9.44E+04
Te-127m	5.49E-10	1.22E+03
Te-129	3.87E-07	8.59E+05
Te-129m	1.32E-07	2.93E+05
Te-131m	6.53E-06	1.45E+07
Te-132	3.25E-06	7.22E+06
Xe-133	3.42E-09	7.59E+03
Xe-135	3.37E-06	7.48E+06
Y-90	3.83E-14	8.50E-02
Y-91	7.49E-09	1.66E+04
Y-92	8.13E-07	1.80E+06
Y-93	4.56E-07	1.01E+06
Zr-95	3.11E-06	6.90E+06
Zr-97	3.82E-06	8.48E+06

Bq= Becquerel

Note: 1 cps/(Bq/m3) = 2.22e+12 cpm/(μCi/cc)

R-28 replacement

Mirion 1-WRA-717, 2-WRA-718

Nuclide	Detection efficiency {cps/(Bq/m3)}	Detection efficiency {cpm/(µCi/cc)}
Am-241	7.29E-10	1.62E+03
Ba-137m	1.71E-05	3.80E+07
Ba-139	1.47E-06	3.26E+06
Ba-140	6.64E-06	1.47E+07
Ce-141	1.85E-06	4.11E+06
Ce-143	9.67E-06	2.15E+07
Ce-144	2.90E-07	6.44E+05
Cm-242	1.38E-10	3.06E+02
Cm-244	1.15E-10	2.55E+02
Cs-134	4.33E-05	9.61E+07
Cs-136	5.19E-05	1.15E+08
Cs-137	1.67E-05	3.71E+07
I-131	1.59E-05	3.53E+07
I-132	5.72E-05	1.27E+08
I-133	1.95E-05	4.33E+07
I-134	6.14E-05	1.36E+08
I-135D	4.15E-05	9.21E+07
Kr-85	7.94E-08	1.76E+05
Kr-85m	5.53E-06	1.23E+07
Kr-87	1.55E-05	3.44E+07

Mirion 1-WRA-717, 2-WRA-718

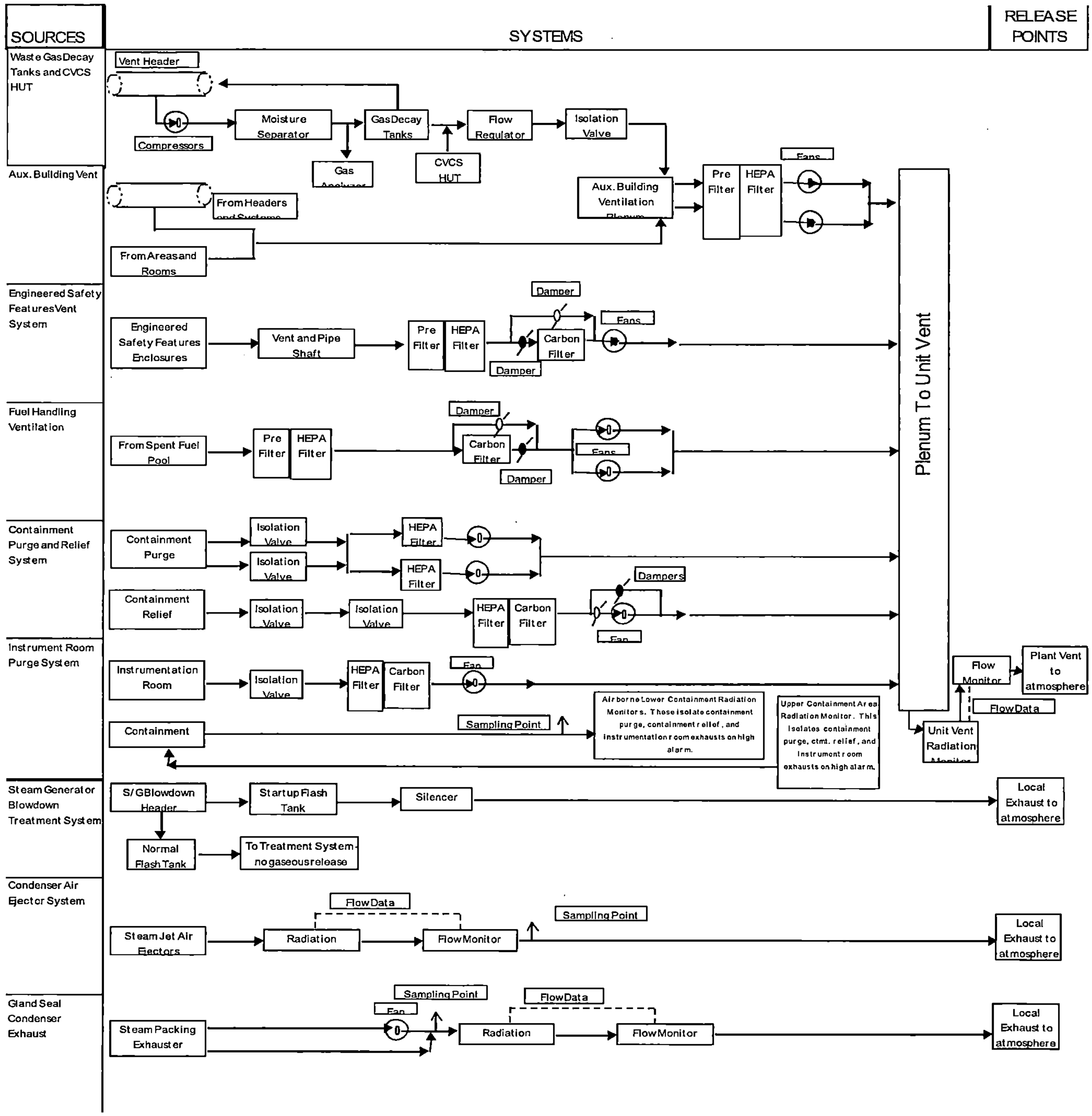
Nuclide	Detection efficiency {cps/(Bq/m3)}	Detection efficiency {cpm/(µCi/cc)}
Kr-88	2.45E-05	5.44E+07
La-140	4.13E-05	9.17E+07
La-141	4.33E-07	9.61E+05
La-142	2.90E-05	6.44E+07
Mo-99	7.11E-06	1.58E+07
Nb-95	1.98E-05	4.40E+07
Nd-147	3.34E-06	7.41E+06
Np-239	4.80E-06	1.07E+07
Pr-143	2.40E-13	5.33E-01
Pr-144	4.93E-07	1.09E+06
Pu-238	6.08E-11	1.35E+02
Pu-239	1.46E-09	3.24E+03
Pu-240	5.84E-11	1.30E+02
Pu-241	1.17E-11	2.60E+01
Rb-86	1.78E-06	3.95E+06
Rb-103m	0.00E+00	0.00E+00
Rh -10 5	3.54E-06	7.86E+06
Rh -106	6.25E-06	1.39E+07
Ru-103	1.74E-05	3.86E+07
Ru - 10 5	2.23E-05	4.95E+07
Sb-127	2.07E-05	4.60E+07

Mirion 1-WRA-717, 2-WRA-718

Nuclide	Detection efficiency {cps/(Bq/m3)}	Detection efficiency {cpm/(µCi/cc)}
Sb-129	3.56E-05	7.90E+07
Sr -89	1.93E-09	4.28E+03
Sr-91	2.85E-05	6.33E+07
Sr -92	2.20E-05	4.88E+07
Tc-99m	2.95E-06	6.55E+06
Te-127	2.08E-07	4.62E+05
Te-127m	3.25E-09	7.22E+03
Te-129	2.05E-06	4.55E+06
Te-129m	7.88E-07	1.75E+06
Te-131m	3.55E-05	7.88E+07
Te-132	9.88E-06	2.19E+07
Xe-133	4.99E-09	1.11E+04
Xe-135	1.25E-05	2.78E+07
Y-90	3.01E-13	6.68E-01
Y-91	5.46E-08	1.21E+05
Y-92	5.51E-06	1.22E+07
Y-93	2.19E-06	4.86E+06
Zr-95	1.90E-05	4.22E+07
Zr-97	2.36E-05	5.24E+07

Bq = Becquerel

Note: 1 cps/(Bq/m3) = 2.22e+12 cpm/(μCi/cc)


SOURCES
SYSTEMS
RELEASE POINTS
Waste Gas Decay Tanks and CVCS HUT
Vent Header
Compressors
Moisture Separator
Gas Decay Tanks
Gas Analyzer
CVCS HUT
Flow Regulator
Isolation Valve
Aux. Building Vent
From Headers and Systems
From Areas and Rooms
Aux. Building Ventilation Plenum
Pre Filter
HEPA Filter
Fans
Engineered Safety Features Vent System
Engineered Safety Features Enclosures
Vent and Pipe Shaft
Damper
Carbon Filter
Fuel Handling Ventilation
From Spent Fuel Pool
Containment Purge and Relief System
Containment Purge
Isolation Valve
Containment Relief
Dampers
Fan
Instrument Room Purge System
Instrumentation Room
Containment
Sampling Point
Airborne Lower Containment Radiation Monitors. These isolate containment purge, containment relief, and instrumentation room exhausts on high alarm.
Upper Containment Area Radiation Monitor. This isolates containment purge, ctmt. relief, and instrument room exhausts on high alarm.
Plenum To Unit Vent
Flow Monitor
Flow Data
Plant Vent to atmosphere
Unit Vent Radiation Monitor
Steam Generator Blowdown Treatment System
S/G Blowdown Header
Startup Flash Tank
Silencer
Normal Flash Tank
To Treatment System no gaseous release
Local Exhaust to atmosphere
Condenser Air Ejector System
Steam Jet Air Ejectors
Radiation
Flow Monitor
Gland Seal Condenser Exhaust
Steam Packing Exhauster

SYSTEM	UNIT	EXHAUST FLOW RATE (CFM)	CAPACITY
I PLANT AUXILIARY BUILDING UNIT VENT	1 2	186,600 max 143,400 max	
WASTE GAS DECAY TANKS (8) AND CHEMICAL & VOLUME CONTROL SYSTEM HOLD UP TANKS (3)	1	125	4082 FT^3 @100 psig 28,741 ft^3 max @ 8#, 0 level
+ AUXILIARY BUILDING EXHAUST	1 2	72,660 59,400	
+ ENG. SAFETY FEATURES VENT	1 & 2	50,000	
+ FUEL HANDLING AREA VENT SYSTEM	1	30,000	
CONTAINMENT PURGE SYSTEM	1 & 2	32,000	
CONTAINMENT PRESSURE RELIEF SYSTEM	1 & 2	1,000	
INSTRUMENT ROOM PURGE SYSTEM	1 & 2	1,000	

II CONDENSER AIR EJECTOR SYSTEM			2 Release Points One for Each Unit
NORMAL STEAM JET AIR EJECTORS	1 & 2	230	
START UP STEAM JET AIR EJECTORS	1 & 2	3,600	

III TURBINE SEALS SYSTEM	1	1,260	
	2	5,508	2 Release Points for Unit 2

IV START UP FLASH TANK VENT	1	1,536	
	2	1,536	

+ Designates total flow for all fans.

$\overline{\chi/Q}$ GROUND AVERAGE (sec/m^3)

DIRECTION	DISTANCE (METERS)				
(WIND FROM)	594	2416	4020	5630	7240
N	4.17E-06	4.82E-07	2.25E-07	1.33E-07	9.32E-08
NNE	3.02E-06	3.64E-07	1.73E-07	1.04E-07	7.29E-08
NE	4.54E-06	5.31E-07	2.60E-07	1.59E-07	1.13E-07
ENE	7.16E-06	7.99E-07	4.04E-07	2.52E-07	1.80E-07
E	1.04E-05	1.13E-06	5.82E-07	3.66E-07	2.63E-07
ESE	1.07E-05	1.18E-06	6.04E-07	3.78E-07	2.72E-07
SE	1.15E-05	1.24E-06	6.36E-07	4.00E-07	2.88E-07
SSE	1.30E-05	1.42E-06	7.27E-07	4.57E-07	3.29E-07
S	1.41E-05	1.57E-06	7.92E-07	4.93E-07	3.54E-07
SSW	7.03E-06	7.81E-07	3.90E-07	2.41E-07	1.72E-07
SW	4.12E-06	4.73E-07	2.28E-07	1.38E-07	9.73E-08
WSW	3.29E-06	3.65E-07	1.76E-07	1.06E-07	7.52E-08
W	3.63E-06	4.11E-07	1.96E-07	1.18E-07	8.31E-08
WNW	3.02E-06	3.43E-07	1.61E-07	9.59E-08	6.71E-08
NW	3.22E-06	3.61E-07	1.71E-07	1.02E-07	7.16E-08
NNW	3.84E-06	4.29E-07	2.02E-07	1.20E-07	8.40E-08

DIRECTION	DISTANCE (METERS)				
(WIND FROM)	12067	24135	40225	56315	80500
N	4.64E-08	1.79E-08	8.89E-09	5.68E-09	3.56E-09
NNE	3.66E-08	1.43E-08	7.13E-09	4.56E-09	2.87E-09
NE	5.75E-08	2.30E-08	1.15E-08	7.41E-09	4.72E-09
ENE	9.30E-08	3.80E-08	1.91E-08	1.23E-08	7.90E-09
E	1.37E-07	5.65E-08	2.85E-08	1.83E-08	1.18E-08
ESE	1.41E-07	5.81E-08	2.93E-08	1.88E-08	1.22E-08
SE	1.50E-07	6.20E-08	3.12E-08	2.01E-08	1.30E-08
SSE	1.71E-07	7.06E-08	3.56E-08	2.29E-08	1.48E-08
S	1.84E-07	7.49E-08	3.77E-08	2.43E-08	1.56E-08
SSW	8.86E-08	3.59E-08	1.80E-08	1.15E-08	7.39E-09
SW	4.93E-08	1.96E-08	9.77E-09	6.27E-09	3.98E-09
WSW	3.80E-08	1.51E-08	7.53E-09	4.83E-09	3.07E-09
W	4.17E-08	1.64E-08	8.13E-09	5.20E-09	3.28E-09
WNW	3.34E-08	1.29E-08	6.41E-09	4.10E-09	2.57E-09
NW	3.57E-08	1.39E-08	6.89E-09	4.41E-09	2.77E-09
NNW	4.19E-08	3.35E-08	8.10E-09	5.19E-09	3.27E-09

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

Worst Case $\overline{\chi/Q}$ = 2.04E-05 sec/m^3 in Sector H 2004

D/Q DEPOSITION (1/m^2)

DIRECTION	DISTANCE (METERS)				
(WIND FROM)	594	2416	4020	5630	7240
N	2.37E-08	2.29E-09	1.04E-09	5.44E-10	3.47E-10
NNE	9.86E-09	9.52E-10	4.32E-10	2.27E-10	1.45E-10
NE	1.29E-08	1.25E-09	5.67E-10	2.97E-10	1.90E-10
ENE	1.59E-08	1.54E-09	6.97E-10	3.66E-10	2.33E-10
E	1.87E-08	1.81E-09	8.20E-10	4.30E-10	2.75E-10
ESE	1.85E-08	1.79E-09	8.12E-10	4.26E-10	2.72E-10
SE	1.90E-08	1.83E-09	8.30E-10	4.36E-10	2.78E-10
SSE	2.40E-08	2.32E-09	1.05E-09	5.52E-10	3.52E-10
S	3.68E-08	3.56E-09	1.61E-09	8.46E-10	5.40E-10
SSW	2.30E-08	2.22E-09	1.01E-09	5.28E-10	3.37E-10
SW	2.22E-08	2.15E-09	9.74E-10	5.11E-10	3.26E-10
WSW	2.11E-08	2.04E-09	9.23E-10	4.84E-10	3.09E-10
W	2.00E-08	1.93E-09	8.74E-10	4.59E-10	2.93E-10
WNW	1.75E-08	1.69E-09	7.64E-10	4.01E-10	2.56E-10
NW	1.58E-08	1.53E-09	6.94E-10	3.64E-10	2.32E-10
NNW	2.30E-08	2.22E-09	1.01E-09	5.28E-10	3.37E-10

DIRECTION	DISTANCE (METERS)				
(WIND FROM)	12067	24135	40225	56315	80500
N	1.45E-10	4.72E-11	1.74E-11	9.27E-12	4.65E-12
NNE	6.36E-11	1.97E-11	7.24E-12	3.86E-12	1.94E-12
NE	8.07E-11	2.58E-11	9.51E-12	5.07E-12	2.54E-12
ENE	9.77E-11	3.17E-11	1.17E-11	6.23E-12	3.13E-12
E	1.14E-10	3.73E-11	1.37E-11	7.34E-12	3.68E-12
ESE	1.13E-10	3.70E-11	1.36E-11	7.26E-12	3.64E-12
SE	1.16E-10	3.78E-11	1.39E-11	7.42E-12	3.72E-12
SSE	1.47E-10	4.79E-11	1.76E-11	9.41E-12	4.72E-12
S	2.25E-10	7.34E-11	2.70E-11	1.44E-11	7.23E-12
SSW	1.41E-10	4.59E-11	1.69E-11	9.01E-12	4.52E-12
SW	1.36E-10	4.43E-11	1.63E-11	8.71E-12	4.37E-12
WSW	1.29E-10	4.20E-11	1.55E-11	8.26E-12	4.14E-12
W	1.22E-10	3.98E-11	1.47E-11	7.82E-12	3.92E-12
WNW	1.07E-10	3.48E-11	1.28E-11	6.84E-12	3.43E-12
NW	9.70E-11	3.16E-11	1.16E-11	6.20E-12	3.11E-12
NNW	1.41E-10	4.58E-11	1.69E-11	9.00E-12	4.52E-12

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

Worst Case D/Q = 4.46E-08 1/m^2 in Sector A 2001

1. Performed or received annual update of $\overline{\chi/Q}$ and $\overline{D/Q}$ values. Provide a description of what has been received.

/

Signature Date

Environmental Department
(print name, title)

2. Worst $\overline{\chi/Q}$ and $\overline{D/Q}$ value and sector determined. PMP-6010-OSD-001 has been updated, if necessary. Provide an evaluation.

/

Signature Date

Environmental Department
(print name, title)

3. Review nuclide mix for gaseous and liquid release paths to determine if the dose conversion factor of total body is still applicable. Provide an evaluation.

/

Signature Date

Environmental Department
(print name, title)

4. Approved and verified by:

/

Signature Date

Environmental Department
(print name, title)

DOSE FACTORS FOR NOBLE GASES AND DAUGHTERS*

RADIONUCLIDE	TOTAL BODY DOSE FACTOR K_i (DFB_i) mrem m³ per μCi yr)	SKIN DOSE FACTOR L_i (DFS_i) (mrem m³ per μCi yr)	GAMMA AIR DOSE FACTOR M_i (DF^{γ}_i) (mrad m³ per μCi yr)	BETA AIR DOSE FACTOR N_i (DF^{β}_i) (mrad m³ per μCi yr)
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 Reg. Guide 1.109, Table B-1.

DOSE FACTORS FOR RADIOIODINES AND RADIOACTIVE PARTICULATE, IN GASEOUS EFFLUENTS FOR CHILD* Ref. 5.2.1ee and ff

RADIONUCLIDE	P_i INHALATION PATHWAY (mrem m³ per μCi yr)	P_i FOOD & GROUND PATHWAY (mrem m² sec per μCi yr)
H-3	1.12E+03	1.57E+03 #
P-32	2.60E+06	7.76E+10
Cr-51	1.70E+04	1.20E+07
Mn-54	1.58E+06	1.12E+09
Fe-59	1.27E+06	5.92E+08
Co-58	1.11E+06	5.97E+08
Co-60	7.07E+06	4.63E+09
Zn-65	9.95E+05	1.17E+10
Rb-86	1.98E+05	8.78E+09
Sr-89	2.16E+06	6.62E+09
Sr-90	1.01E+08	1.12E+11
Y-91	2.63E+06	6.72E+06
Zr-95	2.23E+06	3.44E+08
Nb-95	6.14E+05	4.24E+08
Ru-103	6.62E+05	1.55E+08
Ru-106	1.43E+07	3.01E+08
Ag-110m	5.48E+06	1.99E+10
I-131	1.62E+07	4.34E+11
I-132	1.94E+05	1.78E+06
I-133	3.85E+06	3.95E+09
I-135	7.92E+05	1.22E+07
Cs-134	1.01E+06	4.00E+10
Cs-136	1.71E+05	3.00E+09
Cs-137	9.07E+05	3.34E+10
Ba-140	1.74E+06	1.46E+08
Ce-141	5.44E+05	3.31E+07
Ce-144	1.20E+07	1.91E+08

*As Sr-90, Ru-106 and I-131 analyses are performed, **THEN** use P_i given in P-32 for nonlisted radionuclides.

The units for both H3 factors are the same, mrem m³ per μCi yr

[Ref. 5.2.1w, 5.2.1y, 5.2.1u]

SAMPLE STATION	DESCRIPTION/ LOCATION	SAMPLE TYPE	SAMPLE FREQUENCY	ANALYSIS TYPE	ANALYSIS FREQUENCY
ON-SITE AIRBORNE AND DIRECT RADIATION (TLD) STATIONS					
ONS-1 (T-1)	1945 ft @ 18° from Plant Axis	Airborne Particulate	Weekly	Gross Beta	Weekly
				Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine		I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
ONS-2 (T-2)	2338 ft @ 48° from Plant Axis	Airborne Particulate	Weekly	Gross Beta	Weekly
				Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine		I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
ONS-3 (T-3)	2407 ft @ 90° from Plant Axis	Airborne Particulate	Weekly	Gross Beta	Weekly
				Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine		I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
ONS-4 (T-4)	1852 ft. @ 118° from Plant Axis	Airborne Particulate	Weekly	Gross Beta	Weekly
				Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine		I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
ONS-5 (T-5)	1895 ft @ 189° from Plant Axis	Airborne Particulate	Weekly	Gross Beta	Weekly
				Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine		I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
ONS-6 (T-6)	1917 ft @ 210° from Plant Axis	Airborne Particulate	Weekly	Gross Beta	Weekly
				Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine		I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
T-7	2103 ft @ 36° from Plant Axis	TLD	Quarterly	Direct Radiation	Quarterly
T-8	2208 ft @ 82° from Plant Axis	TLD	Quarterly	Direct Radiation	Quarterly
T-9	1368 ft @ 149° from Plant Axis	TLD	Quarterly	Direct Radiation	Quarterly
T-10	1390 ft @ 127° from Plant Axis	TLD	Quarterly	Direct Radiation	Quarterly
T-11	1969 ft @ 11° from Plant Axis	TLD	Quarterly	Direct Radiation	Quarterly
T-12	2292 ft @ 63° from Plant Axis	TLD	Quarterly	Direct Radiation	Quarterly

CONTROL AIRBORNE AND DIRECT RADIATION (TLD) STATIONS					
NBF	15.6 miles SSW New Buffalo, MI	Airborne Particulate	Weekly	Gross Beta	Weekly
				Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine		I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
SBN	26.2 miles SE South Bend, IN	Airborne Particulate	Weekly	Gross Beta	Weekly
				Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine		I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
DOW	24.3 miles ENE Dowagiac, MI	Airborne Particulate	Weekly	Gross Beta	Weekly
				Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine		I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly
COL	18.9 miles NNE Coloma, MI	Airborne Particulate	Weekly	Gross Beta	Weekly
				Gamma Isotopic	Quart. Comp.
		Airborne Radioiodine		I-131	Weekly
		TLD	Quarterly	Direct Radiation	Quarterly

SAMPLE STATION	DESCRIPTION/ LOCATION	SAMPLE TYPE	SAMPLE FREQUENCY	ANALYSIS TYPE	ANALYSIS FREQUENCY
OFF-SITE DIRECT RADIATION (TLD) STATIONS					
OFT-1	4.5 miles NE, Pole #B294-44	TLD	Quarterly	Direct Radiation	Quarterly
OFT-2	3.6 miles, NE, Stevensville Substation	TLD	Quarterly	Direct Radiation	Quarterly
OFT-3	5.1 miles NE, Pole #B296-13	TLD	Quarterly	Direct Radiation	Quarterly
OFT-4	4.1 miles, E, Pole #B350-72	TLD	Quarterly	Direct Radiation	Quarterly
OFT-5	4.2 miles ESE, Pole #B387-32	TLD	Quarterly	Direct Radiation	Quarterly
OFT-6	4.9 miles SE, Pole #B426-1	TLD	Quarterly	Direct Radiation	Quarterly
OFT-7	2.5 miles S, Bridgman Substation	TLD	Quarterly	Direct Radiation	Quarterly
OFT-8	4.0 miles S, Pole #B424-20	TLD	Quarterly	Direct Radiation	Quarterly
OFT-9	4.4 miles ESE, Pole #B369-214	TLD	Quarterly	Direct Radiation	Quarterly
OFT-10	3.8 miles S, Pole #B422-99	TLD	Quarterly	Direct Radiation	Quarterly
OFT-11	3.8 miles S, Pole #B423-12	TLD	Quarterly	Direct Radiation	Quarterly

GROUNDWATER (WELL WATER) SAMPLE STATIONS					
W-1	1969 ft @ 11° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly
W-2	2302 ft @ 63° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly
W-3	3279 ft @ 107° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly
W-4	418 ft @ 301° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly
W-5	404 ft @ 290° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly
W-6	424 ft @ 273° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly
W-7	1895 ft @ 189° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly
W-8	1274 ft @ 54° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly
W-9	1447 ft @ 22° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly
W-10	4216 ft @ 129° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly
W-11	3206 ft @ 153° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly
W-12	2631 ft @ 162° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly
W-13	2152 ft @ 182° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly
W-14	1780 ft @ 164° from Plant Axis	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly
W-15	725 ft @ 202° from Plant Axis NPDES well MW-12C	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly
W-16	2200 ft @ 208° from Plant Axis NPDES well MW-20	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly
W-17	2200 ft @ 180° from Plant Axis NPDES well MW-21	Groundwater	Quarterly	Gamma Isotopic	Quarterly
				Tritium	Quarterly

DRINKING WATER					
STJ	St. Joseph Public Intake Sta. 9 mi. NE	Drinking water	Once per calendar Day	Gross Beta	14 day Comp.
				Gamma Isotopic	14 day Comp.
				I-131	14 day Comp.
				Tritium	Quart. Comp.
LTW	Lake Twp. Public Intake Sta. 0.6 mi. S	Drinking water	Once per calendar Day	Gross Beta	14 day Comp.
				Gamma Isotopic	14 day Comp.
				I-131	14 day Comp.
				Tritium	Quart. Comp

SAMPLE STATION	DESCRIPTION/ LOCATION	SAMPLE TYPE	SAMPLE FREQUENCY	ANALYSIS TYPE	ANALYSIS FREQUENCY
SURFACE WATER					
SWL-2	Plant Site Boundary – South ~ 500 ft. south of Plant Centerline	Surface Water	Once per calendar Day	Gamma Isotopic	Month. Comp.
				Tritium	Quart. Comp
SWL-3	Plant Site Boundary – North ~ 500 ft. north of Plant Centerline	Surface Water	Once per calendar Day	Gamma Isotopic	Month. Comp.
				Tritium	Quart. Comp.

SEDIMENT					
SL-2	Plant Site Boundary – South ~ 500 ft. south of Plant Centerline	Sediment	Semi-Ann.	Gamma Isotopic	Semi-Annual
SL-3	Plant Site Boundary – North ~ 500 ft. north of Plant Centerline	Sediment	Semi-Ann.	Gamma Isotopic	Semi-Annual

INGESTION – MILK Indicator Farms*					
		Milk	Once every 15 days	I-131	per sample
				Gamma Isotopic	per sample
		Milk	Once every 15 days	I-131	per sample
				Gamma Isotopic	per sample
		Milk	Once every 15 days	I-131	per sample
				Gamma Isotopic	per sample

INGESTION – MILK Background Farm*					
		Milk	Once every 15 days	I-131	per sample
				Gamma Isotopic	per sample

SAMPLE STATION	DESCRIPTION/ LOCATION	SAMPLE TYPE	SAMPLE FREQUENCY	ANALYSIS TYPE	ANALYSIS FREQUENCY
INGESTION – FISH **					
ONS-N	0.3 mile N, Lake Michigan	Fish – edible portion	2/year	Gamma Isotopic	per sample
ONS-S	0.4 mile S, Lake Michigan	Fish – edible portion	2/year	Gamma Isotopic	per sample
OFS-N	3.5 mile N, Lake Michigan	Fish – edible portion	2/year	Gamma Isotopic	per sample
OFS-S	5.0 mile S, Lake Michigan	Fish – edible portion	2/year	Gamma Isotopic	per sample

INGESTION – FOOD PRODUCTS					
On Site					
ONS-G	Nearest sample to Plant in the highest D/Q land sector containing media.	Food Products	At time of harvest	Gamma Isotopic	At time of harvest
ONS-V		Broadleaf vegetation	At time of harvest	Gamma Isotopic	At time of harvest
Off Site					
OFS-G	In a land sector containing food products, approximately 20 miles from the plant, in one of the less prevalent D/Q land sectors	Food Products	At time of harvest	Gamma Isotopic	At time of Harvest
OFS-V		Broadleaf vegetation	At time of harvest	Gamma Isotopic	At time of harvest

INGESTION – BROADLEAF IN LIEU OF GARDEN CENSUS OR IN LIEU OF MILK (*)				
3 samples of different kinds of broad leaf vegetation collected at the site boundary, within five miles of the plant, in each of 2 different sectors with the highest annual average D/Q containing media	Broadleaf vegetation	Monthly when available	Gamma Isotopic I131	Monthly when available
1 background sample of similar vegetation grown 10-20 miles distant in one of the less prevalent wind directions.	Broadleaf vegetation	Monthly when available	Gamma Isotopic I131	Monthly when available

Collect composite samples of Drinking and Surface water at least daily. Analyze particulate sample filters 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, perform gamma isotopic analysis on the individual samples.

*__IF__ at least three indicator milk samples and one background milk sample cannot be obtained, **THEN** three broad leaf samples of different kinds will be collected in each of 2 different offsite locations, within five miles of the plant, with the highest D/Q (refers to the highest annual average ground D/Q). Also, one background broad leaf sample of similar kinds will be collected 10 to 20 miles from the plant in one of the less prevalent D/Q land sectors.

The three milk indicator and one background farm will be determined by the Annual Land Use Census and those that are willing to participate. **IF** it is determined that the milk animals are fed stored feed, **THEN** monthly sampling is appropriate for that time period.

Evaluate samples that identified positive plant effluent related radionuclides and determine if additional analysis are necessary to identify hard to detect radionuclides. The 10 CFR 61 scaling factor report should be consulted along with the radioactive material shipping program owner and the ODCM program owner to assist with this determination.

** Due to the transient nature of fish throughout the year due to lake temperatures and food supplies, it is acceptable to obtain fish sample from alternate locations so long as the intent of sampling fish from close to the plant site and samples of fish serving as a background exist.

[Ref. 5.2.1w]

Radionuclides	Food Product ρCi/kg, wet	Water ρCi/l	Milk ρCi/l	Air Filter ρCi/m³	Fish ρCi/kg, wet	Sediment ρCi/kg, dry
Gross Beta		4		0.01		
H-3		2000				
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		

This Data is directly from our plant-specific Technical Specification.

NOTES

A. The Lower Limit of Detection (LLD) is defined as the smallest concentration of radioactive material in a 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:

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

Where LLD is the a priori lower limit of detection as defined above (as ρCi per unit mass or volume). Perform analysis 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. It should be further clarified that the LLD represents the capability of a measurement system and not as an after the fact limit for a particular measurement.

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

E is the counting efficiency of the detection equipment as counts per transformation (that is, disintegration)

V is the sample size in appropriate mass or volume units

2.22 is the conversion factor from picocuries (ρCi) to transformations (disintegrations) per minute

Y is the fractional radiochemical yield as appropriate

λ is the radioactive decay constant for the particular radionuclide

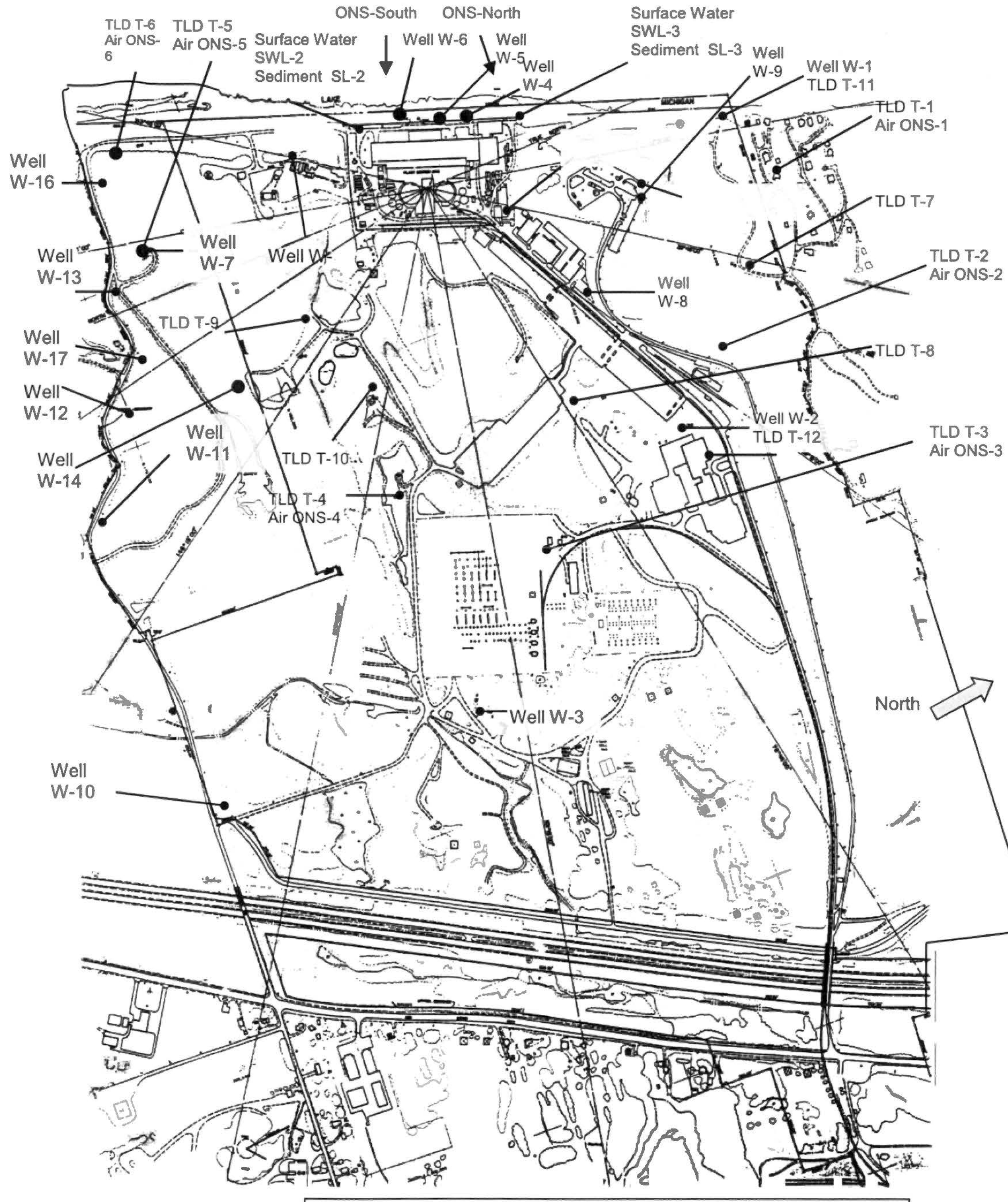
Δt is the elapsed time between the midpoint of sample collection (or end of sample collection period) and time of counting.

B. Identify and report other peaks which are measurable and identifiable, together with the radionuclides listed in Attachment 3.20, Maximum Values for Lower Limits of Detections [A,B] - REMP.

α A 2.71 value may be added to the equation to provide correction for deviations in the Poisson distribution at low count rates, that is, 2.71 + 4.66 x S.

Radionuclides	Food Product ρCi/kg, wet	Water ρCi/l	Milk ρCi/l	Air Filter ρCi/m^3	Fish ρCi/kg, wet
H-3		20000			
Ba-140		200	300		
La-140		200	300		
Cs-134	1000	30	60	10	1000
Cs-137	2000	50	70	20	2000
Zr-95		400			
Nb-95		400			
Mn-54		1000			30000
Fe-59		400			10000
Zn-65		300			20000
Co-58		1000			30000
Co-60		300			10000
I-131	100	2	3	0.90	

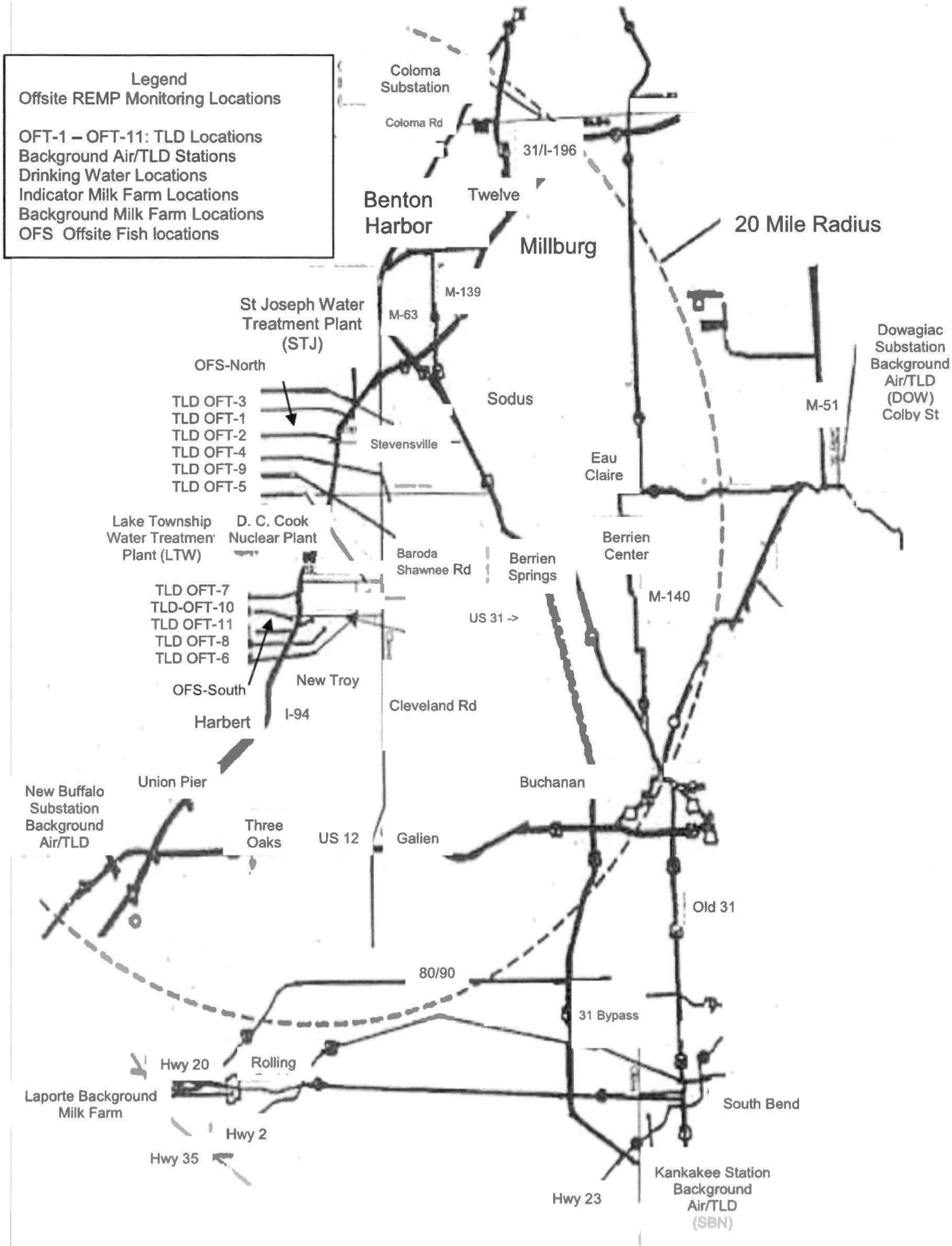
IF any of the above concentration levels are exceeded **THEN** see guidance contained in step 3.5.2a. for additional information.



LEGEND

ONS-1 – ONS-6: Air Sampling Station
T-1 – T-12: TLD Sampling Station
W-1 – W-17: REMP Groundwater Wells
SWL- 2, 3: Surface Water Sampling Stations
SL-2 SL-3: Sediment Sampling Stations
ONS-N & S: Fish sampling locations

Attachment 3.23	Off-Site Monitoring Locations - REMP	Page: 98



REVISION SUMMARY

Procedure No.: PMP-6010-OSD-001 Rev. No.: 26

Title: OFF-SITE DOSE CALCULATION MANUAL

Alteration	Justification
10 CFR 50.59 is not applicable to this procedure revision. Per definition in Attachment 1 of PMP-2010-PRC-002. This is an administrative procedure governing the conduct of facility operations. Changes to this document are made in accordance with Technical Specification 5.5.1 and implemented through 12-EA-6090-ENV-114, Effectiveness Review for ODCM/PCP Programs.	
Security review per PMP-2060-SEC-007 is not applicable to this procedure revision. All review responses of the pre-screening in Data Sheet 1 of PMP-2060-SEC-007 were "No" and peer reviewed per Step 3.3.1.	
Section 1.0 - Added note informing users that the revision reflects pending RMS Project changes to upgrade the system to Mirion detectors.	This is an editorial change to ensure users understand that during the RMS replacement project there will be a transition period where both old and new equipment guidance will be needed, so personnel will need to verify what plant equipment is installed and select the appropriate guidance.
Revised Table of Contents and renumbered as needed; no margin marks used.	Multiple Sections and Attachments required updating of titles and/or updating the contents contained inside which lengthened the documentation. This altered page numbering throughout.
3.1.2.c- Clarified step to describe typical activities involving draining Steam Generators	Editorial correction to enhance understanding, with no changes to intent.
3.2.1.d- Revised the step to reflect the alteration from a single detector (current) to a pair of redundant detectors (Mirion).	Editorial correction to provide clarity once the new detectors are installed. No changes to intent made, as the requirements are true/ unchanged regardless of the number of detectors.
3.2.1 Basis Liquid- Updated to reflect pending changes and corrected reference.	Editorial change to allow the step to be correct regardless of RMS system equipment installed. No changes to intent. Corrected typo on the reference.
3.3.1- Revised the step to reflect the pending alteration for the various detectors (current) to replacement detectors (Mirion). Updated Attachment Titles as needed. Margin marks used on affected sub-steps.	Editorial correction to provide clarity once the new detectors are installed. No changes to intent made, and Titles revisions made to reflect the changing attachments.

REVISION SUMMARY

Procedure No.: PMP-6010-OSD-001 Rev. No.: 26

Title: OFF-SITE DOSE CALCULATION MANUAL

Alteration	Justification
3.3.2- Revised the step to reflect the pending alteration for the various detectors (current) to replacement detectors (Mirion). Updated Attachment Titles as needed. Margin marks used on affected sub-steps.	Editorial correction to provide clarity once the new detectors are installed. Title changes made to reflect the changing attachments.
3.5.1.b- Editorial correction to clarify the step.	Reworded the step so that all bullets were accounted for in the discussion, as the original wording left off discussion on the final bullet.
3.9- Editorial revision of the step to enhance clarity of requirements. Affected sub-steps are not margin marked.	Sub-steps were reworded to provide clarification of intent, as the wording was confusing. The new sub-steps are phrased to reflect the actual processes we perform now and neither create nor remove any actual requirements.
5.2.1.kk- Added reference step	Added new Mirion detector reference for counter efficiencies.
Attachment 3.2- Rewritten to include Mirion information. No margin marks used.	Added new Mirion detector instruments and the appropriate guidance to be used once installed.
Attachment 3.3- Rewritten to include Mirion information. No margin marks used.	Added new Mirion detector instruments and the appropriate guidance to be used once installed.
Attachment 3.4- Rewritten to include Mirion information. No margin marks used.	Added new Mirion detector instruments and the appropriate guidance to be used once installed. Specific guidance provided allowing credit for local display units and computer based data displays (PPC/RadServe).
Attachment 3.5- Rewritten to include Mirion information. No margin marks used.	Added new Mirion detector instruments and the appropriate guidance to be used once installed. Specific guidance provided allowing credit for local display units and computer based data displays (PPC/RadServe), and providing new surveillance requirements associated with the local displays and computer based data displays.

REVISION SUMMARY

Procedure No.: PMP-6010-OSD-001 Rev. No.: 26

Title: OFF-SITE DOSE CALCULATION MANUAL

Alteration	Justification
Attachment 3.8- Rewritten to include Mirion information. No margin marks used.	Added new Mirion detector instruments, with no changes made to MRP or flowrates as these remain unaffected by the RMS project. Notes were updated to reflect new equipment and design.
Attachment 3.11- Added new tables and notes pertaining to the Mirion monitors. No margin marks used.	Added the new detector efficiency data obtained from Mirion and performed unit conversions to align with US standards/ present Cook standards. Only RRS-1001A/B provided in this attachment as the other monitors are covered in following attachments.
Attachment 3.12- Added new tables and notes pertaining to the Mirion monitors. No margin marks used.	Curves are not included for the Mirion detectors as actual data was available (previous curves created empirically). Blowdown detectors formally in Att.#3.11 added here so all blowdown is located in one spot (blowdown detectors listed currently in Att.#3.11 will be replaced by ones listed here). Performed unit conversions to align with US standards/ present Cook standards.
Attachment 3.13- Added new tables and notes pertaining to the Mirion monitors. No margin marks used.	Curves are not included for the Mirion detectors as actual data was available (previous curves created empirically). Performed unit conversions to align with US standards/ present Cook standards.
Attachment 3.19- Added notation "**" for Fish samples. No margin marks used.	Added note to provide additional flexibility when obtaining fish samples due to the transient nature of fish and issues with finding them in our fixed sample spots during sampling evolutions. This does not alter intent and will enhance compliance.
Attachment 3.19- Editorial enhancement that replaced the term "grapes" with "food products". No margin marks used.	Replacement of the "grapes" with "food product" adds additional flexibility on food harvests which vary from season to season. This does not alter intent and will enhance compliance with the Reg.Guide 1.109. AR#2017-10263-6

REVISION SUMMARY

Procedure No.: PMP-6010-OSD-001 Rev. No.: 26

Title: OFF-SITE DOSE CALCULATION MANUAL

Alteration	Justification
Attachment 3.23- Editorial correction to fix several labels not showing correctly. No margin marks used.	Editorial correction to fix image labels. AR#2016-0951-1

REVISION SUMMARY

Procedure No.: PMP-6010-OSD-001 Rev. No.: 26

Title: OFF-SITE DOSE CALCULATION MANUAL

IMPLEMENTATION PLAN

Summary of Change
See Revision Summary for details.

Reason for Change
See Revision Summary for details.

Implementation Schedule
Procedure to be made effective following PORC and upon Plant Manager's approval.

Training Needs
N/A

Expiration Date
N/A

Required Basis Documents Update
None

Related Processes and Procedures
12-THP-6010-RPI-805, Radiation Monitoring System Setpoints
12-THP-6010-RPP-709, Radiation Monitoring System Liquid Effluent Alarm.
These procedures are being updated to reflect the new Mirion monitors and their efficiencies as noted in this procedure. Changes are being tracked by GTs entered in the Corrective Action Program.

Transition Plan
Attachments from previous revision of 12-THP-6010-OSD-001 may be used subject to the conditions described in PMP-2010-PRC-003.

Related Equipment Modifications
Installation of new Mirion radiation monitors in both units per EC-53363 and EC-53364.

Communication Plan
Effective date of this revision will be communicated via email to interested groups.

Special Tools, Aids, Permits, Etc.
N/A

Related Condition Reports
GT 2018-9280; GT-2019-4064; GT 2015-4386; GT 2018-1751; GT 2016-0951-1, GT 2017-10263-6