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March 7, 1997

Attached is a revision to the Offsite Dose Calculation Manual, Dresden Annex, Chapters 10 through 12. Please update your manual as follows:

Remove:

Dresden Chapter 10, Revision 1.8
Dresden Chapter 11, Revision 1.1
Dresden Chapter 12, Revision 1.2

Insert:

Dresden Chapter 10, Revision 1.9
Dresden Chapter 11, Revision 1.2
Dresden Chapter 12, Revision 1.3

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Dresden Station
Chapter 10 Change Summary
ODCM Revision 1.9, January 1997

Page	Change Description
10-I	Updated revision number
10-3	Added descriptive information in parentheses to Section 10.1.2.4.
10-4	Changed statement regarding the location of the definitions of parameters in equations 10-1 and 10-2. The definitions are found throughout Section A.1 of Appendix A and not in only one location as previously stated.

DRESDEN ANNEX INDEX

CHAPTER 10

REVISION 1.9

CHAPTER 10

RADIOACTIVE EFFLUENT TREATMENT AND MONITORING

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RADIOACTIVE EFFLUENT TREATMENT AND MONITORING

10.1 AIRBORNE RELEASES

10.1.1 System Description

A simplified gaseous radwaste and gaseous effluent flow diagram is provided for Dresden Unit 1 in Figure 10-1 and for Dresden Units 2 and 3 in Figure 10-2. Dresden 1 is no longer operational, but monitoring of potentially radioactive releases from the plant chimney continues.

Each airborne release point is classified as stack, vent, or ground level in accordance with the definitions in Section 4.1.4 and the results in Table A-1 of Appendix A. The principal release points for potentially radioactive airborne effluents and their classifications are as follows:

For Dresden 1, the plant chimney (a stack release point).
For Dresden 2/3:
- The ventilation chimney (a stack release point).
- The reactor building ventilation stack (a vent release point).

10.1.1.1 Condenser Offgas Treatment System

The condenser offgas treatment system is designed and installed to reduce radioactive gaseous effluents by collecting non-condensable off-gases from the condenser and providing for holdup to reduce the total radioactivity by radiodecay prior to release to the environment. The daughter products are retained by charcoal and HEPA filters. The system is described in Section 11.3 of the Dresden UFSAR.

10.1.1.2 Ventilation Exhaust Treatment System

Ventilation exhaust treatment systems are designed and installed to reduce gaseous radioiodine or radioactive material in particulate form in selected effluent streams by passing ventilation or vent exhaust gases through charcoal absorbers and/or HEPA filters prior to release to the environment. Such a system is not considered to have any effect on noble gas effluents. The ventilation exhaust treatment systems are shown in Figures 10-1 and 10-2.

Engineered safety features atmospheric cleanup systems are not considered to be ventilation exhaust treatment system components.

10.1.2 Radiation Monitors

10.1.2.1 Unit 1 Chimney Monitor

The SPING continuously monitors the final effluent from the Unit 1 chimney.

The monitor has isokinetic sampling, gaseous grab sampling, and particulate and iodine sampling capability. Tritium samples are obtained using a portable sampling system. A tap is available for obtaining a sample from the isokinetic probe.

In normal operation all three noble gas channels (low, mid-range, high) are on line and active.

No automatic isolation or control functions are performed by this monitor.

10.1.2.2 Units 2/3 Chimney Monitor

The SPING continuously monitors the final effluent from the Units 2/3 chimney.

The monitor has isokinetic sampling, gaseous grab sampling, particulate and iodine sampling, and postaccident sampling capability. Tritium samples are obtained using a portable sampling system. A tap is available for obtaining a sample from the isokinetic probe.

In normal operation the two lower noble gas channels (low and mid-range) are on line and active. The high range noble gas channel flow is bypassed and this channel is in standby. At a predetermined threshold the low and mid-range noble gas channels are bypassed and only the high range noble gas channel remains active.

No automatic isolation or control functions are performed by this monitor. Pertinent information on this monitor is provided in the Dresden UFSAR Section 11.5.

In addition to the primary monitor described above, there is a backup system consisting of two additional detectors and sample taps in series in the primary sample stream.

10.1.2.3 Reactor Building Vent Stack Effluent Monitors

The SPING continuously monitors the final effluent from the reactor building vent stack.

The vent stack monitor has isokinetic sampling, gaseous sampling, and iodine and particulate sampling capability. Tritium samples are obtained using a portable sampling system. A tap is available for obtaining a sample from the isokinetic probe.

All channels are continuously on line and active.

No automatic isolation or control functions are performed by this monitor.

10.1.2.4 Reactor Building Ventilation Monitors

The monitor (located in the ventilation exhaust duct) monitors the effluent from the Unit 2(3) reactor building ventilation. On high alarm, the monitors automatically initiate isolation of the Unit 2(3) reactor building ventilation, and initiate startup of the Unit 2/3 standby gas treatment system.

Pertinent information on these monitors is provided in Dresden UFSAR Section 11.5.

10.1.2.5 Condenser Air Ejector Monitors

The monitors continuously monitor gross gamma activity downstream of the Unit 2 and 3 steam jet air ejector and prior to release to the main chimney.

At the trip setpoint the monitors automatically activate an interval timer which in turn initiates closure of an air operated valve, thus terminating the release.
Pertinent information on these monitors is found in Dresden UFSAR Section 11.5.

10.1.2.6 Isolation Condenser Vent Monitor

The monitor continuously monitors radioactivity in the effluent from the isolation condenser vent. No control device is initiated by this monitor.

Pertinent information on this monitor is provided in Dresden UFSAR Section 11.5.

10.1.3 Alarm and Trip Setpoints

10.1.3.1 Setpoint Calculations

10.1.3.1.1 Reactor Building Vent Monitors

The alarm setpoint for the reactor building vent monitor is established at 10 mr/hr.

10.1.3.1.2 Condenser Air Ejector Monitors

The high-high trip setpoint is established at ≤ 100 μCi/Sec per MWt (≅2.5E5μCi/sec) and the high alarm is established at ≤ 50μCi/sec per MWt (≅1.25E5μCi/sec).

10.1.3.1.3 Units 2/3 Plant Chimney Radiation Monitor

The setpoint is established at a count rate corresponding to no greater than 105,000 μCi/sec.

10.1.3.2 Release Limits

Alarm and trip setpoints of gaseous effluent monitors are established to ensure that the release rate limits of RETS are not exceeded. The release limits are found by solving Equations 10-1 and 10-2 for the total allowed release rate, Q_{tv}.

$$(1.11)\sum\{ f_i[Q_{ts}\overline{S_i} + Q_{tv}\overline{V_i}]\} < 500\text{mrem/yr} \quad (10\text{-}1)$$

$$\sum \{(\overline{L_i}f_i[(X/Q)_s\, Q_{ts}\exp(-\lambda_i R/3600u_s) + (X/Q)_v Q_{tv}\exp-(\lambda_i R/3600u_v)] \quad (10\text{-}2)$$

$$+(1.11)(f_i)[Q_{ts}S_i + Q_{tv}V_i]\}$$

$$< 3000\text{mrem/yr}$$

The summations are over noble gas radionuclides i.

f_i Fractional Radionuclide Composition
The release rate of noble gas radionuclide i divided by the total release rate of all noble gas radionuclides.

Q_{ts} Total allowed Release Rate, Stack Release [μCi/sec]
The total allowed release rate of all noble gas radionuclides released as stack releases.

Q_{tv} Total Allowed Release Rate, Vent Release [μCi/sec]
The total allowed release rate of all noble gas radionuclides released as vent releases.

Refer to Section A.1 of Appendix A for the definitions of the remaining parameters.

Equation 10-1 is based on Equation A-8 of Appendix A and the RETS restriction on whole body dose rate (500 mrem/yr) due to noble gases released in gaseous effluents (see Section A.1.3.1 of Appendix A). Equation 10-2 is based on Equation A-9 of Appendix A and the RETS restriction on skin dose rate (3000 mrem/yr) due to noble gases released in gaseous effluents (see Section A.1.3.2 of Appendix A).

Calibration methods and surveillance frequency for the monitors will be conducted as specified in the RETS.

10.1.3.3 Release Mixture

In the determination of alarm and trip setpoints the radioactivity mixture in the exhaust air is assumed to have the following compositions.

- Reactor building vent effluent monitors.

  The mixture used for the GE monitors is taken from a representative isotopic analysis of the vent stack noble gas released since the last calibration, or based on nominal response of detector. The "mixture" used for the SPING is assumed to be a single pseudo-noble gas radionuclide.

- Condenser air ejector monitor.

  The mixture used for this monitor is taken from a representative isotopic analysis of noble gases collected at the recombiner outlet during plant operation, since the last alarm setpoint calculation.

- Units 2/3 plant chimney monitors.

  The mixture used for the GE monitors is taken from the most recent isotopic analysis of noble gases collected from the chimney monitor which corresponds to an above background recorder reading. The "mixture" used for the SPING is assumed to be a single pseudo-noble gas radionuclide.

10.1.3.4 Conversion Factors

The conversion factors used to establish gaseous effluent monitor setpoints are obtained as follows.

- Reactor building vent effluent monitor.

  For the GE monitors, the isotopic analysis in Section 10.1.3.3 and the monitor reading (in mR/hr) at the time of the analysis or nominal response of detector are used to establish the conversion factor in mR/hr per $\mu Ci/cc$ or $\mu Ci/ft^3$. For the SPING the conversion factor is based on the 0.8 MeV gamma of the pseudo-noble gas radionuclide.

- Condenser air ejector monitor.

  The isotopic analysis in Section 10.1.3.3 and the flow and monitor reading (in mR/hr) at the time of the analysis are used to establish the conversion factor in mR/hr per $\mu Ci/cc$ or $\mu Ci/ft^3$.

- Units 2/3 plant chimney monitors

  For the GE monitors, the isotopic analysis in Section 10.1.3.3 and flow and monitor reading (in CPS) at the time of the analysis are used to establish the conversion factor in CPS per $\mu Ci/cc$ or $\mu Ci/ft^3$. For the SPING the conversion factor is based on the 0.8 MeV gamma of the pseudo-noble gas radionuclide.

10.1.3.5 HVAC Flow Rates

The HVAC exhaust flow rates are obtained from either the Units 2/3 process computers or the SPING control station. For the 2/3 Chimney, additional process flow rates must be added to obtain the total chimney flow (see Figure 10-2). Unit operation may affect actual flow rates which therefore may differ from values listed. If the actual flows are not available, the following default values based on design flow can be used:

Units 2/3 Chimney Air Flow	1.25E10 cc/min
Units 2/3 Combined Reactor Vent	6.23E9 cc/min
Unit 1 Chimney Air Flow	1.76E9 cc/min

10.1.4 Allocation of Effluents from Common Release Points

Radioactive gases, particulates, and iodines released from the Unit 1 chimney originate from Unit 1 only. However, radioactive gaseous effluents released from Units 2/3 are comprised of contributions from both units. Estimates of noble gas contributions from Units 2 and 3 are allocated considering appropriate operating conditions and measured SJAE off-gas activities. Allocation of radioiodine and radioactive particulate releases to Units 2 or 3 specifically is not as practical and is influenced greatly by in-plant leakage. Under normal operating conditions, allocation is made using reactor coolant iodine activities. During unit shutdowns or periods of known major in-plant leakage, the apportionment is adjusted accordingly. The allocation of effluents is estimated on a monthly basis.

10.1.5 Dose Projections

Because the gaseous releases are continuous, the doses are routinely calculated in accordance with the RETS.

10.2 LIQUID RELEASES

10.2.1 System Description

A simplified liquid radwaste and liquid effluent flow diagram is provided in Figure 10-3.

The liquid radwaste treatment system is designed and installed to reduce radioactive liquid effluents by collecting the liquids, providing for retention or holdup, and providing for treatment by evaporator, demineralizer, filter, and further vendor processing systems for the purpose of reducing the total radioactivity prior to reuse or release to the environment. The system is described in the Dresden UFSAR Section 11.2.

10.2.1.1 Unit 1 Storage Tanks

Liquid radioactive effluents are not released from Unit 1 Storage tanks directly to the environment but are made through the Units 2/3 radwaste system.

10.2.1.2 Units 2/3 Waste Sample Tanks

There are three waste sample tanks (33,000 gallons each) which receive water from the liquid waste treatment system. These tanks are transferred to the waste surge tank for discharge to the Illinois River via the discharge canal.

10.2.1.3 Units 2/3 Floor Drain Sample Tanks

There are two floor drain sample tanks (22,000 gallons each) which receive liquid waste from the floor drain treatment system. These tanks are transferred to the waste surge tank for discharge to the Illinois River via the discharge canal.

10.2.1.4 Units 2/3 Waste Surge Tank

The waste surge tank receives processed water from the waste sample tanks and floor drain sample tanks. This tank discharges to the Illinois River via the discharge canal.

10.2.2 Radiation Monitors

10.2.2.1 Liquid Radwaste Effluent Monitor

The monitor is used to monitor all releases from the waste surge tank. On high alarm, a grab sample of the effluent is automatically taken from the discharge side of the sample chamber after a 0 to 60 second delay determined by a locally mounted timer. The release is terminated manually by initiating closure of the low flow or high flow discharge line valves.

Pertinent information on the monitor and associated control devices is provided in the Dresden UFSAR Section 11.5.

10.2.2.2 Units 2 & 3 Service Water Effluent Monitors

The monitors continuously monitor the service water effluent. On high alarm a grab sample is taken.

Pertinent information on these monitors is provided in the Dresden UFSAR Section 11.5..

10.2.2.3 Chemical Cleaning Facility Service Water Effluent Monitor

Service water effluent (when in operation) is continuously monitored from the chemical cleaning facility by the monitor. On high alarm the release is terminated by manually initiating closure of the isolation valve.

No control device is initiated by this monitor.

10.2.3 Alarm and Trip Setpoints

10.2.3.1 Setpoint Calculations

Alarm and trip setpoints of liquid effluent monitors at the principal release points are established to ensure that the limits of 10CFR20 are not exceeded in the unrestricted area.

10.2.3.1.1 Liquid Radwaste Effluent Monitor

The monitor setpoint is found by solving equation 10-3 for the total isotopic activity:

(10-3)

$$P \leq K \times (\Sigma C_i^T / \Sigma(C_i^T / DWC_i)) \times ((F^d + F^r_{max}) / F^r_{max})$$

P	Release Setpoint	[cpm]
C_i^T	Concentration of radionuclide i in the release tank	[μCi/ml]
F^r_{max}	Maximum Release Tank Discharge Flow Rate The flow rate from the radwaste discharge tank. The maximum pump discharge rate of 250 gpm is used for calculating the setpoint.	[gpm]
K	Calibration constant	[cpm/μCi/ml]
DWC_i	Derived Water Concentration (also referred to as Effluent Concentration Limit, ECL) of Radionuclide i The concentration of radionuclide i given in Appendix B, Table 2, Column 2 to 10CFR20.1001-2402. When technical specifications allow, ten[1] (10) times the DWC_i may be used.	[μCi/ml]
F^d	Dilution Flow	[gpm]

[1] Dresden Station may use ten (10) upon Technical Specification approval. Until then, one (1) times the DWC must be used.

10.2.3.1.2 Units 2 & 3 Service Water Effluent Monitor

The monitor setpoint is established at two times the background radiation value.

10.2.3.1.3 Chemical Cleaning Facility Service Water Effluent Monitor

The monitor setpoint is established at two times the background radiation value.

10.2.3.2 Discharge Flow Rates

10.2.3.2.1 Release Tank Discharge Flow Rate

Prior to each batch release, a grab sample is obtained.

The results of the analysis of the sample determine the discharge rate of each batch as follows:

$$F^r_{max} = 0.1(F^d/\sum(C_i/DWC_i)) \quad (10\text{-}4)$$

The summation is over radionuclides i.

0.1 Reduction factor for conservatism.

F^r_{max} Maximum Permitted Discharge Flow Rate [gpm]

The maximum permitted flow rate from the radwaste discharge tank. Releases are not permitted if the calculated discharge rate, F^r_{max}, is less than 250 gpm.

F^d Dilution Flow [gpm]

C_i Concentration of Radionuclide i in the Release Tank [µCi/ml]

The concentration of radioactivity in the radwaste discharge tank based on measurements of a sample drawn from the tank.

DWC_i Derived Water Concentration of Radionuclide i [µCi/ml]

The concentration of radionuclide i given in Appendix B, Table 2, Column 2 to 10CFR20.1001-2402. When technical specifications allow, ten[2] (10) times the DWC_i may be used.

---

[2] Dresden Station may use ten (10) upon Technical Specification approval. Until then, one (1) times the DWC must be used.

10.2.3.3 Release Limits

Release limits are determined from 10CFR20. Calculated maximum permissible discharge rates are divided by 10 to ensure that applicable derived water concentrations (DWC) are not exceeded.

10.2.3.4 Release Mixture

For the liquid radwaste effluent monitor, the release mixture used for the setpoint determination is the radionuclide mix identified in the grab sample isotopic analysis.

For all other liquid effluent monitors, no release mixture is used because the setpoint is established at "two times background."

10.2.3.5 Conversion Factors

The readout for the liquid radwaste effluent monitor is in CPM. The calibration constant is based on the detector sensitivity to Co-60.

The readouts for the Units 2 & 3 service water effluent monitors are in μCi/ml. The calibration constants are based on the detector sensitivity to Co-60.

10.2.3.6 Liquid Dilution Flow Rates

The dilution flow is determined using the installed flowmeter in the discharge canal.

10.2.4 Allocation of Effluents from Common Release Points

Radioactive liquid effluents released from the release tanks are comprised of contributions from all three units. Under normal operating conditions, it is difficult to apportion the radioactivity between the units. Consequently, allocation is normally made evenly between units 2 and 3.

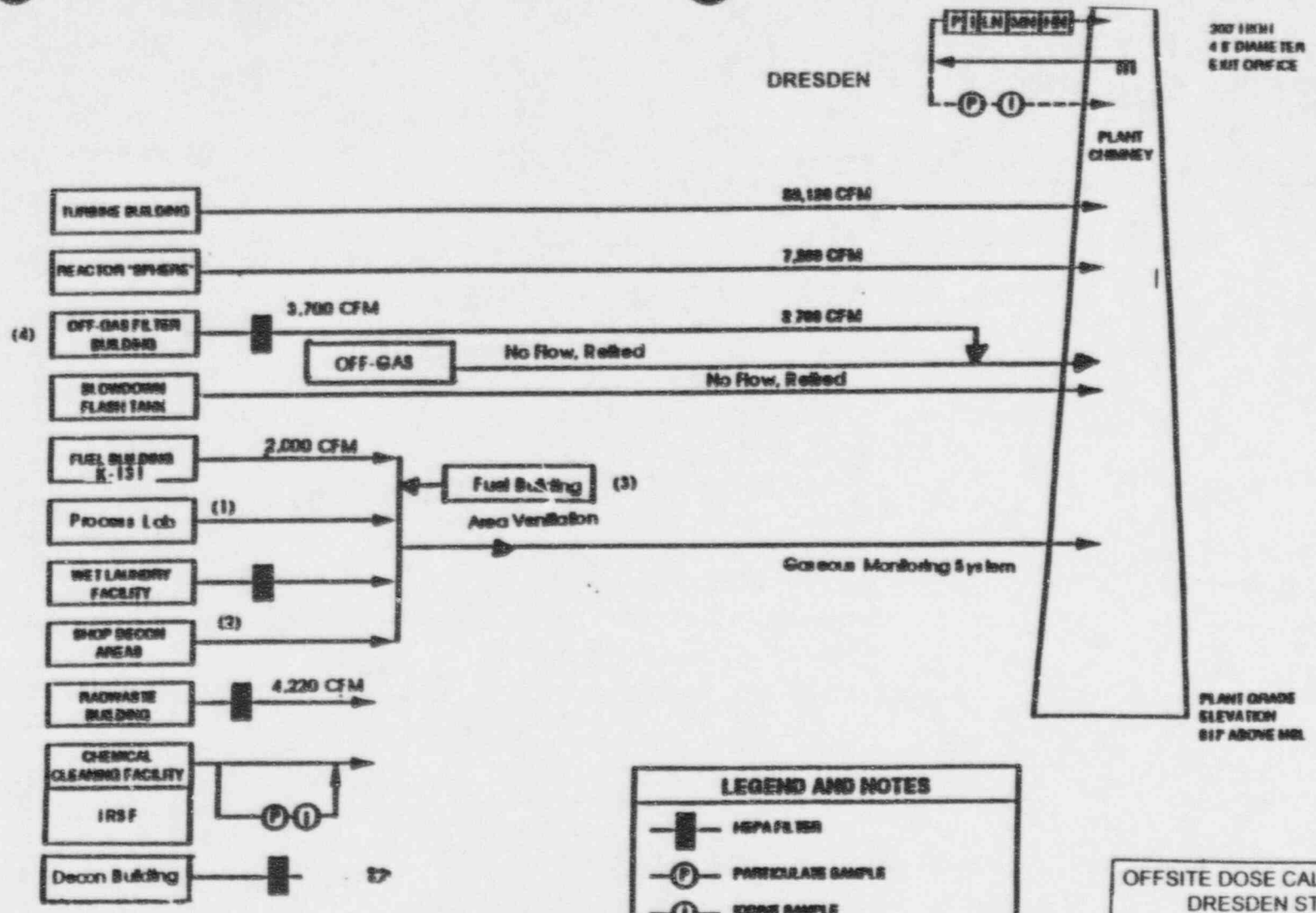
10.2.5 Projected Doses for Releases

Doses due to liquid effluents are calculated in accordance with the RETS.

10.3 SOLIDIFICATION OF WASTE/PROCESS CONTROL PROGRAM

The process control program (PCP) contains the sampling, analysis, and formulation determination by which solidification of radioactive wastes from liquid systems is ensured.

Figure 10-4 is a simplified diagram of solid radwaste processing.



(1) Not running, lab no longer in use

(2) Areas no longer exist, suction ducts capped

(3) New installation, when completed
8,000 CFM summer
4,000 CFM winter

(4) Not normally Run

LEGEND AND NOTES

- HEPA FILTER
- P – PARTICULATE SAMPLE
- I – IODINE SAMPLE
- P I LN MN HN – FLOW THROUGH RADIATION MONITOR: P – PARTICULATE; I – IODINE; LN, MN & HN – LOW, MEDIUM & HIGH RANGE NOBLE GAS

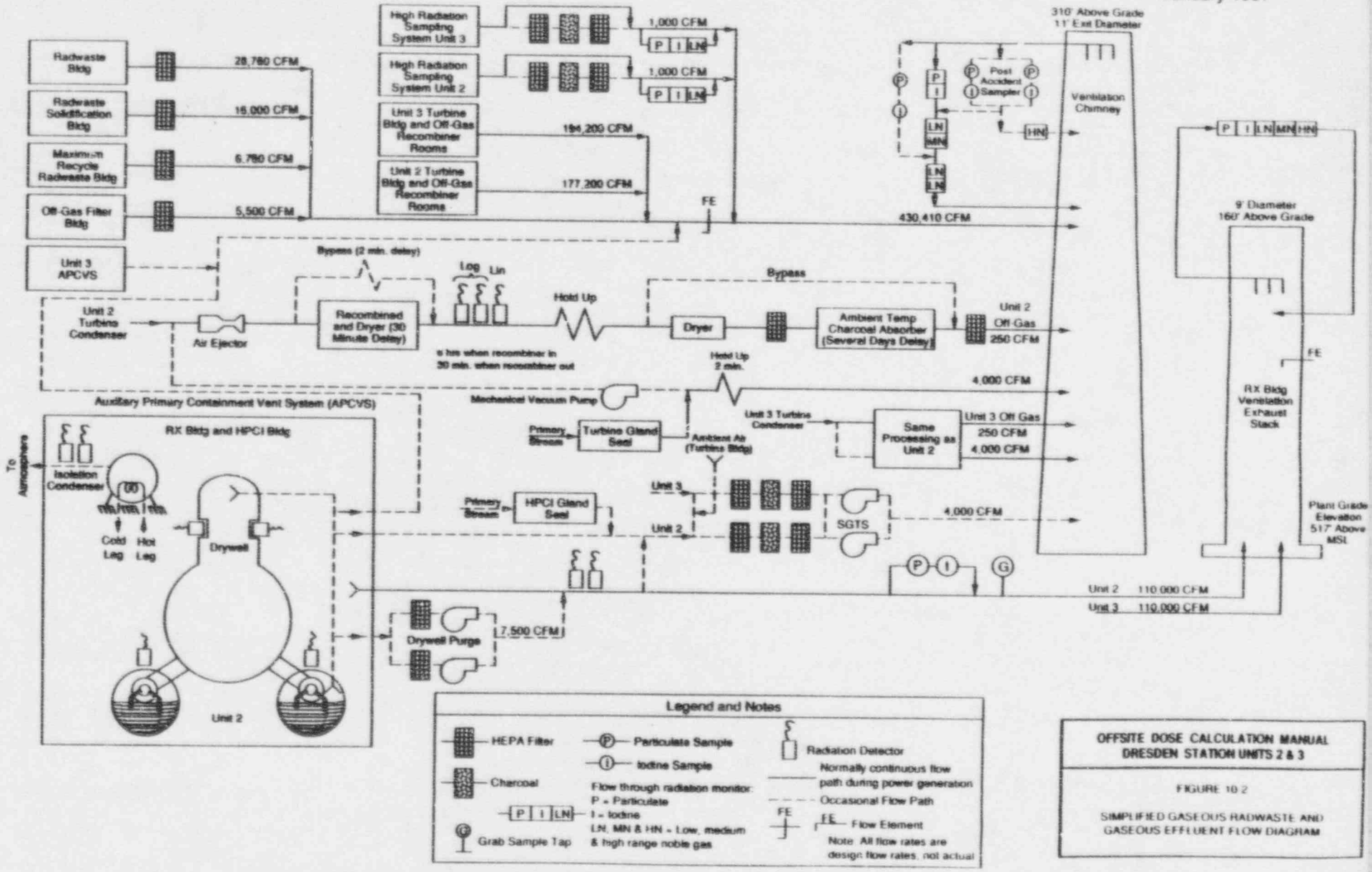
NOTES:
1. UNIT 1 IS NOT OPERATIONAL
2. ALL FLOW RATES ARE DESIGN FLOW RATES, NOT ACTUAL

OFFSITE DOSE CALCULATION MANUAL
DRESDEN STATION UNIT 1

FIGURE 10-1

SIMPLIFIED GASEOUS RADWASTE AND GASEOUS EFFLUENT FLOW DIAGRAM

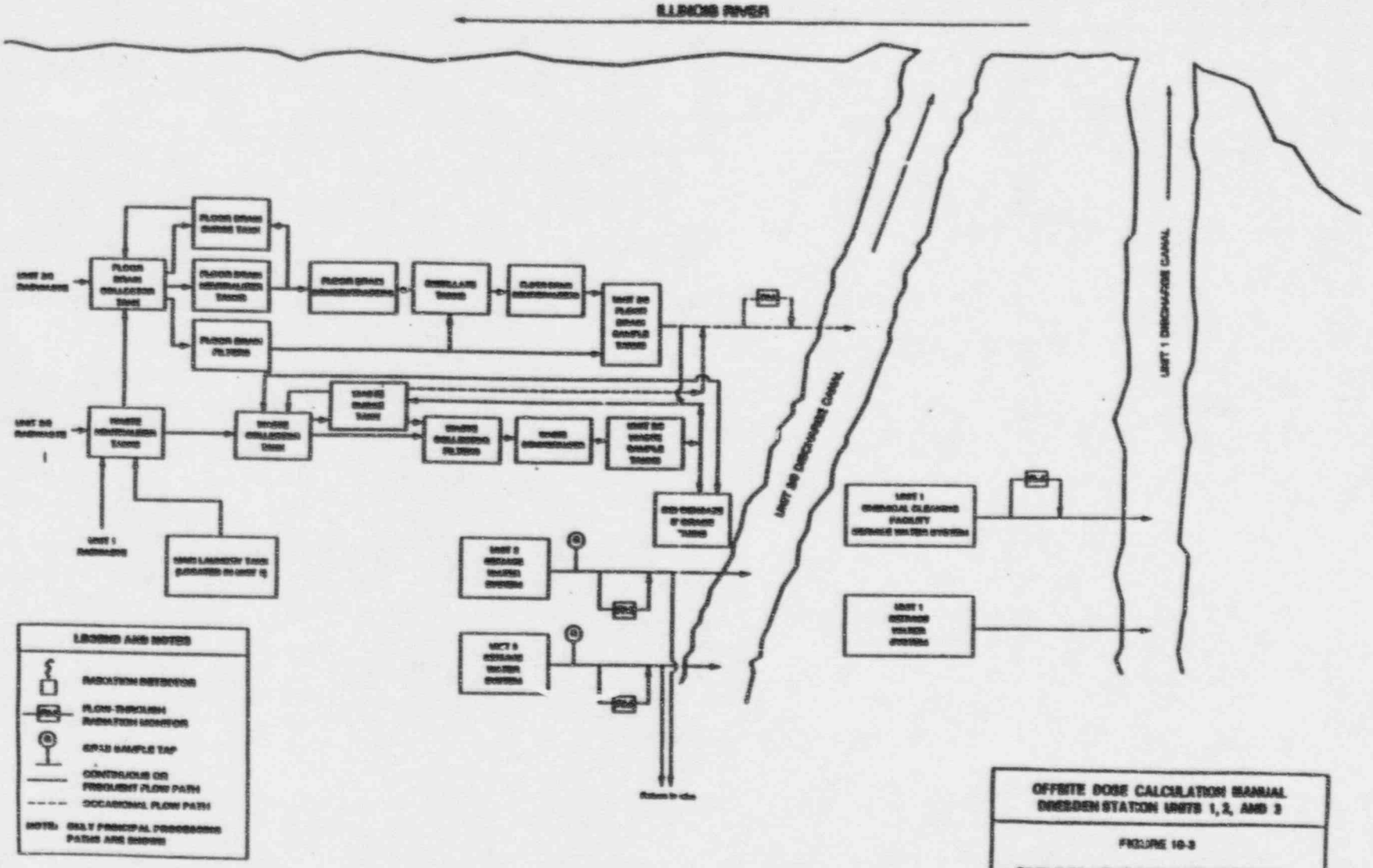
g \d10r1-9 doc



OFFSITE DOSE CALCULATION MANUAL
DRESDEN STATION UNITS 2 & 3

FIGURE 10 2

SIMPLIFIED GASEOUS RADWASTE AND GASEOUS EFFLUENT FLOW DIAGRAM

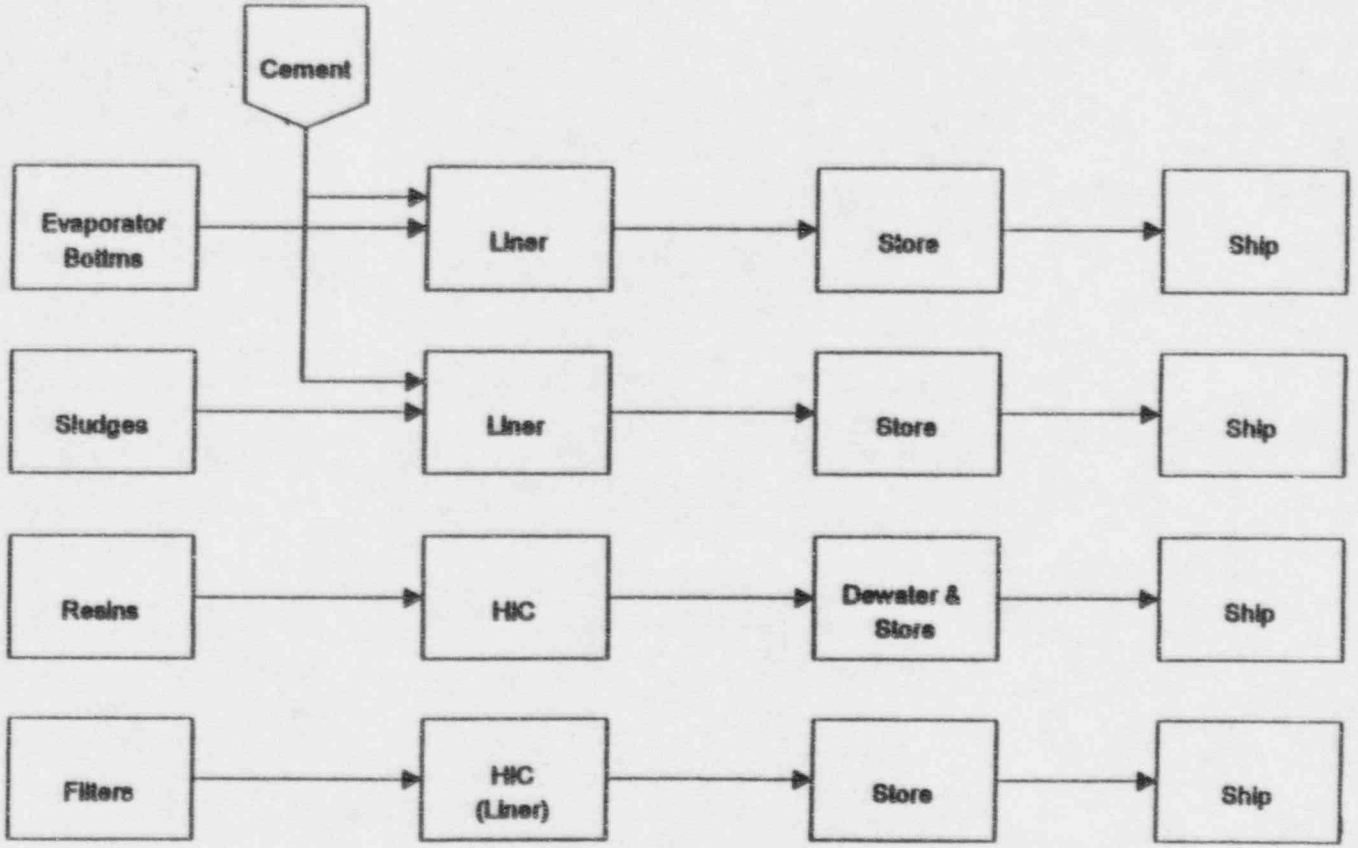


OFFSITE DOSE CALCULATION MANUAL
DRESDEN STATION UNITS 1, 2, AND 3

FIGURE 10-3

SIMPLIFIED LIQUID RADWASTE PROCESSING AND LIQUID EFFLUENT FLOW DIAGRAM

g \d10r1-9 doc



OFFSITE DOSE CALCULATION MANUAL
DRESDEN STATION UNITS 2 AND 3

FIGURE 10-4

SIMPLIFIED SOLID RADWASTE PROCESSING DIAGRAM

Dresden Station
Chapter 11 Change Summary
ODCM Revision 1.2, January 1997

Page	Item
11-i	Removed page index. Individual pages no longer updated.
11-2	Removed D-05 and footnote. D-05 deleted in 1995 as indicated by the footnote. Removed asterisk by D-45 indicating it replaced D-05 in 1995.
11-3	Updated location of TLD's 110-3 and 110-4 to reflect current placement.
11-6	Added D-50 as a unit 2/3 Cooling Water Sample location.
11-7	Changed Director title due to new department responsibilities.
11-12	Deleted D-05 from map. Location no longer exists.
11-13	Added D-50 location due to new cooling water sample. Updated locations for TLD's 110-3 and 110-4 based on current location.
11-14	Removed an incorrect milk location from the map; two different locations were given on the map for D-26.

DRESDEN ANNEX INDEX

CHAPTER 11

Revision 1.2

CHAPTER 11
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
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RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

The parameters for the radiological environmental monitoring program to be performed in the environs around Dresden Nuclear Power Station are given in Table 11-1.

Figure 11-1 shows the 17 fixed air sampling sites and TLD locations; also shown are the outer ring TLD locations. Figure 11-2 shows near station water sample locations and the inner ring TLD locations. The TLDs are coded as follows:

XYY-N

X = 1, means inner ring;

X = 2, means outer ring; and

YY-N is an identification code.

Figure 11-3 shows the milk sample locations and more distant water sample locations.

The reporting levels for radioactivity concentrations in environmental samples are given in Table 11-2. The practical lower limits of detection for this program are given in Table 11-3.

Table 11-1

Radiological Environmental Monitoring Program

Exposure Pathway and/or Sample	Sampling or Monitoring Locations[a]	Sampling or Collection Frequency	Type and Frequency of Analysis
1. Airborne	a. Onsite and Near Field[b]	Continuous sampler operation with particulate filter exchange weekly and radioiodine canister exchange biweekly[c]	Radioiodine Canister:
Radioiodine and Particulates	D-01 Onsite Station 1, 0.6 mi NW (1.0 km Q) D-02 Onsite Station 2, 0.3 mi NE (0.5 km C) D-03 Onsite Station 3, 0.4 mi S (0.6 km J) D-04 Collins Road, 0.9 mi W (1.4 km N) D-06 Will County Road, 1.4 mi SE (2.2 km G) D-45 McKinley Woods Road, 1.5 mi ENE (2.4 km D)		I-131 analysis bi-weekly[c] Particulate Sampler: Gross beta analysis following filter change[d] Sampling Train: Test and maintenance weekly
	b. Far Field[b] D-07 Clay Products, 2.0 mi S (3.2 km J) D-08 Prairie Parks, 4.0 mi SW (6.4 km L) D-09 Coal City, 7.5 mi S (12.0 km J) D-10 Goose Lake Village, 3.8 mi SSW (6.1 km K) D-11 Morris, 8.0 mi WSW (12.9 km M) D-12 Lisbon, 10.0 mi NW (16.1 km Q)	Continuous sampler operation with particulate filter exchange weekly and radioiodine canister exchange biweekly[c]	Radioiodine Canister: I-131 when analyses are made[e] Particulate Sampler: Gross beta when analyses are made[d,e]

Table 11-1 (Cont'd)
Radiological Environmental Monitoring Program

Exposure Pathway and/or Sample	Sampling or Monitoring Locations[a]	Sampling or Collection Frequency	Type and Frequency of Analysis
1. Airborne (Cont'd)	D-13 Minooka, 4.5 mi N (7.2 km A) D-14 Channahon, 3.5 mi NE (5.6 km C) D-15 Joliet, 12.5 mi NE (20.1 km C) D-16 Elwood, 8.0 mi E (12.9 km E) D-17 Wilmington, 8.0 mi SE (12.9 km G)		Sampling Train: Test and maintenance weekly
2. Direct Radiation	a. At Air Sampling Sites Same locations as fixed air sampling locations in Item 1.	Quarterly	Gamma dose quarterly
	b. Inner Ring[f] D-101-1, 1.0 mi N (1.6 km A) D-101-2, 1.0 mi N (1.6 km A) D-102-1, 1.3 mi NNE (2.1 km B) D-102-2, 1.3 mi NNE (2.1 km B) D-103-1, 1.2 mi NE (1.9 km C) D-103-2, 1.2 mi NE (1.9 km C) D-104-1, 1.5 mi ENE (2.4 km D) D-104-2, 1.5 mi ENE (2.4 km D) D-105-1, 1.4 mi E (2.3 km E) D-105-2, 1.4 mi E (2.3 km E) D-106-1, 0.9 mi ESE (1.4 km F) D-106-2, 0.9 mi ESE (1.4 km F) D-107-1, 1.3 mi SE (2.1 km G) D-107-2, 1.3 mi SE (2.1 km G) D-108-1, 1.9 mi SSE (3.1 km H) D-108-2, 1.9 mi SSE (3.1 km H) D-109-1, 0.8 mi S (1.3 km J) D-109-2, 0.8 mi S (1.3 km J) D-110-3 0.8 mi SSW (1.3 km K) D-110-4, 0.8 mi SSW (1.3 km K)		

Table 11-1 (Cont'd)
Radiological Environmental Monitoring Program

Exposure Pathway and/or Sample	Sampling or Monitoring Locations[a]	Sampling or Collection Frequency	Type and Frequency of Analysis
2. Direct Radiation (Cont'd)	D-111-1, 0.6 mi SW (0.97 km L)		
	D-111-2, 0.6 mi SW (0.97 km L)		
	D-112a-1, 0.8 mi WSW (1.3 km M)		
	D-112a-2, 0.8 mi WSW (1.3 km M)		
	D-113-1, 0.9 mi W (1.4 km N)		
	D-113-2, 0.9 mi W (1.4 km N)		
	D-114-1, 1.0 mi WNW (1.6 km P)		
	D-114-2, 1.0 mi WNW (1.6 km P)		
	D-115-1, 0.8 mi NW (1.3 km Q)		
	D-115-2, 0.8 mi NW (1.3 km Q)		
	D-116-1, 1.0 mi NNW (1.6 km R)		
	D-116-2, 1.0 mi NNW (1.6 km R)		
	c. Outer Ring[b]		
	D-201-1, 4.5 mi N (7.2 km A)		
	D-201-2, 4.5 mi N (7.2 km A)		
	D-202-1, 5.0 mi NNE (8.0 km B)		
	D-202-2, 5.0 mi NNE (8.0 km B)		
	D-203-1, 4.5 mi NE (7.2 km C)		
	D-203-2, 4.5 mi NE (7.2 km C)		
	D-204-1, 5.0 mi ENE (8.0 km D)		
	D-204-2, 5.0 mi ENE (8.0 km D)		
	D-205-1, 4.2 mi E (6.8 km E)		
	D-205-2, 4.2 mi E (6.8 km E)		
	D-206-1, 3.5 mi ESE (5.6 km F)		
	D-206-2, 3.5 mi ESE (5.6 km F)		
	D-207-1, 4.5 mi SE (7.2 km G)		
	D-207-2, 4.5 mi SE (7.2 km G)		
	D-208-1, 5.0 mi SSE (8.0 km H)		
	D-208-2, 5.0 mi SSE (8.0 km H)		
	D-209-1, 5.0 mi S (8.0 km J)		
	D-209-2, 5.0 mi S (8.0 km J)		

Table 11-1 (Cont'd)
Radiological Environmental Monitoring Program

Exposure Pathway and/or Sample	Sampling or Monitoring Locations[a]	Sampling or Collection Frequency	Type and Frequency of Analysis
2. Direct Radiation (Cont'd)	D-210-1, 4.8 mi SSW (7.7 km K) D-210-2, 4.8 mi SSW (7.7 km K) D-211-1, 5.0 mi SW (8.0 km L) D-211-2, 5.0 mi SW (8.0 km L) D-212-3, 6.0 mi WSW (9.7 km M) D-212-4, 6.0 mi WSW (9.7 km M) D-213-1, 4.5 mi W (7.2 km N) D-213-2, 4.5 mi W (7.2 km N) D-214-1, 4.5 mi WNW (7.2 km P) D-214-2, 4.5 mi WNW (7.2 km P) D-215-1, 5.1 mi NW (8.2 km Q) D-215-2, 5.1 mi NW (8.2 km Q) D-216-1, 4.8 mi NNW (7.7 km R) D-216-2, 4.8 mi NNW (7.7 km R)		
3. Waterborne[f,g]			
a. Surface	D-21, Illinois River at EJ&E RR Bridge, 1 mi WNW (1.6 km P) D-22, Illinois River upstream of Morris Water Works, 8 mi WSW (12.9 km M)	Weekly	Gamma isotopic on monthly composite
b. Lake Water	D-28, Dresden Pool at Illinois River, 0.5 mi NW (0.8 km Q) D-34A, Cooling Lake, Dresden Road Crossing, 2.6 mi S (4.2 km J) D-34B, Cooling Lake, County Line Crossing, 3.0 mi SSE (4.8 km H)	Weekly	Gamma isotopic and gross beta analysis
c. Ground/ Well Water	D-23, Thorsen Well, 0.7 mi S (1.1 km J) D-35, Dresden Lock & Dam, 0.5 mi NW (0.8 km Q)	Quarterly	Gross beta, gross alpha and tritium

Table 11-1 (Cont'd)

Radiological Environmental Monitoring Program

Exposure Pathway and/or Sample	Sampling or Monitoring Locations[a]	Sampling or Collection Frequency	Type and Frequency of Analysis
3. Waterborne[f,g], (Cont'd)			
d. Cooling Water Sample	D-18, Inlet, Unit 1, at Station D-50, Inlet, Unit 2/3, at Station D-19, Discharge, Unit 1, at Station D-20, Discharge, Unit 2/3, at Station	Weekly	Gross beta analysis weekly
e. Shoreline Sediments	D-27, Dresden Lock & Dam, 0.5 mi NW (0.8 km Q)	Annually	Gamma isotopic annually
4. Ingestion[g]			
a. Milk	D-25, Vince Biros Farm, 11.5 mi SW (18.5 km L) D-26, Halpin's Dairy, 16 mi S (25.7 km J)	Weekly: May to October Monthly: November to April	I-131 analysis on each sample
b. Fish	D-28, Dresden Pool of Illinois River, 0.5 mi NW (0.8 km Q)	Semiannually	Gamma isotopic analysis on edible portions of each sample.
5. Land Use Census			
a. Milch Animals	1. Site boundary to 2 miles	Annually during grazing season	Enumeration by a door-to-door or equivalent counting technique.
	2. 2 to 5 miles	Annually during grazing season	Enumeration by using referenced information from county agricultural agencies or other reliable sources.

Table 11-1 (Cont'd)

Radiological Environmental Monitoring Program

Exposure Pathway and/or Sample	Sampling or Monitoring Locations[a]	Sampling or Collection Frequency	Type and Frequency of Analysis
5. Land Use Census (Cont'd)	3. At dairies listed in Item 4.a.	Annually during grazing season	Inquire as to feeding practices: a. Pasture only. b. Feed and chop only. c. Pasture and feed; if both, ask farmer to estimate fraction of food from pasture: <25%, 25-50%, 50-75%, or >75%.
b. Nearest Resident	In all 16 sectors up to 5 miles.	Annually	

[a] See Table D-16 for definitions of sector codes used with kilometer distances.
[b] See Figure 11-1, "Fixed Air Sampling and TLD Sites and Outer Ring TLD Locations."
[c] Biweekly means every two weeks.
[d] A gamma isotopic analysis shall be performed wherever the gross beta concentration in a sample exceeds by five times (5x) the average concentration of the preceding calendar quarter for the sample location.
[e] Far field samples are analyzed when near field results are inconsistent with previous measurements and radioactivity is confirmed as having its origin in airborne effluents released from the station, or at the discretion of the Radiation Protection Director.
[f] See Figure 11-2, "Inner Ring TLD Locations and Near Station Water Sample Locations."
[g] See Figure 11-3, "Milk Sample Locations and More Distant Water Sample Locations."

Table 11-2

Reporting Levels for Radioactivity Concentrations
in Environmental Samples

Analysis	Water (pCi/L)	Airborne Particulate or Gases (pCi/m^3)	Fish (pCi/kg, wet)	Milk (pCi/L)	Food Products (pCi/kg, wet)
H-3	20,000[a]				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		20,000		
Zn-65	300		20,000		
Zr-Nb-95	400				
I-131	2	0.9		3	100
Cs-134	30	10	1,000	60	2,000
Cs-137	50	20	1,000	70	2,000
Ba-La-140	200			300	

[a]For drinking water samples. This is 40 CFR Part 141 value.

Table 11-3

Detection Capabilities for Environmental Sample Analysis

Analysis	Lower Limit of Detection (LLD)[a] Water (pCi/L)	Airborne Particulate or Gases (pCi/m^3)	Fish (pCi/kg, wet)	Milk (pCi/L)	Sediment (pCi/kg, dry)
Gross beta[b]	5	0.01	1,000	5	2,000
Gamma isotopic	20	0.01	200	20	200
I-131	5	0.10	100[c]	5[d]	
Cs-134	10		100	10	
Cs-137	10		100	5	
H-3	200				

Table 11-3 (Cont'd)

Detection Capabilities for Environmental Sample Analysis

Notes:

1. Other radionuclides which are measurable and identifiable by gamma ray spectrometry, together with the nuclides indicated in Table 11-3, shall also be identified and reported when an actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being present at the LLD level for that nuclide.

Footnotes:

[a]The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.
For a particular measurement system (which may include radiochemical separation)

$$LLD = \frac{(4.66) \cdot (S_b)}{(A)\ (E)\ (V)\ (2.22)\ (Y)\ (\exp(-\lambda_\Delta t))\ (t)}$$

LLD is the a priori lower limit of detection for a blank sample or background analysis as defined above (as pCi per unit mass or volume).

S_b is the square root of the background count or of a blank sample count; it is the estimated standard error of a background count or a blank sample count as appropriate (in units of counts).

E is the counting efficiency (as counts per disintegration). A is the number of gamma rays emitted per disintegration for gamma ray radionuclide analysis (A = 1.0 for gross alpha and tritium measurements).

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

2.22 is the number of disintegrations per minute per picocurie.

Y is the fractional radiochemical yield when applicable (otherwise Y = 1.0).

λ is the radioactive decay constant for the particular radionuclide (in units of reciprocal minutes).

Δt is the elapsed time between the midpoint of sample collection and the start time of counting. (Δt = 0.0 for environmental samples and for gross alpha measurements.)

Table 11-3 (Cont'd)

Detection Capabilities for Environmental Sample Analysis

Notes (Cont'd):

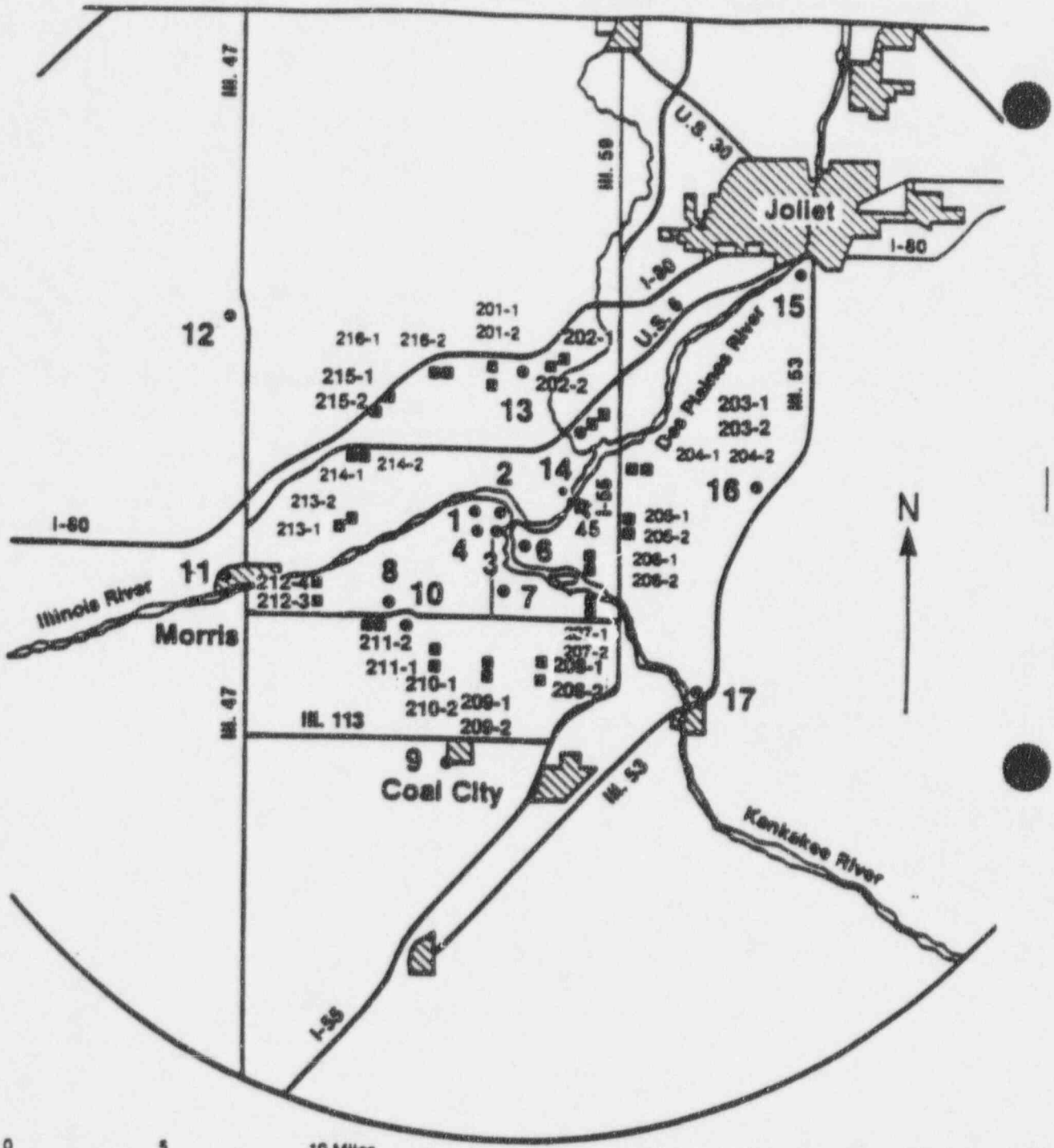
t is the duration of the count (in units of minutes).

The value of S_b used in the calculation of the LLD for a detection system shall be based on an actual observed background count or a blank sample count (as appropriate) rather than on an unverified theoretically predicted value. Typical values of E, V, Y, t, and Δt shall be used in the calculation.

For gamma ray radionuclide analyses the background counts are determined from the total counts in the channels which are within plus or minus one FWHM (full width at half maximum) of the gamma ray photopeak energy normally used for the quantitative analysis for that radionuclide. Typical values of the FWHM shall be used in the calculation.

The LLD for all measurements is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular sample measurement.

[b] Referenced to Cs-137.
[c] For thyroid.
[d] 0.5 pCi/L on samples collected during the pasture season.



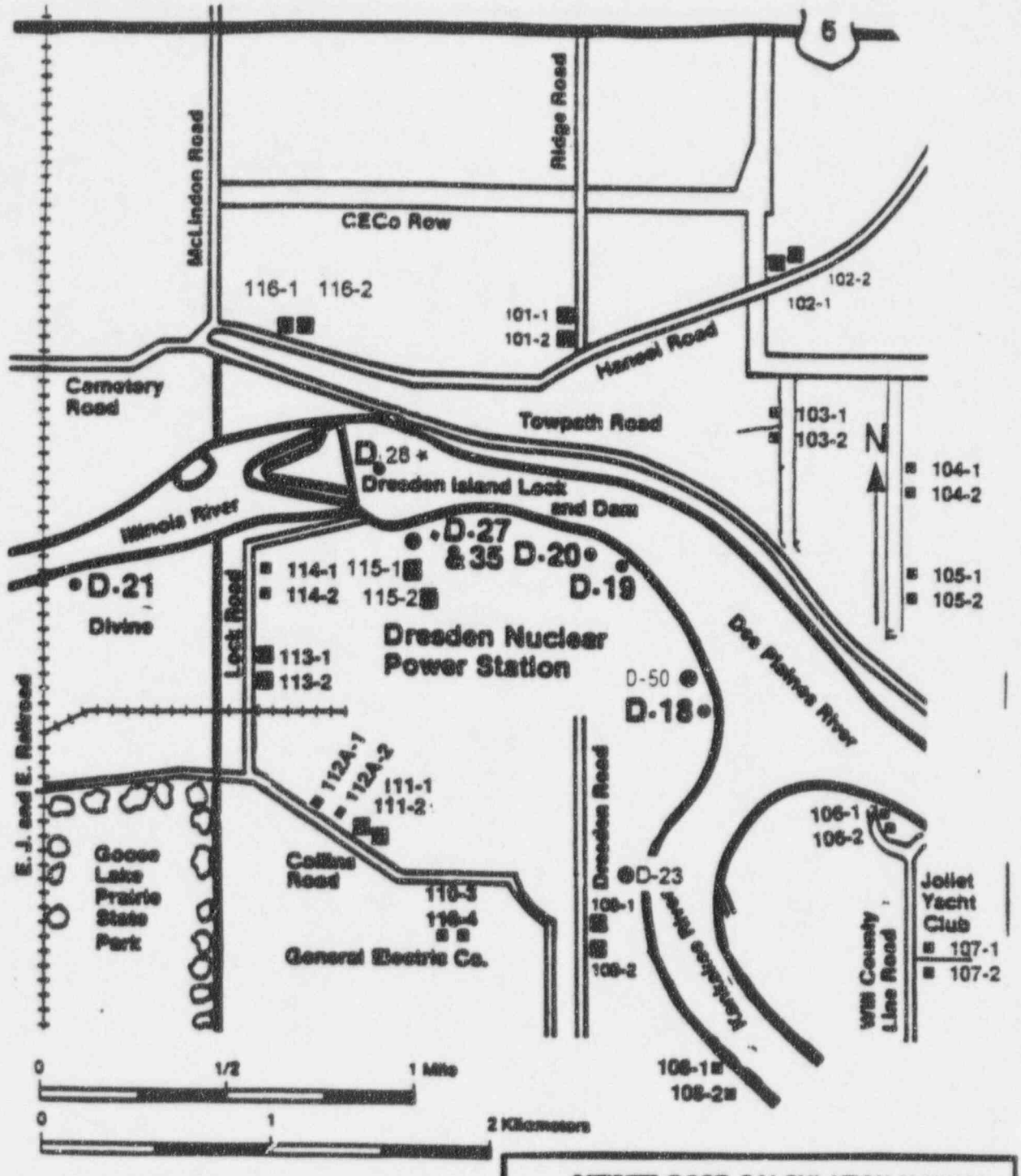
• Air Sampling Location

■ TLD Location

OFFSITE DOSE CALCULATION MANUAL
DRESDEN STATION UNITS 1, 2, & 3

FIGURE 11-1

FIXED AIR SAMPLING AND TLD SITES AND OUTER RING TLD LOCATIONS

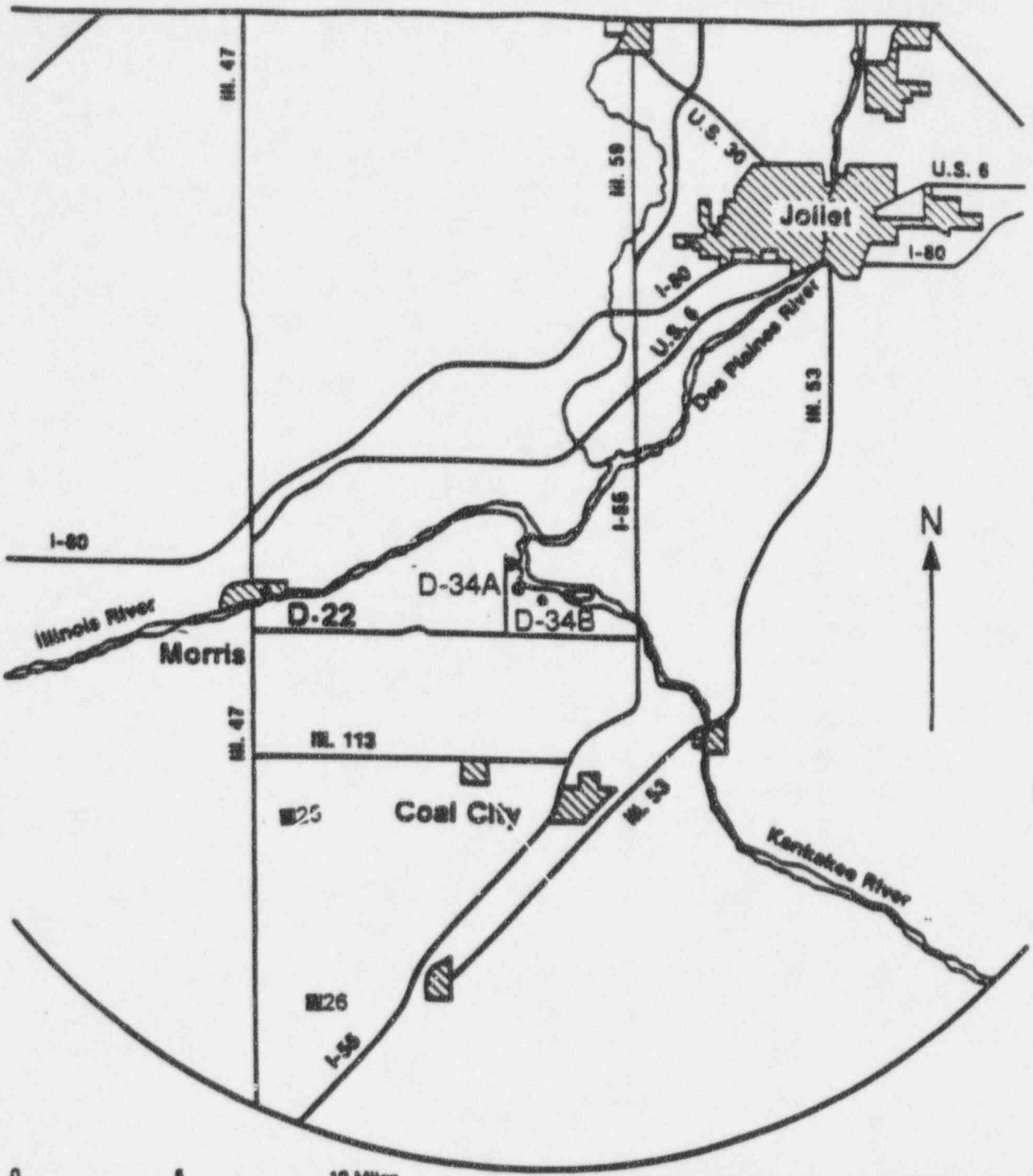


* Fish
■ TLD
◆ Sediment
▲ Vegetables
● Water

OFFSITE DOSE CALCULATION MANUAL
DRESDEN STATION UNITS 1, 2, & 3

FIGURE 11-2

INNER RING TLD LOCATIONS AND NEAR STATION WATER SAMPLE LOCATIONS



OFFSITE DOSE CALCULATION MANUAL
DRESDEN STATION UNITS 1, 2, & 3

FIGURE 11-3

MILK SAMPLE LOCATIONS AND MORE DISTANT WATER SAMPLE LOCATIONS

Dresden Station
Chapter 12 Change Summary
ODCM Revision 1.3, January 1997

Page	Item
12-ii	Revised revision index to 1.3
12-iii	Modified section titles to be consistent with text. Added the four existing sections under 12.3.C.
12-iv	Added the 4 existing sections under 12.4.C and the three existing sections under 12.5.C.
12-5	Modified headings to be consistent with table of contents.
12-6	Capitalized "Unit" in 12.2.B.1.4. Modified headings to be consistent with the table of contents.
12-7	Added footnote indicating discharge is not allowed if actions cannot be performed.
12-9	Added footnote indicating discharge is not allowed if actions cannot be performed.
12-13	Changed Reactor Building Vent Exhaust Duct Radiation Monitor minimum channels to 2 from 1 and Applicable Operational Modes to 1, 2, 3, and when handling irradiated fuel in secondary containment from "at all times". This is consistent with Upgraded Tech Specs.
12-14	Deleted 7 day clock and reporting requirement for Action 20. Upgraded Tech Specs do not address Low Range 2(3) Chimney noble gas monitoring and change is consistent with current Tech Specs. Action 24 was changed to be consistent with current Tech Specs.
12-16	Offgas monitor Functional Test frequency changed from daily to quarterly and Instrument check changed from quarterly to daily to comply with current Tech Specs. Reactor Building Vent Exhaust Duct Radiation Monitor surveillance frequencies shortened and applicable modes changed from "at all times" to modes 1, 2, 3, and when handling irradiated fuel. This is consistent with upgraded Tech Specs.
12-40	Added a "d" on the end of "describe" in last sentence of 12.5.A.2 to correct grammar.
12-41	Added word "Program" to title of 12.5.B for consistency among other section titles.
12-50	Inserted the symbol "Σ" in place of an "s" to represent the requirement for summing factors.

CHAPTER 12.0

SPECIAL NOTE

Until the Unit 2 & 3 Radiological Effluent Technical Specifications have been approved by the Nuclear Regulatory Commission, the requirements of the Technical Specifications shall take precedence over this chapter, should any differences occur.

DRESDEN ANNEX INDEX

CHAPTER 12

Revision 1.3

CHAPTER 12
RADIOLOGICAL EFFLUENT TECHNICAL STANDARDS
(RETS)
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CHAPTER 12

RADIOLOGICAL EFFLUENT TECHNICAL STANDARDS (RETS)
LIST OF TABLES

12.0 RADIOLOGICAL EFFLUENT TECHNICAL STANDARDS

12.1 DEFINITIONS

1. Dose Equivalent I-131 - That concentration of I-131 (microcurie/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in Table III of TID -14844, "Calculation of Distance Factors for Power and Test Reactor Sites".

2. Frequency Notation- Table 12.1-1 provides the definitions of various frequencies for which surveillances, sampling, etc., are performed unless defined otherwise. Refer to Technical Specification Table 1-1.

3. Immediate - Immediate means that the required action will be initiated as soon as practicable considering the safe operation of the unit and the importance of the required action.

4. Instrument Calibration - An instrument calibration means the adjustment of an instrument signal output so that it corresponds, within acceptable range and accuracy, to a known value(s) of the parameter which the instrument monitors. Calibration shall encompass the entire instrument, including actuation, alarm, or trip.

5. Instrument Check - An instrument check is qualitative determination of acceptable operability by observation of instrument behavior during operation. This determination shall include, where possible, comparison of the instrument with other independent instruments measuring the same variable.

6. Instrument Functional Test - An instrument functional test means the injection of a simulated signal into the instrument primary sensor to verify the proper instrument response alarm and/or initiating action.

7. Member of the Public - any individual except when that individual is receiving an occupational dose.

8. Mode - Reactor modes are described in Table 12.1-2 (per Technical Specification Table 1-2).

9. Occupational Dose-The dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation and/or to radioactive material from licensed and unlicensed sources of radiation, whether in the possession of the licensee or other person. Occupational dose does not include dose from background radiation, as a patient from medical practices, from voluntary participation in medical research programs, or as a member of the public.

12.1 DEFINITIONS (Cont'd)

10. The Offsite Dose Calculation Manual (ODCM) shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring Alarm/Trip Setpoints, and in the conduct of the Environmental Radiological Monitoring Program. The ODCM shall also contain (1) the Radioactive Effluent Controls and Radiological Environmental Monitoring Programs described in Section 12.5 and (2) descriptions of the information that should be included in the Annual Radiological Environmental Operating and Radioactive Effluent Release Reports required by Sections 12.6.2.1 and 12.6.2.2.

11. Operable - A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component or device to perform its specified safety function(s) are also capable of performing their related support function(s).

12. The Process Control Program (PCP) shall contain the current formulas, sampling, analyses, test, and determinations to be made to ensure that processing and packaging of solid radioactive wastes based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to assure compliance with 10 CFR Parts 20, 61, and 71, State regulations, burial ground requirements, and other requirements governing the disposal of solid radioactive waste.

13. Rated Thermal Power - Rated thermal power shall be a total reactor core heat transfer rate to the reactor coolant of 2527 thermal megawatts.

14. Reactor Power Operation - Reactor power operation is any operation with the mode switch in the "Startup/Hot Standby" or "Run" position with the reactor critical and above 1% rated thermal power.

15. Source Check - The qualitative assessment of Channel response when the Channel sensor is exposed to a radioactive source.

16. Definitions Related to Estimating Dose to the Public Using the ODCM Computer Program:

    1. Actual - Refers to using known release data to project the dose to the public for the previous month. These data are stored in the database and used to demonstrate compliance with the reporting requirements of Chapter 12.

    2. Projected - Refers to using known release data from the previous month or estimated release data to forecast a future dose to the public. These data are NOT incorporated into the database.

TABLE 12.1-1

SURVEILLANCE FREQUENCY NOTATION

NOTATION	FREQUENCY*
S (Shiftly)	At least once per 12 hours
D (Daily)	At least once per 24 hours
T	At least once per 72 hours
W (Weekly)	At least once per 7 days
M (Monthly)	At least once per 31 days
Q (Quarterly)	At least once per 92 days
SA (Semiannually)	At least once per 184 days
A (Annually)	At least once per 366 days
E (Sesquiannually)	At least once per 18 months (550 days)
S/U (Startup)	Prior to each reactor startup
NA (Not Applicable)	Not applicable

*Each surveillance requirement shall be performed within the specified time interval with a maximum allowable extension not to exceed 25% of the surveillance interval. The bases to Technical Specifications 4.0.B provides clarification to this statement. These definitions do not apply to the Radiological Environmental Monitoring Program (Section 12.5).

TABLE 12.1-2

OPERATIONAL MODES

MODE	MODE SWITCH POSITION[f]	AVERAGE REACTOR COOLANT TEMPERATURE
1. POWER OPERATION	Run	Any temperature
2. STARTUP	Startup/Hot Standby	Any temperature
3. HOT SHUTDOWN	Shutdown[a,e]	> 212°F
4. COLD SHUTDOWN	Shutdown[a,b,e]	≤ 212°F
5. REFUELING[c]	Shutdown or Refuel[a,d]	≤ 140°F

TABLE NOTATIONS

[a] The reactor mode switch may be placed in the Run, Startup/Hot Standby, or Refuel position to test the switch interlock functions provided the control rods are verified to remain fully inserted by a second licensed operator or other technically qualified individual.

[b] The reactor mode switch may be placed in the Refuel position while a single control rod drive is being removed from the reactor pressure vessel per Technical Specification 3.10.I.

[c] Fuel in the reactor vessel with one or more vessel head closure bolts less than fully tensioned or with the head removed.

[d] See Technical Specification Special Test Exceptions 3.12.A and 3.12.B.

[e] The reactor mode switch may be placed in the Refuel position while a single control rod is being recoupled or withdrawn provided the one-rod-out interlock is OPERABLE.

[f] When there is no fuel in the reactor vessel, the reactor is considered not to be in any OPERATIONAL MODE. The reactor mode switch may then be in any position or may be inoperable.

12.2 INSTRUMENTATION

A. Radioactive Liquid Effluent Monitoring Instrumentation

1. Radioactive Liquid Effluent Monitoring Instrumentation Operability

1. The effluent monitoring instrumentation shown in Table 12.2-1 shall be operable with alarm trip setpoints set to insure that the limits of Section 12.3.A are not exceeded. The alarm setpoints shall be determined in accordance with the ODCM.

2. With a radioactive liquid effluent monitoring instrument alarm/trip setpoint less conservative than required, without delay suspend the release of radioactive liquid effluents monitored by the affected instrument, or declare the instrument inoperable, or change the setpoint so it is acceptably conservative.

3. With one or more radioactive liquid effluent monitoring instruments inoperable, take the action shown in Table 12.2-1. Return the instrument to operable status within 30 days and, if unsuccessful, explain in the next Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner. This is in lieu of an LER.

4. In the event operability requirements and associated action requirements cannot be satisfied because of circumstances in excess of those addressed in the specifications, provide a 30-day written report to the NRC and no changes are required in the operational condition of the plant, and this does not prevent the plant from entry into any operational mode.

2. Radioactive Liquid Effluent Monitoring Instrumentation Surveillance

1. Each radioactive liquid effluent monitoring instrument shown in Table 12.2-2 shall be demonstrated operable by performance of the given source check, instrument check, calibration, and functional test operations at the frequencies shown in Table 12.2-2.

B. Radioactive Gaseous Effluent Monitoring Instrumentation

1. Radioactive Gaseous Effluent Monitoring Instrumentation Operability

1. The effluent monitoring instrumentation shown in Table 12.2-3 shall be operable with alarm/trip setpoints set to ensure that the limits of Section 12.4.A are not exceeded. The alarm/trip setpoints shall be determined in accordance with the ODCM.

2. With a radioactive gaseous effluent monitoring instruments alarm/trip set point less conservative than required, without delay suspend the release of radioactive gaseous effluents monitored by the affected instrument, or declare the instrument inoperable, or change the setpoint so it is acceptably conservative.

12.2.B.1 Radioactive Gaseous Effluent Monitoring Instrumentation Operability (Cont'd)

3. With one or more radioactive gaseous effluent monitoring instruments inoperable, take the action shown in Table 12.2-3. Return the instrument to operable status within 30 days and, if unsuccessful, explain in the next Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner. This is in lieu of an LER.

4. The Unit 2/3 plant chimney gas sampling system may be out of service for 48 hours for the purpose of servicing the high range noble gas monitor as long as the following conditions are satisfied:

   1. Both units are at steady state conditions with the recombiners and charcoal absorbers in service for the operating unit(s).

   2. The dose rate in unrestricted areas must be shown by calculation to be less than the limits of 12.4.A assuming the charcoal absorbers are bypassed on both units.

   3. Both offgas monitors on Unit 2 and Unit 3 must be operational and the monitor reading correlated to the chimney release rate based on the conservative assumption of both units' charcoal absorbers being bypassed.

   4. If the provisions of 12.4.A.1.1, 12.4.A.1.2, or 12.4.A.1.3 cannot be met, an orderly load reduction of the unit(s) shall be initiated immediately.

5. In the event operability requirements and associated action requirements cannot be satisfied because of circumstances in excess of those addressed in this Section, provide a 30-day written report to the NRC and no changes are required in the operational condition of the plant, and this does not prevent the plant from entry into any operation mode.

2. Radioactive Gaseous Effluent Monitoring Instrumentation Surveillance

Each radioactive gaseous radiation monitoring instrument in Table 12.2-4 shall be demonstrated operable by performance of the given source check, instrument check, calibration, and functional test operations at the frequency shown in Table 12.2-4.

TABLE 12.2-1

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

UNIT 1

Instrument		Operable	Minimum Channels Channels	Total No. of Action
1.	Service Water Effluent Gross Activity Monitor*	1	1	10
2.	Discharge Canal Sampler*	1	1	12

ACTIONS

ACTION 10 - With less than the minimum number of operable channels, releases via this pathway may continue, provided that at least once per 24 hours grab samples are collected and analyzed for beta or gamma activity at an LLD of less than or equal to 10^{-7} µCi/ml.

ACTION 12 - Operability is verified prior to performing and once a day during planned discharge.

* When Instrument is unavailable and associated actions cannot be performed, then discharges may not be made.

TABLE 12.2-1

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

UNITS 2 & 3

	Instrument	Minimum Channels Operable	Total No. of Channels	Action
1.	Service Water Effluent Gross Activity Monitor	1	1	10
2.	Liquid Radwaste Effluent Gross Activity Monitor	1	1	11

ACTIONS

ACTION 10 - With less than the minimum number of operable channels, releases via this pathway may continue, provided that at least once per 12 hours grab samples are collected and analyzed for beta or gamma activity at an LLD of less than or equal to 10^{-7} uCi/ml.

ACTION 11 - With less than a minimum number of operable channels, effluent releases via this pathway may continue, provided that prior to initiating a release, at least 2 independent samples are analyzed, and at least 2 members of the facility staff independently verify the release calculation and discharge valving. Otherwise, suspend release of radioactive effluent via this pathway.

TABLE 12.2-2

RADIOACTIVE LIQUID EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

UNIT 1

Instrument		Functional Test	Calibration[b][f]	Instrument Check[f]	Source Check
1.	Service Water Effluent Gross Activity Monitor*	Q[a][f][e]	E[c]	D	E
2.	Discharge Canal Sampler* [g]				

*When Instrument is unavailable and associated actions cannot be performed, then discharges may not be made.

TABLE 12.2-2

RADIOACTIVE LIQUID EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

UNITS 2 & 3

Instrument		Functional Test[a)(f)]	Calibration[b)(f)]	Instrument Check[f)]	Source Check
1.	Liquid Radwaste Effluent Gross Activity Monitor	Q[e)]	E[c)]	D	E[d)]
2.	Service Water Effluent Gross Activity Monitor	Q[e)]	E[c)]	D	E

TABLE 12.2-2 (Cont'd)

RADIOACTIVE LIQUID EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

TABLE NOTATIONS

(a) The Instrument Functional Test shall also demonstrate that control room alarm annunciation occurs, if any of the following conditions exist, where applicable.

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

(b) Calibration shall include performance of a functional test.

(c) Calibration shall include performance of a source check.

(d) Source check shall consist of observing instrument response during a discharge.

(e) Functional tests may be performed by using trip check and test circuitry associated with the monitor chassis.

(f) Functional tests, calibrations, and instrument checks are not required when these instruments are not required to be operable or are tripped. Calibration is not required to be performed more than once every 18 months.

(g) Operability is verified prior to performing discharge and once a day during planned discharge.

TABLE 12.2-3

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

UNIT 1

Instrument	Minimum Channels Operable	Total No. of Channels	Applicable Operational Modes	Action
1. Main Chimney SPING Noble Gas Monitors	1	3	*	28
2. Main Chimney Particulate Samplers	1	1	*	27
3. Main Chimney Iodine Samplers	1	1	*	27

* At all times.

TABLE 12.2-3

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

UNITS 2 & 3

Instrument	Minimum Channels Operable	Total No. of Channels	Applicable Operational Modes	Action
1. Main Chimney Noble Gas/SPING/ GE Low Range Activity Monitor	1	3	*	20
2. Main Chimney SPING Noble Gas Monitors Mid, Hi Range	1	1	*	26
3. Main Chimney Iodine Sampler	1	1	*	22
4. Main Chimney Particulate Sampler	1	1	*	22
5. Main Chimney Flow Rate Monitor	1	1	*	21
6. Main Chimney Sampler Flow Rate Monitor	1	1	*	21
7. Reactor Building Vent Exhaust Duct Radiation Monitor	2	2	1, 2, 3 and ***	24
8. Reactor Building Vent SPING Noble Gas Monitor Low, Mid, High Range	1	1	*	25
9. Reactor Building Vent Flow Rate Monitor	1	1	*	21
10. Reactor Building Vent Sampler Flow Rate Monitor	1	1	*	21
11. Reactor Building Vent Iodine Sampler	1	1	*	22
12. Reactor Building Vent Particulate Sampler	1	1	*	22
13. Offgas Radiation Activity Monitor	1	2	**	29

* At all times.
** During Steam Jet Air Ejector operation.
***When handling irradiated fuel in the secondary containment.

TABLE 12.2-3 (Cont'd)
RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION
ACTIONS AND TABLE NOTATIONS

ACTION 20 - With less than the minimum channels operable, effluent releases via this pathway may continue for up to 30 days provided grab samples are taken at least once every 8 hours and analyzed for noble gas within 24 hours.

ACTION 21 - With the number of operable channels less than the minimum required, effluent releases via this pathway may continue provided that the flow rate is estimated at least once per 4 hours.

ACTION 22 - With less than the minimum channels operable, effluent releases via this pathway may continue provided samples are continuously collected with auxiliary sampling equipment, as required in Table 12.4-1.

ACTION 24 - A channel may be placed in an inoperable status for up to 2 hours for required surveillance without placing the channel in the tripped condition provided the functional unit maintains isolation actuation capability. An inoperable channel need not be placed in the tripped condition where this would cause a trip function to occur. In this case, the inoperable channel shall be restored to operable status within 2 hours, or the following action taken. With less than the minimum channels operable, establish Secondary Containment Integrity with the Standby Gas Treatment System operating within one hour.

ACTION 25 - With less than the minimum channels operable, effluent releases via this pathway may continue provided that the minimum number of operable channels for the Reactor Building Vent Exhaust Duct Radiation Monitor are operable.

ACTION 26- With less than the minimum channels operable, effluent releases via this pathway may continue provided the low range monitor is operable and on scale. Restore the inoperable equipment to operable status within 21 days, or prepare and submit a report to the commission pursuant to Technical Specification 6.6.B (Section 6.6.A in Upgraded Technical Specifications) within the next 30 days outlining the plans, actions taken and procedures to be used to provide for the loss of sampling capability of the system.

ACTION 27- The main chimney SPING monitor may be out-of-service for calibration and maintenance provided that particulate and iodine samples are taken and analyzed. The samples shall be collected using alternate filter holders and pumps connected to the main chimney sample stream.

ACTION 28 - With less than the minimum channels operable, effluent releases via this pathway may continue provided daily noble gas samples are taken and analyzed daily. Restore the inoperable equipment to operable status within 30 days. If service can not be returned, document equipment availability difficulties within the Radioactive Effluent Release Report for the period including actions taken in response to the equipment and procedures used to provide for the loss of sampling capability of the system.

ACTION 29 - With less than the minimum channels operable, gases from the main condenser off gas system may be released to the environment for up to 72 hours provided the off gas system is not bypassed and at least one chimney monitor is operable; otherwise, be in HOT STANDBY in 12 hours.

TABLE 12.2-4

RADIOACTIVE GASEOUS EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

UNIT 1

	Instrument	Functional Test[a,c,e]	Calibration[b]	Instrument Check	Source Check	Applicable Operational Modes
1.	Main Chimney SPING Noble Gas Monitor Low Range	Q	E	D	M	*

*At all times.

TABLE 12.2-4

RADIOACTIVE GASEOUS EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

UNITS 2 & 3

Instrument		Functional Test[a][e]	Calibration[b][e]	Instrument Check[e]	Source Check	Applicable Operational Modes
1.	Main Chimney Noble Gas Activity Monitor	Q	E	D	M	*
2.	Main Chimney SPING Noble Gas Monitor Lo, Mid, High Range	Q	E	D	M	*
3.	Main Chimney Particulate and Iodine Sampler	NA	NA	D[c]	NA	*
4.	Main Chimney Flow Rate Monitor	Q	E	D	NA	*
5.	Main Chimney Sampler Flow Rate Monitor	Q[d]	E	D	NA	*
6.	Reactor Bldg Vent Exhaust Duct Radiation Monitor	M	Q	S	Q	1, 2, 3, and ***
7.	Reactor Bldg Vent SPING Noble Gas Monitor Lo, Mid, High Range	Q	E	D	M	*
8.	Reactor Bldg Vent Flow Rate Monitor	Q	E	D	NA	*
9.	Reactor Bldg Sampler Flow Rate Monitor	Q[d]	E	D	NA	*
10.	Reactor Bldg Vent Particulate and Iodine Sampler	NA	NA	D[c]	NA	*
11.	Off Gas Radiation Activity Monitor	Q	E	D	E	**

* At all times.
** During Steam Jet Air Ejector operation.
***Operation required when handling irradiated fuel in the secondary containment.

TABLE 12.2-4 (Cont'd)

RADIOACTIVE GASEOUS EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

TABLE NOTATIONS

(a) The Instrument Functional Test shall also demonstrate that control room alarm annunciation occurs, if any of the following conditions exist, where applicable.

1. Instrument indicates levels above the alarm setpoint.

2. Circuit failure.

3. Instrument indicates a downscale failure.

4. Instrument controls not set in OPERATE mode.

(b) Calibration shall include performance of a functional test.

(c) Instrument check to verify operability of sampler; that the sampler is in place and functioning properly.

(d) Functional test shall be performed on local switches providing low flow alarm.

(e) Functional tests, calibrations, and instrument checks are not required when these instruments are not required to be operable or are tripped. Calibration is not required to be performed more than once every 18 months.

12.2.C Liquid And Gaseous Effluents Instrumentation Bases

1. The radioactive liquid and gaseous effluent instrumentation is provided to monitor the release of radioactive materials in liquid and gaseous effluents during releases. The alarm setpoints for the instruments are provided to ensure that the alarms will occur prior to exceeding the limits of RETS.

12.3 LIQUID EFFLUENTS

12.3.A Liquid Effluents Limits and Reporting Operability

1. Concentration in Unrestricted Areas

The concentration of radioactive material released from the site to unrestricted areas (at or beyond the site boundary, Dresden Station ODCM Annex, Appendix F, Figure F-1) shall be limited to the concentrations specified in Appendix B, Table 2, Column 2 to 10CFR20.1001-20.2402[1], for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to the values listed in Table 12.3-1.

With the concentration of radioactive material released from the site to unrestricted areas exceeding the above limits, without delay decrease the release rate of radioactive materials and/or increase the dilution flow rate to restore the concentration to within the above limits.

2. Dose from Liquid Effluents

The dose or dose commitment above background to a member of the public from radioactive materials in liquid effluents released to unrestricted areas (at or beyond the site boundary) from the site shall be limited to the following:

1. During any Calendar Quarter:

   (1) Less than or equal to 3 mrem to the whole body.
   (2) Less than or equal to 10 mrem to any organ.

2. During any Calendar Year:

   (1) Less than or equal to 6 mrem to the whole body.
   (2) Less than or equal to 20 mrem to any organ.

3. With the calculated dose from the release of radioactive materials in liquid effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days a Special Report which identifies the cause(s) and defines the corrective actions taken and the proposed actions to be taken to ensure that future releases are in compliance with Sections 12.3.A.2.1 and 12.3.A.2.2. This is in lieu of a Licensee Event Report.

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[1]Upon technical specification approval, ten (10) times the Appendix B value may be used to determine the maximum instantaneous liquid release.

12.3.A Liquid Effluents Limits and Reporting Operability
(Cont'd)

4. With the calculated dose from the release of radioactive materials in liquid effluents exceeding the limits of Sections 12.3.A.2.1 or 12.3.A.2.2., prepare and submit a Special Report to the Commission within 30 days and limit the subsequent releases such that the dose or dose commitment to a member of the public from all uranium fuel cycle sources is limited to less than or equal to 25 mrem to the total body or any organ (except thyroid, which is limited to less than or equal to 75 mrem) over 12 consecutive months. This Special Report shall include an analysis which demonstrates that radiation exposures to all real individuals from all uranium fuel cycle sources (including all effluent pathways and direct radiation) are less than the 40 CFR Part 190 Standard. Otherwise obtain a variance from the Commission to permit releases which exceed the 40 CFR Part 190 Standard. The radiation exposure analysis contained in the Special Report shall use methods prescribed in the ODCM. This report is in lieu of a Licensee Event Report.

5. When the projected annual whole body or any internal organ dose computed at the nearest downstream community water system is equal to or exceeds 2 mrem from all radioactive materials released in liquid effluents from the Station, prepare and submit a Special Report within 30 days to the operator of the community water system. The report is prepared to assist the operator in meeting the requirements of 40 CFR Part 141, EPA Primary Drinking Water Standards. A copy of this report will be sent to the NRC. This is in lieu of a Licensee Event Report.

3. Dose Projections

At all times during processing prior to discharge to the environs, process and control equipment provided to reduce the amount or concentration of radioactive materials shall be operated when the projected dose due to liquid effluent releases to unrestricted areas (Dresden Station ODCM Annex, Appendix F, Figure F-1), when averaged over 31 days, exceeds 0.12 mrem to the total body or 0.40 mrem to any organ[a].

[a]These values represent 2% of the annual dose limits of Appendix I to 10CFR50.

12.3.A Liquid Effluents Limits and Reporting Operability (Cont'd)

4. Liquid Radioactive Waste Treatment System

If liquid waste has to be or is being discharged without treatment as required above, prepare and submit to the Commission with 30 days, a report which includes the following information.

1. Identification of the defective equipment.

2. Cause of the defect in the equipment.

3. Action(s) taken to restore the equipment to an operating status.

4. Length of time the above requirements were not satisfied.

5. Volume and curie content of the waste discharged which was not processed by the appropriate equipment but which required processing.

6. Action(s) taken to prevent a recurrence of equipment failures.

This is in lieu of a Licensee Event Report.

5. System Operability and Plant Operations

In the event a limit and/or associated action requirements identified in Sections 12.3.A and 12.3.B cannot be satisfied because of circumstances in excess of those addressed in this Section, no changes are required in the operational condition of the plant, and this does not prevent the plant from entry into any operational mode.

12.3.B Liquid Effluents Surveillance

1. Concentration in Unrestricted Areas

The concentration of radioactive material in unrestricted areas shall be determined to be within the prescribed limits by obtaining representative samples in accordance with the sampling and analysis program specified in Table 12.3-2. The sample analysis results will be used with the calculational methods in the ODCM to determine that the concentrations are within the limits of Section 12.3.A.1.

12.3.B Liquid Effluents Surveillance (Cont'd)

2. Dose from Liquid Effluents

The dose contribution from measured quantities of radioactive material shall be determined by calculation at least once per 31 days and cumulative summation of these total body and organ dosed shall be maintained for each calendar quarter.

Doses computed at the nearest community water system will consider only the drinking water pathway and shall be projected using the methods prescribed in ODCM, at least once per 92 days.

3. Dose Projections

Doses due to liquid releases to unrestricted areas (at or beyond the site boundary) shall be projected at least once per 31 days in accordance with the ODCM.

TABLE 12.3-1

ALLOWABLE CONCENTRATION OF DISSOLVED OR ENTRAINED NOBLE GASES RELEASED FROM THE SITE TO UNRESTRICTED AREAS IN LIQUID WASTE

NUCLIDE	AC(μCi/ml)*
Kr-85m	2×10^{-4}
Kr-85	5×10^{-4}
Kr-87	4×10^{-5}
Kr-88	9×10^{-5}
Ar-41	7×10^{-5}
Xe-131m	7×10^{-4}
Xe-133m	5×10^{-4}
Xe-133	6×10^{-4}
Xe-135m	2×10^{-4}
Xe-135	2×10^{-4}

* Computed from Equation 20 of ICRP Publication 2 (1959), adjusted for infinite cloud submersion in water, and R = 0.01 rem/week, density = 1.0 g/cc and Pw/Pt = 1.0.

TABLE 12.3-2

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

UNIT 1

LIQUID RELEASE TYPE	SAMPLING FREQUENCY[6]	MINIMUM ANALYSIS FREQUENCY[6]	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)[1] (μCi/ml)
A. Service Water Releases[4] [8]	M	M	I-131	$1x10^{-6}$
	M (Grab Sample)	M	Principal Gamma Emitters[5]	$5x10^{-7}$
	M (Grab Sample)	M	Dissolved & Entrained Gases[6] (Gamma Emitters)	$1x10^{-5}$
	M (Grab Sample)	M (Composite)	H-3	$1x10^{-5}$
			Gross Alpha	$1x10^{-7}$
	Q (Grab Sample)	Q	Sr-89, Sr-90	$5x10^{-8}$
			Fe-55	$1x10^{-6}$

LIQUID RELEASE TYPE	SAMPLING FREQUENCY[6]	MINIMUM ANALYSIS FREQUENCY[6]	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)[1] (μCi/ml)
B. Above Ground Liquid Storage Tanks[7]	T	T	Principal Gamma Emitters[5]	$5x10^{-7}$
			Dissolved & Entrained Gases[6] (Gamma Emitters)	$1x10^{-5}$

TABLE 12.3-2
RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM
UNITS 2 & 3

LIQUID RELEASE TYPE	SAMPLING FREQUENCY[6]	MINIMUM ANALYSIS FREQUENCY[6]	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)[1] (μCi/ml)
A. Batch Release Tanks	Prior to Each Batch	Prior to Each Batch	Principal Gamma Emitters[5] I-131	$5x10^{-7}$ $1x10^{-6}$
	Prior to Each Batch	M Composite[2]	Gross Alpha H-3	$1x10^{-7}$ $1x10^{-5}$
	Prior to Each Batch	Q Composite [2]	Fe-55 Sr-89, Sr-90	$1x10^{-6}$ $5x10^{-8}$
	Prior to One Batch/M	M	Dissolved & Entrained Gases [6] (Gamma Emitters)	$1x10^{-5}$
B. Plant Continuous Releases[4]	M[3] (Grab Sample)	M[3]	I-131	$1x10^{-6}$
	M[3] (Grab Sample)	M[3]	Principal Gamma Emitters[5]	$5x10^{-7}$
	M[3] (Grab Sample)	M[3]	Dissolved & Entrained Gases[6] (Gamma Emitters)	$1x10^{-5}$
	M[3] (Grab Sample)	M[3]	H-3	$1x10^{-5}$
			Gross Alpha	$1x10^{-7}$
	Q[3] (Grab Sample)	Q[3]	Sr-89, Sr-90	$5x10^{-8}$
			Fe-55	$1x10^{-6}$
C. Above Ground Liquid Storage Tanks [7]	T	T	Principal Gamma Emitters[5] Dissolved & Entrained Gases[6] (Gamma Emitters)	$5x10^{-7}$ $1x10^{-5}$

TABLE 12.3-2 (Cont'd)
TABLE NOTATION

(1) The LLD is defined in the ODCM.

(2) A composite sample is one in which the quantity of liquid samples 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.

(3) If the alarm setpoint of the service water effluent monitor as determined in the ODCM is exceeded, the frequency of analysis shall be increased to daily until the condition no longer exists.

(4) A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated and then thoroughly mixed to assure representative sampling. A continuous release is the discharge of liquid wastes of a nondiscrete volume; e.g., from a volume or system that has an input flow during the release.

(5) The principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Mn-54, Fe-59, Co-60, Zn-65, Co-58, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. Other peaks which are measurable and identifiable by gamma ray spectrometry together with the above nuclides, shall be also identified and reported when the actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being present at the LLD level for that nuclide.

(6) The dissolved and entrained gases (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. Other dissolved and entrained gases (gamma emitters) which are measurable and identifiable by gamma ray spectrometry, together with the above nuclides, shall also be identified and reported when an actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being present at the LLD level for that nuclide.

(7) A sample(s) from:

Unit 1: Each of the above-grade liquid waste tanks. If no additions to a tank have been made since the last sample, the tank need not be sampled until the next addition.

Units 2 & 3: The Waste Sample Tanks, Floor Drain Sample Tanks and the Waste Surge Tanks, shall be taken, analyzed, and recorded every 72 hours. If no additions to a tank have been made since the last sample, the tank need not be sampled until the next addition.

(8) Sampling and analyses required only when system is operating.

12.3.C LIQUID EFFLUENTS BASES

1. Concentration

This specification is provided to ensure that 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 Appendix B, Table 2, Column 2 to 10CFR20.1001-20.2402.

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 operational requirements implements the guides set forth in Section II.A of Appendix I. The 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 liquid effluents will be kept "as low as reasonably achievable". 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-0113 provides methods for dose calculations consistent with Reg Guide 1.109 and 1.113.

3. 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 requirement that the appropriate portions of this system be used when specified provides assurance that the releases of radioactive materials in liquid effluents will be kept "as low as reasonably achievable". This specification implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50 and design objective Section 11.D of Appendix I to 10 CFR Part 50.

12.3.C LIQUID EFFLUENTS BASES - (Continued)

4. Mechanical Vacuum Pump

The purpose of isolating the mechanical vacuum line is to limit release of activity from the main condenser. During an accident, fission products would be transported from the reactor through the main steam line to the main condenser. The fission product radioactivity would be sensed by the main steamline radioactivity monitors which initiate isolation.

12.4 GASEOUS EFFLUENTS

A. Gaseous Effluents Limits and Reporting Operability

1. Dose Rate

The dose rate in unrestricted areas at or beyond the site boundary (Dresden Station ODCM Annex, Appendix F, Figure F-1) due to radioactive materials released in gaseous effluents from the site shall be limited to the following:

1. For Noble Gases:

   (1) Less than a dose rate of 500 mrem/year to the whole body.
   (2) Less than a dose rate of 3000 mrem/year to the skin.

2. For iodine-131, for iodine-133, tritium and for all radionuclides in particulate form with half-lives greater than 8 days, less than a dose rate of 1500 mrem/year.

3. If the dose rates exceed the above limits, without delay decrease the release rates to bring the dose rates within the limits, and provide notification to the Commission (per 10 CFR Part 20.2203).

2. Noble Gas Dose

The air dose in unrestricted areas at or beyond the site boundary due to noble gases released in gaseous effluents from the unit shall be limited to the following:

1. For Gamma Radiation

   (1) Less than or equal to 5 mrad during any calendar quarter.
   (2) Less than or equal to 10 mrad during any calendar year.

2. For Beta Radiation

   (1) Less than or equal to 10 mrad during any calendar quarter.
   (2) Less than or equal to 20 mrad during any calendar year.

3. With the calculated air dose from radioactive noble gases in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to ensure that future releases are in compliance with Sections 12.4.A.2.1 and 12.4.A.2.2. This is in lieu of a Licensee Event Report.

12.4.A Gaseous Effluents Limits and Reporting Operability (Cont'd)

4. With the calculated air dose from radioactive noble gases in gaseous effluents exceeding the limits of Sections 12.4.A.2.1 or 12.4.A.2.2, prepare and submit a Special Report to the Commission within 30 days and limit the subsequent releases such that the doses or dose commitment to a member of the public from all uranium fuel cycle sources is limited to less than or equal to 25 mrem to the total body or any organ (except thyroid, which is limited to less than or equal to 75 mrem) over 12 consecutive months. This Special Report shall include an analysis which demonstrates that radiation exposures to all members of the public from all uranium fuel cycle sources (including all effluent pathways and direct radiation) are less than 40 CFR Part 190 Standard. Otherwise, obtain a variance from the Commission to permit releases which exceed the 40CFR Part 190 Standard. The radiation exposure analysis contained in the Special Report shall use the methods prescribed in the ODCM. This report is in lieu of a Licensee Event Report.

5. Process and control equipment provided to reduce the amount or concentration of radioactive materials shall be operated when the projected dose due to gaseous effluents released to the unrestricted areas, when averaged over 31 days, exceeds 2% of the annual dose limits of Appendix I to 10CFR50.

3. Iodine-131, Iodine-133, Tritium, and Particulate Dose

The dose to a member of the public in unrestricted areas at or beyond the site boundary from iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released from the unit shall be limited to the following.

1. Less than or equal to 7.5 mrem to any organ during any calendar quarter.

2. Less than or equal to 15 mrem to any organ during any calendar year.

3. With the calculated dose from the release of iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, a Special Report which identifies the cause(s) for exceeding the limit and defines the corrective actions taken to ensure that future releases are in compliance with Section 12.4.A.3.1 and 12.4.A.3.2. This is in lieu of a Licensee Event Report.

4. With the calculated dose from the release of iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents exceeding the limits of Sections 12.4.A.3.1. or 12.4.A.3.2., prepare and submit a Special Report to the Commission within 30 days and limit subsequent releases such that the dose or dose commitment to a member of the public from all uranium fuel sources

12.4.A Gaseous Effluents Limits and Reporting Operability (Cont'd)

is limited to less than or equal to 25 mrem to the total body or organ (except the thyroid, which is limited to less than or equal to 75 mrem) over 12 consecutive months. This Special Report shall include an analysis which demonstrates that radiation exposures to all members of the public from all uranium fuel cycle sources (including all effluent pathways and direct radiation) are less than the 40 CFR Part 190 Standard. Otherwise, obtain a variance from the Commission to permit releases which exceed the 40 CFR Part 190 Standard. The radiation exposure analysis contained in the Special Report shall use the methods prescribed in the ODCM. This report is in lieu of a Licensee Event Report.

5. Process and control equipment provided to reduce the amount or concentration of radioactive materials shall be operated when the projected dose due to gaseous effluents released to the unrestricted areas, when averaged over 31 days, exceeds 2% of the annual dose limits of Appendix I to 10CFR50.

4. Off-Gas Treatment

1. At all times during processing for discharge to the environs, process and control equipment provided to reduce the amount of concentration of radioactive materials shall be operated.

2. The above specification shall not apply for the Off-Gas Charcoal Adsorber Beds below 30 percent of rated thermal power.

3. The recombiner shall be operable whenever the reactor is operating at a pressure greater than 900 psig.

4. The recombiner may be inoperable for 48 hours.

5. With either the recombiners inoperable, or all charcoal beds by-passed for more than 7 days in a calendar quarter while operating above 30 percent of the rated thermal power, prepare and submit to the Commission within 30 days a Special Report which includes the following information.

   a. Identification of the defective equipment.

   b. Cause of the defect in the equipment.

   c. Action(s) taken to restore the equipment to an operating status.

   d. Length of time the above requirements were not satisfied.

   e. Volume and curie content of the waste discharged which was not processed by the inoperable equipment but which required processing.

12.4.A Gaseous Effluents Limits and Reporting Operability (Cont'd)

f. Action(s) taken to prevent a recurrence of equipment failures.

This is in lieu of a Licensee Event Report.

5. Main Condenser Air Ejector

The release rate of the sum of the activities from the noble gases measured at the main condenser air ejector shall be limited to ≤ 100 microcuries/sec per MWt (after 30 minutes decay) when in modes 1,2[a], and 3[a]. With the release rate of the sum of the activities from noble gases at the main condenser air ejector effluent (as measured prior to the offgas holdup line) > 100 microcuries/sec per MWt, after 30 minutes decay, restore the release rate to within its limits within 72 hours, or be in at least STARTUP with the main steam isolation valves closed within the next 8 hours. (Refer to Technical Specification 3.8.1)

6. System Operability and Plant Operations

In the event a limit and/or associated action requirements identified in Sections 12.4.A and 12.4.B cannot be satisfied because of circumstances in excess of those addressed in this Section, no changes are required in the operational condition of the plant, and this does not prevent the plant from entry into any operational mode.

[a] When the main condenser air ejector is in operation.

12.4.B Gaseous Effluents Surveillance

1. Dose Rate

The dose rates due to radioactive materials released in gaseous effluents from the site shall be determined to be within the prescribed limits by obtaining representative samples in accordance with the sampling and analysis program specified in Table 12.4-1. The dose rates are calculated using methods prescribed in the ODCM.

2. Noble Gas Dose

The air dose due to releases of radioactive noble gases in gaseous effluents shall be determined to be within the prescribed limits by obtaining representative samples in accordance with the sampling and analysis program specified in Sections A and B of Table 12.4-1. The allocation of effluents between units having shared effluent control system and the determination of cumulative and projected dose contributions for the current calendar quarter and current calendar year shall be determined in accordance with the methodology and parameters in the ODCM at least once every 31 days.

3. Iodine-131, Iodine-133, Tritium and Particulate Dose

The dose to a member of the public due to releases of iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days shall be determined to be within the prescribed limits by obtaining representative samples in accordance with the sampling and analysis program specified in Table 12.4-1.

For radionuclides not determined in each batch or weekly composite, the dose contribution to the current calendar quarter cumulative summation may be estimated by assuming an average monthly concentration based on the previous monthly or quarterly composite analyses. However, for reporting purposes, the calculated dose contributions shall be based on the actual composite analyses when possible.

The allocation of effluents between units having shared effluent control system and the determination of cumulative and projected dose contributions for the current calendar quarter and current calendar year shall be determined in accordance with the methodology and parameters in the ODCM at least once every 31 days.

4. Off-Gas Treatment

Doses due to treated gases released to unrestricted areas at or beyond the site boundary shall be projected at least once per 31 days in accordance with the ODCM.

12.4.B Gaseous Effluents Surveillance - Continued

5. Noble Gases at the Main Condenser Air Ejector

The release rate of noble gases from the main condenser air ejector shall be continuously monitored. The release rate of the sum of the activities from noble gases from the main condenser air ejector shall be determined to be within the limits of 12.4.A.5 at the following frequencies by performing an isotopic analysis of a representative sample of gases taken at the recombiner outlet, or at the air ejector outlet if the recombiner is by-passed.

1. At least once per 31 days.

2. Within 4 hours following determination of an increase of greater than 50%.

(Refer to Technical Specification 4.8.1)

TABLE 12.4-1

RADIOACTIVE GASEOUS WASTE SAMPLING
AND ANALYSIS PROGRAM
UNIT 1

GASEOUS RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)[1] (µCi/ml)
A. Main Chimney	M (Grab Sample)	M	Principal Gamma Emitters [5] Tritium Noble Gases	$1x10^{-4}$ $1x10^{-6}$ $1x10^{-6}$
	M[4,6] (Continuous)	M [3] Iodine Sample	I-131 I-133	$1x10^{-12}$ $1x10^{-10}$
	M[6] (Continuous)	M [3] Particulate Sample	Principal Gamma Emitters [5]	$1x10^{-11}$
	Q (Continuous)	Q Composite Particulate Sample	Sr-89, Sr-90 Gross Alpha	$1x10^{-11}$

Table 12.4-1

RADIOACTIVE GASEOUS WASTE SAMPLING
AND ANALYSIS PROGRAM
UNITS 2 & 3

GASEOUS RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)[1] (μCi/ml)
A. Main Chimney Reactor Bldg. Vent Stack	M (Grab Sample)	M[2]	Principal Gamma Emitters[5] Tritium	$1x10^{-4}$ $1x10^{-6}$
B. All Release Types as Listed in A above	Continuous[4]	W[3] Iodine Sample	I-131 I-133	$1x10^{-12}$ $1x10^{-10}$
	Continuous[4]	W[3] Particulate Sample	Principal Gamma Emitters [5]	$1x10^{-11}$
	Continuous[4]	Q Composite Particulate Sample	Sr-89 Sr-90	$1x10^{-11}$ $1x10^{-11}$
	Continuous[4]	Q Composite Particulate Sample	Gross Alpha	$1x10^{-11}$
C. Main Chimney	Continuous[4]	Noble Gas Monitor	Noble Gases	$1x10^{-6}$
D. Reactor Bldg. Vent Stack	Continuous[4]	Noble Gas Monitor	Noble Gases	$1x10^{-4}$

TABLE 12.4-1 (Cont'd)

RADIOACTIVE GASEOUS WASTE SAMPLING
AND ANALYSIS PROGRAM

TABLE NOTATION

(1) The lower limit of detection (LLD) is defined in the ODCM.

(2) Sampling and analyses shall also be performed following shutdown, startup, or a thermal power change exceeding 20 percent of rated thermal power in 1 hour unless (1) analysis shows that the dose equivalent I-131 concentration in the primary coolant has not increased more than a factor of 5, and (2) the noble gas activity monitor shows that effluent activity has not increased by more than a factor of 3.

(3) Samples shall be changed at least once per 7 days and the analyses completed within 48 hours after removal from the sampler. Sampling shall also be performed within 24 hours following each shutdown, startup, or thermal power level change exceeding 20% of rated thermal power in one hour. This requirement does not apply if 1) analysis shows that the dose equivalent I-131 concentration in the primary coolant has not increased more than a factor of 5, and 2) the noble gas activity monitor shows that effluent activity has not increased by more than a factor of 3. When samples collected for 24 hours are analyzed, the corresponding LLD's may be increased by a factor of 10.

(4) The ratio of sample flow rate to the sampled stream flow rate shall be known.

(5) 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-60, Zn-65, Co-58, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144 for particulate emissions. Other peaks which are measurable and identifiable by gamma ray spectrometry, together with the above nuclides, shall be also identified and reported when an actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being present at the LLD level for the nuclide.

(6) Analysis frequency shall be increased to 1/week if release rates exceed 1% of any applicable limit referenced in the ODCM, when added to Units 2 and 3 airborne effluents.

12.4.C Gaseous Effluents Bases

1. Gaseous Effluents - Dose

This Section is provided to ensure that the dose at the unrestricted area boundary from gaseous effluents from the units on site will be within the annual dose limits of 10CFR20 for unrestricted areas. These limits provide reasonable assurance that radioactive material discharged in gaseous effluents will not result in the exposure of an individual in an unrestricted area to annual average concentrations exceeding the limits specified in Appendix B, Table 2 of 10CFR20.1001-2402. The release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to an individual at or beyond the unrestricted area boundary to less than or equal to 500 mrem/year to the total body or to less than or equal to 3000 mrem/year to the skin. These release rate limits also restrict, at all times, the corresponding thyroid dose rate above background via the inhalation pathway to less than or equal to 1500 mrem/year. For purposes of calculation doses resulting from airborne releases, the main chimney is considered to be an elevated release point and the reactor building vent stack is considered to be a mixed mode release point.

2. Dose, Noble Gases

This Section is provided to implement the requirements of Sections II.B, III.A and IV.A of Appendix I, 10 CFR Part 50. The Operability Requirements implement the guides set forth in Section II.3 of Appendix I. The 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 conformance with the guides of Appendix I is 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. NUREG-0133 provides methods for dose calculations consistent with Regulatory Guides 1.109 and 1.111.

12.4.C Gaseous Effluents Bases (Cont'd)

3. Dose, Radioiodines, Radioactive Material in Particulate Form and Radionuclides Other than Noble Gases

This Section is provided to implement the requirements of Sections II.C, III.A and IV.A of Appendix I, 10 CFR Part 50. The Operability Requirements are the guides set forth in Section II.C of Appendix I. The 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 materials in gaseous effluents will be kept "as low as reasonably achievable." The ODCM calculational methods specified in the surveillance requirements 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 ODCM calculational methods approved by 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 for determining the actual doses based upon the historical average atmospheric conditions. The release rate limits 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 were examined in the development of these limits were: 1) individual inhalation of airborne radionuclides, 2) deposition of radionuclides onto green leafy vegetation with subsequent consumption by man and 3) deposition onto grassy areas where milk animals graze with consumption of the milk by man.

4. Gaseous Waste Treatment

The operability of the gaseous waste treatment which reduces amounts or concentrations of radioactive materials ensures that the system will be available for use whenever gaseous effluents require treatment prior to release to the environment. The requirement that the appropriate portions of this system be operable when specified provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as reasonably achievable". This specification implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50, and design objective Section II.D of Appendix I to 10 CFR Part 50.

12.5 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

A. Radiological Environmental Monitoring Program

1. The Radiological Environmental Monitoring Program given in Table 12.5-1 shall be conducted except as specified below.

2. With the Radiological Environmental Monitoring Program not being conducted as specified in Table 12.5-1, prepare and submit to the Commission, in the Annual Radiological Environmental Operating Report, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence. Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, contractor omission which is corrected as soon as discovered, malfunction of sampling equipment, or if a person who participates in the program goes out of business. If the equipment malfunctions, corrective actions shall be completed as soon as practical. If a person supplying samples goes out of business, a replacement supplier will be found as soon as possible. All deviations from the sampling schedule shall be described in the Annual Report.

3. When the level of radioactivity in an environmental sampling medium at one or more of the locations specified in the Table 12.5-1 exceeds the limits of the Table 12.5-2 when averaged over any calendar quarter, prepare and submit to the Commission within 30 days from the end of the affected calendar quarter, a Special Report which includes an evaluation of any release conditions, environmental factors or other aspects which caused the limits of the Table 12.5-2 to be exceeded. This report is not required if the measured level of radioactivity was not the result of plant effluents; however in such an event the condition shall be reported and described in the Annual Radiological Environmental Operating Report.

4. With milk samples unavailable from one or more of the sample locations required by Table 12.5-1, identify locations for obtaining replacement samples and add them to the Radiological Environmental Monitoring Program within 30 days. The locations from which samples were unavailable may then be deleted from the monitoring program. In lieu of Licensee Event Report, identify the cause of the unavailability of samples and identify the new location(s) for obtaining replacement samples in the Annual Radiological Environmental Operating Report and also include in the report a revised figure(s) and table reflecting the new location(s).

12.5.A Radiological Environmental Monitoring Program (Cont'd)

5. A census of nearest residences and of animals producing milk for human consumption shall be conducted annually (during the grazing season for animals) to determine their location and number with respect to the site. The nearest residence in each of the 16 meteorological sectors shall also be determined within a distance of five miles. The census shall be conducted under the following conditions:

   1. Within a 2-mile radius from the plant site, enumeration of animals and nearest residences by a door-to-door or equivalent counting technique.

   2. Within a 5-mile radius, enumeration of animals by using referenced information from country agricultural agents or other reliable sources.

6. With a land use census identifying location(s) of animals which yield(s) calculated dose or dose commitment greater than the values currently being calculated in Section 12.4.A.3, the new location(s) shall be added to the Radiological Environmental Monitoring Program within 30 days, if possible.

   The sampling location, having the lowest calculated dose or dose commitment (via the same exposure pathway) may be deleted from this monitoring program after October 31 of the year in which this land use census was conducted.

7. Radiological analyses shall be performed on samples representative of those in Table 12.5-1, supplied as a part of an Interlaboratory Comparison Program.

8. With analyses not being performed as required, report the corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Operating Report.

9. System Operability and Plant Operations

   In the event a limit and/or associated action requirements identified in Sections 12.5.A and 12.5.B cannot be satisfied because of circumstances in excess of those addressed in these Sections, no changes are required in the operational condition of the plant, and this does not prevent the plant from entry into any operational mode.

B. Radiological Environmental Monitoring Program Surveillance

1. The radiological environmental monitoring samples shall be collected pursuant to Table 12.5-1 from the locations specified in the ODCM and shall be analyzed pursuant to the requirements of Table 12.5-3.

12.5.B Radiological Environmental Monitoring Surveillance (Cont'd)

2. The results of analyses performed on radiological environmental monitoring samples shall be summarized in the Annual Radiological Environmental Operating Report.

3. The land use census shall be conducted at least once per twelve months between the dates of June 1 and October 1 by a door-to-door survey, aerial survey, road survey, or by consulting local agriculture authorities.

4. The results of the land use census shall be included in the Annual Radiological Environmental Operating Report.

5. The results of the analyses performed as part of the required Interlaboratory Comparison Program shall be included in the Annual Radiological Environmental Operating Report. The analyses shall be done in accordance with ODCM Table 11-1.

TABLE 12.5-1
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	MINIMUM NUMBER OF SAMPLES AND SAMPLE LOCATIONS*	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
1. AIRBORNE A. Particulates	17 locations	Continuous operation of sampler for a week	Gross beta and gamma isotopic as specified in ODCM Table 11-1.
B. Radioiodine	17 locations	Continuous operation of sampler for two weeks	I-131 as specified in ODCM Table 11-1.
2. DIRECT RADIATION	42 locations (Minimum of two TLDs per packet)	Quarterly	
3. WATERBORNE A. Surface Water	2 locations	Monthly composite of weekly collected samples	Gamma Isotopic analysis of each composite sample
B. Sediment	1 downstream location in receiving body of water	Annually	Gamma Isotopic analysis of each sample
C. Plant Cooling Water	Intake, Discharge	Weekly Composite	Gross Beta analysis of each sample
4. INGESTION A. Milk	2 locations	At least once weekly when animals are on pasture; at least once per month at other times	I-131 analysis of each sample
B. Fish	1 location in receiving body of water	Semiannually	Gamma Isotopic analysis on edible portions

*Sample locations are described in ODCM Chapter 11.

Table 12.5-2

REPORTING LEVELS FOR RADIOACTIVITY
CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GASES (pCi/m³)	FISH (pCi/Kg, wet)	MILK (pCi/l)	FOOD PRODUCTS (pCi/Kg, wet)
H-3	2×10^4 (see Note 1)				
Mn-54	1×10^3		3×10^4		
Fe-59	4×10^2		1×10^4		
Co-58	1×10^3		3×10^4		
Co-60	3×10^3		2×10^4		
Zn-65	3×10^2		2×10^4		
Zr-Nb-95	4×10^2				
I-131	2	0.9		3	1×10^2
Cs-134	30	10	1×10^3	60	2×10^3
Cs-137	50	20	1×10^3	70	2×10^3
Ba-La-140	2×10^2			3×10^2	

Note: 1) For drinking water samples. This is 40 CFR Part 141 value.

Table 12.5-3
PRACTICAL LOWER LIMITS OF DETECTION (LLD) FOR STANDARD
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SAMPLE MEDIA	ANALYSIS	(LLD)[D][E] (4.66σ)	UNITS
Airborne "Particulate"	Gross Beta[B]	0.01	pCi/m^3[C]
	Gamma Isotopic	0.01	pCi/m^3[C]
Airborne I-131	Iodine-131	0.10	pCi/m^3[C]
Milk/Public Water	I-131	5[A]	pCi/l
	Cs-134	10	pCi/l
	Cs-137	10[C]	pCi/l
	Tritium	200	pCi/l
	Gross Beta[B]	5	pCi/l
	Gamma Isotopic	20	pCi/l/nuclide
Sediment	Gross Beta[B]	2	pCi/g dry
	Gamma Isotopic	0.2	pCi/g dry
Fish Tissue	I-133-Thyroid	0.1	pCi/g wet
	Cs-134, 137	0.1	pCi/g wet
	Gross Beta[B]	1.0	pCi/g wet
	Gamma Isotopic	0.2	pCi/g wet

Note:
[A] 0.5 pCi/l on milk samples collected during the pasture season.
[B] Reference to Cs-137
[C] 5.0 pCi/l on milk samples

(Notes continued next two pages)

Table 12.5-3 (Cont'd)

PRACTICAL LOWER LIMITS OF DETECTION (LLD) FOR STANDARD
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

TABLE NOTATION

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

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

$$LLD = \frac{4.66 \cdot (S_b)}{(A) \cdot (E) \cdot (V) \cdot (2.22) \cdot (Y) \cdot (\exp(-\lambda \Delta t)) \cdot (t)}$$

Where:

LLD	is the "A priori" lower limit of detection for a blank sample or background analysis as defined above (as pCi per unit mass or volume).
S_b	is the square root of the background count or of a blank sample count; is the estimated standard error of a background count or a blank sample count as appropriate (in units of counts).
E	is the counting efficiency (as counts per disintegration).
A	is the number of gamma rays omitted per disintegration for gamma ray radionuclide analysis (A = 1.0 for gross alpha and tritium measurements).
V	is the sample size (in units of mass or volume).
2.22	is the number of disintegrations per minute per picocurie.
Y	is the fractional radiochemical yield when applicable (otherwise Y=1.0).
λ	is the radioactive decay constant for the particular radionuclide (in units of reciprocal minutes).
Δt	is the elapsed time between the midpoint of sample collection and the start time of counting. (t = 0.0 for environmental samples and for gross alpha measurements).
t	is the duration of the count (in units of minutes).

The value of "S_b" used in the calculation of the LLD for a detection system shall be based on an actual observed background count or a blank sample count (as appropriate) rather than on an unverified theoretically predicted value. Typical values of "E", "V", "Y", "t", and "Δt" shall be used in the calculation.

Table 12.5-3 (Cont'd)

PRACTICAL LOWER LIMITS OF DETECTION (LLD) FOR STANDARD
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

TABLE NOTATIONS

For gamma ray radionuclide analyses the background counts are determined from the total counts in the channels which are within plus or minus one FWHM (Full Width at Half Maximum) of the gamma ray photopeak energy normally used for the quantitative analysis for that radionuclide. Typical values of the FWHM shall be used in the calculation.

The LLD for all measurements is defined as an "A priori" (before the fact) limit representing the capability of a measurement system and not as an "a posteriori" (after the fact) limit for a particular sample measurement.

(E) Other radionuclides which are measurable and identifiable by gamma ray spectrometry, together with the nuclides indicated in Table 12.5-3, shall also be identified and reported when an actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being present at the LLD level for that nuclide.

12.5.C Radiological Environmental Monitoring Program Bases

1. Monitoring Program

The radiological environmental monitoring program required by this Section provides measurements of radiation and of 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. This monitoring program thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations 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. Program changes may be initiated based on operational experience.

The detection capabilities required by Table 12.5-3 are state-of-the-art for routine environmental measurements in industrial laboratories. The specified lower limits of detection for I-131 in water, milk and other food products correspond to approximately one-quarter of the Appendix I to 10 CFR Part 50 design objective dose-equivalent of 15 mrem/year for atmospheric releases and 10 mrem/year for liquid releases to the most sensitive organ and individual. They are based on the assumptions given 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", October 1977, except the change for an infant consuming 330 liter/year of drinking water instead of 510 liters/year.

2. Land Use Census

This Section is provided to ensure that changes in the use of unrestricted areas are identified and that modifications to the monitoring program are made if required by the results of this census. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50.

3. Interlaboratory Comparison Program

The requirement for participation in an Interlaboratory Comparison Program is provided to ensure that 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 that the results are reasonably valid.

12.6 RECORDKEEPING AND REPORTING

1. Station Operating Records

1. Records and/or logs relative to the following items shall be kept in a manner convenient for review and shall be retained for at least five years.

    1. Records and periodic checks, inspection and/or calibrations performed to verify the surveillance requirements (See the applicable surveillance in the Instrumentation, Liquid Effluents, Gaseous Effluents, and Radiological Environmental Monitoring Sections) are being met. All equipment failing to meet surveillance requirements and the corrective action taken shall be recorded.

    2. Records of radioactive shipments.

2. Records and/or logs relative to the following items shall be recorded in a manner convenient for review and shall be retained for the life of the plant.

    1. Records of off-site environmental monitoring surveys.

    2. Records of radioactivity in liquid and gaseous wastes released to the environment.

    3. Records of reviews performed for changes made to the ODCM.

2. Reports

1. Radioactive Effluent Release Report

    The Radioactive Effluent Release Report covering the operation of the unit during the previous 12 months of operation shall be submitted to the Commission prior to April 1 of each year. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit. The material provided shall be (1) consistent with the objectives outlined in the ODCM and PCP and (2) in conformance with 10 CFR Part 50.36a and Section IV.B.1 of Appendix I to 10 CFR Part 50.

2. Annual Radiological Environmental Operating Report

    The Annual Radiological Environmental Operating Report covering the operation of the unit during the previous calendar year shall be submitted prior to May 1 of each year. The report shall include summaries, interpretations, and analysis of trends of the results of the Radiological Environmental Monitoring Program for the reporting period. The material provided shall be consistent with the objectives in (1) the ODCM and (2) Sections IV.B.2., IV.B.3, and IV.C of Appendix I to 10 CFR Part 50. A detailed listing of the requirement of the report is given below:

12.6.2 Reports - Continued

(a) Results of environmental sampling summarized on a quarterly basis following the format of Regulatory Guide 4.8 Table 1 (December 1975); (individual sample results will be retained at the station);

In the event that some results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. Summaries, interpretations, and analysis of trends of the results are to be provided.

(b) An assessment of the monitoring results and radiation dose via the principal pathways of exposure resulting from plant emissions of radioactivity including the maximum noble gas gamma and beta air doses in the unrestricted area. The assessment of radiation doses shall be performed in accordance with the ODCM.

(c) Results of the census to determine the locations of animals producing milk for human consumption, and the pasture season feeding practices at dairies in the monitoring program.

(d) The reason for the omission if the nearest dairy to the station is not in the monitoring program.

(e) An annual summary of meteorological conditions concurrent with the releases of gaseous effluents in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability.

(f) The results of the interlaboratory comparison program described in Section 12.5.A.7.

(g) The results of the 40 CFR Part 190 uranium fuel cycle dose analysis for each calendar year.

(h) A summary of the monitoring program, including maps showing sampling locations and tables giving distance and direction of sampling locations from the station.

3. Non-Routine Environmental Report

(a) If a confirmed measured radionuclide concentration in an environmental sampling medium averaged over any calendar quarter sampling period exceeds the reporting level given in Table 12.5-2 and if the radioactivity is attributable to plant operation, a written report shall be submitted to the Regional Administrator of NRC Regional Office, with a copy to the Director, Office of Nuclear Reactor Regulation, within 30 days from the end of the quarter. When more than one of the radionuclides in Table 12.5-2 are detected in the medium, the reporting level shall have been exceeded if $\Sigma C_i/(RL)_i$ is equal to or greater than 1 where C is the concentration of the i^{th} radionuclide in the medium and RL is the reporting level of radionuclide i.

12.6.2 Reports - Continued

(b) If radionuclides other than those in Table 12.5-2 are detected and are due to plant effluents, a reporting level is exceeded if the potential annual dose to an individual is equal to or greater than the design objective doses of 10 CFR Part 50, Appendix I.

(c) This report shall include an evaluation of any release conditions, environmental factors, or other aspects necessary to explain the anomalous affect.

12.6.3. Offsite Dose Calculation Manual (ODCM)

1. The ODCM shall contain the methodology and parameters used in the calculation of offsite doses due to radioactive gaseous and liquid effluents and in the calculation of gaseous and liquid effluent monitoring Alarm/Trip setpoints and in the conduct of the Radiological Environmental Monitoring Program. The ODCM shall also contain (1) the Radioactive Effluent Controls and Radiological Environmental Monitoring Programs described in Section 12.2 - 12.5 and (2) descriptions of the information that should be included in the Annual Radiological Environmental Operating and Radioactive Effluent Release Reports required by Sections 12.6.2.1 and 12.6.2.2.

   The ODCM shall be subject to review and approval by the Commission prior to initial implementation.

2. Changes to the ODCM:

   (1) Shall be documented and records of reviews performed shall be retained as required by Technical Specification 6.14.A. This documentation shall contain:

      (a) Sufficient information to support the change together with appropriate analyses or evaluations justifying the change(s); and

      (b) A determination that the change will maintain the level of radioactive effluent control required by 10 CFR Part 20.1302, 40 CFR Part 190, 10 CFR Part 50.36a, and Appendix I to 10 CFR Part 50 and not adversely impact the accuracy or reliability of effluent, dose or set point calculations.

   (2) Shall be effective after review and acceptance by the Onsite Review & Investigative Function and the approval of the Station Manager, on the date specified by the Onsite Review and Investigative Function.

12.6.3 Offsite Dose Calculation Manual (ODCM)-(Cont'd)

(3) Shall be submitted to the Commission in the form of a complete, legible copy of the entire ODCM or updated pages, if the Commission retains a controlled copy. If an entire copy of the ODCM is submitted, it shall be submitted as a part of or concurrent with the Radioactive Effluent Release Report for the period of the report in which any change to the ODCM was made effective. Each change shall be identified by markings in the margin of the affected pages, clearly indicating the area of the page that was changed, and shall indicate the date (e.g., month/year) the change was implemented.

12.6.4. Major Changes to Radioactive Waste Treatment Systems (Liquid and Gaseous)

NOTE: This information may be submitted as part of the annual FSAR update.

1. Licensee initiated major changes to the radioactive waste systems may be made provided:

   The change is reported in the Monthly Operating Report for the period in which the evaluation was reviewed by the On-Site Review and Investigative Function. The discussion of each change shall contain:

   (1) A summary of the evaluation that led to the determination that the change could be made in accordance with 10 CFR Part 50.59;

   (2) Sufficient detailed information to support the reason for the change;

   (3) A detailed description of the equipment, components, and process involved and the interfaces with other plant systems;

   (4) An evaluation of the change which shows the predicted releases of radioactive materials in liquid and gaseous effluents that differ from those previously predicted in the license application and amendments;

   (5) A comparison of the predicted releases of radioactive materials in liquid and gaseous effluents to the actual releases for the period in which the changes were made;

   (6) An estimate of the exposure to plant operating personnel as a result of the change; and

   (7) Documentation of the fact that the change was reviewed and found acceptable by the On-Site Review and Investigative Function.

2. The change shall become effective upon review and acceptance by the On-Site Review and Investigative Function.