



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

WISCONSIN PUBLIC SERVICE CORPORATION
WISCONSIN POWER AND LIGHT COMPANY
MADISON GAS AND ELECTRIC COMPANY

DOCKET NO. 50-305

KEWAUNEE NUCLEAR PLANT

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No.64
License No. DPR-43

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Wisconsin Public Service Corporation, Wisconsin Power and Light Company, and Madison Gas and Electric Company (the licensee) dated March 29, 1985, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-43 is hereby amended to read as follows:


8508090377 850729
PDR ADOCK 05000305
P PDR

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 64, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective on issuance, to be implemented by January 1, 1986.

FOR THE NUCLEAR REGULATORY COMMISSION


Steven A. Varga, Chief
Operating Reactors Branch #1
Division of Licensing

Attachment:
Changes to the Technical
Specifications

Date of Issuance: July 29, 1985

ATTACHMENT TO LICENSE AMENDMENT

AMENDMENT NO. 64 TO FACILITY OPERATING LICENSE NO. DPR-43

DOCKET NO. 50-305

Revise Appendix A as follows:

<u>Remove Pages</u>	<u>Insert Pages</u>
i	i
ii	ii
iii	iii
v	v
vi	vi
vii	vii
-----	viii
1.1-4 and 1.1-5	1.1-4 thru 1.1-7
3.9-1 thru 3.9-11	-----
Table TS 4.1-1 (Page 3 of 5)	Table TS 4.1-1 (Table 3 of 5)
Table TS 4.1-2	Table TS 4.1-2
4.10-1	-----
Table TS 4.10-1 (Pages 1 thru 6)	-----
Table TS 4.10-2	-----
4.11-1 thru 4.11-4	-----
Table TS 4.11-1 (Pages 1 and 2)	-----
Table TS 4.11-2 (Pages 1 and 2)	-----
6-5	6-5
6-11	6-11
6-16 thru 6-26	6-16 thru 6-26
-----	7/8-1 thru 7/8-26
-----	Table TS 7-1 (Pages 1 and 2)
-----	Table TS 7-2 (Pages 1 and 2)
-----	Table TS 7-3 (Pages 1 thru 5)
-----	Table TS 7-4
-----	Table TS 8-0
-----	Table TS 8-1
-----	Table TS 8-2 (Pages 1 and 2)
-----	Table TS 8-3 (Pages 1 thru 3)
-----	Table TS 8-4 (Pages 1 thru 3)
-----	Table TS 8-5 (Pages 1 thru 3)

TABLE TS 4.1-2
MINIMUM FREQUENCIES FOR SAMPLING TESTS

<u>Sampling Tests</u>	<u>Test</u>	<u>Frequency</u>	<u>Maximum Time Between Tests (Days)</u>
1. Reactor Coolant Samples	Gross Beta-Gamma activity (excluding tritium)	5/week	3
	Tritium activity	Monthly	37
	*Chemistry (Cl, F, O ₂)	3/week	4
2. Reactor Coolant Boron	*Boron concentration	2/week	5
3. Refueling Water Storage Tank Water Sample	Boron concentration	Monthly***	37
4. Boric Acid Tanks	Boron concentration	Weekly	8
5. Accumulator	Boron concentration	Monthly	37
6. Spent Fuel Pool	Boron concentration	Monthly**	37
7. Secondary Coolant	Gross Beta or Gamma activity	Weekly	8
	Iodine concentration	Weekly when gross Beta or Gamma activity >1.0 uCi/cc	8

Notes

- * See Spec 4.1.D
- ** Sample will be taken monthly when fuel is in the pool.
- *** And after adjusting tank contents.

changes to the Vice President-Power Production.

- i. Review of all Reportable Events
- j. Review of changes to the Process Control Program, the Offsite Dose Calculation Manual, and the Radiological Environmental Monitoring Manual.

AUTHORITY

6.5.1.7 The PORC shall:

- a. Recommend to the Plant Manager approval or disapproval of items considered under 6.5.1.6a through e above.
- b. Make determinations with regard to whether or not each item considered under 6.5.1.6 above constitutes an unreviewed safety question.
- c. Provide immediate notification in the form of draft meeting minutes to the Manager-Nuclear Power and the Chairman-Nuclear Safety Review and Audit Committee of disagreement between the PORC and the Plant Manager. The Plant Manager shall have responsibility for resolution of such disagreements.

RECORDS

6.5.1.8 Minutes shall be kept of all meetings of the PORC and copies shall be sent to the Manager - Nuclear Power and the Chairman - Nuclear Safety Review and Audit Committee.

6.5.2 CORPORATE NUCLEAR ENGINEERING STAFF (CNES)

FUNCTION

6.5.2.1 The CNES shall function to provide engineering,

- g. Any other area of plant operation considered appropriate by the NSRAC or the Vice-President - Power Production.
- h. The radiological environmental monitoring program and the results thereof at least annually.
- i. The Offsite Dose Calculation Manual and implementing procedures at least once every two years.
- j. The Process Control Program and implementing procedures for processing and packaging of radioactive wastes at least once every two years.

AUTHORITY

6.5.3.9 The NSRAC shall report to and advise the Vice-President - Power Production on those areas of responsibility specified in Section 6.5.3.7 and 6.5.3.8.

RECORDS

6.5.3.10 Records of NSRAC activities shall be prepared, approved and distributed as follows:

- a. Minutes of each NSRAC meeting forwarded to the Vice-President - Power Production within 14 days following each meeting.
- b. Reports of reviews required by Section 6.5.3.7e, f, g and h above, forwarded to the Vice-President - Power Production within 14 days following completion of the review.
- c. Reports of audits performed by NSRAC shall be forwarded to the Vice-President - Power Production and to the management positions responsible for the areas audited within 30 days after completion of the audit.

6.9.3 Unique Reporting Requirements

a. Annual Radiological Environmental Monitoring Report

(1) Routine Radiological Environmental Monitoring Reports covering the operation of the unit during the previous calendar year shall be submitted prior to May 1 of each year.

(a) The Annual Radiological Environmental Monitoring Reports shall include summaries, interpretations, and an analysis of trends of the results of the radiological environmental surveillance activities for the report period, including a comparison with preoperational studies, with operational controls as appropriate, and with previous environmental surveillance reports, and an assessment of the observed impacts of the plant operation on the environment. The reports shall also include the results of land use censuses required by Specification 7.7.2.

(b) The Annual Radiological Environmental Monitoring Reports shall include the results of analysis of radiological environmental samples and of environmental radiation measurements taken during the period pursuant to the locations specified in the Table and Figures in the Radiological Environmental Monitoring Manual, as well as summarized and tabulated results of these analyses and measurements in the format of the table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979. In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report when applicable.

(c) The reports shall also include the following: a summary description of the radiological environmental monitoring

program; legible maps covering all sampling locations keyed to a table giving distances and directions from the centerline of one reactor; the results of licensee participation in the Interlaboratory Comparison Program, required by Specification 7.7.3; discussion of all deviations from the sampling schedule of Table 7.3; and discussion of all analyses in which the LLD required by Table 8.5 was not achievable.

b. Semiannual Radioactive Effluent Release Report

- (1) Routine Radioactive Effluent Release Reports covering the operation of the unit during the previous 6 months of operation shall be submitted within 60 days after January 1 and July 1 of each year.

(a) Radioactive Effluent

The Radioactive Effluent Release Reports shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit following the format of Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," Revision 1, June 1974.

(b) Radiation Dose Assessment

The Radioactive Effluent Release Report to be submitted within 60 days after January 1 of each year shall include an annual summary of hourly meteorological data collected over the previous year. This annual summary may be either in the form of an hour-by-hour listing on magnetic tape of wind speed, wind direction, atmospheric stability, and precipitation (if measured), or in the form of joint frequency distributions of wind speed,

wind direction, and atmospheric stability.³ This same report shall include an assessment of the radiation doses due to the radioactive liquid and gaseous effluents released from the unit during the previous calendar year. The assumptions used in making these assessments, i.e., specific activity, exposure time and location, shall be included in these reports. The assessment of radiation doses shall be performed based on the calculational guidance, as presented in the OFFSITE DOSE CALCULATION MANUAL (ODCM).

The Radioactive Effluent Release Report to be submitted 60 days after January 1 of each year shall also include an assessment of radiation doses to the likely most exposed MEMBER OF THE PUBLIC from reactor releases and other nearby uranium fuel cycle sources, including doses from primary effluent pathways and direct radiation, the previous calendar year to show conformance with 40 CFR Part 190, Environmental Radiation Protection Standards for Nuclear Power Operation.

(c) Solid Waste Shipped

The Radioactive Effluent Release Reports shall include the following information for each class of solid waste (as defined by 10 CFR Part 61) shipped offsite during the report period:

- a. Container volume,
- b. Total curie quantity (specify whether determined by measurement or estimate),
- c. Principal radionuclides (specify whether determined by measurement or estimate),

³ In lieu of submission with the first half year Radioactive Effluent Release Report, the licensee has the option of retaining this summary of required meteorological data on site in a file that shall be provided to the NRC upon request.

- d. Source of waste and processing employed (e.g., dewatered spent resin, compacted dry waste, evaporator bottoms),
- e. Type of container (e.g., LSA, Type A, Type B, Large Quantity), and
- f. Solidification agent or absorbent (e.g., cement, urea formaldehyde).

(d) Unplanned Release

The Radioactive Effluent Release Reports shall include a list and description of unplanned releases from the site to UNRESTRICTED AREAS of radioactive materials in gaseous and liquid effluents made during the reporting period.

(e) PCP and ODCM Changes

The Radioactive Effluent Release Reports shall include any changes made during the reporting period to the PROCESS CONTROL PROGRAM (PCP) and to the OFFSITE DOSE CALCULATION MANUAL (ODCM).

c. Special Reports

(1) Special reports may be required covering inspections, test and maintenance activities. These special reports are determined on an individual basis for each unit and their preparation and submittal are designated in the Technical Specifications.

(a) Special reports shall be submitted to the Director of the NRC Regional Office listed in Appendix D, 10 CFR Part 20, with a copy to the Director, Office of Inspection and Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555 within the time period specified for each report.

6.10 RECORD RETENTION

6.10.1 The following records shall be retained for at least five years:

- a. Records and logs of plant operation, including power levels and periods of operation at each power level.
- b. Records and logs of principal maintenance activities, inspections, repair and replacement of principal items of equipment pertaining to nuclear safety.
- c. Reports of all Reportable Events.
- d. Records of periodic checks, inspections, and calibrations required by these Technical Specifications.
- e. Records of nuclear safety related tests or experiments.
- f. Records of radioactive shipments.
- g. Records of changes to operating procedures.
- h. Records of sealed source leak tests and results.
- i. Records of annual physical inventory of all source material or record.
- j. Records of Quality Assurance activities required by the Operational Quality Assurance Program (OQAP) except where it is determined that the records should be maintained for a longer period of time.

6.10.2 The following records shall be retained for the duration of the Plant Operating License.

- a. Records of a complete set of as-built drawings for the plant as originally licensed and all print changes showing modifications made to the plant.
- b. Records of new and spent fuel inventory, fuel transfers, and assembly burnup histories.
- c. Records of plant radiation and contamination surveys.

- d. Records of radiation exposure of all plant personnel, and others who enter radiation control areas.
- e. Records of radioactivity in liquid and gaseous wastes released to the environment.
- f. Records of transient or operational cycles for these facility components.
- g. Records of training and qualification for current members of the plant staff.
- h. Records of in-service inspections performed pursuant to these Technical Specifications.
- i. Records of meetings of the NSRAC and PORC.
- j. Records for Environmental Qualification.

6.11 RADIATION PROTECTION PROGRAM

Procedures for personnel radiation protection shall be prepared consistent with the requirements of 10 CFR Part 20 and shall be approved, maintained and adhered to for all operations involving personnel radiation exposure.

IODINE MONITORING

The licensee shall implement a program which will ensure the capability to accurately determine the airborne iodine concentration in vital areas under accident conditions. This program shall include the following:

- 1. Training of personnel,
- 2. Procedures for monitoring, and
- 3. Provisions for maintenance of sampling and analysis equipment.

6.12 SYSTEM INTEGRITY

The licensee shall implement a program to reduce leakage from systems outside containment that would or could contain highly radioactive fluids during a serious transient or accident to as low as practical levels. This program shall include the following:

1. Provisions establishing preventive maintenance and periodic visual inspection requirements, and
2. Integrated leak test requirements for each system at a frequency not to exceed refueling cycle intervals.

6.13 HIGH RADIATION AREA

6.13.1 In lieu of the "control device" or "alarm signal" required by Paragraph 20.203 (c) (2):

- a. Each High Radiation Area in which the intensity of radiation is greater than 100 mrem/hr, but less than 1000 mrem/hr, shall be barricaded and conspicuously posted as a High Radiation Area and entrance thereto shall be controlled by requiring issuance of a Radiation Work Permit and any individual or group of individuals permitted to enter such areas shall be provided with a radiation monitoring device which continuously indicates the radiation dose rate in the area.
- b. Each High Radiation Area in which the intensity of radiation is greater than 1000 mrem/hr shall be subject to the provisions of 6.13.1.a above, and in addition locked doors shall be provided to prevent unauthorized entry into these areas. The areas shall be maintained under the administrative control of the Shift Supervisor on duty.

6.14 POST ACCIDENT SAMPLING AND MONITORING

The licensee shall implement a program which will ensure the capability to monitor containment radiation levels, to obtain and analyze reactor coolant and containment atmosphere samples, and to monitor the plant gaseous effluent under accident conditions. The program shall be defined in Administrative Control Directives and will include the following:

1. Responsibilities for program implementation.
2. Delineation of instrumentation required.
3. Provisions for preventive maintenance and periodic surveillance of instrumentation.

4. Pre-planned procedures and back-up instrumentation to be used if one or more monitoring instruments become inoperable.
5. Administrative procedures for returning inoperable instruments to OPERABLE status as soon as practicable.

6.15 SECONDARY WATER CHEMISTRY

The licensee shall implement a secondary water chemistry monitoring program. The intent of this program will be to control corrosion thereby inhibiting steam generator tube degradation. The secondary water chemistry program shall act as a guide for the chemistry group in their routine as well as non-routine activities.

6.16 RADIOLOGICAL EFFLUENTS

Written procedures shall be established, implemented and maintained covering the activities referenced below:

- a. Process Control Program implementation.
- b. Offsite Dose Calculation Manual implementation.
- c. Quality Assurance Program for effluent and environmental monitoring.

6.17 PROCESS CONTROL PROGRAM (PCP)

6.16.1 The PCP shall be approved by the Commission prior to implementation.

6.16.2 Licensee initiated changes to the PCP:

- a. Shall be submitted to the Commission in the Semiannual Radioactive Effluent Release Report for the period in which the change(s) was made. This submittal shall contain:
 1. Sufficiently detailed information to support the rationale for the change without benefit of additional or supplemental information;
 2. A determination that the change did not reduce the overall conformance of the solidified waste product to existing cri-

teria for solid wastes; and

3. Documentation of the fact that the change has been reviewed and found acceptable by the PORC.

b. Shall become effective upon review and acceptance by the PORC.

6.18 OFFSITE DOSE CALCULATION MANUAL (ODCM)

6.18.1 The ODCM shall be approved by the Commission prior to implementation.

6.18.2 Licensee initiated changes to the ODCM:

- a. Shall be submitted to the Commission in the Semiannual Radioactive Effluent Release Report for the period in which the change(s) was made effective. This submittal shall contain:
 1. Sufficiently detailed information to support the rationale for the change without benefit of additional or supplemental information. Information submitted should consist of a package of those pages of the ODCM to be changed with each page numbered and provided with an approval and date box, together with appropriate analyses or evaluations justifying the change(s);
 2. A determination that the change will not reduce the accuracy or reliability of dose calculations or setpoint determinations; and
 3. Documentation of the fact that the change has been reviewed and found acceptable by the PORC.
- b. Shall become effective upon review and acceptance by the PORC.

6.19 MAJOR CHANGES TO RADIOACTIVE LIQUID, GASEOUS AND SOLID WASTE TREATMENT SYSTEMS⁴

6.19.1 Licensee initiated major changes to the radioactive waste systems (liquid, gaseous and solid):

- a. Shall be reported to the Commission in the Semiannual Radioactive Effluent Release Report for the period in which the evaluation was reviewed by the PORC. 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 information to support the reason for the change without benefit of additional or supplemental information;
 3. A description of the equipment, components and processes 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 and/or quantity of solid waste that differ from those previously predicted in the license application and amendments thereto;
 5. An evaluation of the change, which shows the expected maximum exposures to individual in the UNRESTRICTED AREA and to the general population that differ from those previously estimated in the license application and amendments thereto;

⁴ Licensees may choose to submit the information called for in this Specification as part of the annual FSAR update.

6. A comparison of the predicted releases of radioactive materials, in liquid and gaseous effluents and in solid waste, to the actual releases for the period prior to when the changes are to be made;
 7. An estimate of the exposure to plant operating personnel as a result of the change; and
 8. Documentation of the fact that the change was reviewed and found acceptable by the PORC.
- b. Shall become effective upon review and acceptance by the PORC.

7/8.0 RADIOLOGICAL EFFLUENT TECHNICAL SPECIFICATIONS AND
SURVEILLANCE REQUIREMENTS

SPECIFICATIONS

7.0.1 Compliance with the specifications contained in the succeeding text is required during the conditions specified therein; except that upon failure to meet the specifications, the associated ACTION requirements shall be met.

7.0.2 Noncompliance with a Specification shall exist when its requirements and associated ACTION requirements are not met within the specified time intervals. If the Specification is restored prior to expiration of the specified time intervals, completion of the Action requirements is not required.

7.0.3 When a Specification is not met, except as provided in the associated ACTION requirements, reporting pursuant to section 6.9.3 will be initiated.

SURVEILLANCE REQUIREMENTS

8.0.1 Surveillance Requirements shall be met during the conditions specified for individual Specifications unless otherwise stated in an individual Surveillance Requirement.

8.0.2 Each Surveillance Requirement shall be performed within the specified time interval with:

- a. A maximum allowable extension not to exceed 25% of the surveillance interval, but
- b. The combined time interval for any 3 consecutive surveillance intervals shall not exceed 3.25 times the specified surveillance interval.

8.0.3 Failure to perform a Surveillance Requirement within the specified time interval shall constitute a failure to meet the OPERABILITY requirements for a Specification. Exceptions to these requirements are stated in the individual Specification. Surveillance Requirements do not have to be performed on inoperable equipment.

7/8.1 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

SPECIFICATIONS

7.1 The radioactive liquid effluent monitoring instrumentation channels shown in Table 7.1 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Specification 7.3.1 are not exceeded. The alarm/trip setpoints of these channels shall be determined in accordance with the methodology in the OFFSITE DOSE CALCULATION MANUAL (ODCM).

APPLICABILITY: During release via the monitored pathway.

ACTION:

- a. With a radioactive liquid effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above specification, without delay suspend the release of radioactive liquid effluents monitored by the affected channel, or declare the channel inoperable, or change the setpoint so it is acceptably conservative.
- b. With less than the minimum number of radioactive liquid effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 7.1. Exert best efforts to return the instruments to OPERABLE status within 30 days and, if unsuccessful, explain in the next Semiannual Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner.

SURVEILLANCE REQUIREMENTS

- 8.1 Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST operations at the frequencies shown in Table 8.1.

7/8.2 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

SPECIFICATIONS

7.2 The radioactive gaseous effluent monitoring instrumentation channels shown in Table 7.2 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Specification 7.4.1 are not exceeded. The alarm/trip setpoints of these channels shall be determined in accordance with the methodology in the ODCM.

APPLICABILITY: As shown in Table 7.2.

ACTION:

- a. With a radioactive gaseous effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above Specification, without delay suspend the release of radioactive gaseous effluents monitored by the affected channel, or declare the channel inoperable, or change the setpoint so it is acceptably conservative.
- b. With less than the minimum number of radioactive gaseous effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 7.2. Exert best efforts to return the instruments to OPERABLE status within 30 days and, if unsuccessful, explain in the next Semiannual Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner.

SURVEILLANCE REQUIREMENTS

8.2 Each radioactive gaseous effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST operations at the frequencies shown in Table 8.2.

7/8.3 LIQUID EFFLUENTS

CONCENTRATION

SPECIFICATIONS

7.3.1 The concentration of radioactive material released in liquid effluents to UNRESTRICTED AREAS shall be limited to the concentrations specified in 10 CFR Part 20, Appendix B, Table II, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2×10^{-4} uCi/ml total activity.

APPLICABILITY: During release via the monitored pathway.

ACTION:

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

SURVEILLANCE REQUIREMENTS

8.3.1.1 Radioactive liquid wastes shall be sampled and analyzed according to the sampling and analysis program of Table 8.3.

8.3.1.2 The results of the radioactivity analyses shall be used in accordance with the methodology and parameters in the ODOM to assure that the concentrations at the point of release are maintained within the limits of specification 7.3.1.

RADIOACTIVE EFFLUENTS

DOSE

SPECIFICATIONS

7.3.2 The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released to UNRESTRICTED AREAS shall be limited:

- a. During any calendar quarter to less than or equal to 1.5 mrem to the total body and to less than or equal to 5 mrem to any organ, and
- b. During any calendar year to less than or equal to 3 mrem to the total body and to less than or equal to 10 mrem to any organ.

APPLICABILITY: At all times.

ACTION:

- a. With the calculated dose from the release of radioactive materials in liquid effluents exceeding any of the above limits, in lieu of a Licensee Event Report, prepare and submit to the Commission within 30 days, pursuant to Specification 6.9.3.c, a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions that have been taken to reduce the release and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

SURVEILLANCE REQUIREMENTS

8.3.2 Cumulative dose contributions from liquid effluents for the current calendar quarter and the current calendar year shall be determined in accordance with the methodology and parameters in the ODCM once per 31 days.

RADIOACTIVE EFFLUENTS

LIQUID RADWASTE TREATMENT SYSTEM

SPECIFICATIONS

7.3.3 The liquid radwaste treatment system as described in the ODOM shall be used to reduce the radioactive materials in liquid wastes prior to their discharge when the projected doses, due to the liquid effluent, to UNRESTRICTED AREAS would exceed 0.18 mrem to the total body or 0.62 mrem to any organ in a calendar quarter.

APPLICABILITY: At all times.

ACTION:

- a. With radioactive liquid waste being discharged without treatment and in excess of the above limits, in lieu of a Licensee Event Report, prepare and submit to the Commission within 30 days pursuant to Specification 6.9.3.c, a Special Report that includes the following information:
 1. Explanation of why liquid radwaste was being discharged without treatment, identification of any inoperable equipment or subsystems, and the reason for the inoperability,
 2. Action(s) taken to restore the inoperable equipment to OPERABLE status, and
 3. Summary description of action(s) taken to prevent a recurrence.

SURVEILLANCE REQUIREMENTS

8.3.3 Doses due to liquid releases from the unit to UNRESTRICTED AREAS shall be projected once per 31 days in accordance with the methodology and parameters in the ODOM.

7/8.4 GASEOUS EFFLUENTS

DOSE RATE

SPECIFICATIONS

7.4.1 The dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the SITE BOUNDARY shall be limited to the following:

- a. For noble gases: Less than or equal to 500 mrem/yr to the total body and less than or equal to 3000 mrem/yr to the skin, and
- b. For iodine-131, iodine-133, tritium, and for all radionuclides in particulate form with half lives greater than 8 days: Less than or equal to 1500 mrem/yr to any organ.

APPLICABILITY: At all times.

ACTION:

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

SURVEILLANCE REQUIREMENTS

8.4.1.1 The dose rate due to noble gases in gaseous effluents shall be determined to be within the above limits in accordance with the methodology and parameters in the ODCM.

8.4.1.2 The dose rate due to iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half lives greater than 8 days in gaseous effluents shall be determined to be within the above limits in accordance with the methodology and parameters in the ODCM by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in Table 8.4.

DOSE - NOBLE GASES

SPECIFICATIONS

7.4.2 The air dose due to noble gases released in gaseous effluents, to areas at and beyond the SITE BOUNDARY shall be limited to the following:

- a. During any calendar quarter: Less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation and,
- b. During any calendar year: Less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation.

APPLICABILITY: At all times.

ACTION

- a. With the calculated air dose from radioactive noble gases in gaseous effluents exceeding any of the above limits, in lieu of a Licensee Event Report, prepare and submit to the Commission within 30 days, pursuant to Specification 6.9.3.c, a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

SURVEILLANCE REQUIREMENTS

8.4.2 Cumulative dose contributions for the current calendar quarter and current calendar year for noble gases shall be determined in accordance with the methodology and parameters in the ODOM once per 31 days.

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

SPECIFICATIONS

7.4.3 The dose to a MEMBER OF THE PUBLIC from iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released to areas at and beyond the SITE BOUNDARY shall be limited to the following:

- a. During any calendar quarter: Less than or equal to 7.5 mrem to any organ and,
- b. During any calendar year: Less than or equal to 15 mrem to any organ.

APPLICABILITY: At all times.

ACTION:

- a. With the calculated dose from the release of iodine-131, iodine-133, tritium, and radionuclides in particulate form with half lives greater than 8 days, in gaseous effluents exceeding any of the above limits, in lieu of a Licensee Event Report, prepare and submit to the Commission within 30 days, pursuant to Specification 6.9.3.c, a Special Report that identifies the cause(s) for exceeding the limit and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

SURVEILLANCE REQUIREMENTS

8.4.3 Cumulative dose contributions for the current calendar quarter and current calendar year for iodine-131, iodine-133, tritium, and radionuclides in particulate form with half lives greater than 8 days shall be determined in accordance with the methodology and parameters in the ODCM once per 31 days.

GASEOUS RADWASTE TREATMENT SYSTEM

SPECIFICATIONS

7.4.4 The GASEOUS RADWASTE TREATMENT SYSTEM and the VENTILATION EXHAUST TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected gaseous effluent air doses due to gaseous effluent releases to areas at and beyond the SITE BOUNDARY would exceed 0.62 mrad for gamma radiation and 1.25 mrad for beta radiation in a calendar quarter. The VENTILATION EXHAUST TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected doses due to gaseous effluent releases, to areas at and beyond the SITE BOUNDARY would exceed 0.94 mrem to any organ in a calendar quarter.

APPLICABILITY: At all times.

ACTION:

- a. With gaseous waste being discharged without treatment and in excess of the above limits, in lieu of a Licensee Event Report, prepare and submit to the Commission within 30 days, pursuant to Specification 6.9.3.c, a Special Report that includes the following information:
 1. Explanation of why gaseous radwaste was being discharged without treatment, identification of any inoperable equipment or subsystems, and the reason for the inoperability,
 2. Action(s) taken to restore the inoperable equipment to OPERABLE status, and
 3. Summary description of action(s) taken to prevent a recurrence.

SURVEILLANCE REQUIREMENTS

8.4.4 Doses due to gaseous releases from areas at and beyond the SITE BOUNDARY shall be projected once per 31 days in accordance with the methodology and parameters in the ODCM.

7/8.5 SOLID RADIOACTIVE WASTE

SPECIFICATIONS

7.5 The solid radwaste system shall be used in accordance with a PROCESS CONTROL PROGRAM to process wet radioactive wastes to meet shipping and burial ground requirements.

APPLICABILITY: At all times.

ACTION:

- a. With the provisions of the PROCESS CONTROL PROGRAM not satisfied, suspend shipments of defectively processed or defectively packaged solid radioactive wastes from the site.

SURVEILLANCE REQUIREMENTS

8.5 THE PROCESS CONTROL PROGRAM shall be used to verify the solidification of each type of wet radioactive waste (e.g., filter sludges, spent resins, evaporator bottoms, boric acid solutions, and sodium sulfate solutions).

7/8.6 TOTAL DOSE

SPECIFICATIONS

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

APPLICABILITY: At all times.

ACTION

- a. With the calculated doses from the release of radioactive materials in liquid or gaseous effluents exceeding twice the limits of Specification 7.3.2.a, 7.3.2.b, 7.4.2.a, 7.4.2.b, 7.4.3.a, or 7.4.3.b, calculations should be made including direct radiation contributions from the reactor unit to determine whether the above limits have been exceeded. If such is the case in lieu of a Licensee Event Report, prepare and submit to the Commission within 30 days, pursuant to Specification 6.9.3.c, a special report that defines the corrective action to be taken to reduce subsequent releases to prevent recurrence of exceeding the above limits and includes the schedule for achieving conformance with the above limits. This special report as defined in 10 CFR Part 20.405c, shall include an analysis that estimates the radiation exposure (dose) to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, including all effluent pathways and direct radiation, for the calendar year that includes the release(s) covered by this report. It shall also describe levels of radiation and concentrations of radioactive material involved, and the cause of the exposure levels or concentrations. If the estimated dose(s) exceeds the above limits, and if the release condition resulting in violation of 40 CFR Part 190 has not already been corrected, the special report shall include a request for a variance in accordance with the provisions of 40 CFR Part 190. Submittal of the report is considered a timely request, and a variance is granted until staff action on the request is complete.

SURVEILLANCE REQUIREMENTS

8.6.1 Cumulative dose contributions from liquid and gaseous effluents shall be determined in accordance with Specifications 8.3.2, 8.4.2, and 8.4.3, and in accordance with the methodology and parameters in the ODCM.

8.6.2 Cumulative dose contributions from direct radiation from the reactor unit shall be determined in accordance with the methodology and parameters in the ODCM. This requirement is applicable only under conditions set forth in Specification 7.6.a.

7/8.7 RADIOLOGICAL ENVIRONMENTAL MONITORING

MONITORING PROGRAM

SPECIFICATIONS

7.7.1 The radiological environmental monitoring program shall be conducted as specified in Table 7.3.

APPLICABILITY: At all times.

ACTION:

- a. With the radiological environmental monitoring program not being conducted as specified in Table 7.3, in lieu of a Licensee Event Report, prepare and submit to the Commission, in the Annual Radiological Environmental Monitoring Report required by Specification 6.9.3.a, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence.
- b. With the level of radioactivity as the result of plant effluents in an environmental sampling medium at a specified location exceeding the reporting levels of Table 7.4 when averaged over any calendar quarter, in lieu of a Licensee Event Report, prepare and submit to the Commission within 30 days, pursuant to Specification 6.9.3.c, a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce radioactive effluents so that the potential annual dose* to A MEMBER OF THE PUBLIC is less than the calendar year limits of Specifications 7.3.2, 7.4.2, and 7.4.3. When more than one of the radionuclides in Table 7.4 are detected in the sampling medium, this report shall be submitted if:

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

When radionuclides other than those in Table 7.4 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose* to a MEMBER OF THE PUBLIC is equal to or greater than the calendar year limits of Specifications 7.3.2, 7.4.2 and 7.4.3. This report is not required if the measured level of radioactivity was

RADIOLOGICAL ENVIRONMENTAL MONITORING

not the result of plant effluents; however, in such an event the condition shall be reported and described in the Annual Radiological Environmental Monitoring Report.

- c. With milk or fresh leafy vegetable samples unavailable from one or more of the sample locations required by Table 7.3, a sample from an alternative location will be substituted, noting the reason for the unavailability in the Annual Radiological Environmental Monitoring Report. When changes in sampling locations are permanent, the sampling schedule in the RADIOLOGICAL ENVIRONMENTAL MONITORING MANUAL will be updated to reflect the new routine and alternative sampling locations and this revision will be described in the Annual Radiological Environmental Monitoring Report.

SURVEILLANCE REQUIREMENTS

8.7.1 The radiological environmental monitoring samples shall be collected pursuant to Table 7.3 from the specific locations given in the table and figure(s) in the RADIOLOGICAL ENVIRONMENTAL MONITORING MANUAL, and shall be analyzed pursuant to the requirements of Table 7.3 and the detection capabilities required by Table 8.5.

-
- * The methodology and parameters used to estimate the potential annual dose to A MEMBER OF THE PUBLIC shall be indicated in this report.

RADIOLOGICAL ENVIRONMENTAL MONITORING

7/8.7 LAND USE CENSUS

SPECIFICATIONS

7.7.2 A land use census shall be conducted and shall identify within a distance of 8 km (5 miles) the location in each of the 10 meteorological sectors of the nearest milk animal, the nearest residence and the nearest garden* of greater than 50 m² (500 ft²) producing broad leaf vegetation.

APPLICABILITY: At all times.

ACTION:

- a. With a land use census identifying a location(s) that yields a calculated dose or dose commitment greater than the values currently being calculated in Specification 8.4.3, in lieu of a Licensee Event Report, identify the new location(s) in the next Annual Radiological Environmental Monitoring Report pursuant to Specification 6.9.3.a.
- b. With a land use census identifying a location(s) that yields a calculated dose or dose commitment (via the same exposure pathway) 20 percent greater than at a location from which samples are currently being obtained in accordance with Specification 7.7.1, add the new location(s) to the radiological environmental monitoring program within 30 days. The sampling location(s), excluding the control station location, having a lower calculated dose or dose commitment(s), via the same exposure pathway, may be deleted from this monitoring program. In lieu of a Licensee Event Report, identify the new location(s) in the next Annual Radiological Environmental Monitoring Report pursuant to Specification 6.9.3.a and also include in the report a revised figure(s) and table for the REMM reflecting the new location(s).

SURVEILLANCE REQUIREMENT

8.7.2 The land use census shall be conducted during the growing season once per 12 months using reasonable survey methods, such as by a door-to-door survey, aerial survey, or by consulting local agriculture authorities. The results of the land use census shall be included in the Annual Radiological Environmental Monitoring Report pursuant to Specification 6.9.3.a.

* Sampling of leaf vegetation may be performed at the site boundary in each of two different direction sectors with the highest predicted D/Qs in lieu of the garden census. Specifications for broad leaf vegetation sampling in Table 7.3 (item 4c) shall be followed, including analysis of control samples.

RADIOLOGICAL ENVIRONMENTAL MONITORING

7/8.7.3 INTERLABORATORY COMPARISON PROGRAM

SPECIFICATIONS

7.7.3 Analyses shall be performed on radioactive materials supplied as part of an Interlaboratory Comparison Program that has been approved by the Commission.

APPLICABILITY: At all times.

ACTION:

- a. With analyses not being performed as required above, report corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Monitoring Report pursuant to Specification 6.9.3.a.

SURVEILLANCE REQUIREMENTS

8.7.3 The Interlaboratory Comparison Program shall be described in the REMM. A summary of the results obtained as part of the above required Interlaboratory Comparison Program shall be included in the Annual Radiological Environmental Monitoring Report pursuant to Specification 6.9.3.a.

7/8.8 BASIS

7/8.1 Radioactive Liquid Effluent Monitoring Instrumentation

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in liquid effluents during actual or potential releases of liquid effluents. The alarm/trip setpoints for these instruments shall be calculated and adjusted in accordance with the methodology and parameters in the ODOM to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. The operability and use of this instrumentation is consistent with the appropriate requirements of General Design Criteria 60, 63 and 64 of Appendix A to 10 CFR Part 50.

7/8.2 Radioactive Gaseous Effluent Monitoring Instrumentation

The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. The operability and use of this instrumentation is consistent with the appropriate requirements of General Design Criteria 60, 63 and 64 of Appendix A to 10 CFR Part 50.

BASIS

7/8.3 LIQUID EFFLUENTS

7/8.3.1 CONCENTRATION

This specification is provided to ensure that the concentration of radioactive materials released in liquid waste effluents to UNRESTRICTED AREAS will be less than the concentration levels specified in 10 CFR Part 20, Appendix B, Table II, Column 2. This limitation provides additional assurance that the levels of radioactive materials in bodies of water in UNRESTRICTED AREAS will result in exposures within (1) the Section II.A design objectives of Appendix I, 10 CFR Part 50, to a MEMBER OF THE PUBLIC and (2) the limits of 10 CFR Part 20.106(e) to the population. The concentration limit for dissolved or entrained noble gases is based upon the assumption that Xe-135 is the controlling radioisotope and its MPC in air (submersion) was converted to an equivalent concentration in water using the methods described in International Commission on Radiological Protection (ICRP) Publication 2.

The required detection capabilities for radioactive materials in liquid waste samples are tabulated in terms of the lower limits of detection (LLDs). Detailed discussion of the LLD, and other detection limits can be found in HASL Procedures Manual, HASL-300 (revised annually), Currie, L.A., "Limits for Qualitative Detection and Quantitative Determination - Application to Radiochemistry," Anal. Chem. 40, 586-93 (1968), and Hartwell, J.K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

7/8.3.2 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 Limiting Condition for Operation implements the guides set forth in Section II.A of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable". The dose calculation methodology and parameters 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 a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be

BASIS

substantially underestimated. The equations specified in the ODOM for calculating the doses due to the actual release rates of radioactive materials in liquid effluents are 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.

7/8.3.3 LIQUID RADWASTE TREATMENT SYSTEM

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 is 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 the design objective given in Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the liquid radwaste treatment system were specified as a suitable fraction of the dose design objectives set forth in Section II.A of Appendix I, 10 CFR Part 50, for liquid effluents.

7/8.4 GASEOUS EFFLUENTS

7/8.4.1 DOSE RATE

This specification is provided to ensure that the dose at any time at and beyond the SITE BOUNDARY from gaseous effluents will be within the annual dose limits of 10 CFR Part 20 to UNRESTRICTED AREAS. The annual dose limits are the doses associated with the concentrations of 10 CFR Part 20, Appendix B, Table II, Column 1. These limits provide reasonable assurance that radioactive material discharged in gaseous effluents will not result in the exposure of a MEMBER OF THE PUBLIC in an UNRESTRICTED AREA, either within or outside the SITE BOUNDARY, to annual average concentrations exceeding the limits specified in Appendix B, Table II of 10 CFR Part 20 (10 CFR Part 20.106(b)). For MEMBERS OF THE PUBLIC who may at times be within the SITE BOUNDARY, the occupancy of that MEMBER OF THE PUBLIC will usually be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the SITE BOUNDARY. Examples of calculations for such MEMBERS OF THE PUBLIC, with the appropriate occupancy factors, shall be given in the ODOM. The specified release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to a MEMBER OF THE PUBLIC at or beyond the SITE BOUNDARY to less than or equal to 500 mrem/yr to the total body or to less than or equal to 3000 mrem/year to the

BASIS

skin. These release rate limits also restrict, at all times, the corresponding thyroid dose rate above background to a child via the inhalation pathway to less than or equal to 1500 mrem/year.

The required detection capabilities for radioactive materials in gaseous waste samples are tabulated in terms of the lower limits of detection (LLDs). Detailed discussion of the LLD, and other detection limits can be found in HASL Procedures Manual. HASL-300 (revised annually), Currie, L.A., "Limits for Qualitative Detection and Quantitative Determination - Application to Radiochemistry," Anal. Chem. 40, 586-93 (1968), and Hartwell, J.K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

7/8.4.2 DOSE - NOBLE GASES

This specification is provided to implement the requirements of Sections II.B, III.A and IV.A of Appendix I, 10 CFR Part 50. The Limiting Condition for Operation implements the guides set forth in Section II.B of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents to UNRESTRICTED AREAS 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 be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The dose calculation methodology and parameters established in the ODCM for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors," Revision 1, July 1977. The ODCM equations provided for determining the air doses at and beyond the SITE BOUNDARY are based upon the historical average atmospheric conditions.

BASIS

7/8.4.3 DOSE - IODINE-131, IODINE-133, TRITIUM, AND RADIONUCLIDES IN PARTICULATE FORM

This specification is provided to implement the requirements of Sections II.C, III.A and IV.A of Appendix I, 10 CFR Part 50. The Limiting Conditions for Operation are the guides set forth in Section II.C of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive materials in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable". The ODCM calculational methods specified in the Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The ODCM calculational methodology and parameters for calculating the doses due to the actual release rates of the subject materials are 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 specifications for iodine-131, iodine-133, tritium, and radionuclides in particulate form with half lives greater than 8 days are dependent upon the existing radionuclide pathways to man, in areas at and beyond the SITE BOUNDARY. The pathways that were examined in the development of these calculations were: 1) individual inhalation of airborne radionuclides, 2) deposition of radionuclides onto green leafy vegetation with subsequent consumption by man, 3) deposition onto grassy areas where milk animals and meat producing animals graze with consumption of the milk and meat by man, and 4) deposition on the ground with subsequent exposure of man.

7/8.4.4 GASEOUS RADWASTE TREATMENT SYSTEM

The requirement that the appropriate portions of these systems be used, when specified, provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable".

BASIS

This specification implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50, and the design objectives given in Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the systems were specified as a suitable fraction of the dose design objectives set forth in Sections II.B and II.C of Appendix I, 10 CFR Part 50, for gaseous effluents.

7/8.5 SOLID RADIOACTIVE WASTE

This specification implements the requirements of 10 CFR Part 50.36a and General Design Criterion 60 of Appendix A to 10 CFR Part 50. The process parameters included in establishing the PROCESS CONTROL PROGRAM may include, but are not limited to waste type, waste pH, waste/liquid/solidification agent/catalyst ratios, waste oil content, waste principal chemical constituents, and mixing and curing times.

7/8.6 TOTAL DOSE

This specification is provided to meet the dose limitations of 40 CFR Part 190 that have been incorporated into 10 CFR part 20 by 46 FR 18525. The specification requires the preparation and submittal of a Special Report whenever the calculated doses from plant generated radioactive effluents and direct radiation exceed 25 mrem to the total body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrem. It is highly unlikely that the resultant dose to a MEMBER OF THE PUBLIC will exceed the dose limits of 40 CFR Part 190 if the reactor remains within twice the dose design objectives of Appendix I, and if direct radiation doses from the reactor are kept small. The Special Report will describe a course of action that should result in the limitation of the annual dose to a MEMBER OF THE PUBLIC to within the 40 CFR Part 190 limits. For the purposes of the Special Report, it may be assumed that the dose commitment to the MEMBER OF THE PUBLIC from other uranium fuel cycle sources is negligible. If the dose to any MEMBER OF THE PUBLIC is estimated to exceed the requirements of 40 CFR Part 190, the Special Report with a request for a variance (provided the release conditions resulting in violation of 40 CFR Part 190 have not already been corrected), in accordance with the provisions of 40 CFR Part 190.11 and 10 CFR Part 20.405c, is considered to be a timely request and fulfills the requirements of 40 CFR Part 190 until NRC staff action is completed. The variance only relates to the limits of 40 CFR Part 190, and does not apply in any way to the other requirements for dose limitation

BASIS

of 10 CFR Part 20, as addressed in Specifications 7.3.1 and 7.4.1. An individual is not considered a MEMBER OF THE PUBLIC during any period in which he/she is engaged in carrying out any operation that is part of the nuclear fuel cycle.

7/8.7.1 MONITORING PROGRAM

The radiological environmental monitoring program required by this specification provides representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of MEMBERS OF THE PUBLIC resulting from the station operation. This monitoring program implements Section IV.B.2 of Appendix I to 10 CFR Part 50 and 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 the modeling of the environmental exposure pathways. Guidance for this monitoring program is provided by the Radiological Assessment Branch Technical Position on Environmental Monitoring. Program changes may be initiated based on operational experience.

The required detection capabilities for environmental sample analyses are tabulated in terms of the lower limits of detection (LLDs). The LLDs required by Table 8.5 are considered optimum for routine environmental measurements in industrial laboratories. It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

Detailed discussion of the LLD, and other detection limits, can be found in HASL Procedures Manual, HASL-300 (revised annually), Currie, L.A., "Limits for Qualitative Detection and Quantitative Determination - Application to Radiochemistry," Anal. Chem. 40, 586-93 (1968), and Hartwell, J.K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

BASIS

7/8.7.2 LAND USE CENSUS

This specification is provided to ensure that changes in the use of areas at and beyond the SITE BOUNDARY are identified and that modifications to the radiological environmental monitoring program are made if required by the door-to-door survey, from aerial survey or from consulting with local agricultural authorities. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR part 50. Restricting the census to gardens of greater than 50 m² provides assurance that significant exposure pathways via leafy vegetables will be identified and monitored since a garden of this size is the minimum required to produce the quantity (26 kg/yr) of leafy vegetables assumed in Regulatory Guide 1.109 for consumption by a child. To determine this minimum garden size, the following assumptions were made: 1) 20% of the garden was used for growing leafy vegetation (i.e., similar to lettuce and cabbage), and 2) a vegetation yield of 2 kg/m².

7/8.7.3 INTERLABORATORY COMPARISON PROGRAM

The requirement for participation in an approved Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of 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 valid for the purposes of Section IV.B.2 of Appendix I to 10 CFR Part 50.

TABLE 7.1

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

<u>INSTRUMENT</u>	<u>MINIMUM CHANNELS OPERABLE</u>	<u>ACTION</u>
1. Gross Radioactivity Monitors Providing Alarm and Automatic Termination of Release		
a. Liquid Radwaste Effluent Line (R-18)	1	1
b. Steam Generator Blowdown Effluent Line (R-19)	1	2
2. Gross Beta or Gamma Radioactivity Monitors Providing Alarm But Not Providing Automatic Termination of Release		
a. Service Water System Effluent Line (Component cooling, R-20)	1	3
b. Service Water System Effluent Line (Containment fan cooling, R-16)	1	3

TABLE 7.1 (Continued)

TABLE NOTATION

- ACTION 1 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases may continue provided that prior to initiating a release:
- a. At least two independent samples are analyzed in accordance with Specification 8.3.1.1, and
 - b. At least two technically qualified members of the Facility Staff independently verify the release rate calculations and discharge line valving;
- Otherwise, suspend release of radioactive effluents via this pathway.
- ACTION 2 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided grab samples are analyzed for gross radioactivity (beta or gamma) at a lower limit of detection of $1.0E-6$ uCi/ml:
- a. At least once per week with no indication of primary-to-secondary leakage; or
 - b. At least once per 24 hours with identified primary-to-secondary leakage (with secondary side activity $> 1.0E-05$ uCi/ml)
- ACTION 3 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided that, at least once per 12 hours, grab samples are collected and analyzed for gross radioactivity (beta or gamma) at a lower limit of detection of $1.0E-6$ uCi/ml.

TABLE 7.2

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

<u>INSTRUMENT</u>	<u>MINIMUM CHANNELS OPERABLE</u>	<u>APPLICABILITY</u>	<u>ACTION</u>
1. Noble Gas Activity Monitor			
a. R-13 or R-14	1	*	
-Waste Gas Holdup System (auto-isolation)			4
-Auxiliary Building Ventilation System			5
-Containment Purge 2" line (auto-isolation)			6
b. R-12 or R-21	1	*	
-Containment purge 36" duct (auto-isolation)			6
c. R-15	1	*	5
-Condenser Evacuation System			
<hr/>			
2. Radioiodine & Particulate Samplers			
a. Containment Building vent (R-21)	1	*	7
b. Auxiliary Building vent (R-13A)	1	*	7
<hr/>			
3. Sampler flow rate measuring devices			
a. Containment Building vent sampler	1	*	8
b. Auxiliary Building vent sampler	1	*	8

TABLE 7.2 (Continued)

TABLE NOTATION

* At all times

ACTION 4 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, the contents of the tank(s) may be released to the environment provided that prior to initiating the release:

- a. At least two independent samples of the tank's contents are analyzed, and
- b. At least two technically qualified members of the Facility Staff independently verify the release rate calculations and discharge valve lineup;

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION 5 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided grab samples are taken at least once per 12 hours and these samples are analyzed for gross activity within 24 hours.

ACTION 6 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, immediately suspend PURGING of radioactive effluents via this pathway.

ACTION 7 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via the affected pathway may continue provided samples are continuously collected with auxiliary sampling equipment as required in Table 8.4.

ACTION 8 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided the flow rate is estimated at least once per 4 hours.

TABLE 7.3
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample -----	Number of Representative Samples and Sample Locations ^a -----	Sampling and Collection Frequency -----	Type and Frequency of Analysis -----
1. Direct Radiation ^b	TLD, 5 bulbs/packet, 5 Inner Ring locations 6 Outer Ring locations 1 Control location 1 Population center 1 Special interest location 1 Nearby resident	Quarterly	Gamma dose quarterly
2 Airborne			
Radioiodine and Particulates	3 samples close to the site boundary in highest average X/Q	Continuous sampler operation	
		Iodine-Semi- monthly	Iodine-Semi- monthly
	1 sample from the closest community having the highest X/Q	Particulates- weekly, or more frequently if required by dust loading.	Particulates-gross beta analysis following filter change. ^d Gamma isotopic of composite (by location) quarterly. ^e
	1 sample from a control location		

TABLE 7.3 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample -----	Number of Representative Samples and Sample Locations ^a -----	Sampling and Collection Frequency -----	Type and Frequency of Analysis -----
3. Waterborne			
a. Surface ^f	1 Upstream sample 1 Downstream sample	Monthly grab sample	Gamma isotopice analysis monthly. Composite of grab samples for tritium analysis quar- terly.
b. Ground	1-2 location likely to be affected	quarterly grab sample	Gamma isotopice and tritium analy- sis quarterly.
c. Drinking	1-3 samples of nearest water supply.	monthly grab sample	Monthly gross beta and gamma isotopice analysis. Quarterly tri- tium analysis of the com- posite of monthly grab samples.
d. Sediment from shoreline	1 sample from downstream area with potential for recreational value.	semi-annual grab sample	Gamma isotopice analysis, semi-annually.
4. Ingestion			
a. Milk	Samples from milking animals in 3 locations within 5 km having the highest dose potential. 1 alternate location 1 control location	Semi-monthly when animals are on pasture. Monthly other- wise.	Gamma isotopice and I-131 analysis semi-monthly when animals are on pastured. Monthly other- wise.

TABLE 7.3 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample ----- (Ingestion cont.)	Number of Representative Samples and Sample Locations ^a -----	Sampling and Collection Frequency -----	Type and Frequency of Analysis -----
b. Fish	3 random samplings of commercially and recrea- tionally important species in the vicinity of the discharge.	3 times per year	Gamma isotopics on edible por- tions
c. Food Products	Samples of leaf vegetables grown nearest each of two different offsite locations within 5 miles of the plant if milk sampling is not performed.	Annually when available	Gamma isotopics and I-131 Analysis.

TABLE 7.3 (Continued)

Table Notation

a Specific parameters of distance and direction sector from the centerline of the reactor, and additional descriptions where pertinent, are provided for in Tables 1.1 and 1.2 and Figures 2.1 and 2.2 of the Radiological Environmental Monitoring Manual (REMM) for each and every sample location. Deviations from the required sampling schedule will occur if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, reasonable efforts shall be made to complete corrective actions prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the Annual Radiological Environmental Monitoring Report. It is recognized that, at times, it may not be possible or practicable to continue to obtain samples of the media of choice at the most desired location or time. In these instances suitable alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the REMM. The cause of the unavailability of samples for that pathway and the new location(s) for obtaining replacement samples will be identified in the Annual Radiological Environmental Monitoring Report.

b For the purposes of this table, a thermoluminescent dosimeter (TLD) is considered to be one phosphor; two or more phosphors in a packet are considered as two or more dosimeters. The NRC guidance of 40 stations is not an absolute number. The number of direct radiation monitoring stations has been reduced according to geographical limitations; e.g., Lake Michigan.

The frequency of analysis or readout for TLD systems depends upon the characteristics of the specific system used and selection is made to obtain optimum dose information with minimal fading.

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

TABLE 7.3 (Continued)

Table Notation

- d Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than ten times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.
- e Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.
- f The "upstream sample" shall be taken at a distance beyond significant influence of the discharge. The "downstream" sample shall be taken in an area near the mixing zone.

TABLE 7.4

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Analysis	Reporting Levels				
	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				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		10,000		
Zr-Nb-95	400				
I-131	2	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200			300	

TABLE 8.0
FREQUENCY NOTATION

<u>NOTATION</u>	<u>FREQUENCY¹</u>
S	Once per shift
St	Once per 12 hours
D	Once per 24 hours
W	Once per 7 days
M	Once per 31 days
Q	Once per 92 days
SA	Once per 184 days
R	Once per refueling cycle, not to exceed 18 months
P	Prior to each reactor startup if not done previous week
PR	Completed prior to each release
N.A.	Not applicable

¹ A maximum extension not to exceed 25% of the surveillance interval.

TABLE 8.1

RADIOACTIVE LIQUID EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

<u>INSTRUMENT</u>	<u>CHANNEL CHECK</u>	<u>SOURCE CHECK</u>	<u>CHANNEL CALIBRATION</u>	<u>CHANNEL FUNCTIONAL TEST</u>
1. Gross Radioactivity Monitors Providing Alarm and Automatic Termination of Release				
a. Liquid Radwaste Effluent Line (R-18)	D	PR	R	Q
b. Steam Generator Blowdown Effluent Line (R-19)	D	M	R	Q
2. Gross Beta or Gamma Radioactivity Monitors Providing Alarm But Not Providing Automatic Termination of Release				
a. Service Water System Effluent Line (Component cooling, R-20)	D	M	R	Q
b. Service Water System Effluent Line (Containment fan cooling, R-16)	D	M	R	Q

TABLE 8.2

RADIOACTIVE GASEOUS EFFLUENT MONITORING
INSTRUMENTATION SURVEILLANCE REQUIREMENTS

<u>INSTRUMENT</u>	<u>CHANNEL CHECK</u>	<u>SOURCE CHECK</u>	<u>CHANNEL CALIBRATION</u>	<u>CHANNEL FUNCTIONAL TEST</u>	<u>MODES IN WHICH SURVEILLANCE REQUIRED</u>
1. Noble Gas Activity Monitor -					
a. R-13 or R-14					
-Waste Gas Holdup System (auto-isolation)	PR	PR	R	Q	*
-Auxiliary Building Ventilation System	D	M	R	Q	*
-Containment Purge 2" line (auto-isolation)	D	M	R	Q	*
b. R-12 or R-21					
-Containment purge 36" duct (auto-isolation)	D	PR	R	Q	*
c. R-15					
-Condenser Evacuation System	D	M	R	Q	*
2. Radiiodine and Particulate Samplers					
a. Containment Building vent (R-21)	W	N.A.	N.A.	N.A.	*
b. Auxiliary Building vent (R-13A)	W	N.A.	N.A.	N.A.	*

TABLE 8.2 (Continued)

<u>INSTRUMENT</u>	<u>CHANNEL CHECK</u>	<u>SOURCE CHECK</u>	<u>CHANNEL CALIBRATION</u>	<u>CHANNEL FUNCTIONAL TEST</u>	<u>MODES IN WHICH SURVEILLANCE REQUIRED</u>
3. Sampler flow rate measuring devices					
a. Containment Building vent sampler	D	N.A.	R	Q	*
b. Auxiliary Building vent sampler	D	N.A.	R	Q	*

* At all times other than when the line is valved out and tagged.

TABLE 8.3

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) ^a (uCi/ml)
<hr/>				
A. Batch Waste Release Tanks ^b	PR Each Batch	PR Each Batch	Principal Gamma Emitters ^c I-131	1x10 ⁻⁶ 1x10 ⁻⁶
	PR Each Batch	M Composite ^d	H-3 Gross Alpha	1x10 ⁻⁵ 5x10 ⁻⁷
	PR Each Batch	Q Composite ^d	Sr-89, Sr-90 Fe-55	5x10 ⁻⁸ 1x10 ⁻⁶
B. Continuous Releases ^e (SG Blowdown) (TB Sump ^g)	W Grab Sample	W Grab Sample	Principal Gamma Emitters ^c	5x10 ⁻⁷
			I-131	1x10 ⁻⁶
	W Grab Sample	M Composite ^f	H-3 Gross Alpha	1x10 ⁻⁵ 5x10 ⁻⁷
	W Grab Sample	Q Composite ^f	Sr-89, Sr-90 Fe-55	5x10 ⁻⁸ 1x10 ⁻⁶

TABLE 8.3 (Continued)

TABLE NOTATION

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

For a particular measurement system, which may include radiochemical separation:

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

Where:

LLD is the a priori lower limit of detection as defined above, as uCi per unit mass or volume,

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

E is the counting efficiency, as counts per disintegration,

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

2.22×10^6 is the number of disintegrations per minute per microcurie,

Y is the fractional radiochemical yield, when applicable,

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

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

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

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

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

TABLE 8.3 (Continued)

TABLE NOTATION

- c The principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Semiannual Radioactive Effluent Release Report pursuant to Specification 6.9.3.b.
- d A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen that is representative of the liquids released.
- e A continuous release is the discharge of liquid wastes of a nondiscrete volume, e.g., from a volume of a system that has an input flow during the continuous release.
- f As a minimum, the monthly and quarterly composite samples shall be comprised of weekly grab samples.
- g During periods of identified primary-to-secondary leakage (with the secondary activity $> 1.0 \times 10^{-5}$ uCi/ml), grab samples are collected daily and analyzed by gamma spectroscopy.

TABLE 8.4

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) ^a (uCi/ml)
A. Waste Gas Storage Tank	PR Each Tank Grab Sample	PR Each Tank	Principal Gamma Emitters ^b	1×10^{-4}
B. Containment PURGE	PR Each PURGE Grab Sample	PR Each PURGE	Principal Gamma Emitters ^b	1×10^{-4}
C. Auxiliary Building and Containment Building Vent	M Grab Sample	M	Principal Gamma Emitters ^b	1×10^{-4}
	Continuous ^c	W Charcoal Sample	I-131	3×10^{-12}
	Continuous ^c	W Particulate Sample	Principal Gamma Emitter ^b (I-131, others)	1×10^{-11}
	Continuous ^c	M Composite Particulate Sample	Gross Alpha	1×10^{-11}
	Continuous ^c	Q Composite Particulate Sample	SR-89, SR-90	1×10^{-11}
	Continuous ^c	Noble Gas Monitor	Noble Gases Gross Beta or Gamma	1×10^{-6}

TABLE 8.4 (Continued)

TABLE NOTATION

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

For a particular measurement system, which may include radiochemical separation:

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

Where:

LLD is the a priori lower limit of detection as defined above, as uCi per unit mass or volume,

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

E is the counting efficiency, as counts per disintegration,

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

2.22×10^6 is the number of disintegrations per minute per microcurie,

Y is the fractional radiochemical yield, when applicable,

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

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

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

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

TABLE 8.4 (Continued)

- b The principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for gaseous emissions and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141 and Ce-144 for particulate emissions. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Semiannual Radioactive Effluent Release Report pursuant to Specification 6.9.3.b.
- c The ratio of the sample flow rate to the sampled stream flow rate shall be known (based on sampler and ventilation system flow measuring devices or periodic flow estimates) for the time period covered by each dose or dose rate calculation made in accordance with Specifications 7.4.1, 7.4.2 and 7.4.3.

TABLE 8.5

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS^a
 LOWER LIMIT OF DETECTION (LLD)^{b,c}

Analysis	Water (pCi/l)	Airborne Particulate or Gases (pCi/m ³)	Fish (pCi/kg, wet)	Milk (pCi/l)	Food Products (pCi/kg, wet)	Sediment (pCi/kg, dry)
gross beta	4	0.01				
H-3	2000					
Mn-54	15		130			
Fe-59	30		260			
Co-58,60	15		130			
Zr-Nb-95	15					
I-131	1 ^d	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15			15		

TABLE 8.5 (Continued)

Table Notation

- a This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radiological Environmental Monitoring Report, pursuant to Specification 6.9.3.a.
- b Required detection capabilities for thermoluminescent dosimeters used for environmental measurements are given in Regulatory Guide 4.13.
- c The LLD is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66 s_b}{E * V * 2.22 * Y * \exp(-\lambda \Delta t)}$$

Where:

LLD is the a priori lower limit of detection as defined above, as picocuries per unit mass or volume,

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

E is the counting efficiency, as counts per disintegration,

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

2.22 is the number of disintegrations per minute per picocurie,

Y is the fractional radiochemical yield, when applicable,

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

TABLE 8.5 (Continued)

Table Notation

Δt for environmental samples is the elapsed time between sample collection, or end of the sample collection period, and time of counting.

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

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Monitoring Report, pursuant to Specification 6.9.3.a.

d LLD for drinking water samples. If no drinking water pathway exists, the LLD of gamma isotopic analysis may be used.