UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 1000
ARLINGTON, TEXAS 76011

PUBLIC SERVICE COMPANY OF COLORADO

DOCKET 50-267

FORT ST. VRAIN NUCLEAR GENERATING STATION

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 37
License DPR-34

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Public Service Company of Colorado (the licensee) dated March 23, 1983, 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, Facility Operating License DPR-34 is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.D.(2) is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 37 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of January 1, 1984.

FOR THE NUCLEAR REGULATORY COMMISSION

for Eric H. Johnson, Chief
Reactor Project Branch 1

Attachment:
Changes to the Technical Specifications

Date of Issuance: November 23, 1983

ATTACHMENT TO LICENSE AMENDMENT

AMENDMENT NO. 37 TO FACILITY OPERATING LICENSE DPR-34

DOCKET 50-267

Replace the following pages of the Appendix A Technical Specifications with the enclosed pages as indicated.

Remove	Insert
iii	iii
vi	vi
vii	vii
4.8-1 thru 4.8-8	4.8-1
5.8-1	5.8-1
5.8-2	---
5.9-1 thru 5.9-11	5.9-1
6.3-1	6.3-1
6.3-2	6.3-2
---	6.3-3
---	6.3-4
7.1-11	7.1-11
7.1-18	7.1-18
7.1-19	7.1-19
7.3-1 thru 7.3-3	7.3-1 thru 7.3-4
7.4-1 thru 7.4-3	7.4-1 thru 7.4-3
7.5-1 thru 7.5-10	7.5-1 thru 7.5-25
---	7.6-1
---	7.6-2
---	8.0-1 thru 8.0-6
---	8.1-1 thru 8.1-35
---	8.2-1 thru 8.2-15

4.8 RADIOACTIVE EFFLUENT DISPOSAL SYSTEM - LIMITING CONDITIONS FOR OPERATION

(These requirements have been deleted. Refer to Section 8.0 for Radiological Technical Specifications.)

5.8 RADIOACTIVE EFFLUENT DISPOSAL SYSTEMS - SURVEILLANCE REQUIREMENTS

(These requirements have been deleted. Refer to Section 8.0 for Radiological Technical Specifications.)

5.9 ENVIRONMENTAL SURVEILLANCE - SURVEILLANCE REQUIREMENTS

(These requirements have been deleted. Refer to Section 8.0 for Radiological Technical Specifications.)

6.3 SITE DESIGN FEATURES

Applicability

Applies to the location and extent of the Reactor Site.

Objective

To define those aspects of the site which affect the overall safety of the installation.

Specification DF 6.3 - Site, Design Features

The Fort St. Vrain Nuclear Generating Station, Unit No. 1, is situated on a tract of land located about 3.5 miles northwest from the center of Platteville, Colorado. The tract is situated in Weld County, Colorado (See FSAR Section 2.1).

The exclusion area is approximately 1 mile square and is defined in Figure 6.3-1. The closest distance from the reactor building to the boundary of the exclusion area is 1,935 feet. The limits of 10 CFR 20 shall apply at the boundary of this exclusion area. The Low Population Zone (LPZ) is defined by a radius of 16,000 meters. The exclusion area is zoned industrial, and the area surrounding the exclusion area is zoned agricultural. Agricultural activities may continue on the site including a portion of the exclusion area, and an evacuation

procedure will be maintained. There are no permanent residences located within the exclusion area.

A security fence surrounds the plant area, as shown in FSAR Fig. 1.2-2. Fences inside the security fence limit routine access into the plant from the parking lot inside the main gate to the main plant entrance. The main gate is electrically operated and controllable from within the plant.

An Information Center is located within the exclusion area, but outside the main gate. An evacuation procedure will be maintained for the Information Center.

Points where radioactive gaseous and liquid effluents are released are shown on Figure 6.3-2 as are the liquid effluent pathways leaving the site.

Basis for Specification DF 6.3

The site offers adequate distances and favorable seismologic, meteorologic, geologic, hydrologic, and population characteristics as described in Section 2 of the FSAR. The favorable characteristics of the site and the design of the plant ensure that 10 CFR 100 and 10 CFR 20 requirements can be met satisfactorily.

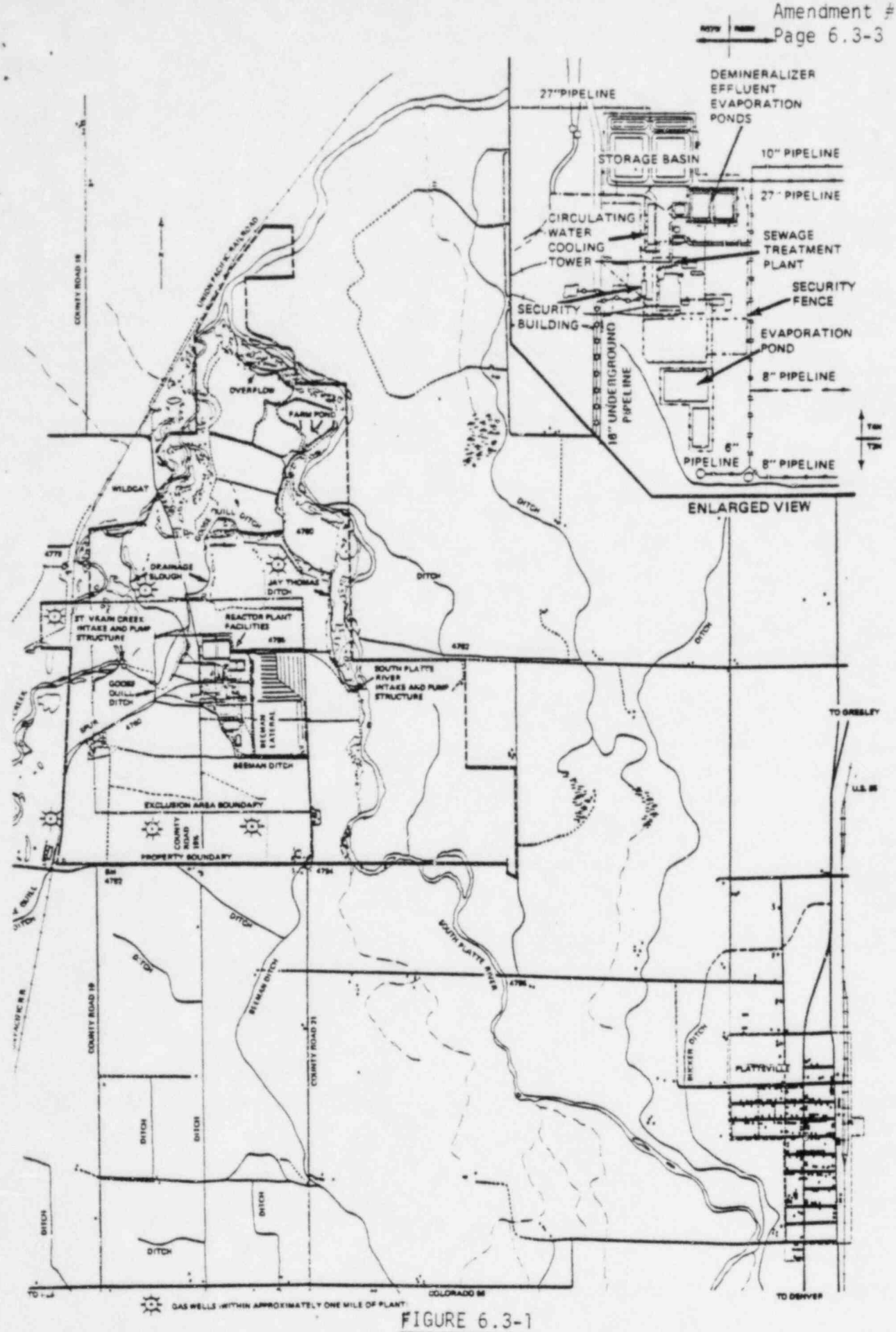

FIGURE 6.3-1

Site of Fort St. Vrain Nuclear
Generating Station

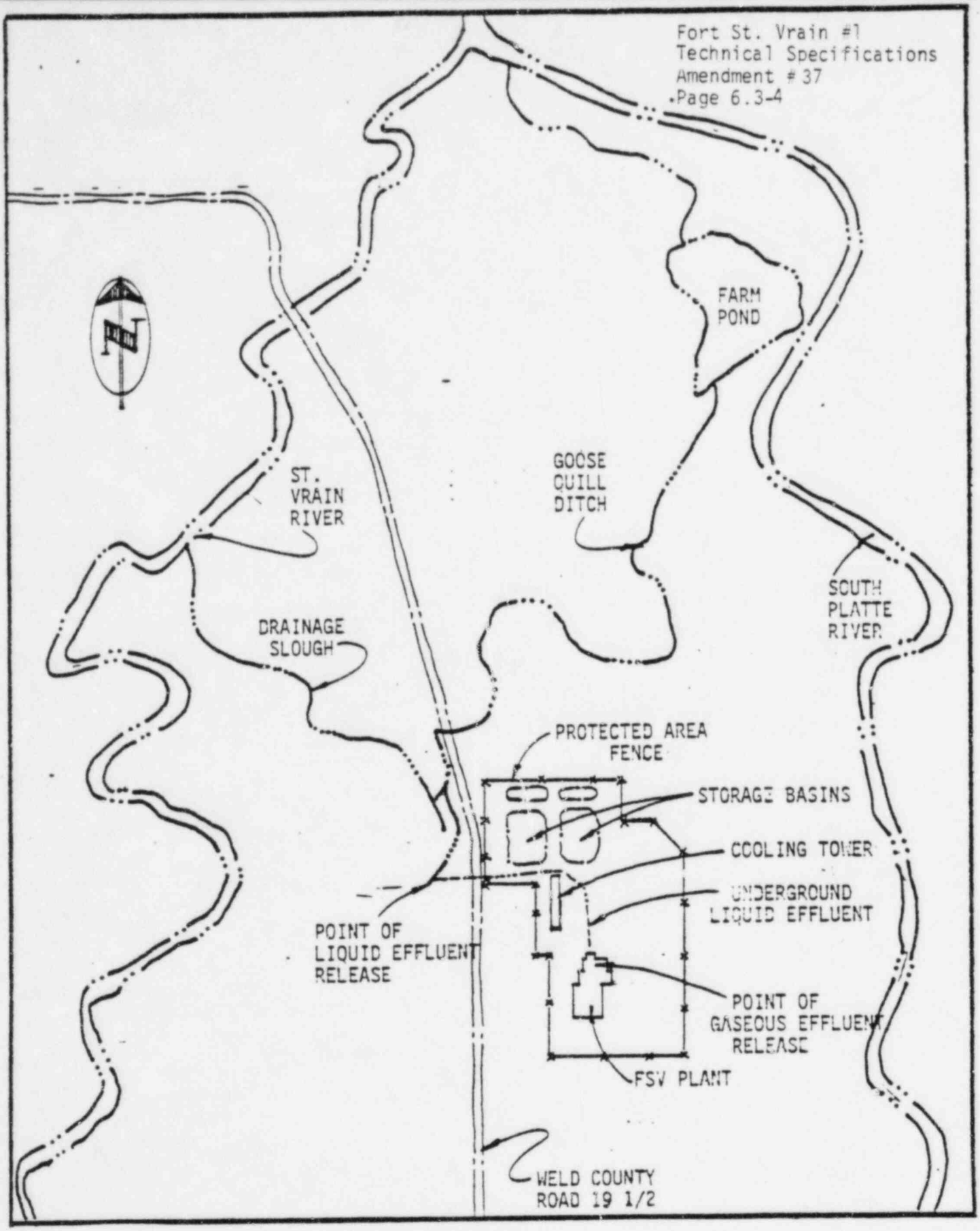

FIGURE 6.3-2

Fort St. Vrain Site Detail

h. Performance of special reviews, investigations, and reports thereon as requested by the Chairman of the Nuclear Facility Safety Committee.

i. Review of the Plant Security Plan and implementing procedures and submittal of recommended changes to the Chairman of the Fort St. Vrain Security Committee.

j. Review of the plant Radiological Emergency Response Plan and implementing procedures.

k. Review of every unplanned onsite release of radioactive material to the environs, including the preparation of reports concerning evaluation, recommendations, and disposition of the corrective action to prevent recurrence and the forwarding of these reports to the Manager, Nuclear Production and the Nuclear Facility Safety Committee (NFSC).

6. Authority

The PORC shall:

a. Function to advise the Manager, Nuclear Production on all matters that affect nuclear safety.

b. Recommend to the Manager, Nuclear Production in writing, approval, or disapproval of items considered under 5.a through 5.d, above.

c. Render determinations in writing with regard to whether or not each item considered under 5.a through 5.e above constitutes an unreviewed safety question.

d. Provide immediate written notification to the Manager, Nuclear Production and the Chairman of NFSC of disagreement between the PORC and the

personnel or an outside fire protection firm;

(b) a biennial audit of the fire protection program and implementing procedures;

(c) a triennial fire protection and loss prevention inspection and audit utilizing an outside qualified fire consultant.

(9) The offsite Dose Calculation Manual and Process Control Program and implementing procedures at least once per 24 months.

(10) The Radiological Environmental Monitoring Program and the results thereof at least once per 12 months.

(11) The performance of activities required by the Quality Assurance Program to meet the provisions of Regulatory Guide 1.21 Revision 1, June 1974 and Regulatory Guide 4.1, Revision 1, April 1975, at least once per 12 months.

8. Authority

The NFSC shall report to and advise the Vice President, Electric Production, on those areas of responsibility specified in 7.a. and 7.b. above.

9. Records

Records of NFSC activities shall be prepared, approved, and distributed as indicated below:

a. Minutes of each NFSC meeting shall be prepared, approved, and forwarded to the Vice President, Electric Production, within 30 days following each meeting.

b. Reports of reviews encompassed by Section 7.a, above shall be forwarded to the Vice President, Electric Production, within 30 days following completion of the review.

c. Audit reports encompassed by Section 7.b, above shall be forwarded to the Vice President, Electric Production, and to the management positions responsible for the areas audited within 30 days after completion of the audit.

7.3 RECORDS - ADMINISTRATIVE CONTROLS

Applicability

Applies to the records of operation which will be maintained to verify that the plant is operated in a safe manner.

Objective

To insure that an adequate record of plant operation is maintained to verify that the plant is operated in a safe manner.

Specification AC 7.3 - Records, Administrative Controls

Records and logs relative to the operation of Fort St. Vrain Unit No. 1 shall be maintained in accordance with present Public Service Company of Colorado policy. Records and logs relative to the following specific items shall be retained as indicated.

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

   1) Records and logs of facility operation covering time interval at each power level.

   2) Records and logs of principal maintenance activities, inspections, repair and replacement of principal items of equipment related to nuclear safety.

3) Reportable Occurrence Reports.

4) Records of surveillance activities, inspections and calibrations required by these Technical Specifications.

5) Records of reactor tests and experiments.

6) Records of changes made to Operating Procedures.

7) Records of radioactive shipments.

8) Records of sealed source leak tests and results.

9) Records of annual physical inventory of all source material of record.

b) The following records shall be retained for the duration of the Facility Operating License:

1) Record and drawing changes reflecting facility design modifications made to systems and equipment described in the Final Safety Analysis Report.

2) Records of new and irradiated fuel inventory, fuel transfers and assembly burnup histories.

3) Records of facility radiation and contamination surveys.

4) Records of radiation exposure for all individuals entering radiation control areas.

5) Records of gaseous and liquid radioactive material released to the environs.

6) Records of transient or operational cycles for those facility components designed for a limited number of transients or cycles.

7) Records of training and qualification for current members of the plant staff.

8) Records of in-service inspections performed pursuant to these Technical Specifications.

9) Records of Quality Assurance activities required by the QA Manual.

10) Records of reviews performed for changes made to procedures or equipment or reviews of tests and experiments pursuant to 10 CFR 50.59.

11) Records of meetings of the PORC and the NFSC.

12) Records for Environmental Qualification which are covered under provisions of Section 7.6.

13) Records and logs pertaining to the environmental monitoring program including baseline data from the pre-operational environmental monitoring programs (both radiological and non-radiological).

7.4 PROCEDURES - ADMINISTRATIVE CONTROLS

Applicability

Applies to administrative procedures which will govern plant operations.

Objective

To ensure that written procedures will be maintained to define requirements for plant operation.

Specification AC 7.4 - Procedures, Administrative Controls

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

1. The applicable procedures recommended in Appendix A of Regulatory Guide 1.33, November, 1972.

2. Refueling operations.

3. Surveillance and test activities of safety-related equipment.

4. Security Plan implementation.

5. Emergency Plan implementation.

6. Process Control Program (PCP) implementation.

7. Offsite Dose Calculation Manual (ODCM) implementation.

8. Quality Assurance Program for effluent and environmental monitoring using the guidance in Regulatory Guide 1.21, Revision 1, June, 1974 and Regulatory Guide 4.1, Revision 1, April, 1975.

b. Procedures and administrative policies of a) above, and changes thereto, shall be reviewed by the PORC and approved by the appropriate Manager prior to implementation and reviewed periodically as set forth in Administrative Procedures.

Security Plan procedures, and changes thereto, shall be reviewed by the Plant Operations Review Committee and approved by the designated Plant Security Officer prior to implementation.

Security Plan procedures and changes thereto, shall be reviewed by the Fort St. Vrain Security Committee.

c. Temporary changes to procedures of a) above may be made provided:

1. The intent of the original procedure is not altered.

2. The change is approved by two members of the plant management staff, at least one of whom holds a Senior Reactor Operators License.

3. The change is documented, reviewed by the PORC and approved by the appropriate Superintendent within 14 days of implementation.

d. 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.

Respiratory protective equipment shall be provided in accordance with 10 CFR 20.103.

7.5 REPORTING REQUIREMENTS

In addition to the applicable reporting requirements of Title 10, Code of Federal Regulations, the following identified reports shall be submitted to the Regional Administrator of the appropriate Regional Office unless otherwise noted.

7.5.1 Routine Reports

a. Startup Report

A summary report of plant startup and power escalation testing shall be submitted following (1) receipt of an operating license, (2) amendment to the license involving a planned increase in power level, (3) installation of fuel that has a different design or has been manufactured by a different fuel supplier, and (4) modifications that may have significantly altered the nuclear, thermal, or hydraulic performance of the plant. The report shall address each of the tests identified in the FSAR and shall in general include a description of the measured values of the operating conditions or characteristics obtained during the test program and a comparison of these values with design predictions and specifications. Any

corrective actions that were required to obtain satisfactory operation shall also be described. Any additional specific details required in license conditions based on other commitments shall be included in this report.

Startup reports shall be submitted within (1) 90 days following completion of the startup test program, (2) 90 days following resumption or commencement of commercial power operation, or (3) 9 months following initial criticality, whichever is earliest. If the Startup Report does not cover all three events (i.e., initial criticality, completion of startup test program, and resumption or commencement of commercial power operation), supplementary reports shall be submitted at least every three months until all three events have been completed.

b. Annual Occupational Exposure Report

A tabulation on an annual basis of the number of station, utility, and other personnel (including contractors) receiving exposures greater than 100 mrem/year and their associated man-rem exposure according to work and job functions, e.g., reactor operations

and surveillance, in-service inspection, routine maintenance, special maintenance (describe maintenance), waste processing, and refueling. The dose assignment to various duty functions may be estimates based on pocket dosimeter, TLD, or film badge measurements. Small exposures totaling less than 20% of the individual total dose need not be accounted for. In the aggregate, at least 80% of the whole body dose received from external sources shall be assigned to specific major work functions.

c. Monthly Operating Report

A routine operating report covering the operation of the unit during the previous month shall be submitted prior to the fifteenth calendar day of the following month. Submittal shall be to the Director, Office of Inspection and Enforcement, U. S. Nuclear Regulatory Commission, Washington, D. C. 20555, ATTN: Document Control Desk with a copy to the appropriate NRC Regional Administrator.

Each monthly operating report shall include:

1. A narrative summary of operating experience during the report period relating to safe operation of the facility, including major safety-related maintenance.

2. Report of any single release of radioactivity or radiation exposure which accounts for more than 10% of the allowable annual values.

3. Indications of failed fuel resulting from irradiated fuel examinations, completed during the report period.

4. The monthly statistical information contained in Regulatory Guide 1.16.

d. Annual Radiological Environmental Monitoring Report

A report on the Radiological Environmental Monitoring Program for the previous calendar year shall be submitted to the Regional Administrator of the Nuclear Regulatory Commission Regional Office (with a copy to the Director, Office of Nuclear Reactor

Regulation) as a separate document by May 1 of each year.

The Annual Radiological Environmental Monitoring Reports shall include summaries, interpretations, and an analysis of trends of the results of the radiological environmental monitoring activities for the report period, including a comparison with pre-operational studies, operational controls (as appropriate), and previous environmental monitoring 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 ELCO 8.2.1.

The Annual Radiological Environmental Monitoring Reports shall include the results of analysis of all radiological environmental samples and of all measurements taken during the period pursuant to the Table and Figures in the ODCM, 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.

The reports shall also include the following: A summary description of the Radiological Environmental Monitoring Program; at least two legible maps* covering all sampling locations keyed to a table giving distances and directions from the center line of the reactor; the results of licensee participation in the interlaboratory comparison program; and discussion of all analyses in which the lower limits of detection required by Table 8.2-2 was not achievable.

If the Radiological Environmental Monitoring Program is not being conducted as specified in Table 8.2-1, in lieu of a Licensee Event Report, a description of the reasons the program was not conducted as required and the plans for preventing recurrence shall be

*One map shall cover stations near the site boundary; a second shall include the more distant stations.

prepared and submitted to the Nuclear Regulatory Commission in the Annual Radiological Environmental Monitoring Report.

e. Semi-annual Radioactive Effluent Release Report

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

The Radioactive Effluent Release Reports shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit as outlined in 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, with data summarized on a quarterly basis following the format of Appendix B thereof.

An annual summary of hourly meteorological data collected over the previous year shall be maintained for five years by the licensee.

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. This summary report shall include an assessment of the radiation doses due to the radioactive liquid and gaseous effluents released from the unit or station during the previous calendar year, and shall also include an assessment of the radiation doses from radioactive liquid and gaseous effluents to members of the public due to their activities inside the site boundary (Figure 6.3-1) during the report period. All assumptions used in making these assessments (i.e., specific activity, exposure time, and location) shall be included in these reports. The meteorological conditions concurrent with the time of release of radioactive materials in gaseous effluents (as determined by sampling frequency and measurement) shall be used for determining the gaseous pathway doses. [For operating reactors, conservative approximate methods are acceptable.] The assessment of radiation doses shall be

performed in accordance with 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 (including doses from primary effluent pathways and direct radiation) for the previous calendar year to show conformance with 40CFR Part 190, Environmental Radiation Protection Standards for Nuclear Power Operation. Acceptable methods for calculating the dose contribution from liquid and gaseous effluents are given in Regulatory Guide 1.109, Revision 1, October, 1977.

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

1. Container volume,

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

3. Principal radionuclides (specify whether determined by measurement or estimate),

4. Source of waste and processing employed (e.g., dewatered spent resin, compacted dry waste, evaporator bottoms),

5. Type of container (e.g., LSA, Type A, Type B, large quantity), and

6. Solidification agent or absorbent (e.g., cement, urea formaldehyde).

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.

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), as well as a listing of new locations for dose calculations and/or environmental monitoring identified by the land use census pursuant to Specification ELCO 8.2.1.

The Semi-annual Effluent Radioactive Release Report shall contain a discussion of licensee

initiated major changes to the radioactive waste systems (liquid, gaseous, and solid) and shall be reported to the Commission in the Semi-annual Radioactive Effluent Release Report for the period in which the evaluation was reviewed by the Plant Operations Review Committee. 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 10CFR Part 50.59.

2. Sufficient detailed information to totally support the reason for the change without benefit of additional or supplemental information;

3. A detailed 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 individuals in the unrestricted area and to the general population that differ from those previously estimated in the license application and amendments thereto;

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 Plant Operations Review Committee.

7.5.2 Reportable Occurrences

Reportable occurrences, including corrective actions and measures to prevent recurrence, shall be reported to the NRC. Supplemental reports may

be required to fully describe final resolution of occurrence. In case of corrected or supplemental reports, a licensee event report shall be completed and reference shall be made to the original report date.

a. Prompt Notification With Written Followup

The types of events listed below shall be reported as expeditiously as possible, but within 24 hours by telephone and confirmed by telegraph, mailgram, or facsimile transmission to the appropriate NRC Regional Administrator or his designee no later than the first working day following the event, with a written followup report within two weeks. A copy of the confirmation and the written followup report shall also be sent to the Document Control Desk, U. S. Nuclear Regulatory Commission, Washington, D. C. 20555. The written followup report shall include, as a minimum, a completed copy of a licensee event report form, and shall be supplemented, as needed, by additional narrative material to provide complete explanation of the circumstances surrounding the event.

1. Failure of the reactor protection system or other systems subject to limiting safety-system settings to initiate the required protective function by the time a monitored parameter reaches the setpoint specified as the limiting safety-system setting in the Technical Specifications or failure to complete the required protective function.

   NOTE: Instrument drift discovered as a result of testing need not be reported under this item but may be reportable under items a.5., a.6., or b.1., below.

2. Operation of the unit or affected systems when any parameter or operation subject to a limiting condition is less conservative than the least conservative aspect of the limiting condition for operation established in the Technical Specifications.

   NOTE: If specified action is taken when a system is found to be operating between the most conservative and the least conservative aspects of

a limiting condition for operation listed in the Technical Specifications, the limiting condition for operation is not considered to have been violated and need not be reported under this item, but it may be reportable under item b.2. below.

3. Abnormal degradation discovered in fuel cladding or the reactor coolant pressure boundary.

   NOTE: Leakage of valve packing or gaskets within the limits for identified leakage set forth in Technical Specifications need not be reported under this item.

4. Reactivity anomalies, involving disagreement with the predicted value of reactivity balance under steady-state conditions during power operation, greater than or equal to 1% $\Delta k/k$; a calculated reactivity balance indicating a shutdown margin less conservative than specified in the Technical Specifications; short-term reactivity

increases that correspond to a reactor period of less than 5 seconds or, if sub-critical, an unplanned reactivity insertion of more than 0.5% Δk/k; or occurrence of any unplanned criticality.

5. Failure or malfunction of one or more components which prevents or could prevent, by itself, the fulfillment of the functional requirements of system(s) used to cope with accidents analyzed in the FSAR.

6. Personnel error or procedural inadequacy which prevents or could prevent, by itself, the fulfillment of the functional requirements of systems required to cope with accidents analyzed in the FSAR.

   NOTE: For items a.5. and a.6. reduced redundancy that does not result in a loss of system function need not be reported under this section but may be reportable under items b.2. and b.3. below.

7. Conditions arising from natural or man-made events that, as a direct result of the event, require plant shutdown,

operation of safety systems, or other protective measures required by the Technical Specifications.

8. Errors discovered in the transient or accident analyses, or in the methods used for such analyses as described in the FSAR or in the bases for the Technical Specifications that have or could have permitted reactor operation in a manner less conservative than assumed in the analyses.

9. Performance of structures, systems, or components that requires remedial action or corrective measures to prevent operation in a manner less conservative than that assumed in the accident analyses in the FSAR or Technical Specifications bases; or discovery during plant life of conditions not specifically considered in the FSAR or Technical Specifications that require remedial action or corrective measures to prevent the existence or development of an unsafe condition.

NOTE: This item is intended to provide for reporting of potentially generic problems.

b. Thirty Day Written Reports

The reportable occurrences discussed below shall be the subject of written reports to the appropriate NRC Regional Administrator within thirty days of occurrence of the event. A copy of the written report shall also be sent to the Document Control Desk, U. S. Nuclear Regulatory Commission, Washington, D. C. 20555. The written report shall include, as a minimum, a completed copy of a licensee event report form. Information provided on the licensee event report form shall be supplemented, as needed, by additional narrative material to provide complete explanation of the circumstances surrounding the event.

1. Reactor protection system or engineered safety feature instrument settings which are found to be less conservative than those established by the Technical Specifications, but which do not prevent

the fulfillment of the functional requirements of affected systems.

2. Conditions leading to operation in a degraded mode permitted by a limiting condition for operation or plant shutdown required by a limiting condition for operation.

   NOTE: Routine surveillance testing, instrument calibration, or preventative maintenance which require system configurations, as described in items b.1. and b.2., need not be reported except where test results themselves reveal a degraded mode as described above.

3. Observed inadequacies in the implementation of administrative or procedural controls which threaten to cause reduction of degree of redundancy provided in reactor protection systems or engineered safety feature systems.

4. Abnormal degradation of systems other than those specified in item a.3. above designed to contain radioactive material resulting from the fission process.

NOTE: Sealed sources or calibration sources are not included under this item. Leakage of valve packing or gaskets within the limit for identified leakage set forth in the Technical Specifications need not be reported under this item.

7.5.3 Non-Routine Radiological Reports

a. Radioactive Gaseous Effluent

1. If the calculated dose from the release of gaseous effluents pursuant to ESR 8.1.1.i) exceeds any of the limits in ELCO 8.1.1.h), in lieu of a Licensee Event Report, 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 will be prepared and submitted to the NRC within 30 days.

2. If gaseous waste is discharged without treatment and in excess of the limits, in lieu of a Licensee Event Report, a special report that includes the following information shall be prepared and submitted to the NRC within 30 days:

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

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

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

b. Radioactive Liquid Effluent

1. If the calculated dose from the release of radioactive materials in liquid effluents pursuant to ESR 8.1.2.e) exceeds any of the limits specified in ELCO 8.1.2.g), in lieu of a Licensee Event Report, 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 will be prepared and submitted to the NRC within 30 days.

2. If radioactive liquid waste is discharged without treatment pursuant to ELCO 8.1.2.h), and in excess of the limits, in lieu of a Licensee Event Report, a special report that includes the following information shall be prepared and submitted to the NRC within 30 days:

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

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

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

c. Radioactive Effluents - Total Dose

1. If the limits of ELCO 8.1.5.a) have been exceeded, in lieu of a Licensee Event Report, 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 shall be prepared and submitted to the NRC within 30 days. This special report, as defined in 10CFR 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 40CFR Part 190 has not already been corrected, the special report shall include a request for a variance in accordance with the provisions of 40CFR Part 190. Submittal of the report is considered a timely request, and a variance is granted until staff action on the request is complete.

d. Radiological Environmental Monitoring

1. If the level of radioactivity as a result of plant effluents in an environmental sample medium at a specified location exceeds the reporting levels of Table 8.2-3 of ELCO 8.2.1, when averaged over any calendar quarter, in lieu of a Licensee Event Report, pursuant to Specification ELCO 8.2.1.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 such that the potential annual dose to a member of the public is less than the calendar year limits of Specifications ELCO 8.1.1.h) and ELCO 8.1.2.g) will be prepared and

submitted to the NRC within 30 days. When more than one of the radionuclides in Table 8.2-3 are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{Concentration (1)}}{\text{Reporting Level (1)}} + \frac{\text{Concentration (2)}}{\text{Reporting Level (2)}} + \ldots \geq 1.0$$

When radionuclides other than those in Table 8.2-3 are detected and are the result of plant effluents, a 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 ELCO 8.1.1.i) and ELCO 8.1.2.g). 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 Monitoring Report.

7.6 Environmental Qualification

A. By no later than June 30, 1982, all safety-related electrical equipment in the facility shall be qualified in accordance with the provisions of: Division of Operating Reactors "Guidelines for Evaluating Environmental Qualification of Class IE Electrical Equipment in Operating Reactors" (DOR Guidelines; or, NUREG-0588 "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment", December 1979, to the extent applicable to a gas cooled reactor. Copies of these documents are attached to Order for Modification, of License No. DPR-34 dated October 27, 1980.

B. By no later than December 1, 1980, complete and auditible records must be available and maintained at a central location which describe the environmental qualification method used for all safety-related electrical equipment in sufficient detail to document the degree of compliance with the DOR Guidelines or NUREG-0588, to the extent applicable to a gas cooled reactor. Thereafter, such records should be updated and maintained current as

equipment is replaced, further tested, or otherwise further qualified.

8.0 RADIOLOGICAL AND ENVIRONMENTAL TECHNICAL SPECIFICATIONS

These Radiological and Environmental Technical Specifications apply to the Fort St. Vrain Nuclear Generating Station Unit No. 1. These specifications address the total environmental monitoring program; the radiological effluent disposal system, and the Radiological Monitoring Program. The administrative controls pertinent to these Technical Specifications are found in Section 7.0, "Administrative Controls."

The following frequently used terms are defined to provide a uniform basis for interpretation of the Technical Specifications.

Alternate Liquid Effluent Discharge Path

Alternate liquid discharge path is the effluent discharge path along the Goosequill Ditch through a drainage slough into the St. Vrain River.

Background

Background is the radiation not attributable to plant operations. This includes naturally occurring and fall-out radiation, etcetera.

Blowdown

Blowdown is that effluent released from the open circulating water systems to control the concentration of chemical constituents. The release is normally made from the hot water

side returning to the cooling towers. Provisions have been made to facilitate release of the blowdown from the cold water side, leaving the circulating water cooling tower.

Composite Sample

A composite sample is one comprised of two or more individual samples which are combined for purposes of analysis and is representative of the liquids released.

Continuous Release

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

Dose Equivalent I-131

The dose equivalent I-131 shall be 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" [or in Table E-7 of Nuclear Regulatory Commission Regulatory Guide 1.109, Revision 1, October, 1977].

Equivalent Curies of Kr-88

The equivalent curies of Kr-88 shall be that quantity of Kr-88 (curies) which alone would produce the same whole body dose as the quantity and isotopic mixture of the noble gas isotopes actually present. The whole body dose conversion factors for noble gas isotopes are contained in the Offsite Dose Calculation Manual (ODCM).

Exclusion Area

Exclusion area is approximately one square mile area within the site boundary with the plant located near the center of the area, as defined in Figure 6.3-1.

Member(s) of the Public

Member(s) of the public shall include all persons who are not occupationally associated with the plant. This category does not include employees of the utility, its contractors, or vendors. Also excluded from this category are persons who enter the site to service equipment or to make deliveries. This category does include persons who use portions of the site for recreational, occupational, or other purposes not associated with the plant.

Non-Radioactive Effluent

Non-radioactive effluent is an effluent released from the plant containing only background radioactivity.

Normal Liquid Effluent Discharge Path

Normal effluent discharge path is the effluent discharge path along the Goosequill Ditch, the Jay Thomas Ditch, through the farm pond into the South Platte River.

Offsite Dose Calculation Manual (ODCM)

The Offsite Dose Calculation Manual contains the current methodology and parameters used in the calculation of off-site doses due to radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring alarm/trip setpoints, and in the conduct of the Radiological Environmental Monitoring Program.

Process Control Program (PCP)

The Process Control Program contains the current formula, sampling, analyses, tests, and determinations to be made to ensure that the 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 10CFR Part 20 10CFR Part 71, and Federal and State regulations and other requirements governing the disposal of the radioactive waste.

Radioactive Effluent

Radioactive effluent is an effluent released from the plant containing radioactivity above the background level in the environs of the plant.

Representative Sample

To be representative of the quantities and concentrations of radioactive materials in effluents, samples are collected continuously in proportion to the rate of flow of the effluent stream.

Site Boundary

The site boundary shall be that line beyond which the land is neither owned, or leased, nor otherwise controlled by the licensee.

Solidification

Solidification shall be the conversion of wet wastes into a form that meets shipping and burial ground requirements.

Source Check

A source check shall be the qualitative assessment of channel response when the channel sensor is exposed to a source of increased radioactivity.

Unrestricted Area

Unrestricted area is the area outside the protected area as defined in Figure 6.3-2.

8.1 RADIOLOGICAL EFFLUENT DISPOSAL SYSTEM

Applicability

Applies to the configuration, characteristics, and surveillance of the radiological effluent disposal system.

Objective

To assure that the quantity of radioactive effluent released from the plant is maintained as low as reasonably achievable and in any event within the limits of 10CFR20 and in accordance with 10CFR50.

The results of the radioactivity analyses shall be used in accordance with the methodology and parameters in the ODCM to assure that the concentrations at the point of release are maintained within the limits of these specifications.

Specification ELCO 8.1.1 - Radioactive Gaseous Effluent, Limiting Conditions for Operation

a) Analysis of gaseous effluents from the gas waste surge tanks shall be made on an isotopic basis and releases shall be limited in accordance with the following equation:

$$\Sigma_i r \frac{C_i}{(MPC)_i} \leq 3 \times 10^{10} \frac{cm^3}{sec}$$

Where r is the release rate in std. cc/sec; C_i is the concentration in μCi/std. cc of any

radioisotope, i; and $(MPC)_i$ is the maximum permissible concentration of any radioisotope i, as defined in Table II, Column 1, of Appendix B to 10CFR20 and is in units of microcuries per cubic centimeter.

b) For purposes of calculating permissible release rates by the above formula, MPC for halogens and particulates with half-lives longer than eight days will be reduced by a factor of 700 from their listed value in Table II, Column 1, of Appendix B to 10CFR20.

If conditions a) and b) cannot be met, immediate action shall be taken to terminate release from the gas waste system. If conditions a) and b) cannot be met with this termination of gas waste system releases, the reactor shall be shutdown immediately.

c) The maximum amount of gaseous radioactivity in a gas waste surge tank shall not exceed 370 equivalent curies of Kr-88.

If condition c) cannot be met, immediate action shall be taken to terminate any operations which result in the production of radioactive gases for storage in the tank.

d) Prior to the release of gaseous radioactivity from the gas waste surge tanks, the contents shall be sampled and analyzed for tritium, and a gamma spectral analysis shall be performed to determine that releases will be in compliance with conditions a) and b).

e) Under normal operating conditions, tritium from the hydrogen getters shall be disposed of as solid waste on an adsorbent material.

f) At least one Reactor Building exhaust fan shall be operating whenever releases from the gas waste system are taking place.

g) Gaseous radioactive effluents released from the plant shall be continuously monitored and recorded.

1) During power operation and/or a release from the gaseous waste holdup system, one noble gas monitor, one halogen monitor, and one particulate monitor and their associated recorders shall be operable.

2) If the halogen monitor or the particulate monitor becomes inoperable, gaseous effluent releases from the Reactor Building ventilation system may continue, provided the effluent stream is continuously

monitored with auxiliary sampling equipment.

If the recorder becomes inoperable, releases may continue provided the count rate of each operable monitor is recorded at least once per four hours during actual releases.

3) If both noble gas monitors become inoperable, gaseous effluent releases from the Reactor Building ventilation system, exclusive of releases from the gas waste holdup system, may continue, provided grab samples are taken at least once per eight hours and these samples are analyzed for noble gas activity within 24 hours, or the release is continuously monitored using auxiliary sampling equipment. If the recorder becomes inoperable, releases may continue provided the count rate of each operable monitor is recorded at least once per four hours during actual releases.

4) If both noble gas monitors become inoperable, gaseous effluent releases from the gas waste holdup system may continue, provided that prior to the release:

(a) Duplicate samples of th gas waste holdup system contents are analyzed per ELCO 8.1.1.d) and

(b) At least two technically qualified members of the facility staff independently verify the release rate calculations and discharge valve lineup.

5) If the gaseous waste holdup system effluent flow rate measuring devices or the Reactor Building exhaust stack flow rate measuring device becomes inoperable, releases may continue, provided the flow rate is estimated at least once per four hours. The exhaust stack flow rate is not used in calculating allowable gas waste discharge flow rates; however it can be estimated by observing how many reactor building exhaust fans are operating. Flow rate from the gaseous waste holdup system can be estimated by performing a pressure decay evaluation.

6) If the gas waste header noble gas activity monitor becomes inoperable, gaseous effluent releases may continue, provided a daily grab sample is taken and analyzed within 24 hours for gamma activity or the effluents are diverted to the gas waste surge tank. If the recorder becomes inoperable, releases may continue provided the count rate of each operable monitor is recorded at least once per four hours during actual releases.

7) If during power operation the steam jet air ejector discharge monitor becomes inoperable, the reactor must be shut down within 48 hours. If there is indication of a primary to secondary leak through the steam generator reheater section, a grab sample shall be taken at least once per twelve hours and analyzed for noble gas activity within twenty-four hours.

8) With one or more of the radioactive gaseous effluent monitoring instruments inoperable, best efforts shall be exerted to return the instruments to operable status within thirty days, and, if unsuccessful, the failure to correct the inoperability in a timely

fashion shall be explained in the next Semi-annual Radioactive Effluent Release Report.

h) The air dose due to noble gases released in gaseous effluents at the unrestricted area will be limited to 5 millirad gamma and 10 millirad beta during any calendar quarter and 10 millirad gamma and 20 mrad beta during any calendar year. In addition, the dose to a member of the public due to I-131, tritium, and radioactive particulates with half-lives longer than eight days in gaseous effluents will be limited to 7.5 millirem to any organ during any calendar quarter and 15 millirem to any organ during any calendar year.

i) The dose rate due to radioactive materials released in gaseous effluents from the site to unrestricted areas shall be limited to the following:

For noble gases - less than or equal to 500 millirems per year to the total body and less than or equal to 3,000 millirems per year to the skin.

For I-131, for tritium, and for all radionuclides in particulate form with half-lives greater than eight days - less than or equal to 1,500 millirems per year to any organ.

j) The alarm/trip setpoints of radioactive gaseous effluent activity monitors shall be determined and adjusted in accordance with the Offsite Dose Calculation Manual (ODCM).

Specification ESR 8.1.1 - Radioactive Gaseous Effluent, Surveillance Requirements

a) The gas waste header noble gas activity monitor and exhaust vent monitors shall be channel checked daily, source checked monthly, functionally tested quarterly, and calibrated once per 18 months and following maintenance on the detector system.

b) Automatic vent exhaust high activity blocking and transfer functions of the gaseous waste system, including termination to the Reactor Building ventilation exhaust, shall be tested prior to each controlled release or once a month, whichever is more frequent.

c) Gaseous waste and reactor plant ventilation system flow recorders and flow indicators shall be channel checked during each release, functionally tested quarterly, and calibrated once per 18 months.

NOTE: The channel functional test shall also demonstrate the Control Room alarm annunciation occurs if any of the following conditions exists:

1. Instrument indicates measured levels above the alarm setpoint.

2. Circuit failure.

3. Instrument indicates a downscale failure.

4. Instrument controls not set in operate mode.

The initial channel calibration shall be performed using one or more reference standards certified by the National Bureau of Standards (NBS) or using standards that have been obtained from suppliers that participate in measurement assurance activities with NBS. These standards shall permit calibrating the system over its intended range of energy and measurement. For subsequent channel calibration, sources that have been related to the initial calibration shall be used. (Previously

established calibration procedures may be substituted for this requirement.)

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

d) A sample from the gas waste tank in service shall be obtained weekly and a gamma spectral analysis performed as soon as practicable.

e) The on-line vent iodine/particulate monitor filter shall be analyzed for gross alpha activity, gross beta activity, and principal gamma emitting nuclides once per week to determine that releases are in compliance with ELCO 8.1.1.a) and b). Analysis for Sr-89 and Sr-90 will be done when the gross beta activity exceeds three times the lower limit of detection.

f) The on-line vent iodine/particulate monitor iodine cartridge shall be analyzed weekly for I-131 to determine that releases are in compliance with ELCO 8.1.1.b).

g) The results of the analysis in ESR 8.1.1.e and ESR 8.1.1.f shall be used in accordance with the methodology and parameters in the ODCM to assure that the concentrations at the point of release are maintained within the limits of Specification ELCO 8.1.1.a.

h) The lower limits of detection (LLD) for the radioactive gaseous waste sampling and analysis program shall satisfy the following:

Principal Gamma Emitters (gas)	1×10^{-4} µci/ml
Principal Gamma Emitters (particulate sample)	1×10^{-11} µci/ml
H-3 (gas)	1×10^{-6} µci/ml
I-131 (charcoal sample)	1×10^{-12} µci/ml
Gross Alpha (particulate sample)	1×10^{-11} µci/ml
Sr-89, Sr-90 (particulate sample)	1×10^{-11} µci/ml
Noble Gas Monitor	1×10^{-6} µci/ml
Gross Beta (particulate sample)	1×10^{-11} µci/ml

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:

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

Where:

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

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

E is the counting efficiency, as counts per disintegration,

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

2.22×10^6 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.

The principal gamma emitters for which the lower limits of detection (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 Semi-annual Radioactive Effluent Release Report pursuant to Specification 7.5.1.e.

i) Dose Calculations Cumulative dose contributions for noble gases, I-131, tritium, and radionuclides in particulate form with half-lives longer than eight

days for the current calendar quarter and current calendar year, shall be determined in accordance with the ODCM at least once per 31 days and reported to the Nuclear Regulatory Commission as described in Sections 7.5.1 and/or 7.5.3.

Basis for Specification ELCO 8.1.1

The major source of gaseous radioactive waste will be the regeneration of the low temperature filter adsorbers of the helium purification system. The design objective for the plant's radioactive gas releases is 4160 curies per year; 4120 curies of this are predicted to be long-lived Kr-85 (half-life is 10.8 years).

Redundant noble gas, iodine, and particulate monitors are available; during power operations and/or release from the gas waste holdup system, only one of each type of monitor is required to be operational.

The limiting value for radioactive gaseous release is based on (1/annual average dilution factor). Tritium evolving from hydrogen getter utilization will normally be disposed of as solid waste. Under unusual conditions, such as a steam generator tube leak, it may be necessary to release tritium to the atmosphere.

The limitation on the curie inventory of a gas waste surge tank is to limit potential site exclusion radius annual

whole body doses to less than 0.5 rem in the event of a tank rupture.

It is the intent that through these operating limits, the annual releases from this plant will be as low as reasonably achievable. At the same time, the licensee is permitted flexibility of operation, compatible with considerations of health and safety, to assure that the public is provided a dependable source of power, even under unusual operation conditions, which may temporarily result in releases higher than small fractions of, but still within, limits specified in 20.106 of 10CFR20. It is expected that in using this operational flexibility under unusual operating conditions, the licensee will exert his best efforts to keep levels of radioactive material in effluents as low as reasonably achievable.

Specification ELCO 8.1.2 - Radioactive Liquid Effluent, Limiting Conditions for Operation

a) The maximum instantaneous release rate of radioactive liquid effluents from the site shall be such that the concentration of radionuclides in the cooling tower blowdown does not exceed the values specified in Table II, Column 2, of Appendix B to 10CFR20. The corresponding limit for dissolved and entrained gases is 2×10^{-4} microcuries per milliliter. If plant conditions exist such that the

concentration of radioactivity in the liquid effluent from the plant exceeds the specified limits, immediate action shall be taken to terminate the release.

b) 1) Prior to release, two representative samples of liquid effluent from the radioactive liquid waste system shall be analyzed for gross alpha activity, gross beta activity, principal gamma emitters, I-131, tritium, dissolved and entrained gases (gamma emitters), and the samples will be analyzed for other radioisotopes of concern, as identified by previous operating experience. A quarterly composite sample will be analyzed for Sr-89 and Sr-90.

The results of the analyses in ELCO 8.1.2 b)1) shall be used in accordance with the methodology and parameters in the ODCM to ensure that the concentrations at the point of release are maintained within the limits of specification ELCO 8.1.2 a).

2) The lower limits of detection (LLD) for the radioactive liquid waste sampling and analysis program shall satisfy the following:

Principal Gamma Emitters	5×10^{-7} µci/ml
Dissolved and Entrained Gases (Gamma Emitters)	1×10^{-5} µci/ml
H-3	1×10^{-5} µci/ml
I-131	1×10^{-6} µci/ml
Gross Alpha	1×10^{-7} µci/ml
Sr-89, Sr-90 (Composite)	5×10^{-8} µci/ml

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:

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

Where:

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

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

E is the counting efficiency, as counts per disintegration,

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

2.22×10^6 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.

3) 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 Semi-annual Radioactive Effluent Release Report pursuant to Specification 7.5.1.e.

c) All liquid effluent releases from the radioactive liquid waste holdup system shall be continuously monitored by two activity monitors and their associated recorder. Equipment shall be operable to automatically terminate the release on high specific activity or low cooling water blowdown flow and give a Control Room alarm.

d) If one or both of the two activity monitors become inoperable, liquid effluent releases may continue, provided that prior to initiating the release, at least two technically qualified members of the facility staff independently verify the release rate calculations and discharge valve lineup. With one or more of the radioactive liquid effluent monitoring instruments inoperable, best efforts shall be exerted to return the instruments to operable status within thirty days, and if unsuccessful, the failure to correct the inoperability in a timely fashion shall be explained in the next Semi-annual Radioactive Effluent Release Report.

e) If the recorder associated with the two activity monitors becomes inoperable, liquid effluent releases may continue, provided the count rate of each operable monitor is recorded at least once per four hours during actual releases.

Best efforts shall be exerted to return the recorder to operable status within thirty days, and if unsuccessful, the failure to correct the inoperability in a timely fashion shall be explained in the next Semi-annual Radioactive Effluent Release Report.

f) If the blowdown flow measuring devices become inoperable, liquid effluent releases may continue, provided the flow rate is estimated at least once per four hours during actual releases. Flow rate can be estimated using the Parshall Flume in the liquid discharge pathway.

g) The dose or dose commitment to a member of the public from radioactive materials in liquid effluents released from each reactor unit to unrestricted areas shall be limited as follows:

1) During any calendar quarter to less than or equal to 1.5 millirems to the total body and to less than or equal to 5 millirems to any organ, and

2) During any calendar year to less than or equal to 3 millirems to the total body and to less than or equal to 10 millirems to any organ.

h) The liquid radwaste treatment system shall be utilized to the maximum extent practicable to process radioactive liquids prior to their discharge. Discharge of liquid that has not been treated shall be reported as described in Section 7.5.3.

i) The alarm/trip setpoints of radioactive liquid effluent activity monitors shall be determined and adjusted in accordance with the Offsite Dose Calculation Manual (ODCM).

j) During power operations, one or more of the Gas Waste Compressor Cooling Water Activity Monitors and their associated recorder shall be operable.

If both of the activity monitors become inoperable, effluent releases via this pathway may continue provided that at least once per twelve hours, grab samples are collected and analyzed for noble gas activity.

If the associated recorder becomes inoperable, effluent releases may continue provided the count rate of each operable activity monitor is recorded at least once per four hours.

Best efforts shall be exerted to return the recorder to operable status within thirty days, and, if unsuccessful, the failure to correct the inoperability in a timely fashion shall be explained in the next Semi-annual Radioactive Effluent Release Report.

If radioactivity is detected at greater than two times background levels by the activity monitors the Service Water System shall be sampled for radioactivity once per 24 hours until the level detected is less than two times background.

Specification ESR 8.1.2 - Radioactive Liquid Effluent, Surveillance Requirements

a) The level alarms and pump interlocks on the two liquid waste receiver tanks and monitoring tank shall be tested once per year.

b) The liquid effluent discharge blocking valve shall be functionally tested prior to each release or once a month, whichever is more frequent.

c) The activity monitors of the liquid effluent discharge line and the Gas Waste Compressor Cooling Water System, and the low cooling water blowdown flow switch shall be functionally tested quarterly. The liquid effluent activity monitors shall be source checked prior to each release; channel checked during each release, and calibrated once per 18 months and following maintenance on the detector system. The Gas Waste Compressor Cooling Water System monitors shall be channel checked weekly, source checked monthly, and calibrated once per 18 months and following maintenance on the detector system.

d) Flow rate monitors and activity recorders shall be channel checked during each release, functionally tested quarterly, and calibrated once per 18 months.

NOTE: The channel functional test shall also demonstrate that Control Room alarm annunciation occurs if any of the following conditions exist:

1. Instrument indicates measured levels above the alarm setpoint.

2. Circuit failure.

3. Instrument indicates a downscale failure.

4. Instrument controls not set in operate mode.

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

Channel check shall consist of verifying indication of flow during periods of release. Channel check shall be made at least once per 24 hours on days on which

continuous, periodic, or batch releases are made.

e) 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 at least once per 31 days and reported to the Nuclear Regulatory Commission as described in Section 7.5.1 and/or 7.5.3.

Basis for Specification ELCO 8.1.2

Liquid waste from the radioactive effluent discharge system is diluted in the cooling tower blowdown flow. Interlocks between the waste treatment system discharge valve, the discharge line activity monitors, and the cooling tower blowdown flow meter will terminate the discharge of waste in the event of high activity and/or low blowdown flow.

It is expected that plant releases of radioactive materials and effluents will be small fractions of the limits specified in 10CFR20.106 and will be held as near to background levels as reasonably achievable.

The design objective of the liquid waste treatment system was to limit annual liquid waste discharge from the plant to 0.2 curies (excluding tritium and dissolved noble gas).

The liquid waste discharged from the plant will normally flow to a farm pond (Goosequill Pond) on the north end of the Public Service Company property near the confluence of the St. Vrain Creek and the South Platte River. The Goosequill Pond drains to the South Platte River. An alternate flow path is to a slough which drains to the St. Vrain Creek. The Radiological Environmental Monitoring program directs special attention to these areas so that possible buildup of radioactivity will be detected. It is expected that releases of radioactive materials in effluents will be only small fractions of the limits specified in 20.106 of 10CFR20. At the same time, flexibility of operation, compatible with considerations of health and safety, assure that the public is provided a dependable source of power, even under unusual operating conditions which may temporarily result in releases higher than small fractions of, but still within, the limits specified in 20.106 of 10CFR20.

It is expected that, in using this operational flexibility under unusual operating conditions, the licensee will exert his best efforts to keep levels of radioactivity in effluents as low as reasonably achievable.

Specification ELCO 8.1.3 - Reactor Building Sump Effluent, Limiting Conditions for Operation

a) The discharge from the Reactor Building sump pumps shall be continuously sampled, filtered, and the flow limited to less than or equal to 10 gallons per minute when operated in the automatic mode. An analysis shall be performed as soon as practical on the samples as described in ELCO 8.1.2.b).

b) If effluent discharges from the Reactor Building sump at flow rates greater than 10 gallons per minute are to be made, two grab samples shall be taken and analyzed per ELCO 8.1.2.b) prior to the start of the discharge. During the discharge, the pump outlet shall be continuously sampled. An analysis shall be performed as soon as practical on the sample per ELCO 8.1.2.b).

c) Effluent discharge from the Reactor Building sump shall not occur simultaneously with discharge from the radioactive liquid waste system.

d) All liquid effluent releases from the Reactor Building sump shall be continuously monitored by two activity monitors and their associated recorder. Equipment shall be operable to automatically terminate the release on high specific activity or low cooling water blowdown flow.

e) If one or both of the two activity monitors become inoperable, liquid effluent releases may continue, provided that grab samples are taken every 12 hours and analyzed for principal gamma emitters, I-131, and tritium. With one or more of the radioactive liquid effluent monitoring instruments inoperable, best efforts shall be exerted to return the instruments to operable status within thirty days and, if unsuccessful, the failure to correct the inoperability in a timely fashion shall be explained in the next Semi-annual Radioactive Effluent Release Report.

f) If the recorder associated with the two activity monitors becomes inoperable, liquid effluent releases may continue, provided the count rate of each operable monitor is recorded at least once per four hours during actual releases.

Best efforts shall be exerted to return the recorder to operable status within thirty days, and if unsuccessful, the failure to correct the inoperability in a timely fashion shall be explained in the next Semi-annual Radioactive Effluent Release Report.

g) If the blowdown flow measuring device becomes inoperable, liquid effluent releases may continue,

provided the flow rate is estimated at least once per four hours during actual releases.*

h) If the continuous sampler should be inoperable, automatic discharge from the sump would be permitted provided daily samples are taken from the sump and analyses made as soon as practical as described in ELCO 8.1.2.b).

Specification ESR 8.1.3 - Reactor Building Sump Effluent, Surveillance Requirements

a) An analysis per ELCO 8.1.2.b) of the Reactor Building sump composite sample shall be made three times per week.

b) The continuous composite sampler will be channel checked daily, functionally tested quarterly, and calibrated once per 18 months, .

*Flow rate can be estimated using the Parshall Flume in the liquid discharge path.

Basis for Specification ELCO 8.1.3

Limiting the discharge flow rate from the Reactor Building sump to less than or equal to 10 gallons per minute provides for effluent monitoring sensitivity to assure conformance with the limits of 10CFR20, in the event that the sump should contain any radioactive liquid.

Sampling and analysis performed prior to discharging from the sump at flow rates greater than 10 gallons per minute and prohibiting discharge to the radioactive liquid waste discharge line simultaneously with a discharge from the radioactive liquid waste system will assure conformance with the limits of 10CFR20.

Specification ELCO 8.1.4 - Solid Radioactive Waste, Limiting Conditions for Operation

The solid radwaste system shall be used in accordance with a Process Control Program, as appropriate, to process wet radioactive wastes to meet shipping and burial ground requirements.

If the provisions of the Process Control Program are not satisfied, shipments of solid radioactive wastes from the site shall be suspended immediately.

Specification ESR 8.1.4 - Solid Radioactive Waste, Surveillance Requirements

The Process Control Program shall be used to verify the solidification of at least one representative test specimen from at least every tenth batch of each type of wet radioactive waste (e.g., filter sludges, spent resins, etc.).

a) If any test specimen fails to verify solidification, the solidification of the batch under test shall be suspended until such time as additional test specimens can be obtained, alternative solidification parameters can be determined in accordance with the Process Control Program, and a subsequent test verifies solidification. Solidification of the batch may then be resumed using the alternative solidification parameters determined by the Process Control Program.

b) If the initial test specimen from a batch of waste fails to verify solidification, the Process Control Program shall provide for the collection and testing of representative test specimens from each consecutive batch of the same type of wet waste until at least three consecutive initial test specimens demonstrate solidification. The Process Control Program shall be modified as required to

assure solidification of subsequent batches of waste.

Basis for Specification ELCO 8.1.4

This specification implements the requirements of 10CFR 50.36a and General Design Criterion 60 of Appendix A to 10CFR 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, mixing and curing times.

Specification ELCO 8.1.5 - Total Dose, Limiting Conditions for Operation

a) The annual (calendar year) dose or dose commitment to any member of the public due to releases of radioactivity and to radiation from uranium fuel cycle sources shall be limited to less than or equal to 25 millirems to the total body or any organ, except the thyroid, which shall be limited to less than or equal to 75 millirems.

b) If the calculated doses from the release of radioactive materials in liquid or gaseous effluents exceed twice the limits of Specification ELCO 8.1.1.h) or ELCO 8.1.2.g), calculations shall

be made, including direct radiation contributions from the reactor unit and from outside storage tanks to determine whether the limits of ELCO 8.1.5.a) have been exceeded. The results of these calculations shall be reported to the Nuclear Regulatory Commission as described in Section 7.5.3.

Specification ESR 8.1.5 - Total Dose, Surveillance Requirements

a) Cumulative dose contributions from gaseous and liquid effluents shall be determined in accordance with Specifications ESR 8.1.1 and ESR 8.1.2 and in accordance with the methodology and parameters in the ODCM.

b) Cumulative dose contributions from direct radiation from the reactor unit and from radwaste outside storage tanks shall be determined in accordance with the methodology and parameters in the ODCM. This requirement is applicable only under the conditions set forth in Specification ELCO 8.1.5.

Basis for Specification ELCO 8.1.5

This specification is provided to meet the dose limitations of 40CFR 190 that have now been incorporated into 10CFR 20 by 46FR 18525. The specification requires the preparation and submittal

of a Special Report whenever the calculated doses from plant radioactive effluents exceed twice the design objective doses of Appendix I of 10 CFR 50. 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 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 with the exception that dose contributions from other nuclear fuel cycle facilities at the same site or within a radius of 8 km must be considered. If the dose to any Member of the Public is estimated to exceed the requirements of 40 CFR 190, the Special Report with a request for a variance (provided the release conditions resulting in violation of 40 CFR 190 have not already been corrected), in accordance with the provisions of 40 CFR 190.11 and 10 CFR 20.405c, is considered to be a timely request and fulfills the requirements of 40 CFR 190 until NRC staff action is completed. The variance only relates to the limits of 40 CFR 190, and does not apply in any way to the other requirements for dose limitation of 10 CFR 20, as addressed in Specification ELCO 8.1.1. 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.

8.2 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Applicability

Applies to the characteristics and surveillance of the Radiological Environmental Monitoring Program.

Objective

A Radiological Environmental Monitoring Program shall be conducted to provide data on levels of radiation and radioactive material in the site environs. The program shall discriminate between those changes in environmental radiation and radioactivity levels resulting from radioactive releases from the nuclear generating station and those changes attributed to other sources, such as world-wide fallout from weapons testing. The program shall evaluate the relationship between quantities of radioactive material released in liquid and gaseous effluents, and resultant radiation doses to individuals from principal pathways of exposure. The results of this program shall be used to verify the effectiveness of in-plant measures applied to control the release of radioactive materials.

Specification ELCO 8.2.1 - Radiological Environmental Monitoring Program, Limiting Conditions for Operation

a) A Radiological Environmental Monitoring Program shall be conducted in accordance with Table 8.2-1.

b) The radiological environmental monitoring samples shall be collected pursuant to Table 8.2-1 from the specific locations given in the table and figure(s) in the ODCM, and shall be analyzed pursuant to the requirements of Table 8.2-1 and the detection capabilities required by Table 8.2-2.

c) If a confirmed measured radionuclide concentration in an environmental sampling medium averaged over any quarter sampling period exceeds the reporting level given in Table 8.2-3, a special report shall be submitted to the Nuclear Regulatory Commission within 30 days as described in Section 7.5.3.

d) Analytical techniques used shall be such that the detection capabilities in Table 8.2-2 are achieved.

e) Radiological sampling station locations shall be delineated in maps and in written descriptions contained in each Annual Radiological Environmental Monitoring Report. All changes in sampling station locations which occur through the year shall be explained in each annual report.

f) Deviations are permitted from the required sampling schedule 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, every effort shall be made to complete corrective action prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the annual report.

If milk or fresh leafy vegetable samples are unavailable from one or more of the sample locations required by Table 8.2-1, locations for obtaining replacement samples shall be identified and added to the radiological environmental monitoring program within 30 days. The specific locations from which samples were unavailable may then be deleted from the monitoring program. In lieu of a Licensee Event Report and pursuant to Specification 7.5.1, the cause of the unavailability of samples and the new location(s) for obtaining replacement samples shall be identified in the next Annual Radiological Environmental Monitoring Report. The report shall also include a revised figure(s) and table for the ODCM reflecting the new location(s).

g) Analyses shall be performed on radioactive materials supplied as part of an interlaboratory comparison program that has been approved by the Nuclear Regulatory Commission.

1) If analyses are not being performed as required, corrective actions taken to

prevent a recurrence shall be reported to the Nuclear Regulatory Commission in the Annual Radiological Environmental Monitoring Report.

2) The interlaboratory comparison program shall be described in the ODCM. 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.

h) A census shall be conducted annually during the growing season to determine the location of the nearest resident, the nearest milk animal, and the nearest garden greater than 50 square meters (500 square feet) producing broad leaf vegetation in each of the 16 meteorological sectors within a distance of 8 kilometers (5 miles).

1) When the land-use census identifies a location(s) that yields a calculated dose or dose commitment greater than the values currently being calculated in Specification ESR 8.1.1.h), in lieu of a Licensee Event Report, the new location(s) will be identified in the next Semi-annual

Radioactive Effluent Release Report, pursuant to Specification 7.5.1.e.

2) If it is learned from this census that the milk animals or gardens are present at a location which yields a calculated dose or dose commitment 20% greater than those previously calculated, or if the census results in changes in the sampling location, a written report shall be submitted in the next annual report submitted per Specification 7.5.1, identifying the new location (distance and direction). Milk animals or garden locations resulting in 20% higher calculated doses shall be added to the monitoring program within 30 days or as soon as practicable.

3) The sampling location (excluding the control sample location) having the lowest calculated dose may then be dropped from the surveillance program at the end of the grazing or growing season during which the census was conducted. Any location from which milk can no longer be obtained may be dropped from the monitoring program after notifying the Nuclear Regulatory Commission in writing that milk samples are no longer

obtainable at that location. The results of the land-use census shall be reported in the annual report submitted per Specification 7.5.1.

Basis for Specification ELCO 8.2.1

A pre-operational environmental radiation surveillance program for the Fort St. Vrain Station environs has been conducted for the Public Service Company of Colorado by Colorado State University. Continuous operation of this program since March of 1969 has provided baseline data which will be utilized as control values for statistical analysis of the results of the operational radiological surveillance program.

These Environmental Technical Specifications specify the requirements for the Radiological Environmental Monitoring Program which will continue to be the responsibility of Public Service Company of Colorado. Additional monitoring in the vicinity of the facility is conducted or coordinated by other organizations, notably the Colorado Department of Health.

The results of the radiological environmental monitoring are intended to supplement the results of the radiological effluent monitoring 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. Thus, the specified environmental monitoring program provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides which lead to the highest potential radiation exposures to individuals resulting from the station operation. Sampling locations were selected on the basis of local meteorological conditions and airborne concentrations calculated from those conditions, proximity to the reactor of residences and communities, and other considerations in accordance with Table 8.2-1. Each radiological environmental monitoring report shall contain a map and tables which present detailed information regarding sampling station locations.

The sampling and collection frequencies indicated in Table 8.2-1 were selected on the basis of filter loading, crop harvest time, calculated potential human doses from plant effluents, and other considerations.

Samples will be analyzed in accordance with Table 8.2-1 for radionuclides which may be attributable to effluents released from the facility. Table 8.2-2 indicates the achievable detection capabilities for environmental sample analysis based upon the instrumentation and analytical procedures utilized.

The requirement for participation in the Environmental Protection Agency cross-check program, or similar program, is based on the need for independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices as part of the quality assurance program for environmental monitoring, in order to demonstrate that the results are reasonably valid.

The census of milk animals and gardens producing broad leaf vegetation is based on the requirement in Appendix I of 10CFR Part 50 to "Identify changes in the use of unrestricted areas (e.g., for agricultural purposes) to permit modifications in monitoring programs for evaluating doses to individuals from principal pathways of exposure." The consumption of milk from animals grazing on contaminated pasture and of leafy vegetation contaminated by airborne radioiodine is a major potential source of exposure. Samples from milk animals are considered a better indicator of radioiodine in the environment than vegetation.

The 50 square meter garden, considering 20% used for growing broad leaf vegetation (i.e., similar to lettuce and cabbage), and a vegetation yield of 2 kilograms per square meters, will produce the 26 kilograms per year assumed in Regulatory Guide 1.109 for child consumption of leafy vegetation.

TABLE 8.2-1

OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples and Locations	Sampling Collection Frequency	Type and Frequency of Analysis
AIRBORNE			
Tritium Oxide Radioiodine and Particulates	Samples from seven locations: Four samples from off-site locations (in different sectors) of the highest calculated annual average ground level D/Q and airborne X/Q. One sample from the vicinity of a community having the highest calculated annual average ground level D/Q. Two samples from control location 15 to 30 kilometers (10 to 20 miles) distant and in the least prevalent wind direction.	Continuous sampler operation with sample collection weekly or as required by dust loading, whichever is more frequent.	Radioiodine Canister: Analyze weekly for I-131 liquid scintillation counting for tritium on water vapor extracted from silica gel on each sample collected. Particulate Sampler: Gross beta radioactivity following filter change, composite (by location) for gamma isotopic quarterly. [a]
DIRECT RADIATION	Forty stations with two or more dosimeters or one instrument for measuring and recording dose rate continuously to be placed as follows: 1) an inner ring of stations in the general area of the site boundary and an outer ring in the 4 to 5 mile range from the site with a station in each sector of each ring (16 sectors x 2 rings = 32 stations). The balance of the stations, eight, shall be placed in special interest areas such an population centers, nearby residences, schools, and in two or three areas to serve as control stations.	Quarterly exposure.	Gamma dose quarterly.
WATERBORNE			
Surface	One sample upstream, each stream, one sample downstream.	Samples collected monthly.	Gamma isotopic analysis and tritium monthly.
Surface (Farm Pond)	One sample in immediate area of discharge.	Composite sample over one week period. The weekly composites will be combined for the monthly sample.	Gamma isotopic analysis and composite for tritium monthly.

[a] If gross beta activity in air or water is greater than ten times the yearly mean of control sample for any medium, gamma isotopic analysis should be performed on the individual samples.

TABLE 8.2-1

OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples and Locations	Sampling Collection Frequency	Type and Frequency of Analysis
Ground	Samples from two sources most likely to be affected.	Quarterly	Gamma isotopic and tritium.
Drinking	One sample from the nearest water supply which could be affected by facility's discharge.	Composite sample over two week period.	Composite for tritium, gross beta, and gamma isotopic analyses every two weeks.
	One sample from a control location.		
Sediment from Shoreline	One sample from downstream area with existing or potential recreational value.	Semi-annually	Gamma isotopic analyses semi-annually.
INGESTION			
Milk	Samples from milking animals in all locations, up to a total of three locations, within 5 kilometers.	Semi-monthly when animals are on pasture, monthly at other times.	Gamma isotopic and I-131 analysis semi-monthly when animals are on pasture; monthly at other times.
	One sample from milking animals in each of three areas between 5 to 8 kilometers distant having the highest dose potential. [b]		
	One sample from milking animals at a control location (15 to 30 kilometers) distant and in the least prevalent wind direction).	Semi-monthly when animals are on pasture, monthly at other times.	Gamma isotopic and I-131 analysis semi-monthly when animals are on pasture; monthly at other times.
Aquatic Biota	Sample fish in vicinity of discharge point, upstream and downstream.	Sample semi-annually.	Gamma isotopic analyses.
Food Products	One sample of each principal class of food products from any area which is irrigated by water in which liquid plant wastes have been discharges.	At time of harvest.	Gamma isotopic analyses.

[b] The dose shall be calculated for the maximum organ and age group using the methodology contained in Regulatory Guide 1.109 and the actual parameters particular to the site.

TABLE 8.2-2

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

LOWER LIMIT OF DETECTION[a]

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

NOTE: This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall also be identified and reported.

TABLE 8.2-3

REPORTING LEVELS FOR NONROUTINE OPERATING REPORTS

Analysis	Water (pCi/ℓ)	Airborne Particulate or Gas (pCi/m³)	Fish (pCi/kg,wet)	Milk (pCi/ℓ)	Broad Leaf Vegetation (pCi,kg, wet)
	REPORTING LEVEL (RL)				
H-3	2×10^{4}[a]				
Mn-54	1×10^{3}		3×10^{4}		
Fe-59	4×10^{2}		1×10^{4}		
Co-58	1×10^{3}		3×10^{4}		
Co-60	3×10^{2}		1×10^{4}		
Zn-65	3×10^{2}		2×10^{4}		
Nb-95,Zr-95	4×10^{2}				
I-131	2	0.9		3	1×10^{2}
Cs-134	30	10	1×10^{3}	60	1×10^{3}
Cs-137	50	20	2×10^{3}	70	2×10^{3}
Ba-140,La-140	2×10^{2}			3×10^{2}	

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

[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:

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

Where:

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

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

E is the counting efficiency, as counts per disintegration,

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

2.22×10^6 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 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 LLD's 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 LLD's unachievable. In such cases, the contributing factors shall be identified and described in the

Annual Radiological Environmental Monitoring Report pursuant to Specification 7.5.1.d of Appendix A of the Fort St. Vrain Technical Specifications.

[b] Lower limit of detection for drinking water samples. If no drinking water pathway exists, the LLD of gamma isotopic analysis may be used.