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March 7, 2016

SUBJECT: WESTINGHOUSE LICENSE RENEWAL APPLICATION REVISED CHAPTERS (TAC #: L33317)

Westinghouse Electric Company LLC (Westinghouse) is pleased to submit revised chapters for Integrated Safety Analysis (Chapter 4.0), Chemical Safety Program (Chapter 7.0) and Environmental Protection (Chapter 10.0) to replace the chapters submitted in the SNM-1107 renewal application dated December 17, 2014.

If you have any questions, please contact me at (803) 647-3338.

Nancy Blair Parr

Nancy Blair Parr, Manager
Licensing
Westinghouse Columbia Fuel Fabrication Facility
Docket 70-1151 License SNM-1107

Enclosures: Chapter 4.0 Integrated Safety Analysis (ISA) – 10 pages
Chapter 7.0 Chemical Safety Program – 4 pages
Chapter 10.0 Environmental Protection – 10 pages

cc:

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CHAPTER 4.0

INTEGRATED SAFETY ANALYSIS (ISA)

4.1 ISA PROGRAM STRUCTURE

The Columbia Fuel Fabrication Facility (CFFF) develops and maintains an Integrated Safety Analysis (ISA) and ISA Summary for the site. The ISA is a systematic analysis to identify facility and external hazards and their potential for initiating accident sequences, the potential accident sequences, their likelihood and consequences, and the Items Relied On For Safety (IROFS).

4.1.1 The ISA

An ISA begins as a baseline document. This document identifies equipment and operations presenting hazards, and the control features that are relied upon for protection of the environment, and the health and safety of facility employees and the neighboring public.

The ISA and ISA Summary are developed in accordance with 10 CFR Part 70 regulations and methods acceptable to CFFF Management as documented in the ISA Handbook and approved procedures. Depending on when a specific system ISA was developed during the multiyear CFFF ISA development process, any specific ISA may or may not embrace a given activity described in the Handbook. Each ISA is performed in accordance with the requirements identified in this license application.

In general, the ISA provides:

- a description of the structures, equipment, and process activities at the facility,
- an identification and systematic analysis of hazards at the facility,
- a comprehensive identification of potential accident/event sequences that would result in unacceptable consequences, and the expected magnitudes and likelihoods of those sequences,
- an identification and description of safety systems that are relied upon to limit or prevent potential accidents or mitigate their consequences; and,
- an identification of management measures taken to ensure the availability and reliability of identified safety systems.

The ISA is written in an appropriate level of detail for the complexity of the process and identifies radiological hazards related to possessing and processing licensed material at the CFFF as well as chemical hazards of licensed material and hazardous chemicals produced from licensed material. The ISA includes facility hazards that could affect the safety of licensed materials. The ISA also identifies potential accident sequences caused by process upset situations and credible external events.

Credible accident sequences will be identified using any of the methodologies listed in NUREG-1513, "Integrated Safety Analysis Guidance Document" (e.g. Hazard and Operability Analysis (HAZOP), What-if/checklist analysis, Failure Modes and Effects Analysis (FMEA), Fault Tree/Event Tree Analysis, etc.).

The ISA is performed by a team consisting of members with expertise in the safety disciplines being evaluated and with members familiar with the process, engineering, and operations involved. Updates to the ISA's and the ISA Summaries are performed by individuals with the same levels of expertise as the original team members.

Figure 4.1 outlines the Accident Sequence Risk Evaluation Process. Table 4.1 is the Risk Analysis Table and represents the acceptance criteria used in the ISA Documents. The criteria for determining event consequences are shown in Table 4.2. The criteria for determining the indices for the likelihood of initiating events and IROFS failures are defined in Table 4.3 and Table 4.4 which are extracted from the Handbook. Alternatively, published failure data can also be utilized.

4.1.1.1 System ISAs

Baseline ISAs for the following systems make up the CFFF ISA:

(a) Site and Structures;
(b) Plant Ventilation;
(c) Chemicals Receipt, Handling, and Storage;
(d) Nuclear Material Storage;
(e) ADU Conversion;
(f) ADU Bulk Powder Blending;
(g) Pelleting;
(h) ADU Fuel Rod Manufacturing;
(i) Burnable Absorber Fuel Processing;
(j) Burnable Absorber Fuel Rod Manufacturing;
(k) Erbia;
(l) Final Assembly;
(m) Scrap Uranium Processing;
(n) UF_6 Cylinder Washing;
(o) Safe Geometry Dissolver;
(p) Solvent Extraction;
(q) Uranyl Nitrate Bulk Storage Tanks;
(r) Hoods and Containment;
(s) URRS Wastewater Treatment;
(t) Low Level Radioactive Waste Processing; and,
(u) Laboratories.

4.1.2 The ISA Summary

An ISA Summary is generated from information extracted directly from the ISA. An ISA Summary (1) presents key aspects of the ISA in sufficient detail to enable an independent overview of the subject systems, and (2) provides reasonable assurance that operation of these systems will not lead to a situation that would exceed the performance requirements specified in Section 70.61 of the 10 CFR Part 70 regulations. ISA Summaries are submitted to the NRC and are updated as appropriate to reflect any safety-significant changes.

4.1.2.1 ISA Summary Content

The ISA Summary includes the following information:

(a) Site

The site description focuses on those factors that could affect safety, such as geography, meteorology (*e.g.*, high winds and flood potential), seismology, demography, and nearby industrial facilities and transportation routes.

(b) Facility

The facility description focuses on features that could affect potential accidents and their consequences. Examples of such features include facility location, facility design information, and the location and arrangement of structures on the facility site.

(c) Processes, Hazards, and Accident Sequences

The process description addresses each process that was analyzed as part of the ISA. This description also includes a discussion of the hazards (and interactions of hazards) for each process and the accident sequences that could result from such hazards, and for which the unmitigated consequences could exceed the performance requirements of 10 CFR 70.61.

(d) Demonstration of Compliance with 10 CFR 70.61

For each applicable process, the following information, developed in the ISA, is presented to demonstrate compliance with the performance requirements of 10 CFR 70.61:

1. Postulated consequences and comparison to the consequence levels identified in the performance requirements, as well as information (such as inventory and release path factors) supporting the results of the consequence evaluation.

2. Information showing how CFFF established the likelihoods of accident sequences that could exceed the performance requirements of 10 CFR 70.61.
3. Information describing how designated Items Relied on for Safety (IROFS) protect against accident sequences that could exceed the performance requirements of 10 CFR 70.61.
4. Information on management measures applied to IROFS.
5. Information on how the criticality monitoring requirements of 10 CFR 70.24 are met.
6. When applicable, how the baseline design criteria of 10 CFR 70.64 are addressed.

(e) Team Qualifications and ISA Methods

A discussion of the ISA Team's qualifications and ISA methods used is presented. Specific examples of the application of ISA methods is included as necessary to demonstrate appropriate selection and use.

4.1.2.2 ISA and ISA Summary Maintenance

The ISAs and ISA Summary are maintained current through implementation of the Configuration Management program described in Section 3.1 of this License Application and in accordance with 10CFR70.72. All subsequent changes that might affect the Baseline ISA are reviewed by the same safety disciplines that were involved in preparation of the Baseline ISA. If safety analyses are required for the change, they are performed to the current standards required for the Baseline ISA. Summary details of the change, including required approvals, are documented on a Configuration Change Control Form that is maintained as record associated with the applicable Baseline ISA, thus providing a substantially complete "living" framework for the facility safety basis.

New or additional IROFS will be designated and appropriate management measures will be applied if necessary resulting from the evaluation of configuration control changes to the facility or its operation. Existing IROFS and the management measures associated with them will be evaluated for adequacy if they are impacted by configuration changes to ensure that the risk associated with a previously analyzed accident sequence remains acceptable and to designate additional or different IROFS, if necessary.

ISA Summaries are submitted to the NRC Licensing Staff, and are maintained as current, stand-alone documents. Whenever CFFF regulatory management makes a decision to approve a substantive change to the ISA Summary, requiring NRC pre-approval under 10CFR70.72., the NRC Licensing Project Manager is apprised, and an amendment request is submitted. Whenever the CFFF makes a change to the ISA Summary that does not require NRC pre-approval under 10CFR70.72, changed pages to update the ISA Summary are submitted to the NRC annually, within 30 days after the end of the calendar year during which the change occurred.

Figure 4.1 Accident Sequence Risk Evaluation Process

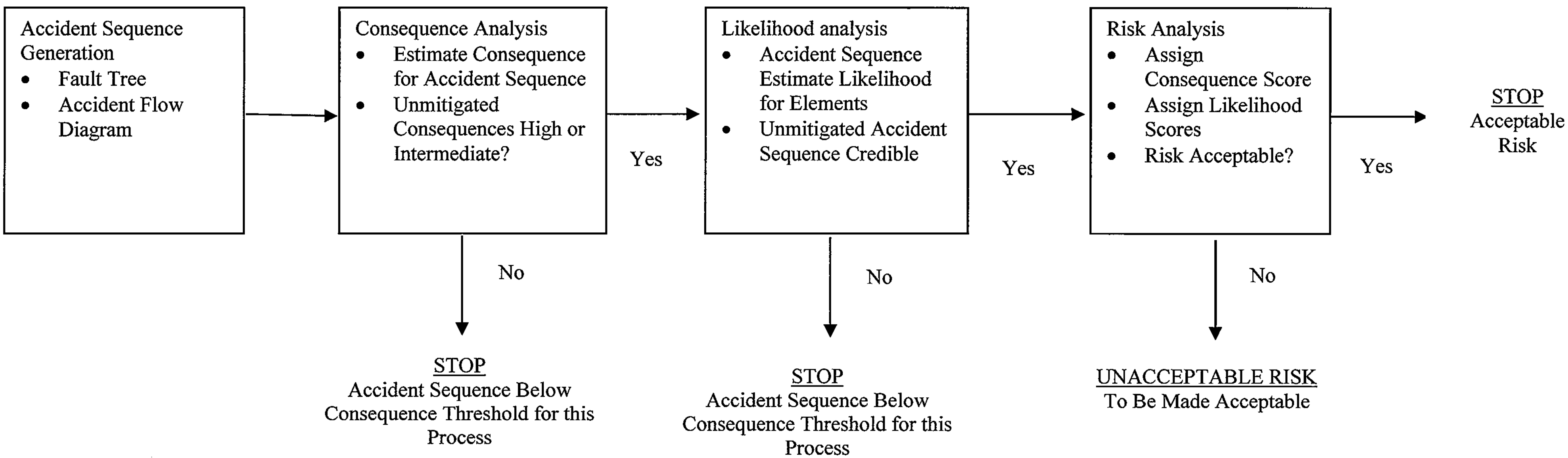


Table 4.1 Risk Analysis Table

Overall Likelihood of Accident

Severity of Consequences			Highly Unlikely	Unlikely		Not Unlikely		
			-4	-3	-2	-1	0	1
	High	6						
		5						
	Intermediate	4						
		3						
	Low	2	BELOW SEVERITY THRESHOLD					
		1						
		0						

(light stipple) = Risk Zone 1 (Does not meet performance criteria; unacceptable risk for continued operation)

(dark hatch) = Risk Zone 2 (Meets performance criteria but unacceptable risk for long-term operation)

(blank) = Risk Zone 3 (Meets performance criteria; acceptable risk)

Note: When the overall likelihood is calculated quantitatively in units of "events per year," the exponent of the likelihood value is used. That is, for an event calculated to occur $4x10^{-5}$/ year, the overall likelihood index is -5.

Table 4.2 Accident Sequence Consequence

				Chemical Consequence	Fire Consequence	Criticality Consequence	Radiological Consequence
Score	**Performance Requirement**		**Qualitative Descriptor**	**Effects from Chemical Hazards Exposure[1]**	**Effects from Fire Hazards Exposure[1]**	**Effects from Criticality Hazards Exposure**	**Effects from Radiological Hazards Exposure**
6	• Greater than or equal to 100 rem dose equivalent to a worker, and/or • Greater than or equal to ERPG-3 chemical exposure to a worker, and/or • Greater than or equal to 25 rem dose equivalent to the offsite public, and/or • Greater than or equal to ERPG-2 chemical exposure to the offsite public • Greater than or equal to 30 milligrams soluble uranium intake by the offsite public, and/or • Greater than or equal to 400 milligrams soluble intake of uranium by a worker, and/or		Very High Multiple fatalities	Acute chemical exposure to an individual from licensed material or hazardous chemicals produced from licensed material that could cause death to multiple workers or permanently disable a member of the public at the site boundary	Fire that could cause commensurate radiological, chemical, or criticality consequences	Occurrence of a criticality	Lethal radiation dose
5			High Fatality or multiple permanent health effects	Acute chemical exposure to an individual from licensed material or hazardous chemicals produced from licensed material that could endanger the life of the worker or lead to irreversible or other serious long-lasting health effects to a member of the public at the site boundary	Fire that could cause commensurate radiological or chemical consequences	N/A	Lethal radiation dose

<table>
<tr><th colspan="4"></th><th>Chemical Consequence</th><th>Fire Consequence</th><th>Criticality Consequence</th><th>Radiological Consequence</th></tr>
<tr><th>Score</th><th>Performance Requirement</th><th></th><th>Qualitative Descriptor</th><th>Effects from Chemical Hazards Exposure[1]</th><th>Effects from Fire Hazards Exposure[1]</th><th>Effects from Criticality Hazards Exposure</th><th>Effects from Radiological Hazards Exposure</th></tr>
<tr><td>4</td><td rowspan="2">• Greater than or equal to 25 rem dose equivalent to a worker, and/or
• Greater than or equal to ERPG-2 chemical exposure to a worker, and/or
• Greater than or equal to 5 rem dose equivalent[2] to the offsite public, and/or
• Greater than or equal to ERPG-1 chemical exposure to the offsite public, and/or
• Greater than or equal to 10 milligrams soluble intake of uranium by the offsite public, and/or
• Greater than or equal to 150 milligrams soluble intake of uranium by a worker, and/or
• A 24 hour average release of radioactive material greater than or equal to 5,000 times Table 2, Appendix B, 10</td><td></td><td>Intermediate

Permanent loss of function/limb or multiple lost-time injuries</td><td>Acute chemical exposure to an individual from licensed material or chemicals produced from a licensed material that could lead to irreversible or serious long-lasting effects to a worker or mild transient health effects to a member of the public at the site boundary</td><td>Fire that could cause commensurate radiological or chemical consequences</td><td>N/A</td><td>Exposure of worker or member of the public substantially in excess of 10 CFR 20 limits</td></tr>
<tr><td>3</td><td></td><td>Medium

Restricted/lost-time work injury or multiple medical treatment cases</td><td>Chemical accident that could result in exceeding radiological criteria</td><td>Fire that could cause commensurate radiological or chemical consequences</td><td>Loss of double contingency protection</td><td>Exposure of worker or member of the public in excess of 10 CFR 20 limits</td></tr>
</table>

				Chemical Consequence	Fire Consequence	Criticality Consequence	Radiological Consequence
Score	**Performance Requirement**		**Qualitative Descriptor**	**Effects from Chemical Hazards Exposure[1]**	**Effects from Fire Hazards Exposure[1]**	**Effects from Criticality Hazards Exposure**	**Effects from Radiological Hazards Exposure**
	CFR 20 radioactivity release[3] outside the restricted area, and/or • Loss of nuclear criticality safety double contingency protection						
2 1 0			Anticipated process upset consequences that are controlled and remediated by licensed safety programs				

[1] Does not include plant conditions that result in an occupational risk, but do not affect the safety of licensed radioactive materials.
[2] From exposure of a hypothetical individual at the site boundary, due to an airborne radioactivity release to the environment.
[3] Concentration of radioactivity in liquid released to ground water on site or surface water off site.

Table 4.3 Occurrence Rate Scores for Initiating Events Analysis

Score[1]	Occurrence Rate	Qualitative Description and/or Example of Prevention Mechanism
1	1/month	Expected to occur regularly during plant lifetime; prevention ineffective
0	1/year	Expected to occur occasionally during plant lifetime; prevention by a trained operator performing a non-routine task
-1	1/10 years	Expected to occur sometime during plant lifetime; prevention by a trained operator performing a routine task
-2	1/100 years	Not expected, but might occur during plant lifetime; prevention by a functionally tested hardware and/or software system
-3	1/1,000 years	Not expected to occur during plant lifetime; prevention by an inspected passive device, or a functionally tested hardware and/or software system with trained operator backup
-4	1/10,000 years	Physically possible (credible) but not expected to occur; prevention by two independent, redundant methods or systems each functionally tested (consistent with double contingency protection and control)
-5	—	Not credible (events determined to be *not credible* are those events that are not expected to be possible, based upon generally accepted physical or engineering principles; if an initiating event is determined to be *not credible*, then further analysis of the accident sequence progression is not necessary)

[1] If detection and correction systems are in place to detect and correct the failure that results in the initiating event before the accident progresses to the ultimate consequences, then the index score may be lowered by one. This is acceptable since detection and correction will limit the amount of time that the system remains in the failed state. This may be applied only to frequency scores of 1, 0, -1, or -2.

Table 4.4 Failure Probability for Protective Mechanisms

Index Score	Failure Probability	Qualitative Description or Example of Protection Mechanism
0	1	No protection or extremely weak protection
-1	0.1	Protection by a trained operator performing a non-routine task
-2	0.01	Protection by a trained operator performing a routine task, or a functionally tested active safety device
-3	0.001	Protection by an inspected passive safety device, or a functionally tested active safety device with trained operator backup.
-4	0.0001	Protection by two independent, redundant safety methods or systems each functionally tested (consistent with double contingency protection)

CHAPTER 7.0

CHEMICAL SAFETY PROGRAM

7.1 CHEMICAL SAFETY PROGRAM STRUCTURE

The Columbia Fuel Fabrication Facility (CFFF) maintains a Chemical Safety Program for the site which provides adequate protection against chemical hazards related to the storage, handling and processing of licensed materials. A primary purpose of the Chemical Safety Program is to assure that workers, the public and the environment are adequately protected from the chemical hazards of licensed materials. Chemical safety is also an element of the Integrated Safety Analysis (ISA) program described in Chapter 4.0 of this license application. CFFF chemical safety commitments related to compliance with 10CFR70 Subpart H requirements, including Process Descriptions, Process Theory, Accident Sequences, Accident Consequences and IROFS are described in Chapter 4.0 of this License Application. The programmatic elements discussed in this Chapter are applicable to all normal and non-routine operations.

7.1.1 Program Basis

7.1.1.1 Chemical Safety Program activities are implemented through approved procedures at the CFFF. Equipment and facilities important to the chemical safety of licensed materials and to protect health and minimize danger to life or property are described in detail in the CFFF ISA and ISA Summary.

7.1.1.2 Other key elements of the Chemical Safety Program include the following attributes:

- The CFFF commits to having written procedures defining the Authority and Responsibility for Safety. This authority and responsibility applies to Westinghouse Management, Westinghouse employees, Contractor employees, Visitors, Customer representatives and Regulatory personnel.
- A Hazard Communication Program is implemented to ensure that hazardous chemicals used at the CFFF are evaluated for their hazards and that this information, along with information about appropriate protective measures is transmitted to employees.
- An Energy Isolation and Lock Out Tag Out (LOTO) Program is implemented to protect employees and contractors from injuries that may result from the unexpected start up of equipment or the release of stored energy.
- Procedures also exist to provide information and guidance on selection of Chemical Personal Protection Equipment (PPE) to minimize the potential for chemical exposure injuries and illness.

- In areas where chemicals are stored, handled, or used, emergency eyewash and safety shower stations are installed to provide clean water to wash chemicals from the face, skin, and eyes of individuals who are exposed to these materials.

7.1.2 Program Practices

7.1.2.1 The CFFF Chemical Safety Program is designed to assure that processes and operations comply with applicable federal and state regulations pertaining to chemical safety.

7.1.2.2 The Chemical Safety Program is implemented to assure that hazards associated with the risk posed by chemicals used at the CFFF are evaluated, and that appropriate measures are taken to assure operations are performed in a safe manner.

7.1.2.3 Appropriate facilities, equipment, and procedures for the safe storage and handling of hazardous chemicals are maintained at the CFFF. Face velocity requirements for enclosures whose primary control function relates to chemical fumes, mists, and dusts are specified by the Chemical Safety Function per the OSHA standards. The exhaust system shall provide an average face velocity of at least 100 feet per minute (fpm) with a minimum of 70 fpm at any point.

7.1.2.4 Employees using hazardous chemicals are specifically trained in procedures for safe handling and disposal of them.

7.1.2.5 The Chemical Safety Program includes evaluations of:

(a) Potential physical, chemical, and/or fire hazards;

(b) Development and implementation of safety programs and procedures designed to minimize accidents and injuries to employees;

(c) Purchase and maintenance of protection and monitoring equipment; and,

(d) Maintenance of appropriate records and reports.

7.1.2.6 The Site Emergency Plan and Implementing Procedures, described in Chapter 9.0 of this License Application, detail the manner in which the CFFF responds to any accidental release of hazardous chemicals.

7.1.3 Performance and Documentation of Analyses

7.1.3.1 Hazard and Operability (HAZOP) Analysis, What-If/Checklist, and/or other recognized methods are used to systematically evaluate the safety of chemical operations at the CFFF. The hazard evaluation method selected is based on the complexity of the process being analyzed.

7.1.3.2 Hazards to be evaluated are based on the nature of the chemicals involved, the process conditions (flow, temperature, pressure, concentration, etc.), personnel experience, and information about previous incidents in the facility. The evaluation is used to ensure that adequate safety margin is present in each chemical process. For areas where additional safety controls might be required, an action plan is developed for increasing the safety margin of the process, in accordance with CFFF priorities and resources.

7.1.3.3 The physical design and implementation of chemical operations at the CFFF is evaluated to identify deviations from the intended operation, which could result in potential hazards or operational concerns. These hazards include the following, when applicable:

(a) Potential for criticality safety incidents;
(b) Potential to violate a License commitment;
(c) Potential for personnel exposure or injury; and/or,
(d) Potential for radioactive contamination, release of chemicals to the atmosphere, fire or explosion.

7.1.3.4 Chemical Safety Analysis

(a) Analysis Performance

(1) The Chemical Safety Analysis is a comprehensive assessment of each component within a defined system. The analysis identifies controls required to maintain a sufficient margin of safety.

(2) Chemical accident sequences are analyzed using the accident flow diagram format. In this format, the analyst traces each sequence through the diagram (starting with the initiating event) to arrive at a consequence of interest. Each identified pathway defines an initiating event and protective measure failures that collectively represent an accident sequence.

(3) All relevant chemical hazard exposure pathways are included in the Chemical Safety Analysis.

(b) Analysis documentation

(1) The Chemical Safety Analysis is one of the ISA safety analyses described in Chapter 4.0 of this License Application. The level of detail for a particular analysis is based on the complexity of the initial system, and subsequent proposed changes to the system. Thus, the scope and content of a Chemical Safety Analysis are customized to reflect the particular characteristics and needs of the system being analyzed.

(2) Chemical Safety Analyses are maintained current through implementation of the Configuration Management program described in Sections 3.1 and 4.1 of this License Application. If a Chemical Safety Analysis is required for a proposed change, it is performed to the current standards required for the baseline analysis. Summary details of the change, including required approvals, are documented on a Configuration Change Control Form that is linked to the applicable Baseline ISA, thus providing a substantially complete "living" framework for the facility chemical safety basis.

7.1.4 Audits and Assessments

Audits and assessments are conducted to compare established chemical safety standards to CFFF performance. These audits and assessments are performed in accordance with the requirements in Chapter 3.0, Section 3.6, of this License Application.

7.1.4.1 Program assessments take the form of program audits. Specific portions of the Chemical Safety Program, evaluated during a particular assessment, are based on previous internal audit findings, external audit findings, NRC inspection activities, current operating conditions, and the time since the last assessment. The Chemical Safety Program is assessed on a triennial frequency. Results of the assessments are documented and maintained for NRC Staff review and inspection.

7.1.4.2 Process assessments take the form of compliance audits that evaluate implementation of chemical safety requirements (*e.g.*, personal protective equipment, following procedures and postings, *etc.*) for CFFF operations (*i.e.*, Site and Structures, ADU Conversion, Solvent Extraction, *etc.*) The frequency of these audits is based on previous internal audit findings, NRC inspection results, incidents (those reported, and those requiring notification), configuration management activities, and the time since the last assessment. The complete set of operations making up the CFFF ISA is assessed on a five year frequency. Results of the assessments are documented and maintained for NRC Staff review and inspection.

CHAPTER 10.0

ENVIRONMENTAL PROTECTION

10.1 ENVIRONMENTAL PROTECTION PROGRAM STRUCTURE

The Columbia Fuel Fabrication Facility (CFFF) maintains an Environmental Protection Program for the site. A primary purpose of the Environmental Protection Program is to assure that exposure of the public and the environment to hazardous materials used in facility operations are kept well below permissible limits.

The CFFF prepared an Environmental Evaluation Report, dated March 1975, that was subsequently updated in revisions dated April 1983, April 1990, December 2004, and December 2014. Also, an extensive update of much of the information in the March 1975 report was documented in an Integrated Safety Analysis (ISA) and ISA Summary titled "CFFF Site and Structures." Annual reviews of Environmental Protection Program data are documented in the ALARA Reports described in Chapter 5.0 of this License Application.

The Derived Airborne Concentration (DAC) and Annual Limit on Intake (ALI) referenced in this Chapter, and used to calculate Total Effective Dose Equivalent (TEDE), are based on the dose coefficients in ICRP Publication No. 68.

10.1.1 Gaseous Effluent Control

For operations that might result in exhausting radioactive materials to unrestricted areas, representative stack sampling is performed to determine the adequacy of gaseous effluent controls. Such sampling is performed continuously during production operations involving licensed materials and the results are used to demonstrate compliance with applicable regulatory limits. Samples are collected and analyzed daily.

ALARA goals and investigation limits are established based on guidance provided in Reg. Guide 8.37. If the investigation level is exceeded, corrective actions are taken to reduce emissions, as appropriate. If radioactivity in gaseous effluents results in a TEDE in excess of 10 mrem/yr to a member of the public in an unrestricted area, a report is prepared and submitted to NRC Staff within 30-days upon discovery. This report identifies the cause of exceeding the limit and the corrective actions taken to reduce release rates. The report is submitted to NRC Headquarters with a copy to NRC Region II. Subsequently, if any parameters important to a dose assessment in the original report are found to have changed, a follow-up report is submitted within 30-days of disclosure which describes the changes in parameters and includes an estimate of the resultant change in dose commitment.

If measurement results indicate the Total Effective Dose Equivalent (TEDE) to any member of the public in a calendar year could exceed a limit of 100 millirem, immediate steps are taken to reduce emissions to levels that will bring the TEDE back below the limit.

10.1.2 Liquid Effluent Control

Liquid waste treatment facilities, with sufficient capacity and capability to enable holdup, treatment, sampling, analysis, and discharge of liquid wastes in accordance with applicable regulations, are provided and maintained in proper operating condition.

Control of radioactivity in the process liquid waste stream is achieved by operation of two treatment systems in series:

(a) A continuous in-line gamma spectroscopy monitor and quarantine tank filtration system within the chemical controlled area of the main Plant building; and,

(b) An Advanced Wastewater Treatment Facility (for removing uranium to ALARA levels) that is external to the building.

The first system is installed following quarantine tanks, diversion tanks, and filtration operations. This system assures that the process liquid waste stream, being transferred from the internal chemical controlled area to the external treatment area, meets the discharge limit in approved operating procedures. This limit is nominally less than 24 parts per million uranium. When the liquid has successfully passed the scan for discharge from the first system, it is transferred from the in-plant final pump-out tank to the second system for further uranium removal.

The second system assures that uranium in the discharge is removed to a nominal limit of less than 0.2 parts per million uranium.

ALARA goals and investigation limits are established based on guidance provided in Reg. Guide 8.37. If the investigation level is exceeded, corrective actions are taken to reduce radioactive effluent, as appropriate. If measurement results indicate the TEDE to any member of the public in a calendar year could exceed a limit of 100 mrem, immediate steps are taken to reduce radioactive effluent to levels that will bring the TEDE back below the limit.

Miscellaneous liquid wastes are filtered and sampled on a batch basis to assure uranium is effectively removed to levels that will enable conformance to ALARA goals.

Quiescent settling in the North, South, East, and West Lagoons further reduce uranium levels in liquid wastes prior to final discharge to the Congaree River. A continuous, proportional sample of the liquid effluent released to Congaree River is collected. A monthly composite of this sample is analyzed for recording the gross alpha and beta activity and isotopic uranium content of the final discharge.

If the CFFF's NPDES Permit is revoked, or if Permit conditions are revised, NRC Headquarters and Region II Staff are promptly notified.

10.1.3 Solid Waste Disposal

Solid waste disposal preparation facilities, with sufficient capacity and capability to enable processing, packaging, and transfer of solid wastes to licensed treatment or disposal sites, in accordance with applicable regulations, are provided and maintained in proper operating condition.

10.1.4 Environmental Monitoring

The CFFF environmental monitoring program includes the sampling criteria presented in Figure 10.1. Action levels for sample results are established by approved procedures. (Note: For wells found not to contain water at the time of sampling, an evaluation is performed by the Environmental Protection Function to determine if alternate well data can be used to represent the dry well; or, if a new well must be dug.) Typical program analytical sensitivities are as presented in Figure 10.2. Locations of air, vegetation and soil monitoring stations are as presented in Figure 10.3. Locations of monitoring wells are as presented in Figure 10.4. Surface water monitoring stations are located at the following locations:

- Entrance – Sample obtained from entrance side of flood gate valve that controls flow from Mill Creek Swamp into Upper Sunset Lake. GPS Coordinates: N-33°52'59.72 W-80°55'56.32
- Exit – Sample obtained from exit side of flood gate valve that controls flow from Sunset Lake Swamp into the canal.
  GPS Coordinates: N-33°52'16.94 W-80°55'28.52
- Pond (Gator) – Sample obtained from surface of pond.
  GPS Coordinates: N-33°52'47.54 W-80°55'17.46
-
- Spillway – Sample obtained from between Lower Sunset Lake and Sunset Lake Swamp. GPS Coordinates: N-33°52'34.72 W-80°55'14.58
- Causeway – Sample obtained from concrete flume connecting Upper and Lower Sunset Lakes. GPS Coordinates: N-33°52'43.55 W-80°55'24.
- Roadway – Sample is obtained from Plant side of roadway, where Control Valve A/B stream and Control Valve D/E stream connect. This is before the stream flows into Control Valve C. GPS Coordinates: N-33°52'52.88 W-80°55'20.68

Fish and sediment samples are taken annually at or near the point of diffuser discharge into the Congaree River. River water samples are taken at the following locations:

- Blossom Street Bridge
- 500 yards above the discharge
- 500 yards below the discharge
- Mill Creek

These sampling criteria, sensitivities, and/or locations can be changed without prior NRC Staff approval provided:

(a) A documented evaluation by the Environmental Protection Function demonstrates that the changes will not decrease the overall effectiveness of the environmental monitoring program; and,

(b) The changes are submitted to NRC Staff as part of the subsequent updates of this License Application to enable opportunity to inspect the evaluation.

10.1.5 Periodic Reporting of Surveillance Data

Quantities of radioactive material in air and liquids released from the facility are reported to NRC Staff, in accordance with applicable regulatory guidance and regulations, on a semiannual basis.

10.1.6 Off-Site Dose Control

Compliance with 10CFR20 (NRC) and 40CFR190 (EPA) requirements, for off-site dose to the maximally exposed member of the public, is assured by demonstrating that the annual dose equivalent does not exceed 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem to any other organ. Dose calculation methodology includes models that have been evaluated and approved by the Environmental Protection Function and that have been recognized by the appropriate regulatory agencies.

Figure 10.1 Environmental Sampling Criteria

TYPE OF SAMPLE	LOCATIONS	ANALYSES	MINIMUM SAMPLING FREQUENCY
Air Particulates	Four	Alpha	Continuous (Collection Weekly)
Surface Water[3]	Six	Alpha; Beta; Uranium; Tc-99	Quarterly
Well Water[1]	Ten	Alpha; Beta; Uranium; Tc-99	Semi - Annually
River Water[3]	Four	Alpha; Beta; Uranium; Tc-99	Quarterly
Sediment[3]	One	Alpha; Beta; Uranium; Tc-99	Annually
Soil[3]	Four	Alpha; Beta; Uranium; Tc-99	Annually
Vegetation[2,3]	Four	Alpha; Beta; Fluoride; Uranium; Tc-99	Annually
Fish[3]	One	Alpha; Beta; Uranium; Tc-99	Annually

[1]If gross alpha activity exceeds 15 pCi/l, isotopic analyses for Uranium will be conducted. If gross beta activity exceeds 50 pCi/l, beta/gamma analyses are conducted. Wells exceeding a mean concentration of 30 pCi/l of total Uranium are documented in the annual ALARA report. An action plan will be developed for wells exceeding an annual average of 300 pCi/l Uranium

[2]If a vegetation gross alpha activity result exceeds 10 pCi/gram, an investigation will be performed.

[3]If gross alpha activity exceeds 15 pCi/l or 15 pCi/g, as applicable, isotopic analyses for Uranium will be performed. If gross beta activity exceeds 50 pCi/l or 50 pCi/g, as applicable, Tc-99 analyses will be performed.

Figure 10.2 Typical Environmental Programs Radiological Analytical Sensitivities

TYPE OF SAMPLE	ANALYSES[1]	TYPICAL SAMPLE QUANTITY	NOMINAL MINIMUM DETECTION LEVEL
Air Particulates	Alpha	571 Cubic Meters	6.0E-14 μCi/ml
Surface Water	Alpha	1 Liter	5 pCi/l
	Beta	1 Liter	5 pCi/l
	Uranium	1 Liter	0.5 pCi/l
	Tc-99	1 Liter	300 pCi/l
Well Water	Alpha	1 Liter	5 pCi/l
	Beta	1 Liter	5 pCi/l
	Uranium	1 Liter	0.5 pCi/l
	Tc-99	1 Liter	300 pCi/l
River Water	Alpha	1 Liter	5 pCi/l
	Beta	1 Liter	5 pCi/l
	Uranium	1 Liter	0.5 pCi/g
	Tc-99	1 Liter	300 pCi/l
Sediment	Alpha	100 Grams	4 pCi/g
	Beta	100 Grams	10 pCi/g
	Uranium	100 Grams	0.5 pCi/g
	Tc-99	100 Grams	5 pCi/g
Soil	Alpha	100 Grams	4 pCi/g
	Beta	100 Grams	10 pCi/g
	Uranium	100 Grams	0.5 pCi/g
	Tc-99	100 Grams	5 pCi/g
Vegetation	Alpha	100 Grams	4 pCi/g
	Beta	100 Grams	10 pCi/g
	Fluoride	100 Grams	Variable (based on dilution level)
	Uranium	100 Grams	0.5 pCi/g
	Tc-99	100 Grams	5 pCi/g
Fish	Alpha	30 Grams	4 pCi/g
	Beta	30 Grams	10 pCi/g
	Uranium	1 Kilogram	0.5 pCi/g
	Tc-99	100 Grams	5 pCi/g

Figure 10.3 Locations of Air, Vegetation and Soil Monitoring Stations

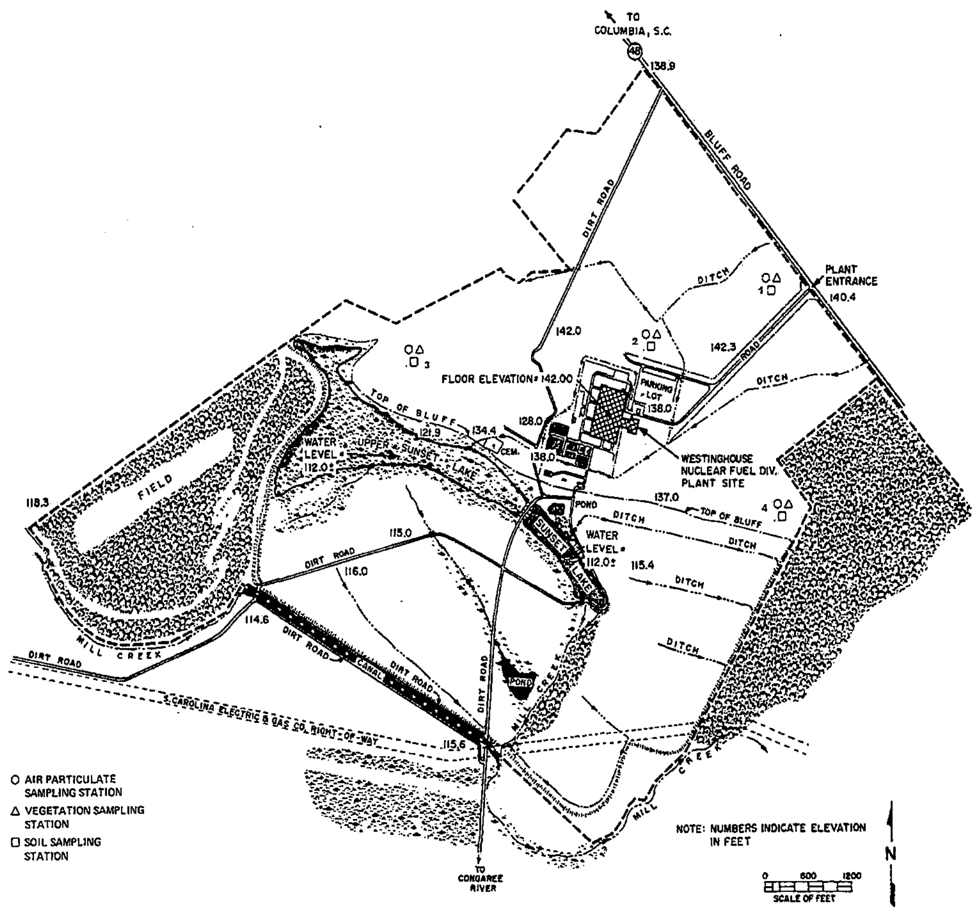
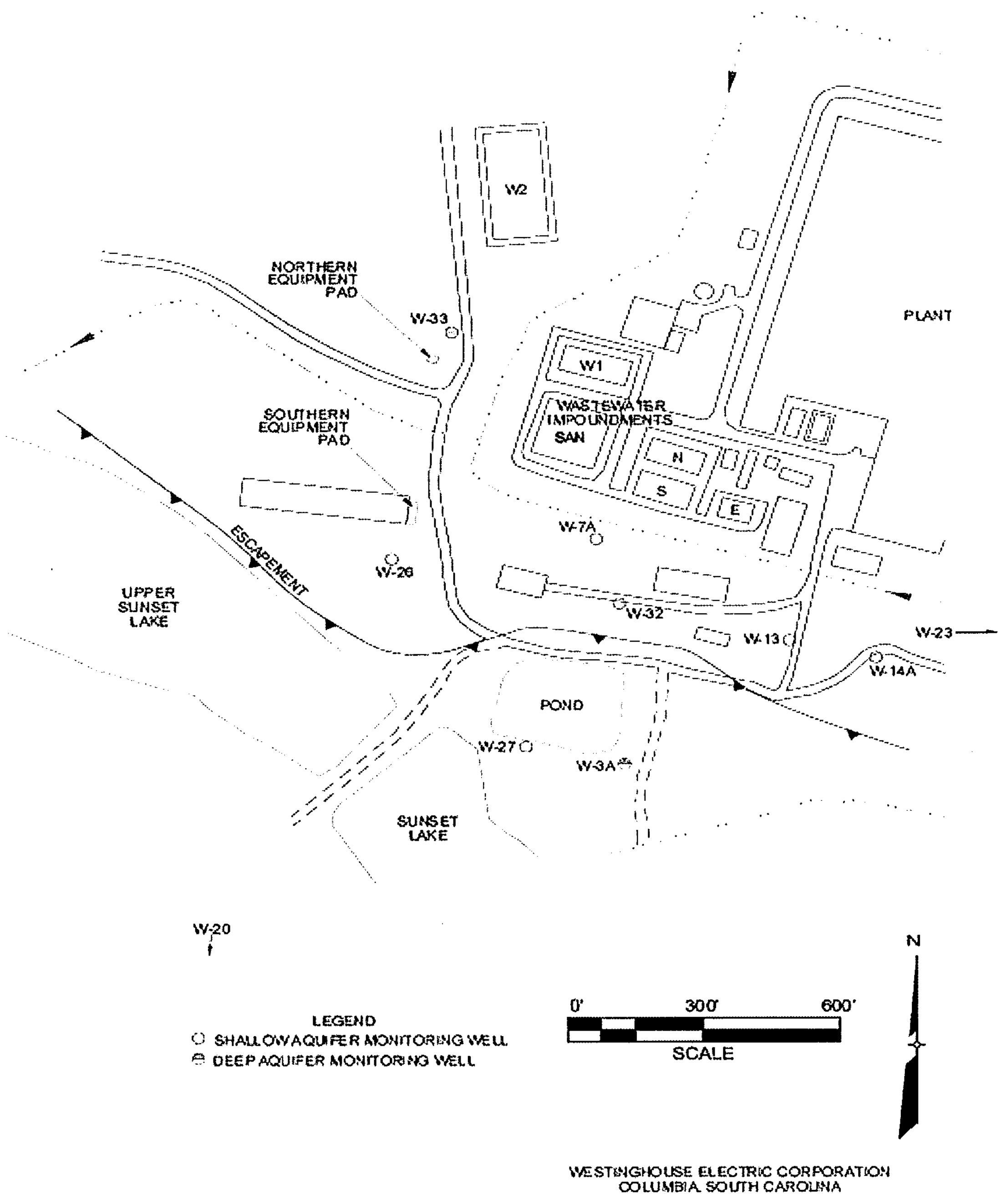


Figure 10.4 Locations of Monitoring Wells



10.1.7 Performance and Documentation of Analyses

10.1.7.1 Environmental Protection Analysis

Analysis Performance:

The Environmental Protection Analysis is a comprehensive assessment of each component within a defined system. The analysis identifies controls required to maintain a sufficient margin of safety.

Environmental accident sequences are analyzed using the accident flow diagram format. In this format, the analyst traces each sequence through the diagram (starting with the initiating event) to arrive at a consequence of interest. Each identified pathway defines an initiating event and protective measure failures that collectively represent an accident sequence.

Analysis Documentation:

The Environmental Protection Analysis is one of the ISA safety analyses described in Chapter 4.0 of this License Application. The level of detail for a particular analysis is based on the complexity of the initial system, and subsequent proposed changes to the system. Thus, the scope and content of an Environmental Protection Analysis are customized to reflect the particular characteristics and needs of the system being analyzed.

Environmental Protection Analyses are maintained current through implementation of the Configuration Management program described in Sections 3.1 and 4.1 of this License Application. If an Environmental Protection Analysis is required for a proposed change, it is performed to the current standards required for the baseline analysis. Summary details of the change, including required approvals, are documented on a Configuration Change Form that is linked to the applicable Baseline ISA, thus providing a substantially "living" framework for the facility Environmental Protection basis.

10.1.8 Audits and Assessments

10.1.8.1 Audits and assessments are conducted to compare established environmental protection standards to CFFF performance. These audits and assessments are performed in accordance with the requirements in Chapter 3.0, Section 3.6, of this License Application.

Program assessments take the form of program audits. Specific portions of the Environmental Protection Program, evaluated during a particular assessment, are based on previous internal audit findings, external audit findings, NRC inspection activities, current operating conditions, and the time since the last assessment. The Environmental Protection Program is assessed on a triennial frequency. Results of the assessments are documented and maintained for NRC Staff review and inspection.

Process assessments take the form of compliance audits that evaluate implementation of environmental protection requirements (*e.g.,* effluent controls, following procedures and postings, *etc.*) for CFFF operations (*i.e.,* Site and Structures, ADU Conversion, Solvent Extraction, *etc.*). Frequency of audit is based on previous internal audit findings, NRC inspection results, incidents (those reported, and those requiring notification), configuration management activities, and the time since the last assessment. The complete set of operations making up the CFFF ISA is assessed on a five year frequency. Results of the assessments are documented and maintained for NRC Staff review and inspection.

10.1.8.2 The Regulatory Component performs a triennial audit of vendors used to analyze environmental samples. Such audits are also performed if substantive program anomalies are disclosed. The audits consider the need for "spike" and/or "replicate sample" submittals, as part of evaluation of a vendor's capability and quality control effectiveness.