Chapter 11 Radioactive Waste Management

11.1 Source Terms

This section of the referenced DCD is incorporated by reference with no departures or supplements.

11.2 Liquid Waste Management System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

11.2.1 Design Basis

Safety Design Bases

Add the following at the end of this section.

EF3 SUP 11.2-1

Regulatory Guide 1.110 methodology was applied to satisfy the cost-benefit analysis requirements of 10 CFR 50, Appendix I, Section II. D, for the system augments compatible with BWR plant design features. Cost parameters used to calculate the Total Annual Cost (TAC) for each applicable radwaste treatment system augment listed in RG 1.110 are taken without exception from RG 1.110, Appendix A. These costs are Annual Operating Cost (AOC) (Table A-2), Annual Maintenance Cost (AMC) (Table A-3), Direct Cost of Equipment and Materials (DCEM) (Table A-1), and Direct Labor Cost (DLC) (Table A-1). Other cost parameters used to determine TAC are as follows:

- Capital Recovery Factor (CRF) - Obtained from RG 1.110, Table A-6, this factor reflects the cost-of-money for capital expenditures. A cost-of-money value of 7 percent per year is assumed in this analysis, consistent with "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs" (OMB Circular A-94) (Reference 11.2-201). Based on a 30-year service life, Table A-6 gives a CRF of 0.0806.
- Indirect Cost Factor (ICF) - Obtained from RG 1.110, Table A-5, this factor takes into account whether the radwaste system will be shared with an operating unit on site. At Fermi, the radwaste system for Fermi

3 will not be shared with the radwaste system for Fermi 2; which gives an ICF of 1.625.

- Labor Cost Correction Factor (LCCF) - Obtained from RG 1.110, Table A-4, this factor takes into account the relative labor cost differences among geographical regions. A factor of 1.5 is assumed in the analysis based on Fermi being located in Region II as shown on RG 1.110, Figure A-1.

A value of $1,000 per person-rem is prescribed in 10 CFR 50, Appendix I.

If it is conservatively assumed that each radwaste treatment system augment is a "perfect" technology that reduces the effluent dose by 100 percent, the annual cost of the augment can be determined and the lowest annual cost can be considered a threshold value. The lowest-cost option for augments is a 20 gpmcartridge filter at $11,900 per year, which yields a threshold value of 11.9 person-rem whole body or thyroid dose from liquid effluents.

Neglecting the modeling of filters in the development of the source term, the addition of a 20 gpm cartridge filter would treat only 20 percent of the total analyzed liquid radwaste discharge of 105 gpm. Assuming 100 percent effectiveness, this would represent a dose reduction of 21.08 person-rem x 20 percent = 4.216 person-rem. The cost benefit ratio for this augment is therefore greater than the $1000/person-rem and not a cost benefit augment.

Note that the ESBWR Radwaste LWMS is designed to monitor and process all radioactive liquid streams and to provide water management for those streams. Under normal conditions, the water management is not expected to result in any routine release of radioactive effluents in the liquid discharges.

11.2.2.3 Detailed System Component Description

11.2.2.3.3 Processing Systems

Replace the first two paragraphs with the following.

STD COL 11.2-1-A

Specific equipment connection configuration and plant sampling procedures are used to implement the guidance in Inspection and Enforcement (IE) Bulletin 80-10 (DCD Reference 11.2-10). The permanent and mobile/portable non-radioactive systems, which are connected to radioactive or potentially radioactive portions of process LWMS, are protected from contamination with an arrangement of double check valves in each line. The configuration of each line is also equipped with a tell-tale connection, which permits periodic checks to confirm the integrity of the line and its check valve arrangement. Plant procedures describe sampling of non-radioactive systems that could become contaminated by cross-connection with systems that contain radioactive material. In accordance with the guidance in RG 1.109, exposure pathways that may arise due to unique conditions are considered for incorporation into the plant-specific ODCM if they are likely to contribute significantly to the total dose.

STD COL 11.2-2-A

Section 12.6 discusses how ESBWR design features and procedures for operation will minimize contamination of the facility and environment, facilitate decommissioning, and minimize the generation of radioactive wastes, in compliance with 10 CFR 20.1406. Section describes the requirement for procedures for operation of radioactive waste processing system. Operating procedures for LWMS process systems required by Section 12.4, Section 12.5, and Section address the requirements of 10 CFR 20.1406.

11.2.6 **COL Information**

11.2-1-A **Implementation of IE Bulletin 80-10**

STD COL 11.2-1-A

This COL item is addressed in Subsection 11.2.2.3.

11.2-2-A **Implementation of Part 20.1406**

STD COL 11.2-2-A

This COL item is addressed in Subsection 11.2.2.3.

11.2.7 **References**

11.2-201 OMB Circular A-94, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs," October 29, 1992, Office of Management and Budget.

11.3 Gaseous Waste Management System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

11.3.1 Design Basis

Add the following at the end of this section.

EF3 SUP 11.3-1

Regulatory Guide 1.110 was used as the basis for a cost benefit evaluation to assess gaseous radwaste system augments. The overall principle behind Regulatory Guide 1.110 is to determine when it is economically feasible to implement an augmented system to reduce radiation exposure to the public further below the regulatory threshold. The regulatory guidance specifies that an augmented system should be implemented if the cumulative dose to a population within an 80-km (50-mile) radius of the reactor site can be reduced at an annual cost of less than $1000 per person-rem or $1000 per person-thyroid-rem.

Only the augments applicable to the ESBWR conceptual design are considered.

Cost Benefit Analysis Determination

Appendix A of Regulatory Guide 1.110 states that augments with a Total Annual Cost (TAC) lower than the reduced dose multiplied by $1000 per person-rem and/or $1000 per person-thyroid-rem, should be implemented in order of diminishing cost-benefit. TAC of radwaste system augments considered herein is determined following Regulatory Guide 1.110, Appendix A, assuming that Fermi 2 and Fermi 3 will have separate radwaste systems and a seven percent per year cost of money. The maximum reduction of any augment is bounded by the total annual dose exposures. As shown in Table 12.2-204, the annual whole body dose from gaseous effluents is less than 4.5 person-rem/year total body and 23.5 person-rem/year thyroid for the 80-km (50-mile) population. Therefore, for augments that have a TAC below the $4500 and $23,500 thresholds, the TAC is divided by the amount of the total annual dose that the augment is assumed to eliminate.

3-Ton Charcoal Absorber

The annual cost of the 3-ton charcoal absorber is $9691/year; thus, potential reductions to thyroid dose are considered. Per DCD Table 11.3-1, the total mass of charcoal in the Offgas System (OGS) is 237,000 kg (523,000 lb), or approximately 237 metric tonnes (262 tons). Addition of a 3-ton charcoal absorber provides an additional 1.1 percent capacity to the existing OGS. Section 12.2 shows that the annual airborne releases from the OGS represent approximately 4 percent of the total annual airborne releases. Additional charcoal absorbers would improve the holdup times of the xenon and krypton isotopes, but those only contribute 4.1 percent to the thyroid dose. Therefore, additional charcoal absorber material could make a maximum improvement of 0.16 percent of the 23.5 person-rem/year thyroid dose, or 0.04 person-rem/year. The $9691/year cost of the 3-ton charcoal absorber augment divided by the annual dose reduction of 0.04 person-rem/year, results in an estimated cost of over $240,000/person-rem saved. This augment exceeds the cost-benefit ratio of $1000/person-rem and is eliminated from further consideration.

Charcoal Vault Refrigeration

Charcoal vault refrigeration would improve the performance of the OGS which uses activated charcoal absorber beds to minimize and control the release of radioactive material into the atmosphere by delaying release of the offgas process stream. The annual cost of the charcoal vault refrigeration system is $29,655/year. This value exceeds $23,500 for person-rem/year thyroid dose and $4500 person-rem/year total body dose; therefore this augment exceeds the cost-benefit ratio of $1000/person-rem and is eliminated from further consideration.

Main Condenser Vacuum Pump Charcoal/HEPA Filtration System

The annual cost of the main condenser vacuum pump charcoal/HEPA filtration system is $8210/year; thus, potential reductions to thyroid dose are considered. The addition of a main condenser vacuum pump charcoal/HEPA filtration system would provide for a reduction in the amount of iodides discharged from the plant. DCD Table 12.2-16 shows the mechanical vacuum pump contributes approximately 0.7 percent of the total iodine releases. The maximum improvement to the off-site dose would be 0.7 percent of the 23.5 person-rem/year thyroid dose, or less than 0.20 person-rem/year. The $8210/year cost of the main condenser vacuum pump HEPA filtration system augment divided by the annual dose reduction of 0.2 person-rem/year, results in an estimated cost of over $41,000/person-rem saved. This augment exceeds the cost-benefit ratio of $1000/person-rem and is eliminated from further consideration.

15,000-cfm HEPA Filtration System

ESBWR has four structures that contain potentially radioactive air: the Fuel Building, Radwaste Building, Reactor Building, and Turbine Building. Because the buildings all have flow rates that exceed the 15,000-cfm flow rate, multiple 15,000-cfm HEPA filters would be needed. The total annual cost for each 15,000-cfm HEPA filter is $17,167 for those located in the Turbine Building, and $27,952 for all other locations. The number of HEPA filters and the total annual cost for those filters is shown in Table 11.3-201.

These values all exceed $23,500 for person-rem/year thyroid dose and $4500 person-rem/year total body dose; therefore this augment exceeds the cost-benefit ratio of $1000/person-rem and is eliminated from further consideration.

Charcoal/HEPA Filtration Systems

Table A-1 of Regulatory Guide 1.110 lists several charcoal/HEPA filtration system sizes, 1000-cfm, 15,000-cfm, and 30,000-cfm. It is assumed that these are to be combined in the most economical manner to envelope the building flow rates. There are different direct costs for the 15,000-cfm and 30,000-cfm systems depending on their location.

ESBWR has four structures that contain potentially radioactive air: the Fuel Building, Radwaste Building, Reactor Building, and Turbine Building. The exhaust systems for these buildings and their flow rates are listed in Table 11.3-201.

Because the buildings all have flow rates that exceed the 30,000-cfm flow rate, combinations of 1000-cfm, 15,000-cfm, and 30,000-cfm charcoal/HEPA filters are needed. The total annual cost for each 1000-cfm charcoal/HEPA filter is $8231; each 15,000-cfm charcoal/HEPA filter is $33,286 for those located in the Turbine Building, and $34,972 for all other locations; and each 30,000-cfm charcoal/HEPA filter is $54,958 for those located in the Turbine Building, and $57,578 for all other locations. The number of HEPA filters and the total annual cost for those filters is shown in Table 11.3-202.

These values all exceed $23,500 for person-rem/year thyroid dose and $4500 person-rem/year total body dose; therefore this augment exceeds the cost-benefit ratio of $1000/person-rem and is eliminated from further consideration.

600-ft^3 Gas Decay Tank

The gas decay tank would be used as an augment to the OGS. The gas decay tank would be utilized to allow noble gas decay before release through the exhaust. Based on the OGS flow rate of 54 m^3/hr (31.8 cfm) (DCD Table 12.2-15), the average residence time in the decay tank is 18.9 minutes.

The total tank size would need to be sized for 4.48 hours (Kr-85m half-life) of hold-up to impact the half-lives of the Ar and Kr isotopes (with the exception of Kr-85). Fifteen 600 ft^3 tanks would be required to provide a hold-up of 4.48 hours. Each 600 ft^3 tank has a total annual cost of $9036, and 15 tanks would cost over $135,000. This value exceeds the $23,500 threshold for person-rem/year thyroid dose, and the $4500 person-rem/year total body dose; therefore this augment is not cost beneficial for dose reduction.

Conclusion

There are no gaseous radwaste system augments that are cost beneficial to implement for Fermi 3.

Table 11.3-201 HEPA Filter Locations and Costs [EF3 SUP 11.3-1]

HVAC Subsystem	Flow (l/s)	No. of 15,000-cfm HEPA filters needed	Total Annual Cost per 15,000-cfm HEPA filter	Total Annual Cost for Augment
FBGAVS	13,550	2	$27,952	$55,904
FBFPVS	15,790	3	$27,952	$83,856
RWGAVS	25,000	4	$27,952	$111,808
REPAVS	32,000	5	$27,952	$139,760
CONAVS	19,950	3	$27,952	$83,856
TBE	52,800	8	$17,167	$137,336

Acronyms from ESBWR DCD:

FBGAVS – Fuel Building General Area HVAC Subsystem

FBFPVS – Fuel Building Fuel Pool Area HVAC Subsystem

RWGAVS – Radwaste Building General Area HVAC Subsystem

REPAVS – Reactor Building Refueling and Pool Area HVAC Subsystem

CONAVS – Reactor Building Contaminated Area HVAC Subsystem

TBE – Turbine Building Exhaust

Table 11.3-202 HEPA Filter Annual Costs [EF3 SUP 11.3-1]

HVAC Subsystem	Flow (l/s)	No. and Type of Filters Used	Total Annual Cost per Charcoal/HEPA filter	Total Annual Cost for Augment
FBGAVS	13,550	1x30,000	$57,578	$57,578
FBFPVS	15,790	1x30,000	$57,578	$90,502
		4x1000	$8231	
RWGAVS	25,000	2x30,000	$57,578	$115,156
REPAVS	32,000	2x30,000	$57,578	$149,948
		1x15,000	$34,792	
CONAVS	19,950	1x30,000	$57,578	$92,370
		1x15,000	$34,792	
TBE	52,800	4x30,000	$54,958	$219,832

Acronyms from ESBWR DCD:

FBGAVS – Fuel Building General Area HVAC Subsystem

FBFPVS – Fuel Building Fuel Pool Area HVAC Subsystem

RWGAVS – Radwaste Building General Area HVAC Subsystem

REPAVS – Reactor Building Refueling and Pool Area HVAC Subsystem

CONAVS – Reactor Building Contaminated Area HVAC Subsystem

TBE – Turbine Building Exhaust

11.4 Solid Waste Management System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

11.4.1 SWMS Design Bases

Add the following after the second paragraph.

STD SUP 11.4-1

The LWMS offsite dose calculations, which are described in Subsection 12.2.2.4, include the offsite doses from the SWMS liquid effluents, as they are processed by the LWMS. Similarly, the GWMS offsite dose calculations, which are described in Subsection 12.2.2.2 include the offsite doses from the SWMS gaseous effluents, as they are inputs processed by the GWMS. The cost-benefit analyses in Section 11.2.1 for the LWMS and in Section 11.3.1 for the GWMS address the liquid and gaseous effluents that are generated from solid waste processing by the SWMS. Because these two cost-benefit analyses include the liquid and gaseous effluents from the SWMS, the augments considered for the LWMS and GWMS apply to the SWMS, which provides inputs to those systems. As described in Sections 11.2.1 and 11.3.1, no augments are needed for the LWMS and GWMS to comply with 10 CFR 50, Appendix I, Section II.D. Therefore, no augments are needed for the SWMS to comply with 10 CFR 50, Appendix I,Section II.D.

Add the following to the seventh bullet.

STD COL 11.4-4-A

The site does not utilize any temporary storage facilities to support plant operation.

Replace the fourth sentence of the fifth paragraph with the following:

STD COL 11.4-5-A

Section 12.6 discusses how the ESBWR design features and procedures for operation will minimize contamination of the facility and environment, facilitate decommissioning, and minimize the generation of radioactive wastes, in compliance with 10 CFR 20.1406. Section describes the requirement for procedures for operation of the radioactive waste processing system. Operating procedures for mobile/portable SWMS required by Section 12.5, Section 12.6, and Section address requirements of 10 CFR 20.1406.

11.4.2.3 **Detailed System Component Description**

11.4.2.3.5 **SWMS Processing Subsystem**

Replace the last three sentences of the second paragraph with the following.

STD COL 11.4-1-A Testing of the SWMS includes testing specified in Table 1 of RG 1.143. Implementation of the programs described in Section 12.1, for maintaining occupational dose ALARA, and Section 12.5, Radiation Protection Program, ensure that operation, maintenance, and testing of the SWMS satisfy the guidance in RG 8.8.

STD COL 11.4-2-A Specific equipment connection configuration and plant sampling procedures are used to implement the guidance in Inspection and Enforcement (IE) Bulletin 80-10 (DCD Reference 11.4-19). The permanent and mobile/portable non-radioactive systems, which are connected to radioactive or potentially radioactive portions of SWMS, are protected from contamination with an arrangement of double check valves in each line. The configuration of each line is also equipped with a tell-tale connection, which permits periodic checks to confirm the integrity of the line and its check valve arrangement. Plant procedures describe sampling of non-radioactive systems that could potentially become contaminated by cross-connection with systems that contain radioactive material. In accordance with the guidance in RG 1.109, exposure pathways that may arise due to unique conditions are considered for incorporation into the plant-specific ODCM if they are likely to contribute significantly to the total dose.

STD COL 11.4-3-A Waste classification and process controls are described in the PCP. NEI 07-10, “Generic FSAR Template Guidance for Process Control Program (PCP),” which is under review by the NRC, is incorporated by reference. (Reference 11.4-201). The milestone for development and implementation of the PCP is addressed in Section 13.4.

11.4.6 COL Information

11.4-1-A SWMS Processing Subsystem Regulatory Guide Compliance

STD COL 11.4-1-A This COL item is addressed in Subsection 11.4.2.3.5.

11.4-2-A Compliance with IE Bulletin 80-10

STD COL 11.4-2-A This COL item is addressed in Subsection 11.4.2.3.5.

11.4-3-A Process Control Program

STD COL 11.4-3-A This COL item is addressed in Subsection 11.4.2.3.5.

11.4-4-A Temporary Storage Facility

STD COL 11.4-4-A This COL item is addressed in Subsection 11.4.1.

11.4-5-A Compliance with Part 20.1406

STD COL 11.4-5-A This COL item is addressed in Subsection 11.4.1.

11.4.7 References

11.4-201 NEI 07-10, Generic FSAR Template Guidance for Process Control Program (PCP).

11.5 Process Radiation Monitoring System

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Add the following paragraph at the end of this section.

STD COL 11.5-3-A Replace text references to DCD Table 11.5-5 with Table 11.5-201.

11.5.4.4 Setpoints

Replace the first sentence in this section with the following.

STD COL 11.5-2-A The derivation of setpoints used for offsite dose monitors described in the ODCM. Refer to Subsection 11.5.4.5 for a discussion regarding ODCM development and implementation.

11.5.4.5 Offsite Dose Calculation Manual

Replace this section with the following.

STD COL 11.5-2-A

The methodology and parameters used for calculation of offsite dose and monitoring are described in the ODCM. NEI 07-09, Generic FSAR Template Guidance for Offsite Dose Calculation Manual (ODCM) Program Description, which is under review by the NRC, is incorporated by reference. (Reference 11.5-201) The milestone for development and implementation of the ODCM is addressed in Section 13.4. **[START COM 11.5-001]** The provisions for sampling liquid and gaseous waste streams identified in Table 11.5-201and DCD Table 11.5-6 will be included in the ODCM. **[END COM 11.5-001]**

11.5.4.6 Process and Effluent Monitoring Program

Replace this section with the following.

STD COL 11.5-3-A

The program for process and effluent monitoring and sampling is described in the ODCM. Refer to Subsection 11.5.4.5 for a discussion regarding ODCM development and implementation.

11.5.4.7 Sensitivity or Subsystem Lower Limit of Detection

Replace this section with the following.

STD COL 11.5-1-A

The ODCM describes the methodology for deriving the lower limit of detection for each effluent monitor. Refer to Subsection 11.5.4.5 for a discussion regarding ODCM development and implementation. The estimated sensitivities (i.e., the dynamic detection ranges) of process radiation monitors are described in DCD Tables 11.5-2 and 11.5-4 . The bases for these values are provided in DCD Table 11.5-9. These ranges are adjusted according to unique plant configurations and radiation background in accordance with written procedures. The processes described in these procedures are consistent with the bases defined in DCD Table 11.5-9. If changes to the values in DCD Tables 11.5-2 or 11.5-4 are necessary, the FSAR is updated to reflect these new values.

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11.5.4.8 Site Specific Offsite Dose Calculation

Replace this section with the following.

STD COL 11.5-4-A

10 CFR 50, Appendix I guidelines are addressed in the ODCM. Refer to Subsection 11.5.4.5 for a discussion regarding ODCM development and implementation.

Site-specific evaluations for dose to members of the public are addressed in Section 12.2.

11.5.4.9 Instrument Sensitivities

Replace this section with the following.

STD COL 11.5-5-A

The sensitivities, sampling and analytical frequencies and bases for each gaseous and liquid sample are described in the ODCM. Refer to Subsection 11.5.4.5 for a discussion regarding ODCM development and implementation.

11.5.5.8 Setpoints

Replace this section with the following:

STD COL 11.5-2-A

Refer to Subsection 11.5.4.4.

Replace DCD Table 11.5-5 with Table 11.5-201.

11.5.7 COL Information

11.5-1-A Sensitivity or Subsystem Lower Limit of Detection

STD COL 11.5-1-A

This COL item is addressed in Subsection 11.5.4.7.

11.5-2-A Offsite Dose Calculation Manual

STD COL 11.5-2-A

This COL item is addressed in Subsection 11.5.4.4, Subsection 11.5.4.5, and Subsection 11.5.5.8.

11.5-3-A Process and Effluent Monitoring Program

STD COL 11.5-3-A

This COL item is addressed in Section 11.5 and Subsection 11.5.4.6, and Table 11.5-201.

11.5-4-A Site Specific Offsite Dose Calculation

STD COL 11.5-4-A This COL item is addressed in Subsection 11.5.4.8.

11.5-5-A Instrument Sensitivities

STD COL 11.5-5-A This COL item is addressed in Subsection 11.5.4.9.

11.5.8 References

11.5-201 NEI 07-09, “Generic FSAR Template Guidance for Offsite Dose Calculation Manual (ODCM) Program Description”

DCD Table 11.5-2

Replace the ** note with the following.

STD COL 11.5-3-A Activity levels are expected to be at the subsystem’s lower limit of detection (LLD). Applicable values are included in the plant-specific ODCM. See Section 12.2 for expected activity of various processes and effluents

DCD Table 11.5-4

Replace the ** note with the following.

STD COL 11.5-3-A Activity levels are expected to be at the subsystem’s LLD. Applicable values are included in the plant-specific ODCM. See Section 12.2 for expected activity of various processes and effluents.

Table 11.5-201 Provisions for Sampling Liquid Streams (Sheet 1 of 2) [STD COL 11.5-3-A]

No.	Process Systems as listed in NUREG-0800, SRP 11.5 Table 2 (Draft Rev. 4)	ESBWR System(s) that Perform the Equivalent SRP 11.5 Function (Note 1)	In Process	In Effluent	
			Grab Notes 2 & 7	Grab Notes 2 & 7	Continuous Notes 2 & 7
1	Liquid Radwaste (Batch) Effluent System Note 3	Equipment (Low Conductivity) Drain Subsystem Floor (High Conductivity) Drain Subsystem Detergent Drain Subsystem	S&A	S&A, H3 Note 4	--
2	Service Water System and/or Circulating Water System	Plant Service Water System and Circulating Water System	--	S&A, H3 Note 9	
3	Component Cooling Water System	Reactor Component Cooling Water System	S&A	S&A H3	(S&A) Notes 6 & 8
4	Spent Fuel Pool Treatment System	Spent Fuel Pool Treatment System	S&A	S&A H3	(S&A) Notes 6 & 8
5	Equipment & Floor Drain Collection and Treatment Systems	LCW Drain Subsystem HCW Drain Subsystem Detergent Drain Subsystem Chemical Waste Drain Subsystem Reactor Component Cooling Water System (RCCWS) Drain Subsystem	--	S&A H3	(S&A) Notes 6 & 8
6	Phase Separator Decant & Holding Basin Systems	Equipment (Low Conductivity) Drain Subsystem Floor (High) Drain Subsystem	--	S&A H3	(S&A) Notes 6 & 8
7	Chemical & Regeneration Solution Waste Systems	Chemical Waste Drain Subsystem	--	S&A H3	(S&A) Notes 6 & 8
8	Laboratory & Sample System Waste Systems	Chemical Waste Drain Subsystem	--	S&A H3	(S&A) Notes 6 & 8
9	Laundry & Decontamination Waste Systems	Detergent Drain Subsystem	--	S&A H3	(S&A) Notes 6 & 8
10	Resin Slurry, Solidification & Baling Drain Systems	Equipment (Low Conductivity) Drain Subsystem Floor (High) Drain Subsystem	--	S&A H3	(S&A) Notes 6 & 8
11	Storm & Underdrain Water System	Storm Drains	--	S&A, H3 Notes 3 & 10	

Table 11.5-201 Provisions for Sampling Liquid Streams (Sheet 2 of 2) [STD COL 11.5-3-A]

No.	Process Systems as listed in NUREG-0800, SRP 11.5 Table 2 (Draft Rev. 4)	ESBWR System(s) that Perform the Equivalent SRP 11.5 Function (Note 1)	In Process	In Effluent	
			Grab Notes 2 & 7	Grab Notes 2 & 7	Continuous Notes 2 & 7
12	Tanks and Sumps Inside Reactor Building	Equipment (Low Conductivity) Drain Subsystem Floor (High) Drain Subsystem Chemical Waste Drain Subsystem Detergent Drain Subsystem	--	S&A H3	(S&A) Notes 6 & 8
13	Ultrasonic Resin Cleanup Waste Systems	Note 5	--	Note 5	Note 5
14	Non-Contaminated Waste Water System	Sanitary Waste Discharge System	--	S&A, H3 Note 11	
15	Liquid Radioactive Waste Processing Systems (Includes Reverse Osmosis Systems)	Liquid Radioactive Waste Processing Systems (Includes Reverse Osmosis Systems)	S&A	(S&A, H3)	(S&A) Notes 6 & 8

Table 11.5-201 Provisions for Sampling Liquid Streams (Notes) [STD COL 11.5-3-A]

Notes for Table 11.5-201:

1. Table 11.5-201 addresses sampling provisions for ESBWRs as recommended in Table 2 of SRP 11.5 for BWRs. For process systems identified for BWRs in SRP 11.5 Table 2, but not shown in Table 11.5-201, those systems are not applicable to ESBWR. In some cases, there are multiple subsystems that are used to perform the overall equivalent SRP function and are listed as such in the column.
2. S&A = Sampling & Analysis of radionuclides, to include gross radioactivity, identification and concentration of principal radionuclides and concentration of alpha emitters; R = Gross radioactivity (beta radiation, or total beta plus gamma); H3 = Tritium.
3. Liquid Radwaste is processed on a batch-wise basis. The Liquid Waste Management System sample tanks can be sampled for analysis of the batch. See DCD Section 11.2.2.2 for more information on Liquid Radwaste Management.
4. Monitoring of effluents from the Equipment, Floor, and Detergent Drain Subsystems is included in the Offsite Dose Calculation Manual.
5. The ESBWR does not include ultrasonic resin cleanup waste system at this time. Should one be installed, the Liquid Waste Management System would provide sampling and monitoring provisions.
6. The use of parenthesis indicates that these provisions are required only for the systems not monitored, sampled, or analyzed (as indicated) prior to release by downstream provisions.
7. The sensitivity of detection, also defined here as the Lower Limit of Detection (LLD), for each indicated measured variable, is based on the applicable radionuclide (or collection of radionuclides as applicable) as given in ANSI/IEEE N42.18.
8. Processed through radwaste Liquid Waste Management System (LWMS) prior to discharge. Therefore, this process system is monitored, sampled, or analyzed prior to release by downstream provisions. See Note 6 above. Depending on utility’s discretion, additional sampling lines may be installed. Continuous Effluent sampling is not required per Standard Review Plan 11.5 Draft Rev. 4, April 1996, Table 2 for this system function.

9 Grab samples can be obtained from a cooling tower basin. See Subsection 9.2.1.2 for the PSWS cooling tower basin and Subsection 10.4.5.2.3 for the Circulating Water System cooling tower basin.

10 Grab samples can be obtained from the Condensate Storage Tank (CST) basin sump. See DCD Section 9.2.6.2.

11 Grab samples can be obtained from the sewage treatment plant. See Subsection 9.2.4.2.