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Supplemental Data for the 200 West Area Tank Treatment Mission Waste Incidental to Reprocessing Evaluation and NEPA Document

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ACRONYMS

200W	200 West Area
A ₂	relative hazard
ACEM	Activity Concentration for Exempt Material
ALEC	Activity Limit for Exempt Consignment
BBI	Best Basis Inventory
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulation
DF	decontamination factor
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DST	double-shell tank
GTCC	greater-than-Class-C
HISI	Hanford Information Systems Inventory
IBC	intermediate bulk container
IP	industrial packaging
LDR	Land Disposal Restrictions
LLR	low-level radioactive waste
LSA	Low Specific Activity
NEPA	National Environmental Policy Act of 1969
NRC	U.S. Nuclear Regulatory Commission
EIS	Environmental Impact Statement
MLLW	mixed low-level waste
PM	process module
SCO	surface contaminated object
SST	single-shell tank
WARM	West Area Risk Management
WIR	Waste Incidental to Reprocessing

1.0 OBJECTIVE/PURPOSE

This report documents the 200 West Area (200W) flowsheet supplemental data needed to support the *Draft Waste Incidental to Reprocessing Evaluation for the 200 West Area Tank Treatment Mission at the Hanford Site* (Draft WIR Evaluation) and the National Environmental Policy Act (NEPA) documentation, for evaluating the impacts of transporting the pretreated liquid or solid waste from the Hanford Site to onsite or offsite facilities for solidification and disposal¹. The data provided in this document is based on the results of a 200W flowsheet model run evaluating single-shell tank (SST) retrievals for all S, SX, and U Farms, except for Tank S-112, which was retrieved in March of 2007 (HNF-EP-0182, *Waste Tank Summary Report for Month End August 31, 2024*). The evaluation also includes the current waste inventory in double-shell tanks (DSTs) in SY Farm.

The supplemental data in this report was created based on the utility calculation software documented in RPP-PLAN-65926, "*Software Management Plan for Grade D Utility Calculation Software West Area Flowsheet – Excel Based*". This software is registered in the Hanford Information Systems Inventory (HISI) under number 5504. The supplemental data spreadsheet and other sensitivity analyses are attached to this report in the SmartPlant Foundation².

¹ The 200W tank treatment mission includes current and future capital and expense projects, along with their future operations, that are required to meet the mission need of treating waste from the S, SX, and U farm tanks in 200W by 2040. Current projects under the 200W tank treatment mission include the West Area Risk Management (WARM) capital project and the following expense projects: SY Farm Infrastructure Upgrades, Cross-Site Supernate Transfer Line Reactivation, SY-103 Remediation, SY Flush System, Waste Feed Delivery, SY-01A Mixer Pump Removal, and SY Pit Repairs.

² SmartPlant Foundation is a trademark of Hexagon AB, Stockholm, Sweden.

2.0 INTRODUCTION/BACKGROUND

This section discusses the applicable regulatory requirements associated with treating and disposing of radioactive waste from the 200W underground tanks:

- U.S. Department of Energy (DOE) M 435.1-1, *Radioactive Waste Management Manual*
- *National Environmental Policy Act of 1969* (NEPA)
- 10 CFR 61.55, “*Waste Classification*”
- 49 CFR 173.403, “*Transportation*,” “*Shippers—General Requirements for Shipments and Packagings*,” “*Radioactive Materials*,” “*Definitions*.”

2.1 DOE M 435.1-1, RADIOACTIVE WASTE MANAGEMENT - WASTE INCIDENTAL TO REPROCESSING EVALUATION

Waste stored in underground tanks at the Hanford Site is managed as high-level radioactive waste (HLW)³ until otherwise classified. As part of DOE’s Radioactive Waste Management program, certain reprocessing waste may be classified as non-HLW if the waste meets specific criteria.

Under DOE Manual 435.1-1, DOE may determine that certain waste is non-HLW through application of the Waste Incidental to Reprocessing (WIR) Evaluation. Reprocessing waste that is determined to be non-HLW is managed per the DOE requirements for low-level waste (LLW) in Chapter IV of the Manual DOE M 435.1-1 provided that the wastes:

- “(1) *Have been processed, or will be processed, to remove key radionuclides to the maximum extent that is technically and economically practical; and*
- “(2) *Will be managed to meet safety requirements comparable to the performance objectives set out in 10 CFR 61, Subpart C, Performance Objectives; and*
- “(3) *Are to be managed, pursuant to DOE authority under the Atomic Energy Act of 1954, as amended, and in accordance with the provisions of Chapter IV of this Manual, provided the waste will be incorporated in a solid physical form at a concentration that does not exceed the applicable concentration limits for Class C low-level waste as set out in 10 CFR 61.55, Waste Classification.*”⁴

³ Tank waste is considered waste from reprocessing spent nuclear fuel. Reprocessing waste is waste generated from processes necessary to separate fissile elements and/or transuranic elements from other materials contained in spent nuclear fuels.

⁴ This provision in DOE M 435.1 also includes the following language: “or will meet alternative requirements for waste classification and characterization as DOE may authorize.” DOE is not using or relying upon this language in the Draft WIR Evaluation.

2.2 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

DOE NEPA regulations state that "DOE shall prepare a supplemental EIS (Environmental Impact Statement) if there are substantial changes to the proposal or significant new circumstances or information relevant to environmental concerns" (10 CFR 1021.314(a)). DOE's NEPA regulations also state that when it "is unclear whether or not an EIS supplement is required, DOE shall prepare a Supplement Analysis" (10 CFR 1021.314(c)). This Supplemental Analysis provides sufficient information for DOE to determine whether (1) to supplement an existing EIS, (2) to prepare a new EIS, or (3) no further NEPA documentation is required (10 CFR 1021.314(c)(2)(i)–(iii)).

2.3 WASTE CLASSIFICATION CONCENTRATION LIMITS

As described previously, Criterion 3 of DOE M 435.1-1 refers to the U.S. Nuclear Regulatory Commission (NRC) Title 10, *Code of Federal Regulations (CFR)*, Part 61, Subpart D, § 61.55, "Waste Classification" (10 CFR 61.55), which sets forth concentration limits applicable to classification of radioactive waste for near-surface disposal. Generally, waste forms that meet Class A, Class B, and Class C waste classifications can be disposed at a near-surface disposal site. Waste that is not generally acceptable for near-surface disposal is waste that requires different disposal methods, and in general, more stringent, than those specified for Class C and below waste [i.e., greater-than-Class-C (GTCC) waste]. Determination of the classification of radioactive waste involves two considerations: long-lived and short-lived radionuclides.

First, the classification is determined by long-lived radionuclides. If radioactive waste contains only radionuclides listed in 10 CFR 61.55, Table 1 (recreated in the following Table 2-1), classification shall be determined as follows:

- (i) If the concentration does not exceed 0.1 times the value in Table 1, the waste is Class A.
- (ii) If the concentration exceeds 0.1 times the value in Table 1 but does not exceed the value in Table 1, the waste is Class C.
- (iii) If the concentration exceeds the value in Table 1, the waste is not generally acceptable for near-surface disposal.
- (iv) For wastes containing mixtures of radionuclides listed in Table 1, the total concentration shall be determined by the sum of fractions rule.

Table 2-1. 10 CFR 61.55 Table 1 Radionuclides Concentration Limits

Radionuclide	Concentration (Ci/m ³)
C-14	8
C-14 in activated metal	80
Ni-59 in activated metal	220
Nb-94 in activated metal	0.2
Tc-99	3
I-129	0.08
Alpha emitting transuranic nuclides with half-life greater than 5 years ⁽²⁾	100 ⁽¹⁾
Pu-241	3,500 ⁽¹⁾
Cm-242	20,000 ⁽¹⁾

¹ Units are nanocuries per gram.

² Transuranic elements are those elements that lie beyond uranium on the periodic table. In the context of this table, they include Np-237, Pu-238, Pu-239, Pu-240, Pu-242, Am-241, Am-243, Cm-243, and Cm-244.

Source: Title 10, *Code of Federal Regulations*, Part 61, Subpart D, § 61.55, "Waste Classification" (10 CFR 61.55)

Second, the classification is determined by short-lived radionuclides. If radioactive waste does not contain any of the radionuclides listed in Table 1, classification shall be determined based on the concentrations shown in 10 CFR 61.55, Table 2 (recreated in the following Table 2-2). If radioactive waste does not contain any nuclides listed in either Table 1 or 2, it is Class A.

- (i) If the concentration does not exceed the value in Column 1, the waste is Class A.
- (ii) If the concentration exceeds the value in Column 1, but does not exceed the value in Column 2, the waste is Class B.
- (iii) If the concentration exceeds the value in Column 2, but does not exceed the value in Column 3, the waste is Class C.
- (iv) If the concentration exceeds the value in Column 3 (i.e., GTCC), the waste is not generally acceptable for near-surface disposal.⁵
- (v) For wastes containing mixtures of the nuclides listed in Table 2, the total concentration shall be determined by the sum of fraction rule.

⁵ The disposition of GTCC is beyond the scope of the Draft WIR Evaluation.

Table 2-2. 10 CFR 61.55 Table 2 Radionuclides Concentration Limits

Radionuclide	Concentration (Ci/m ³)		
	Col. 1	Col. 2	Col. 3
Total of all nuclides with less than 5-year half-life	700	(1)	(1)
H-3	40	(1)	(1)
Co-60	700	(1)	(1)
Ni-63	3.5	70	700
Ni-63 in activated metal	35	700	7,000
Sr-90	0.04	150	7,000
Cs-137	1	44	4,600

¹ There are no limits established for these radionuclides in Class B and C wastes. Practical considerations such as the effects of external radiation and internal heat generation on transportation, handling, and disposal will limit the concentrations of these wastes. These wastes shall be Class B unless the concentrations of other nuclides in Table 2 determine the waste to be Class C independent of these nuclides.

Source: Title 10, *Code of Federal Regulations*, Part 61, Subpart D, § 61.55, "Waste Classification" (10 CFR 61.55)

For radioactive waste that contains a mixture of radionuclides listed in both 10 CFR 61.55 Table 1 and Table 2, the classification shall be determined as following [10 CFR 61.55(a)(5)].

- (i) If the concentration of a nuclide listed in Table 1 does not exceed 0.1 times the value listed in Table 1, the class shall be that determined by the concentration of nuclides listed in Table 2.
- (ii) If the concentration of a nuclide listed in Table 1 exceeds 0.1 times the value listed in Table 1 but not exceed the value in Table 1, the waste shall be Class C, provided the concentration of nuclides listed in Table 2 does not exceed the value shown in Column 3 of Table 2.

Pretreated wastes processed through the 200W process module (PM) contain a mix of long-lived radionuclides and short-lived radionuclides listed in 10 CFR 61.55 Table 1 and Table 2, respectively. Therefore, the sum of fractions rule is used to evaluate waste classification for pretreated waste. Waste classification is determined based on liquid waste characteristics prior to being shipped for further treatment and offsite disposal. The sum of fractions is determined by dividing each radionuclide's concentration by the appropriate limit and adding the resulting values.

Offsite waste solidification/immobilization facilities require waste generators to identify the waste class as received prior to shipment, even if the waste is going to be processed. Once the waste class is identified, federal regulations do not allow changes to the waste classification for disposal. Since the baseline for the *Preliminary 200 West Area Flowsheet* (RPP-RPT-64319) includes shipment of pretreated liquid waste to further treatment and offsite disposal, the waste classification must be completed on the as-shipped liquid waste.

2.4 RADIOACTIVE WASTE TRANSPORTATION REQUIREMENTS

Onsite or offsite transportation of radioactive liquid waste must follow the U.S. Department of Transportation (DOT) requirements for hazardous materials. Radioactive materials must be packaged in accordance with the level of hazard associated with the potential release of material that might occur during normal transport conditions or accidental release of the material during transport. The greater the hazard, the more robust the packaging required to transport the material.

The transportation hazard of radioactive material is determined by evaluation of the A_2 (relative hazard) of the material. The A_2 ⁶ values for various radioactive isotopes were developed to show the level of harm that would occur due to exposure to these isotopes. DOT has published a list of A_2 values for many radioactive isotopes in Title 49, *Code of Federal Regulations*, Part 173, “Shippers – General Requirements for Shipments and Packagings”, Subpart I – Class 7 (Radioactive) Materials, § 173.435, “Table of A_1 and A_2 Values for Radionuclides” (49 CFR 173.435). To determine the relative hazard of a material, the fractional value of each isotope in a proposed shipment is calculated and the resulting sum of fractions is determined. Table 2-3 presents different inventory/concentration limits associated with the transportation categories and packaging options.

Table 2-3. Transportation and Packaging Categorization for Radioactive Liquids (2 pages)

Radioactive Material Characteristic	Radioactive Material Package Categorization for Transportation ^a				
	Exempt Packages	LSA-I	LSA-II	Type A	Type B
Inventory	Less than ACEM or ALEC	< 30 ACEM, < 100 A_2 per conveyance, distributed throughout	< 10^{-5} A_2 /g, < 100 A_2 per conveyance, distributed throughout	1 A_2 or less per package	Greater than 1 A_2 per package
Packaging	not applicable	IP-1	IP-1 if < 1 A_2 , otherwise IP-2 or IP-3	Type A packaging	Type B packaging
Dose Rate	-	< 200 mrem/hr on contact, < 10 mrem/hr at 2 m from package side			

⁶ A_2 means the maximum activity of Class 7 (radioactive) material, other than special form material, Low Specific Activity (LSA) material, and surface contaminated object (SCO), permitted in a Type A package. This value is either listed in 49 CFR§173.435 or may be derived in accordance with the procedures prescribed in 49 CFR§173.433.

**Table 2-3. Transportation and Packaging Categorization for Radioactive Liquids
(2 pages)**

Radioactive Material Characteristic	Radioactive Material Package Categorization for Transportation ^a				
	Exempt Packages	LSA-I	LSA-II	Type A	Type B
Fissile Materials (U-233, U-235, Pu-239, Pu-241)	-	Required to meet at least one fissile exempt condition listed in 49 CFR 173.453 ^b	Required to meet at least one fissile exempt condition listed in 49 CFR 173.453 ^b	-	-
Testing Required	-	None	1-ft drop for heavy packages, stack test, etc.	30-ft drop for liquid packages	30-ft drop, 30-minutes fire, etc.
Certification	-	Self-certified	Self-certified	Self-certified	NRC, DOE, or DOT certificate required
Example Packages ^c	-	IBC tote, supertainer tote	Metal IBC tote, cargo tank, portable tank	LQ-375, Hedgehog II	10-180B cask, Spent Fuel cask

^a Information in this table was combined from multiple requirements in Title 49, *Code of Federal Regulations*, Part 173, Subpart I, "Class 7 (Radioactive) Materials," Sections § 173.401 through Section §173.477 (49 CFR 173)

^b Fissile exemption conditions are listed in Title 49, *Code of Federal Regulations*, Part 173, Subpart I, § 173.453, "Fissile Material – Exceptions" (49 CFR 173.453)

^c Specific manufacturing totes or tank will have to be qualified for the material package categorization. Plastic totes cannot be decontaminated to DOT rad-empty requirements and returned to waste generator (Hanford Tank Farms); therefore, only metal totes are considered.

ACEM = Activity Concentration for Exempt Material

IBC = intermediate bulk container

ALEC = Activity Limit for Exempt Consignment

IP = industrial packaging

DOE = U.S. Department of Energy

LSA = Low Specific Activity

DOT = U.S. Department of Transportation

NRC = U.S. Nuclear Regulatory Commission

Type B is the most robust packaging category that is used to transport the highest hazard materials (e.g., spent nuclear fuels). Type B packaging is for material that contains greater than one A₂ per package. Type B packaging must demonstrate through testing that the radioactive

material would be contained during all foreseeable normal and accident conditions (e.g., 30-ft drop, 30-minute fire). An example of Type B packaging is a large spent fuel cask. Type B packages must be certified by the associated regulatory authority including NRC, DOE, and/or DOT.

Type A is a less robust packaging as compared to Type B packaging. Type A packaging is used for transporting materials that contain less than one A_2 per package. Type A packaging also requires testing, but the testing requirements are generally less severe than for Type B packaging. However, Type A packaging for liquids must endure the same 30-ft drop test as required for Type B packaging without releasing the contents. Type A packages can be self-certified by waste handlers.

The next two lower transportation categories are LSA-I and LSA-II. Packaging in these categories can be used to transport bulk materials that contain low concentrations of radioactive isotopes in a relatively large volume. Depending on the level of activity of the liquid waste, the shipment can be done as LSA-I or LSA-II. To qualify for transporting material in LSA-I packaging, the activity concentration for exempt material (ACEM) value defined in Title 49, *Code of Federal Regulations*, Subpart I, § 173.436, "Exempt Material Activity Concentrations and Exempt Consignment Activity Limits for Radionuclides" (49 CFR 173.436) must be less than 30 times the ACEM. To qualify for shipping liquids in LSA-II packaging, the average specific activity must be less than $1.0 \times 10^{-5} A_2/g$ and the quantity of LSA material transported in any single conveyance may not exceed 100 A_2 .

The LSA-I and LSA-II categories also have a requirement that the radioactive activity of the liquid being transported must be "distributed throughout" as defined in 49 CFR 173.403. This requirement is evaluated against the probability that solids containing radiological constituents will precipitate from the liquid. Solids that do not contain radionuclides may precipitate and still meet the "activity distributed throughout" requirement. This requirement can be evaluated with a waste sample that is allowed to sit for an extended period (minimum 30 days) and then cooled to freezing and heated to hot ambient conditions (120°F) and then monitored for solids formation. For simplification, radionuclide activity is assumed to be distributed throughout in pretreated liquid waste during transportation.

All four packaging categories must meet the requirements for dose rate to be less than 200 mrem/hr on contact, and less than 10 mrem/hr at 2 meters from the outer lateral surfaces of an "exclusive-use" vehicle (49 CFR 173.441(b)). Packages that contain any of the fissile isotopes U-233, U-235, Pu-239, and Pu-240 must be evaluated for the total mass of these isotopes. Waste shipping in LSA-I or LSA-II package is required to meet at least one fissile material exempt condition listed in 49 CFR 173.453. Only Type A and Type B can be qualified as fissile packages. Therefore, these package types do not need to meet fissile material exempt condition.

3.0 INPUT DATA

Inputs for the flowsheet calculations include Best Basis Inventory (BBI)⁷ data for all DSTs in SY Farm and all SSTs in S, SX, and U Farms, except for Tank S-112. The flowsheet calculation software was built with an option to evaluate two SST retrievals simultaneously and the retrieved waste from both operations are sent to DST SY-103. However, for this supporting document, all SST retrievals are evaluated individually.

Flowsheet calculations and sensitivity analyses were done using the utility calculation software that is documented in RPP-PLAN-65926.

⁷ BBI contains best-basis inventory estimates for 25 chemical and 46 radionuclide components for each of the 177 Hanford Site underground storage tanks (149 single-shell tanks and 28 double-shell tanks). BBI provides waste composition data for the process flowsheet modeling work, safety analyses, risk assessment, and waste retrieval, treatment, and disposal system design. Development and maintenance of the BBI is an on-going effort.

4.0 ASSUMPTIONS

All flowsheet assumptions are documented in RPP-PLAN-65926. Specifically for this supplemental data report, the flowsheet calculations conservatively assume only Cs-137 is removed by ion exchange media, and no Sr-90 removal occurs. Each process module in the 200W PM has a filtration system to remove entrained solids in the feed stream; however, evaluations in this report also conservatively assume 0% filter efficiency (all solids pass through filter screen).

5.0 METHOD OF ANALYSIS

Flowsheet calculation software documented in RPP-PLAN-65926 was used to generate all data in this supplemental data report. The following sections discuss the methodology used by the utility calculation software to generate supporting data for the Draft WIR Evaluation and transportation waste categorization to support the NEPA document.

5.1 WASTE CLASSIFICATION EVALUATION

The main body of the Draft WIR Evaluation assumes no removal of Sr-90 and 0% removal of entrained solids by filtration. The results of this supplemental data report provide the estimated retrieval volume and key radionuclide inventory for each 200W SST and SY Farm DSTs.

Waste classification was evaluated for the pretreated liquid waste and the solidified waste using the sum of fractions method in accordance with 10 CFR 61.55, *Waste Classification*. DOE may solidify the waste onsite and/or offsite. DOE will dispose of the solidified waste at one or more offsite, licensed, commercial disposal facilities outside the state of Washington. DOE has not made decisions on the location of either the solidification facility(ies) or the disposal facility(ies).⁸

A sensitivity scenario was also evaluated with assuming a Sr-90 removal efficiency of 96.8% by ion exchange media. The input for the Sr-90 decontamination factor (DF) was adjusted to 31, which is equivalent to a Sr-90 removal efficiency of 96.8%. This Sr-90 DF results in the highest number of feeds meeting Class A concentration limits. The potential option for DOE to solidify and dispose of waste at *EnergySolutions* (Clive, Utah) is only possible if the waste meets Class A concentration limits. The results of these sensitivity scenarios are provided in the Appendix A of this supplemental data report.

5.2 RADIOACTIVE LIQUID TRANSPORTATION CATEGORY EVALUATION

To evaluate options for transporting radioactive liquid waste to subsequent facilities, radionuclide activities in the pretreated waste were compared to the A_2 values listed in 49 CFR 173.435. The A_2 values for various radioactive isotopes were developed to show a level of harm that would occur due to exposure to these isotopes. A sum of fractions of A_2 limits was estimated and a total fissile materials mass was calculated for each source tank. Fissile materials include U-233, U-235, Pu-239, and Pu-241 as defined in Title 49, *Code of Federal Regulations*, Part 173, Subpart 403, "Definitions" (49 CFR 173.403). Based on radionuclide concentrations of the pretreated waste, it is expected that radioactive liquid waste from all source tanks can be transported in either LSA-II or Type A packages. Evaluations for LSA-I and Exempt Packages were excluded from this flowsheet.

Regardless of transportation category, the surface dose rate is required to be less than 200 mrem/hr on contact and < 10 mrem/hr at 2 meters from the package. Dose rate calculation was

⁸ *EnergySolutions* is both a solidification and disposal facility. However, it is limited to accepting Class A LLW and MLLW. WCS is both a solidification and disposal facility and is licensed to accept Class A, B, and C LLW and MLLW.

not performed in this flowsheet calculation software. All packages were assumed to meet DOT dose rate requirements.

5.2.1 LSA-II Packaging

To transport radioactive liquid in an LSA-II category package, the package must have an A_2 average specific activity less than $1 \times 10^{-5} A_2/g$, the quantity of LSA material transported in any single conveyance may not exceed $100 A_2$, and meet at least one condition for fissile material exemptions listed in 49 CFR 173.453. Each of these criteria were considered:

1. To evaluate the A_2 concentration, the total A_2 value in each LSA-II package is needed. The total A_2 value is calculated using a sum of fractions of the activity of each radionuclide divided by its respective A_2 limit. This total A_2 value is divided by the feed source mass. If the A_2 concentration is less than $1 \times 10^{-5} A_2/g$, the package meets the LSA-II requirement.
2. To evaluate if each package has less than $100 A_2$, the total A_2 value is multiplied by the LSA-II package to total volume ratio. If it is less than $100 A_2$, the package meets the LSA-II requirement.
3. To evaluate the fissile exempt requirement, mass of U-233, U-235, Pu-239, and Pu-241 in each feed is calculated by dividing the activity of the radionuclide by its specific activity, and then summed to a total fissile mass. The fraction of an LSA-II package volume (assumed 5,000 gallons) to the total feed source volume was applied to estimate total fissile mass per package. If the fissile mass is less than 15 grams in each package, the shipment is considered fissile exempt and can be transported in an LSA-II package, given the package meets the nonfissile solids to fissile material mass ratio condition stated in 49 CFR 173.453(b).

The fissile exempt condition of 49 CFR 173.453(b) states:

An individual or bulk packaging containing 15 grams or less of fissile material provided the package has at least 200 grams of solid nonfissile material for every gram of fissile material. Lead, beryllium, graphite, and hydrogenous material enriched in deuterium may be present in the package but must not be included in determining the required mass for solid nonfissile material.

Up to 15 grams of fissile material may be shipped in a package provided the packaging has at least 200 grams of solid nonfissile material for every gram of fissile material. A bulk package needs at least 3,000 grams (~ 7 lbs.) of solid nonfissile solids to meet this ratio with 15 grams of fissile materials to be considered "fissile exempt". "Individual or bulk packaging" includes the combination of content being transported and the packaging. The tank shipping the liquid waste is solid, and likely fabricated from nonfissile stainless steel with minimal lead, beryllium, graphite, or hydrogenous material enriched in deuterium. Tanker trucks are thus expected to be allowed to transport up to 15 grams of fissile material under LSA-II category.

The $100 A_2$ inventory and fissile exempt limit (< 15 g) were used to estimate the maximum volume allowed per shipment. If the maximum allowed volume is greater than the package volume (assumed 5,000 gallons), it is safe to transport liquid waste in LSA-II package. If the maximum allowed volume is less than the LSA-II package volume, the LSA-II package cannot

be filled to capacity. Fill controls will be needed, or the waste can be transported in a higher transportation category package, which has more stringent requirements and smaller capacity.

Another transportation requirement is that the radionuclide activity must be distributed throughout the material in an LSA-II package. The flowsheet assumed this condition will be met in all LSA-II packages.

5.2.2 Type A and Type B Packaging

Type A is the next transportation category package for shipping radioactive liquid waste. Type A package has a significantly smaller volume as compared to LSA-II package and must meet additional requirements, such as drop test at 30-ft. One of the Type A package options is the LQ-375 Type A Liquid Container. This metal container can hold approximately 375 gallons. Multiple containers can be transported on a flatbed or box trailer.

To evaluate the Type A transportation option, the flowsheet assumes container volume is 375 gallons. The volume fraction of Type A package (375 gallons) to each feed volume was estimated. This volume fraction value was applied to the total A_2 of each feed for the A_2 inventory per Type A package. The Type A transportation category requires each package to have one A_2 or less. If the total A_2 per package is greater than one, the Type A container cannot be filled to capacity. Fill controls will be needed, or the waste can be transported in a higher transportation category package (e.g., Type B).

Type B packages have the most stringent requirements including withstanding a 30-ft drop test as well as 30-minute fire exposure. Type B packaging must be certified by NRC, DOE, and/or DOT while lower transportation categories can be self-certified by the waste handlers.

6.0 USE OF COMPUTER SOFTWARE

Grade D, Excel-based utility calculation software documented in RPP-PLAN-65926 was used to perform all calculations to generate supporting data in this document.

7.0 SUPPLEMENTAL DATA RESULTS

Supplemental data to support Draft WIR Evaluation and NEPA documentation is provided in the following sections.

7.1 SUPPORTING DATA FOR THE 200 WEST AREA TANK TREATMENT MISSION WASTE INCIDENTAL TO REPROCESSING EVALUATION

The following sections provide waste classification evaluations to support the development of the *Draft WIR Evaluation*.

7.1.1 Retrieval Waste Inventory

This section provides retrieval volume estimates and key radionuclide inventories for each 200W SST including DSTs SY-101 and SY-102 before and after pretreatment via the 200W PM. Table 7-1 provides an estimated retrieval volume and density for each of the SSTs in S, SX, and U Farm (except for Tank S-112, which was retrieved in 2007). Table 7-1 does not include data for Tank SY-103 since most of the waste inventory from this tank will be transferred to Tank SY-102 prior to SST retrievals and will be pretreated in the 200W PM with waste from Tank SY-102.

Table 7-1. Retrieved Waste Volume and Density

Source Tank	Retrieval Volume (kgal)	Retrieved Waste Density (kg/kL) ^a
SY-101	831	1,233
SY-102 ^b	836	1,270
S-101	782	1,334
S-102	474	1,132
S-103	987	1,186
S-104	749	1,247
S-105	1,102	1,299
S-106	1,576	1,199
S-107	864	1,307
S-108	1,785	1,232
S-109	1,469	1,303
S-110	1,165	1,299
S-111	1,346	1,190
U-201	97	1,027
U-202	90	1,031
U-203	61	1,025
U-204	44	1,021

Table 7-1. Retrieved Waste Volume and Density

Source Tank	Retrieval Volume (kgal)	Retrieved Waste Density (kg/kL) ^a
U-101	775	1,019
U-102	1,178	1,219
U-103	1,528	1,182
U-104	400	1,133
U-105	1,285	1,242
U-106	633	1,168
U-107	1,257	1,176
U-108	1,559	1,213
U-109	1,399	1,177
U-110	475	1,280
U-111	921	1,189
U-112	1,545	1,017
SX-101	1,280	1,280
SX-102	1,073	1,251
SX-103	1,653	1,305
SX-104	1,045	1,286
SX-105	1,245	1,238
SX-106	1,184	1,163
SX-107	438	1,263
SX-108	257	1,276
SX-109	1,088	1,200
SX-110	170	1,297
SX-111	478	1,201
SX-112	308	1,197
SX-113	109	1,072
SX-114	660	1,206
SX-115	50	1,075

Notes:

^a For DSTs (SY-101 & SY-102), waste density is the liquid density of waste feed to the 200W PM. For SSTs (all S, SX, and U tanks), waste density is the bulk density of retrieved waste.

^b Tank SY-103 waste inventory is included in Tank SY-102 inventory.

Table 7-2 provides estimates for total feed inventory, total pretreated waste inventory, and the percent removal for each key radionuclide.

Table 7-2. Total Key Radionuclides Inventory in Feed and Pretreated Waste

Key Radionuclide	Feed Inventory (Ci)	Pretreated Liquid Inventory (Ci)	Percent Removal
H-3	2.21E+02	2.20E+02	0.43%
C-14	1.40E+02	1.39E+02	0.41%
Co-60	2.89E+00	2.88E+00	0.39%
Ni-63	1.08E+03	1.08E+03	0.37%
Sr-90	1.12E+05	1.12E+05	0.32%
Tc-99	5.40E+03	5.38E+03	0.40%
I-129	5.12E+00	5.09E+00	0.40%
Cs-137	3.16E+06	2.76E+03	99.91%
Np-237	5.25E+00	5.23E+00	0.39%
Pu-238	3.97E+00	3.96E+00	0.30%
Pu-239	1.62E+02	1.61E+02	0.29%
Pu-240	3.33E+01	3.32E+01	0.29%
Am-241	2.54E+02	2.54E+02	0.33%
Pu-241	4.85E+01	4.84E+01	0.30%
Cm-242	3.87E+00	3.86E+00	0.40%
Pu-242	1.85E-03	1.84E-03	0.31%
Am-243	1.57E-01	1.56E-01	0.34%
Cm-243	1.67E-01	1.66E-01	0.40%
Cm-244	2.65E+00	2.64E+00	0.40%

Notes: This evaluation conservatively assumes no Sr-90 removal and no solids removal by filtration in the 200W PM. Only Cs-137 is removed by ion exchange operation. Any minor differences noted between the feed inventory and the pretreated liquid inventory for other radionuclides are an artifact of mass balance calculation uncertainty and do not represent removal via ion exchange.

Table 7-3 provides an estimate of the key radionuclide inventory in the feed stream before pretreatment via the 200W PM for each SST in S, SX, and U Tank Farms and DSTs in SY Tank Farm (Tank SY-103 data is excluded since most of waste inventory from this tank will be transferred to Tank SY-102 prior to SST retrievals and will be pretreated with waste from Tank SY-102).

Table 7-4 provides an estimate of key radionuclide activity in the 200W PM product stream (post pretreatment). Percent removal of total key radionuclides was estimated for each tank by dividing the difference between the total key radionuclide activity in the feed stream (from Table 7-3) and pretreated waste by the total radionuclide activity in the feed stream.

Table 7-3. 200W Feed Stream Key Radionuclide Activity (2 pages)

Tank	H-3 (Ci)	C-14 (Ci)	Co-60 (Ci)	Ni-63 (Ci)	Sr-90 (Ci)	Tc-99 (Ci)	I-129 (Ci)	Cs-137 (Ci)	Np-237 (Ci)	Pu-238 (Ci)	Pu-239 (Ci)	Pu-240 (Ci)	Am-241 (Ci)	Pu-241 (Ci)	Cm-242 (Ci)	Pu-242 (Ci)	Am-243 (Ci)	Cm-243 (Ci)	Cm-244 (Ci)	Feed Stream Total Activity (Ci)
SY-101	1.57E-01	2.07E+00	1.82E-01	3.57E+01	2.36E+03	3.77E+02	3.01E-01	2.00E+05	8.51E-03	1.19E-01	7.17E-01	1.54E-01	3.85E+00	3.29E-01	2.44E-01	9.92E-05	2.31E-03	3.39E-02	5.46E-01	2.03E+05
SY-102	1.73E-01	2.24E+00	2.34E-01	4.68E+01	2.50E+03	4.86E+02	3.77E-01	2.54E+05	1.07E-02	1.62E-01	9.57E-01	2.06E-01	5.38E+00	4.47E-01	3.43E-01	1.33E-04	3.23E-03	4.77E-02	7.68E-01	2.57E+05
S-101	5.58E+00	2.13E+00	6.87E-02	1.78E+01	3.28E+03	1.63E+02	9.26E-02	1.24E+05	1.23E-02	7.93E-02	2.83E+00	5.59E-01	2.88E+00	5.93E-01	7.96E-02	4.57E-05	1.46E-03	1.04E-02	1.68E-01	1.27E+05
S-102	3.24E+00	1.59E+00	1.73E-02	1.53E+01	1.26E+03	5.42E+01	4.41E-02	4.86E+04	2.77E-02	2.16E-02	6.71E-01	1.40E-01	5.60E-01	2.23E-01	4.29E-02	1.20E-05	3.32E-04	2.47E-03	3.98E-02	4.99E+04
S-103	4.64E+00	4.12E+00	6.29E-02	1.78E+01	2.48E+03	1.47E+02	1.45E-01	1.00E+05	8.10E-02	3.29E-02	1.32E+00	2.74E-01	9.83E-01	4.22E-01	4.17E-02	1.56E-05	5.95E-04	1.35E-03	2.16E-02	1.03E+05
S-104	2.22E+00	1.79E+00	1.42E-02	8.41E+00	2.77E+03	5.66E+01	5.44E-02	4.05E+04	4.42E-02	5.93E-02	2.56E+00	5.20E-01	1.37E+00	6.15E-01	7.09E-03	2.06E-05	5.78E-04	1.78E-04	2.82E-03	4.33E+04
S-105	7.36E+00	8.52E+00	8.42E-02	1.87E+01	2.43E+03	2.55E+02	2.52E-01	4.47E+04	8.69E-02	2.09E-02	8.24E-01	1.74E-01	5.50E+00	2.79E-01	2.02E-02	9.42E-06	3.45E-03	4.18E-04	6.69E-03	4.74E+04
S-106	6.19E+00	7.41E+00	2.52E-02	1.39E+01	3.34E+03	2.21E+02	2.19E-01	1.01E+05	2.83E-01	1.27E-02	4.53E-01	9.80E-02	2.32E+00	1.76E-01	1.90E-02	5.89E-06	1.46E-03	3.87E-04	6.18E-03	1.05E+05
S-107	1.85E+01	2.22E+00	3.80E-02	8.47E+00	2.23E+03	3.73E+01	3.21E-02	4.76E+04	4.03E-02	1.58E-01	8.53E+00	1.76E+00	3.46E+00	2.48E+00	8.32E-03	8.34E-05	7.94E-04	2.31E-04	3.55E-03	4.99E+04
S-108	1.46E+01	8.45E+00	3.38E-02	1.98E+01	4.08E+03	2.62E+02	2.59E-01	1.59E+05	3.68E-01	4.81E-02	1.91E+00	4.05E-01	4.17E+00	6.63E-01	7.28E-02	2.23E-05	2.56E-03	1.51E-03	2.41E-02	1.64E+05
S-109	9.45E+00	1.06E+01	6.69E-02	2.07E+02	3.68E+03	3.32E+02	3.31E-01	4.36E+04	5.46E-01	4.30E-02	2.56E+00	5.06E-01	1.02E+00	5.01E-01	1.68E-02	1.75E-05	5.49E-04	3.39E-04	5.43E-03	4.78E+04
S-110	8.06E+00	7.06E+00	6.17E-02	4.58E+01	3.37E+03	2.12E+02	2.09E-01	7.63E+04	3.40E-01	1.18E-01	6.97E+00	1.37E+00	5.21E+00	1.43E+00	4.99E-02	4.91E-05	2.62E-03	1.01E-03	1.61E-02	7.99E+04
S-111	5.70E+00	4.63E+00	1.88E-02	1.11E+01	3.84E+03	1.63E+02	1.64E-01	6.44E+04	3.00E-01	2.92E-02	1.50E+00	3.02E-01	1.06E+00	3.72E-01	1.42E-02	1.27E-05	5.79E-04	2.89E-04	4.62E-03	6.84E+04
U-201	4.39E-01	2.78E-01	5.95E-04	5.44E-01	1.82E+02	1.02E+01	1.02E-02	3.94E+03	1.89E-02	1.26E-03	5.91E-02	1.21E-02	3.23E-02	1.64E-02	4.72E-04	5.58E-07	1.84E-05	9.60E-06	1.53E-04	4.14E+03
U-202	4.14E-01	1.93E-01	3.95E-04	4.76E-01	1.25E+02	6.95E+00	6.97E-03	2.67E+03	1.29E-02	8.41E-04	3.92E-02	8.03E-03	2.12E-02	1.10E-02	3.06E-04	3.73E-07	1.22E-05	6.22E-06	9.93E-05	2.80E+03
U-203	2.80E-01	1.02E-01	2.04E-04	3.43E-01	6.47E+01	3.61E+00	3.61E-03	1.38E+03	6.67E-03	4.31E-04	2.00E-02	4.10E-03	1.08E-02	5.64E-03	1.54E-04	1.91E-07	6.28E-06	3.14E-06	5.01E-05	1.45E+03
U-204	2.02E-01	6.08E-02	1.20E-04	2.59E-01	3.87E+01	2.10E+00	2.10E-03	8.04E+02	3.88E-03	3.85E-04	2.23E-02	4.41E-03	9.07E-03	5.12E-03	8.84E-05	1.71E-07	3.66E-06	1.80E-06	2.87E-05	8.45E+02
U-101	1.38E+00	3.08E-01	1.26E-03	1.75E+00	1.43E+03	8.60E+00	9.69E-03	6.64E+03	1.61E-02	9.63E-03	6.49E-01	1.26E-01	1.89E-01	1.14E-01	4.55E-04	3.93E-06	5.85E-05	7.47E-06	1.20E-04	8.08E+03
U-102	5.05E+00	3.46E+00	1.12E-01	1.32E+02	3.71E+03	1.02E+02	1.13E-01	9.18E+04	1.26E-01	1.86E-01	9.32E+00	1.87E+00	4.42E+00	2.39E+00	5.30E-02	8.09E-05	2.38E-03	1.12E-03	1.79E-02	9.58E+04
U-103	5.64E+00	6.15E+00	1.01E-01	4.00E+01	4.31E+03	1.83E+02	1.86E-01	1.40E+05	5.33E-01	1.62E-01	7.08E+00	1.46E+00	1.77E+01	2.14E+00	1.35E-01	7.24E-05	1.07E-02	2.77E-03	4.44E-02	1.44E+05
U-104	1.17E+00	1.09E+00	4.98E-02	9.31E+00	1.02E+03	3.24E+01	3.35E-02	2.60E+04	1.01E-01	2.76E-02	1.08E+00	2.26E-01	2.67E+00	3.86E-01	1.78E-02	1.28E-05	1.59E-03	3.67E-04	5.88E-03	2.70E+04
U-105	8.21E+00	5.52E+00	2.67E-01	5.54E+01	5.53E+03	2.01E+02	1.60E-01	1.28E+05	1.22E-01	5.62E-01	2.40E+01	4.93E+00	2.62E+01	7.98E+00	4.37E-01	2.63E-04	1.41E-02	9.12E-03	1.46E-01	1.34E+05
U-106	2.90E+00	2.81E+00	5.97E-01	4.55E+01	5.12E+03	9.01E+01	8.26E-02	7.34E+04	5.62E-02	2.74E-01	1.01E+01	2.16E+00	3.65E+01	3.83E+00	3.70E-01	1.28E-04	2.28E-02	7.57E-03	1.21E-01	7.87E+04
U-107	6.31E+00	4.76E+00	2.46E-01	4.77E+01	3.00E+03	2.01E+02	1.94E-01	8.26E+04	1.68E-01	2.68E-01	9.57E+00	2.05E+00	1.60E+01	3.80E+00	2.81E-01	1.26E-04	9.83E-03	5.80E-03	9.28E-02	8.59E+04
U-108	1.03E+01	6.75E+00	1.02E-01	2.27E+01	3.57E+03	2.47E+02	2.45E-01	1.30E+05	2.94E-01	1.70E-01	7.48E+00	1.63E+00	2.94E+00	2.74E+00	1.04E-01	7.89E-05	1.68E-03	2.16E-03	3.46E-02	1.34E+05
U-109	7.66E+00	5.48E+00	1.41E-01	5.58E+01	3.10E+03	1.94E+02	1.91E-01	1.03E+05	2.48E-01	5.60E-02	2.19E+00	4.70E-01	2.79E+00	8.31E-01	4.07E-02	2.61E-05	1.71E-03	8.37E-04	1.35E-02	1.07E+05
U-110	9.39E-01	8.53E-01	1.71E-02	7.22E+00	8.69E+02	2.64E+01	2.63E-02	1.25E+04	2.80E-02	1.28E-02	7.79E-01	1.44E-01	4.55E-01	1.58E-01	4.21E-03	5.33E-06	2.36E-04	8.60E-05	1.38E-03	1.34E+04
U-111	3.07E+00	3.13E+00	6.52E-02	3.40E+01	2.16E+03	1.10E+02	1.09E-01	5.75E+04	1.19E-01	9.26E-02	4.26E+00	8.57E-01	2.30E+00	1.22E+00	5.44E-02	4.12E-05	1.33E-03	1.12E-03	1.80E-02	5.98E+04
U-112	2.76E+00	1.03E+00	2.14E-02	1.24E+01	3.29E+03	3.49E+01	3.39E-02	2.06E+04	3.42E-02	2.51E-02	1.18E+00	2.36E-01	5.78E-01	3.32E-01	1.66E-02	1.12E-05	2.87E-04	3.42E-04	5.48E-03	2.39E+04
SX-101	9.55E+00	3.78E+00	1.51E-02	1.45E+01	3.75E+03	1.22E+02	1.46E-01	1.05E+05	5.07E-02	7.94E-02	3.55E+00	7.23E-01	2.04E+01	8.95E-01	2.05E-01	3.02E-05	1.10E-02	4.41E-03	6.92E-02	1.09E+05
SX-102	5.04E+00	4.08E+00	1.34E-02	1.14E+01	2.83E+03	1.38E+02	1.46E-01	1.35E+05	1.55E-01	3.85E-02	1.64E+00	3.42E-01	5.45E+00	5.10E-01	1.64E-01	1.72E-05	3.08E-03	3.38E-03	5.38E-02	1.38E+05
SX-103	8.48E+00	7.73E+00	3.25E-02	2.38E+01	6.07E+03	2.56E+02	2.62E-01	2.17E+05	3.58E-01	1.30E-01	5.95E+00	1.21E+00	7.73E+00	1.57E+00	4.09E-01	5.32E-05	4.61E-03	8.42E-03	1.34E-01	2.23E+05

Table 7-3. 200W Feed Stream Key Radionuclide Activity (2 pages)

Tank	H-3 (Ci)	C-14 (Ci)	Co-60 (Ci)	Ni-63 (Ci)	Sr-90 (Ci)	Tc-99 (Ci)	I-129 (Ci)	Cs-137 (Ci)	Np-237 (Ci)	Pu-238 (Ci)	Pu-239 (Ci)	Pu-240 (Ci)	Am-241 (Ci)	Pu-241 (Ci)	Cm-242 (Ci)	Pu-242 (Ci)	Am-243 (Ci)	Cm-243 (Ci)	Cm-244 (Ci)	Feed Stream Total Activity (Ci)
SX-104	6.14E+00	4.65E+00	2.37E-02	1.45E+01	2.95E+03	1.57E+02	1.65E-01	1.03E+05	2.09E-01	9.85E-02	5.59E+00	1.10E+00	3.83E+00	1.14E+00	8.52E-02	3.95E-05	1.88E-03	1.74E-03	2.78E-02	1.06E+05
SX-105	6.40E+00	5.28E+00	7.90E-02	1.64E+01	5.37E+03	1.61E+02	1.65E-01	1.06E+05	2.57E-01	2.86E-01	1.57E+01	3.09E+00	9.17E+00	3.05E+00	1.49E-01	1.05E-04	5.66E-03	5.60E-03	8.23E-02	1.11E+05
SX-106	3.85E+00	4.16E+00	6.95E-02	3.08E+01	2.74E+03	1.62E+02	1.63E-01	1.03E+05	1.34E-01	2.84E-01	1.06E+01	2.25E+00	5.24E+00	3.91E+00	2.22E-01	1.30E-04	3.15E-03	5.08E-03	7.98E-02	1.06E+05
SX-107	2.88E+00	7.71E-01	9.29E-03	8.12E+00	1.37E+03	2.91E+01	2.70E-02	2.44E+04	1.64E-02	5.22E-02	2.07E+00	4.31E-01	6.17E+00	6.67E-01	3.35E-02	2.23E-05	4.41E-03	7.81E-04	1.22E-02	2.59E+04
SX-108	2.90E+00	4.44E-01	3.26E-03	3.83E+00	1.08E+03	1.58E+01	1.32E-02	2.00E+04	5.63E-03	2.80E-02	1.20E+00	2.45E-01	3.32E+00	3.28E-01	3.71E-02	1.10E-05	2.35E-03	1.41E-03	2.07E-02	2.11E+04
SX-109	1.20E+01	1.97E+00	7.43E-03	1.39E+01	4.26E+03	6.69E+01	4.77E-02	5.49E+04	1.11E-02	5.12E-02	1.80E+00	3.76E-01	1.66E+01	5.09E-01	3.87E-02	1.67E-05	1.24E-02	1.56E-03	2.28E-02	5.93E+04
SX-110	2.40E+00	2.42E-01	5.91E-04	1.49E+00	9.13E+02	9.92E+00	1.04E-02	1.05E+04	7.78E-04	8.71E-03	1.74E-01	3.99E-02	1.86E+00	7.24E-02	6.19E-03	2.24E-06	1.46E-03	2.72E-04	3.93E-03	1.15E+04
SX-111	6.16E+00	4.99E-01	7.32E-04	2.57E+00	1.82E+03	2.16E+01	2.98E-02	3.07E+04	7.57E-04	1.76E-02	4.56E-01	9.93E-02	2.08E+00	1.51E-01	1.65E-02	4.80E-06	1.64E-03	7.36E-04	1.06E-02	3.25E+04
SX-112	3.83E+00	2.84E-01	2.82E-04	1.36E+00	1.05E+03	1.22E+01	1.84E-02	2.06E+04	2.12E-04	9.80E-03	2.69E-01	5.80E-02	7.48E-01	8.49E-02	1.08E-02	2.70E-06	5.97E-04	4.84E-04	7.00E-03	2.16E+04
SX-113	1.67E+00	1.32E-01	8.99E-05	4.51E-01	2.91E+02	5.36E+00	8.31E-03	8.53E+03	1.66E-04	1.63E-03	5.79E-02	1.20E-02	2.06E-01	1.50E-02	4.30E-03	4.90E-07	1.14E-04	1.92E-04	2.78E-03	8.83E+03
SX-114	6.13E+00	6.29E-01	6.98E-03	6.66E+00	2.43E+03	2.22E+01	2.17E-02	3.02E+04	8.63E-03	2.75E-02	8.95E-01	1.88E-01	1.85E+01	2.49E-01	1.55E-02	8.08E-06	1.48E-02	6.86E-04	9.91E-03	3.27E+04
SX-115	9.34E-01	9.14E-02	1.30E-03	9.04E-01	1.69E+02	3.33E+00	3.22E-03	4.23E+03	1.27E-03	1.06E-01	1.96E+00	4.57E-01	2.63E+00	8.56E-01	3.75E-03	2.63E-05	2.10E-03	1.67E-04	2.41E-03	4.41E+03

Table 7-4. Pretreated Waste Key Radionuclide Activity (2 pages)

Tank	H-3 (Ci)	C-14 (Ci)	Co-60 (Ci)	Ni-63 (Ci)	Sr-90 (Ci)	Tc-99 (Ci)	I-129 (Ci)	Cs-137 (Ci)	Np-237 (Ci)	Pu-238 (Ci)	Pu-239 (Ci)	Pu-240 (Ci)	Am-241 (Ci)	Pu-241 (Ci)	Cm-242 (Ci)	Pu-242 (Ci)	Am-243 (Ci)	Cm-243 (Ci)	Cm-244 (Ci)	Feed Stream Total Activity (Ci) ^a	Pretreated Waste Total Activity (Ci)	Percent Removed (%)
SY-101	1.56E-01	2.06E+00	1.81E-01	3.56E+01	2.36E+03	3.76E+02	3.00E-01	3.92E+01	8.48E-03	1.19E-01	7.14E-01	1.54E-01	3.83E+00	3.28E-01	2.43E-01	9.88E-05	2.30E-03	3.38E-02	5.44E-01	2.03E+05	2.81E+03	99%
SY-102	1.73E-01	2.23E+00	2.33E-01	4.66E+01	2.49E+03	4.84E+02	3.75E-01	4.80E+01	1.07E-02	1.61E-01	9.53E-01	2.05E-01	5.36E+00	4.45E-01	3.42E-01	1.32E-04	3.22E-03	4.76E-02	7.65E-01	2.57E+05	3.08E+03	99%
S-101	5.55E+00	2.12E+00	6.83E-02	1.77E+01	3.27E+03	1.62E+02	9.21E-02	5.92E+01	1.22E-02	7.92E-02	2.83E+00	5.59E-01	2.88E+00	5.93E-01	7.92E-02	4.56E-05	1.46E-03	1.04E-02	1.67E-01	1.27E+05	3.53E+03	97%
S-102	3.23E+00	1.59E+00	1.72E-02	1.52E+01	1.25E+03	5.40E+01	4.40E-02	2.67E+01	2.76E-02	2.15E-02	6.69E-01	1.39E-01	5.58E-01	2.23E-01	4.28E-02	1.20E-05	3.31E-04	2.47E-03	3.97E-02	4.99E+04	1.36E+03	97%
S-103	4.63E+00	4.11E+00	6.26E-02	1.78E+01	2.47E+03	1.46E+02	1.44E-01	2.09E+01	8.07E-02	3.29E-02	1.32E+00	2.73E-01	9.81E-01	4.21E-01	4.15E-02	1.55E-05	5.94E-04	1.34E-03	2.15E-02	1.03E+05	2.67E+03	97%
S-104	2.21E+00	1.78E+00	1.41E-02	8.38E+00	2.76E+03	5.63E+01	5.42E-02	4.26E+01	4.40E-02	5.92E-02	2.56E+00	5.20E-01	1.37E+00	6.14E-01	7.06E-03	2.06E-05	5.78E-04	1.78E-04	2.81E-03	4.33E+04	2.88E+03	93%
S-105	7.33E+00	8.49E+00	8.39E-02	1.87E+01	2.42E+03	2.54E+02	2.51E-01	1.11E+02	8.67E-02	2.08E-02	8.21E-01	1.73E-01	5.48E+00	2.78E-01	2.01E-02	9.39E-06	3.44E-03	4.17E-04	6.67E-03	4.74E+04	2.82E+03	94%
S-106	6.17E+00	7.38E+00	2.51E-02	1.39E+01	3.33E+03	2.20E+02	2.19E-01	6.52E+01	2.82E-01	1.27E-02	4.52E-01	9.77E-02	2.31E+00	1.76E-01	1.89E-02	5.87E-06	1.45E-03	3.86E-04	6.16E-03	1.05E+05	3.64E+03	97%
S-107	1.84E+01	2.21E+00	3.79E-02	8.44E+00	2.23E+03	3.71E+01	3.20E-02	1.21E+02	4.01E-02	1.58E-01	8.53E+00	1.76E+00	3.45E+00	2.48E+00	8.27E-03	8.34E-05	7.93E-04	2.29E-04	3.53E-03	4.99E+04	2.43E+03	95%
S-108	1.45E+01	8.41E+00	3.37E-02	1.97E+01	4.07E+03	2.61E+02	2.58E-01	9.08E+01	3.67E-01	4.80E-02	1.90E+00	4.04E-01	4.16E+00	6.61E-01	7.25E-02	2.23E-05	2.56E-03	1.51E-03	2.40E-02	1.64E+05	4.47E+03	97%
S-109	9.41E+00	1.05E+01	6.67E-02	2.06E+02	3.67E+03	3.30E+02	3.29E-01	1.55E+02	5.44E-01	4.29E-02	2.56E+00	5.05E-01	1.02E+00	5.00E-01	1.67E-02	1.74E-05	5.48E-04	3.38E-04	5.41E-03	4.78E+04	4.38E+03	91%
S-110	8.03E+00	7.04E+00	6.14E-02	4.57E+01	3.36E+03	2.11E+02	2.08E-01	5.56E+01	3.39E-01	1.17E-01	6.95E+00	1.37E+00	5.20E+00	1.42E+00	4.97E-02	4.90E-05	2.61E-03	1.01E-03	1.61E-02	7.99E+04	3.70E+03	95%
S-111	5.67E+00	4.61E+00	1.87E-02	1.11E+01	3.83E+03	1.63E+02	1.63E-01	2.94E+02	2.99E-01	2.91E-02	1.49E+00	3.00E-01	1.06E+00	3.71E-01	1.42E-02	1.26E-05	5.77E-04	2.88E-04	4.60E-03	6.84E+04	4.31E+03	94%
U-201	4.38E-01	2.77E-01	5.93E-04	5.42E-01	1.81E+02	1.01E+01	1.02E-02	8.72E-01	1.89E-02	1.26E-03	5.89E-02	1.21E-02	3.22E-02	1.64E-02	4.70E-04	5.55E-07	1.83E-05	9.56E-06	1.53E-04	4.14E+03	1.94E+02	95%

Table 7-4. Pretreated Waste Key Radionuclide Activity (2 pages)

Tank	H-3 (Ci)	C-14 (Ci)	Co-60 (Ci)	Ni-63 (Ci)	Sr-90 (Ci)	Tc-99 (Ci)	I-129 (Ci)	Cs-137 (Ci)	Np-237 (Ci)	Pu-238 (Ci)	Pu-239 (Ci)	Pu-240 (Ci)	Am-241 (Ci)	Pu-241 (Ci)	Cm-242 (Ci)	Pu-242 (Ci)	Am-243 (Ci)	Cm-243 (Ci)	Cm-244 (Ci)	Feed Stream Total Activity (Ci) ^a	Pretreated Waste Total Activity (Ci)	Percent Removed (%)
U-202	4.12E-01	1.92E-01	3.93E-04	4.74E-01	1.24E+02	6.92E+00	6.94E-03	4.43E-01	1.29E-02	8.38E-04	3.90E-02	8.00E-03	2.12E-02	1.10E-02	3.05E-04	3.71E-07	1.22E-05	6.19E-06	9.90E-05	2.80E+03	1.33E+02	95%
U-203	2.79E-01	1.02E-01	2.04E-04	3.41E-01	6.44E+01	3.59E+00	3.59E-03	1.94E-01	6.65E-03	4.29E-04	1.99E-02	4.09E-03	1.08E-02	5.61E-03	1.54E-04	1.90E-07	6.26E-06	3.12E-06	4.99E-05	1.45E+03	6.90E+01	95%
U-204	2.01E-01	6.06E-02	1.20E-04	2.58E-01	3.85E+01	2.09E+00	2.09E-03	1.02E-01	3.86E-03	3.84E-04	2.22E-02	4.39E-03	9.04E-03	5.10E-03	8.80E-05	1.70E-07	3.65E-06	1.79E-06	2.86E-05	8.45E+02	4.13E+01	95%
U-101	1.38E+00	3.07E-01	1.26E-03	1.74E+00	1.42E+03	8.57E+00	9.65E-03	5.74E-01	1.61E-02	9.59E-03	6.47E-01	1.25E-01	1.89E-01	1.14E-01	4.54E-04	3.91E-06	5.83E-05	7.44E-06	1.19E-04	8.08E+03	1.44E+03	82%
U-102	5.03E+00	3.45E+00	1.11E-01	1.31E+02	3.70E+03	1.01E+02	1.13E-01	2.15E+02	1.26E-01	1.85E-01	9.28E+00	1.86E+00	4.41E+00	2.38E+00	5.28E-02	8.06E-05	2.37E-03	1.11E-03	1.78E-02	9.58E+04	4.17E+03	96%
U-103	5.61E+00	6.13E+00	1.01E-01	3.98E+01	4.29E+03	1.82E+02	1.85E-01	3.14E+01	5.31E-01	1.61E-01	7.05E+00	1.46E+00	1.76E+01	2.14E+00	1.34E-01	7.22E-05	1.07E-02	2.76E-03	4.43E-02	1.44E+05	4.59E+03	97%
U-104	1.17E+00	1.09E+00	4.96E-02	9.28E+00	1.02E+03	3.22E+01	3.34E-02	1.04E+01	1.01E-01	2.75E-02	1.08E+00	2.25E-01	2.66E+00	3.85E-01	1.77E-02	1.28E-05	1.59E-03	3.66E-04	5.86E-03	2.70E+04	1.08E+03	96%
U-105	8.18E+00	5.50E+00	2.66E-01	5.52E+01	5.51E+03	2.00E+02	1.59E-01	1.29E+02	1.22E-01	5.61E-01	2.39E+01	4.92E+00	2.62E+01	7.95E+00	4.35E-01	2.62E-04	1.41E-02	9.08E-03	1.46E-01	1.34E+05	5.97E+03	96%
U-106	2.89E+00	2.80E+00	5.95E-01	4.53E+01	5.10E+03	8.98E+01	8.22E-02	1.26E+01	5.60E-02	2.73E-01	1.01E+01	2.15E+00	3.63E+01	3.82E+00	3.69E-01	1.27E-04	2.27E-02	7.54E-03	1.21E-01	7.87E+04	5.31E+03	93%
U-107	6.29E+00	4.74E+00	2.45E-01	4.75E+01	2.99E+03	2.00E+02	1.94E-01	8.33E+01	1.67E-01	2.67E-01	9.53E+00	2.04E+00	1.59E+01	3.79E+00	2.80E-01	1.26E-04	9.79E-03	5.78E-03	9.25E-02	8.59E+04	3.37E+03	96%
U-108	1.03E+01	6.72E+00	1.01E-01	2.26E+01	3.55E+03	2.46E+02	2.44E-01	3.15E+02	2.93E-01	1.70E-01	7.45E+00	1.62E+00	2.93E+00	2.73E+00	1.04E-01	7.87E-05	1.67E-03	2.15E-03	3.45E-02	1.34E+05	4.17E+03	97%
U-109	7.63E+00	5.46E+00	1.41E-01	5.55E+01	3.09E+03	1.93E+02	1.91E-01	1.58E+02	2.47E-01	5.58E-02	2.18E+00	4.69E-01	2.77E+00	8.28E-01	4.05E-02	2.60E-05	1.71E-03	8.34E-04	1.34E-02	1.07E+05	3.52E+03	97%
U-110	9.34E-01	8.48E-01	1.70E-02	7.18E+00	8.65E+02	2.63E+01	2.61E-02	1.41E+01	2.78E-02	1.27E-02	7.76E-01	1.43E-01	4.53E-01	1.58E-01	4.19E-03	5.31E-06	2.35E-04	8.55E-05	1.37E-03	1.34E+04	9.16E+02	93%
U-111	3.06E+00	3.12E+00	6.49E-02	3.39E+01	2.15E+03	1.10E+02	1.09E-01	1.05E+02	1.19E-01	9.23E-02	4.24E+00	8.54E-01	2.29E+00	1.22E+00	5.41E-02	4.10E-05	1.33E-03	1.12E-03	1.79E-02	5.98E+04	2.41E+03	96%
U-112	2.74E+00	1.03E+00	2.13E-02	1.23E+01	3.28E+03	3.48E+01	3.38E-02	2.06E+00	3.41E-02	2.50E-02	1.17E+00	2.35E-01	5.76E-01	3.31E-01	1.65E-02	1.11E-05	2.86E-04	3.40E-04	5.46E-03	2.39E+04	3.33E+03	86%
SX-101	9.51E+00	3.76E+00	1.51E-02	1.45E+01	3.74E+03	1.22E+02	1.45E-01	9.94E+01	5.05E-02	7.94E-02	3.55E+00	7.22E-01	2.03E+01	8.95E-01	2.05E-01	3.02E-05	1.09E-02	4.39E-03	6.89E-02	1.09E+05	4.01E+03	96%
SX-102	5.02E+00	4.06E+00	1.33E-02	1.13E+01	2.82E+03	1.37E+02	1.46E-01	3.68E+01	1.54E-01	3.84E-02	1.63E+00	3.41E-01	5.43E+00	5.09E-01	1.63E-01	1.72E-05	3.07E-03	3.37E-03	5.36E-02	1.38E+05	3.02E+03	98%
SX-103	8.44E+00	7.70E+00	3.24E-02	2.37E+01	6.06E+03	2.55E+02	2.61E-01	6.41E+01	3.56E-01	1.30E-01	5.93E+00	1.21E+00	7.73E+00	1.56E+00	4.07E-01	5.31E-05	4.61E-03	8.38E-03	1.34E-01	2.23E+05	6.43E+03	97%
SX-104	6.11E+00	4.63E+00	2.36E-02	1.44E+01	2.94E+03	1.56E+02	1.65E-01	7.22E+01	2.09E-01	9.83E-02	5.57E+00	1.10E+00	3.82E+00	1.14E+00	8.49E-02	3.93E-05	1.87E-03	1.74E-03	2.77E-02	1.06E+05	3.21E+03	97%
SX-105	6.37E+00	5.26E+00	7.87E-02	1.64E+01	5.36E+03	1.60E+02	1.64E-01	6.27E+01	2.56E-01	2.85E-01	1.56E+01	3.09E+00	9.15E+00	3.05E+00	1.48E-01	1.05E-04	5.65E-03	5.58E-03	8.19E-02	1.11E+05	5.64E+03	95%
SX-106	3.83E+00	4.14E+00	6.93E-02	3.07E+01	2.73E+03	1.61E+02	1.63E-01	6.14E+01	1.34E-01	2.83E-01	1.06E+01	2.24E+00	5.22E+00	3.90E+00	2.21E-01	1.30E-04	3.14E-03	5.06E-03	7.95E-02	1.06E+05	3.01E+03	97%
SX-107	2.86E+00	7.67E-01	9.24E-03	8.08E+00	1.37E+03	2.90E+01	2.69E-02	1.84E+01	1.63E-02	5.20E-02	2.06E+00	4.30E-01	6.14E+00	6.65E-01	3.33E-02	2.22E-05	4.39E-03	7.77E-04	1.22E-02	2.59E+04	1.43E+03	94%
SX-108	2.88E+00	4.42E-01	3.25E-03	3.82E+00	1.07E+03	1.57E+01	1.31E-02	1.69E+01	5.60E-03	2.79E-02	1.19E+00	2.45E-01	3.31E+00	3.27E-01	3.69E-02	1.10E-05	2.34E-03	1.40E-03	2.06E-02	2.11E+04	1.12E+03	95%
SX-109	1.20E+01	1.96E+00	7.40E-03	1.38E+01	4.25E+03	6.67E+01	4.75E-02	9.19E+01	1.10E-02	5.11E-02	1.80E+00	3.75E-01	1.66E+01	5.08E-01	3.86E-02	1.66E-05	1.24E-02	1.56E-03	2.28E-02	5.93E+04	4.46E+03	92%
SX-110	2.39E+00	2.40E-01	5.88E-04	1.48E+00	9.12E+02	9.87E+00	1.03E-02	2.35E+00	7.74E-04	8.70E-03	1.74E-01	3.99E-02	1.85E+00	7.23E-02	6.16E-03	2.24E-06	1.46E-03	2.71E-04	3.92E-03	1.15E+04	9.30E+02	92%
SX-111	6.13E+00	4.96E-01	7.28E-04	2.56E+00	1.81E+03	2.15E+01	2.97E-02	4.66E+00	7.54E-04	1.76E-02	4.56E-01	9.91E-02	2.08E+00	1.51E-01	1.64E-02	4.79E-06	1.64E-03	7.33E-04	1.06E-02	3.25E+04	1.85E+03	94%
SX-112	3.81E+00	2.82E-01	2.81E-04	1.36E+00	1.05E+03	1.21E+01	1.83E-02	2.63E+00	2.11E-04	9.78E-03	2.69E-01	5.79E-02	7.46E-01	8.48E-02	1.08E-02	2.70E-06	5.96E-04	4.82E-04	6.97E-03	2.16E+04	1.07E+03	95%
SX-113	1.66E+00	1.31E-01	8.96E-05	4.50E-01	2.91E+02	5.35E+00	8.28E-03	9.46E-01	1.65E-04	1.63E-03	5.77E-02	1.19E-02	2.06E-01	1.49E-02	4.29E-03	4.88E-07	1.14E-04	1.92E-04	2.77E-03	8.83E+03	2.99E+02	97%
SX-114	6.10E+00	6.26E-01	6.94E-03	6.63E+00	2.42E+03	2.21E+01	2.16E-02	1.95E+01	8.59E-03	2.75E-02	8.93E-01	1.87E-01	1.84E+01	2.48E-01	1.54E-02	8.06E-06	1.47E-02	6.83E-04	9.87E-03	3.27E+04	2.50E+03	92%
SX-115	9.32E-01	9.12E-02	1.30E-03	9.02E-01	1.69E+02	3.32E+00	3.22E-03	5.51E-01	1.27E-03	1.05E-01	1.96E+00	4.56E-01	2.62E+00	8.54E-01	3.74E-03	2.62E-05	2.10E-03	1.66E-04	2.41E-03	4.41E+03	1.81E+02	96%

Note: ^a Feed stream total activity data column in this table was obtained from Table 7-3.

7.1.2 Waste Classification Evaluation for Pretreated Liquid Waste

A comparison of the key radionuclide concentrations in the pretreated liquid waste against Class C concentrations limits in 10 CFR 61.55 Table 1 are provided in Table 7-5. The data in this table is based on the sum of fractions results for long-lived radionuclide against the Class C concentration limits. The tables in the *Texas Administrative Code* (30 TAC Rule 336.362, Appendix E, Tables I and II) and the *Utah Administrative Code* (UAC R313-15-1009) mirror the 10 CFR 61.55 tables with the exception of Ra-226, which is included by both the State of Texas and the State of Utah. Because Ra-226 is a decay product of U-238, which has a half-life of 4.5 billion years, and it is in very low quantities in Hanford Site tank waste (per the BBI), this radionuclide is not included as a key radionuclide in this evaluation.

Table 7-5. Waste Classification Evaluation for Pretreated Liquid Based on 10 CFR 61.55 Table 1 Class C Sum of Fractions for Long-Lived Radionuclides (2 pages)

10 CFR 61.55 Table 1 Class C Limits Evaluation (all values are fractions of limits)							
Source Tank	C-14	I-129	Tc-99	Pu-241	Cm-242	Total Alpha	Table 1 Class C Sum of Fractions
SY-101	8.21E-05	1.20E-03	4.00E-02	2.42E-05	3.14E-06	1.40E-02	5.53E-02
SY-102	8.86E-05	1.49E-03	5.12E-02	3.18E-05	4.27E-06	1.87E-02	7.16E-02
S-101	1.20E-04	5.23E-04	2.46E-02	6.15E-05	1.44E-06	2.38E-02	4.91E-02
S-102	1.09E-04	3.04E-04	9.94E-03	3.02E-05	1.02E-06	6.92E-03	1.73E-02
S-103	1.35E-04	4.72E-04	1.28E-02	2.71E-05	4.68E-07	6.11E-03	1.96E-02
S-104	9.59E-05	2.92E-04	8.08E-03	6.54E-05	1.32E-07	1.70E-02	2.55E-02
S-105	2.58E-04	7.64E-04	2.06E-02	1.53E-05	1.93E-07	1.27E-02	3.43E-02
S-106	1.63E-04	4.82E-04	1.29E-02	7.40E-06	1.39E-07	4.66E-03	1.82E-02
S-107	1.25E-04	1.81E-04	5.61E-03	2.82E-04	1.65E-07	5.55E-02	6.17E-02
S-108	1.61E-04	4.92E-04	1.33E-02	2.40E-05	4.60E-07	8.76E-03	2.27E-02
S-109	2.41E-04	7.53E-04	2.01E-02	2.04E-05	1.19E-07	6.67E-03	2.78E-02
S-110	2.18E-04	6.44E-04	1.74E-02	7.98E-05	4.87E-07	2.74E-02	4.58E-02
S-111	1.24E-04	4.37E-04	1.16E-02	1.94E-05	1.30E-07	5.83E-03	1.81E-02
U-201	9.21E-05	3.38E-04	8.99E-03	1.10E-05	5.51E-08	2.89E-03	1.23E-02
U-202	6.99E-05	2.52E-04	6.71E-03	8.26E-06	4.02E-08	2.16E-03	9.21E-03
U-203	5.59E-05	1.97E-04	5.26E-03	6.51E-06	3.12E-08	1.70E-03	7.22E-03
U-204	4.68E-05	1.61E-04	4.31E-03	8.42E-06	2.54E-08	2.31E-03	6.84E-03
U-101	1.29E-05	4.05E-05	9.58E-04	1.07E-05	7.49E-09	3.26E-03	4.28E-03
U-102	1.03E-04	3.37E-04	8.05E-03	1.40E-04	5.44E-07	3.28E-02	4.14E-02
U-103	1.39E-04	4.21E-04	1.11E-02	9.53E-05	1.05E-06	4.19E-02	5.37E-02
U-104	8.63E-05	2.65E-04	6.83E-03	6.19E-05	4.99E-07	2.31E-02	3.03E-02
U-105	1.54E-04	4.45E-04	1.49E-02	4.26E-04	4.08E-06	1.05E-01	1.21E-01
U-106	1.53E-04	4.49E-04	1.31E-02	4.11E-04	6.95E-06	1.85E-01	1.99E-01
U-107	1.28E-04	5.24E-04	1.44E-02	2.02E-04	2.62E-06	5.24E-02	6.76E-02
U-108	1.47E-04	5.32E-04	1.43E-02	1.15E-04	7.63E-07	1.83E-02	3.35E-02
U-109	1.36E-04	4.76E-04	1.28E-02	4.06E-05	3.47E-07	9.84E-03	2.33E-02
U-110	8.53E-05	2.63E-04	7.04E-03	3.24E-05	1.51E-07	1.02E-02	1.76E-02
U-111	1.20E-04	4.19E-04	1.13E-02	9.30E-05	7.22E-07	2.03E-02	3.22E-02

Table 7-5. Waste Classification Evaluation for Pretreated Liquid Based on 10 CFR 61.55 Table 1 Class C Sum of Fractions for Long-Lived Radionuclides (2 pages)

10 CFR 61.55 Table 1 Class C Limits Evaluation (all values are fractions of limits)							
Source Tank	C-14	I-129	Tc-99	Pu-241	Cm-242	Total Alpha	Table 1 Class C Sum of Fractions
U-112	2.22E-05	7.32E-05	2.01E-03	1.59E-05	1.39E-07	3.45E-03	5.58E-03
SX-101	1.05E-04	4.05E-04	9.04E-03	4.79E-05	1.92E-06	4.65E-02	5.61E-02
SX-102	1.31E-04	4.69E-04	1.18E-02	3.06E-05	1.71E-06	1.61E-02	2.85E-02
SX-103	1.68E-04	5.69E-04	1.48E-02	6.20E-05	2.83E-06	2.15E-02	3.72E-02
SX-104	1.60E-04	5.70E-04	1.44E-02	7.23E-05	9.44E-07	2.41E-02	3.93E-02
SX-105	1.49E-04	4.66E-04	1.21E-02	1.63E-04	1.39E-06	5.34E-02	6.63E-02
SX-106	1.22E-04	4.80E-04	1.27E-02	2.28E-04	2.26E-06	3.79E-02	5.14E-02
SX-107	7.97E-05	2.80E-04	8.03E-03	1.40E-04	1.22E-06	6.40E-02	7.26E-02
SX-108	6.04E-05	1.79E-04	5.72E-03	8.90E-05	1.76E-06	4.57E-02	5.18E-02
SX-109	6.57E-05	1.59E-04	5.96E-03	3.38E-05	4.49E-07	4.39E-02	5.01E-02
SX-110	6.20E-05	2.67E-04	6.79E-03	3.70E-05	5.52E-07	3.73E-02	4.44E-02
SX-111	4.68E-05	2.80E-04	5.41E-03	2.91E-05	5.54E-07	1.80E-02	2.37E-02
SX-112	3.87E-05	2.51E-04	4.44E-03	2.42E-05	5.38E-07	1.09E-02	1.57E-02
SX-113	3.21E-05	2.02E-04	3.48E-03	7.74E-06	3.89E-07	5.09E-03	8.81E-03
SX-114	4.13E-05	1.42E-04	3.89E-03	3.42E-05	3.71E-07	9.42E-02	9.83E-02
SX-115	3.84E-05	1.35E-04	3.72E-03	7.54E-04	5.78E-07	1.59E-01	1.64E-01

Table 7-6 provides a comparison of the key radionuclide concentrations in the pretreated liquid against Class C concentration limits in 10 CFR 61.55 Table 2 for short-lived radionuclides using the sum of fractions approach.

Table 7-6. Waste Classification Evaluation for Pretreated Liquid Based on 10 CFR 61.55 Table 2 Class C Sum of Fractions for Short-Lived Radionuclides (2 pages)

10 CFR 61.55 Table 2 Class C Limits Evaluation (all values are fractions of limits)				
Source Tank	Ni-63	Sr-90	Cs-137	Table 2 Class C Sum of Fractions
SY-101	1.62E-05	1.07E-04	2.72E-06	1.26E-04
SY-102	2.11E-05	1.13E-04	3.31E-06	1.37E-04
S-101	1.15E-05	2.12E-04	5.85E-06	2.30E-04
S-102	1.20E-05	9.90E-05	3.21E-06	1.14E-04
S-103	6.67E-06	9.27E-05	1.19E-06	1.01E-04
S-104	5.16E-06	1.70E-04	3.99E-06	1.79E-04
S-105	6.48E-06	8.39E-05	5.89E-06	9.63E-05
S-106	3.49E-06	8.38E-05	2.50E-06	8.98E-05
S-107	5.48E-06	1.44E-04	1.20E-05	1.62E-04
S-108	4.30E-06	8.88E-05	3.02E-06	9.61E-05
S-109	5.38E-05	9.58E-05	6.17E-06	1.56E-04

Table 7-6. Waste Classification Evaluation for Pretreated Liquid Based on 10 CFR 61.55 Table 2 Class C Sum of Fractions for Short-Lived Radionuclides (2 pages)

10 CFR 61.55 Table 2 Class C Limits Evaluation (all values are fractions of limits)				
Source Tank	Ni-63	Sr-90	Cs-137	Table 2 Class C Sum of Fractions
S-110	1.61E-05	1.19E-04	2.99E-06	1.38E-04
S-111	3.39E-06	1.17E-04	1.37E-05	1.35E-04
U-201	2.06E-06	6.89E-05	5.04E-07	7.15E-05
U-202	1.97E-06	5.16E-05	2.80E-07	5.38E-05
U-203	2.14E-06	4.04E-05	1.85E-07	4.27E-05
U-204	2.28E-06	3.40E-05	1.36E-07	3.64E-05
U-101	8.35E-07	6.82E-05	4.19E-08	6.91E-05
U-102	4.47E-05	1.26E-04	1.11E-05	1.82E-04
U-103	1.04E-05	1.12E-04	1.24E-06	1.23E-04
U-104	8.42E-06	9.24E-05	1.44E-06	1.02E-04
U-105	1.76E-05	1.76E-04	6.28E-06	2.00E-04
U-106	2.83E-05	3.18E-04	1.19E-06	3.48E-04
U-107	1.47E-05	9.26E-05	3.92E-06	1.11E-04
U-108	5.63E-06	8.85E-05	1.20E-05	1.06E-04
U-109	1.58E-05	8.82E-05	6.86E-06	1.11E-04
U-110	8.25E-06	9.94E-05	2.46E-06	1.10E-04
U-111	1.49E-05	9.47E-05	7.01E-06	1.17E-04
U-112	3.06E-06	8.13E-05	7.76E-08	8.44E-05
SX-101	4.60E-06	1.19E-04	4.81E-06	1.28E-04
SX-102	4.17E-06	1.04E-04	2.06E-06	1.10E-04
SX-103	5.91E-06	1.51E-04	2.43E-06	1.59E-04
SX-104	5.70E-06	1.16E-04	4.34E-06	1.27E-04
SX-105	5.31E-06	1.73E-04	3.09E-06	1.82E-04
SX-106	1.04E-05	9.22E-05	3.15E-06	1.06E-04
SX-107	9.60E-06	1.62E-04	3.33E-06	1.75E-04
SX-108	5.96E-06	1.67E-04	4.01E-06	1.77E-04
SX-109	5.30E-06	1.63E-04	5.35E-06	1.73E-04
SX-110	4.37E-06	2.69E-04	1.05E-06	2.74E-04
SX-111	2.76E-06	1.95E-04	7.64E-07	1.99E-04
SX-112	2.13E-06	1.64E-04	6.28E-07	1.67E-04
SX-113	1.26E-06	8.11E-05	4.02E-07	8.28E-05
SX-114	5.00E-06	1.83E-04	2.24E-06	1.90E-04
SX-115	4.33E-06	8.12E-05	4.03E-07	8.59E-05

7.1.3 Waste Classification Evaluation for Pretreated Waste After Solidification

The plan for dispositioning the 200W tank waste from S, SX, and U Tank Farms including waste from DSTs SY-101 and SY-102 includes onsite and/or offsite solidification and offsite disposal.

The pretreated liquid waste will be transported to an onsite or offsite treatment facility(ies) to be solidified to meet the acceptance requirements of the offsite disposal facility(ies). Potential facilities that could solidify the pretreated waste include:

1. Perma-Fix Northwest (PFNW) in Richland, Washington
2. EnergySolutions near Clive, Utah [EnergySolutions (Clive)]
3. Waste Control Specialists (WCS) near Andrews, Texas
4. Onsite facility, Hanford Site
5. Offsite commercial facility, Richland, Washington.

DOE will dispose of the pretreated and solidified waste as mixed LLW (MLLW) at one or more offsite, licensed, commercial disposal facilities, potentially EnergySolutions (Clive Disposal Facility) near Clive, Utah, and/or the WCS Federal Waste Facility (WCS FWF), near Andrews, Texas. DOE has not made decisions on the location of either the solidification facility(ies) or the disposal facility(ies).⁹

This report also evaluates a scenario that assumes waste solidification/immobilization will be performed onsite and that the solidified waste will be transported to an offsite disposal facility(ies). Waste classification is provided for the solidified waste on a tank-by-tank basis. Target water to dry mix ratio of 0.6 is assumed based on VSL-22R5150-1, *FY22 Development of Improved Grout Waste Forms for Supplemental Low Activity Waste Treatment*. This results in approximately 1.5 m³ of grout yielded for each 1 m³ of liquid waste treated. An average grout density of 1,800 kg/m³ was used in this calculation. Note that this solidified waste volume may be slightly different than the waste volume generated by the commercial treatment facility. Table 7-7 provides waste classification results for the solidified waste against Class C concentration limits in 10 CFR 61.55 Table 1 for long-lived radionuclides using the sum of fractions method.

Table 7-7. Waste Classification Evaluation for Solidified/Immobilized Waste Product Based on 10 CFR 61.55 Table 1 Class C Sum of Fractions for Long-Lived Radionuclides (2 pages)

10 CFR 61.55 Table 1 Class C Limits Evaluation (all values are fractions of limits)							
Source Tank	C-14	I-129	Tc-99	Pu-241	Cm-242	Total Alpha	Table 1 Class C Sum of Fractions
SY-101	5.44E-05	7.93E-04	2.65E-02	1.10E-05	1.43E-06	6.35E-03	3.37E-02
SY-102	5.85E-05	9.83E-04	3.38E-02	1.48E-05	1.99E-06	8.74E-03	4.36E-02
S-101	7.91E-05	3.45E-04	1.62E-02	2.82E-05	6.58E-07	1.09E-02	2.75E-02
S-102	7.27E-05	2.02E-04	6.60E-03	1.30E-05	4.36E-07	2.97E-03	9.86E-03
S-103	8.97E-05	3.15E-04	8.53E-03	1.17E-05	2.02E-07	2.63E-03	1.16E-02
S-104	6.49E-05	1.97E-04	5.47E-03	2.84E-05	5.72E-08	7.37E-03	1.31E-02

⁹ EnergySolutions is both a solidification and disposal facility. However, it is limited to accepting Class A LLW and MLLW. WCS is both a solidification and disposal facility and is licensed to accept Class A, B, and C LLW and MLLW.

Table 7-7. Waste Classification Evaluation for Solidified/Immobilized Waste Product Based on 10 CFR 61.55 Table 1 Class C Sum of Fractions for Long-Lived Radionuclides (2 pages)

10 CFR 61.55 Table 1 Class C Limits Evaluation (all values are fractions of limits)							
Source Tank	C-14	I-129	Tc-99	Pu-241	Cm-242	Total Alpha	Table 1 Class C Sum of Fractions
S-105	1.75E-04	5.18E-04	1.40E-02	7.29E-06	9.21E-08	6.04E-03	2.07E-02
S-106	1.08E-04	3.21E-04	8.60E-03	3.27E-06	6.16E-08	2.06E-03	1.11E-02
S-107	8.35E-05	1.21E-04	3.74E-03	1.19E-04	6.96E-08	2.35E-02	2.75E-02
S-108	1.06E-04	3.25E-04	8.79E-03	1.06E-05	2.03E-07	3.87E-03	1.31E-02
S-109	1.60E-04	5.00E-04	1.34E-02	9.63E-06	5.64E-08	3.15E-03	1.72E-02
S-110	1.44E-04	4.28E-04	1.16E-02	3.71E-05	2.27E-07	1.28E-02	2.49E-02
S-111	8.19E-05	2.89E-04	7.70E-03	8.35E-06	5.59E-08	2.51E-03	1.06E-02
U-201	6.11E-05	2.25E-04	5.97E-03	4.59E-06	2.30E-08	1.21E-03	7.47E-03
U-202	4.66E-05	1.68E-04	4.47E-03	3.37E-06	1.64E-08	8.83E-04	5.58E-03
U-203	3.73E-05	1.32E-04	3.51E-03	2.61E-06	1.25E-08	6.83E-04	4.37E-03
U-204	3.13E-05	1.08E-04	2.89E-03	3.35E-06	1.01E-08	9.17E-04	3.95E-03
U-101	8.70E-06	2.74E-05	6.48E-04	4.09E-06	2.86E-09	1.24E-03	1.93E-03
U-102	6.82E-05	2.24E-04	5.34E-03	5.98E-05	2.32E-07	1.40E-02	1.97E-02
U-103	9.25E-05	2.79E-04	7.34E-03	4.10E-05	4.50E-07	1.80E-02	2.58E-02
U-104	5.74E-05	1.76E-04	4.54E-03	2.58E-05	2.08E-07	9.61E-03	1.44E-02
U-105	1.02E-04	2.95E-04	9.86E-03	1.87E-04	1.79E-06	4.59E-02	5.64E-02
U-106	1.03E-04	3.02E-04	8.78E-03	1.78E-04	3.01E-06	8.00E-02	8.93E-02
U-107	8.53E-05	3.48E-04	9.59E-03	8.65E-05	1.12E-06	2.24E-02	3.25E-02
U-108	9.74E-05	3.53E-04	9.52E-03	5.03E-05	3.35E-07	8.05E-03	1.81E-02
U-109	9.01E-05	3.14E-04	8.48E-03	1.73E-05	1.49E-07	4.21E-03	1.31E-02
U-110	5.66E-05	1.74E-04	4.67E-03	1.33E-05	6.20E-08	4.19E-03	9.11E-03
U-111	7.97E-05	2.78E-04	7.47E-03	3.96E-05	3.07E-07	8.65E-03	1.65E-02
U-112	1.50E-05	4.93E-05	1.36E-03	6.14E-06	5.36E-08	1.33E-03	2.76E-03
SX-101	6.99E-05	2.70E-04	6.04E-03	2.11E-05	8.46E-07	2.05E-02	2.69E-02
SX-102	8.58E-05	3.08E-04	7.74E-03	1.36E-05	7.65E-07	7.19E-03	1.53E-02
SX-103	1.10E-04	3.73E-04	9.73E-03	2.84E-05	1.29E-06	9.86E-03	2.01E-02
SX-104	1.06E-04	3.76E-04	9.52E-03	3.30E-05	4.31E-07	1.10E-02	2.10E-02
SX-105	9.81E-05	3.07E-04	7.96E-03	7.22E-05	6.15E-07	2.37E-02	3.21E-02
SX-106	8.13E-05	3.19E-04	8.42E-03	9.72E-05	9.65E-07	1.62E-02	2.51E-02
SX-107	5.33E-05	1.87E-04	5.38E-03	5.87E-05	5.14E-07	2.69E-02	3.26E-02
SX-108	4.05E-05	1.20E-04	3.84E-03	3.81E-05	7.51E-07	1.96E-02	2.36E-02
SX-109	4.43E-05	1.07E-04	4.01E-03	1.46E-05	1.94E-07	1.89E-02	2.31E-02
SX-110	4.18E-05	1.80E-04	4.57E-03	1.60E-05	2.38E-07	1.60E-02	2.09E-02
SX-111	3.15E-05	1.88E-04	3.64E-03	1.22E-05	2.32E-07	7.51E-03	1.14E-02
SX-112	2.61E-05	1.69E-04	2.99E-03	9.94E-06	2.21E-07	4.48E-03	7.67E-03
SX-113	2.16E-05	1.36E-04	2.35E-03	3.12E-06	1.57E-07	2.05E-03	4.55E-03
SX-114	2.77E-05	9.55E-05	2.61E-03	1.40E-05	1.52E-07	3.85E-02	4.13E-02
SX-115	2.58E-05	9.09E-05	2.50E-03	3.07E-04	2.35E-07	6.46E-02	6.75E-02

Table 7-8 provides waste classification results for the solidified waste product against Class C concentration limits 10 CFR 61.55 Table 2 for short-lived radionuclides using the sum of fractions method.

Table 7-8. Waste Classification Evaluation for Solidified/Immobilized Waste Product Based on 10 CFR 61.55 Table 2 Class C Sum of Fractions for Short-Lived Radionuclides (2 pages)

10 CFR 61.55 Table 2 Class C Limits Evaluation (all values are fractions of limits)				
Source Tank	Ni-63	Sr-90	Cs-137	Table 2 Class C Sum of Fractions
SY-101	1.07E-05	7.11E-05	1.80E-06	8.37E-05
SY-102	1.39E-05	7.45E-05	2.19E-06	9.07E-05
S-101	7.59E-06	1.40E-04	3.85E-06	1.51E-04
S-102	7.99E-06	6.58E-05	2.13E-06	7.59E-05
S-103	4.44E-06	6.17E-05	7.93E-07	6.69E-05
S-104	3.49E-06	1.15E-04	2.70E-06	1.21E-04
S-105	4.40E-06	5.70E-05	4.00E-06	6.54E-05
S-106	2.32E-06	5.58E-05	1.66E-06	5.98E-05
S-107	3.65E-06	9.63E-05	7.99E-06	1.08E-04
S-108	2.84E-06	5.87E-05	1.99E-06	6.35E-05
S-109	3.57E-05	6.36E-05	4.10E-06	1.03E-04
S-110	1.07E-05	7.87E-05	1.98E-06	9.14E-05
S-111	2.24E-06	7.77E-05	9.06E-06	8.90E-05
U-201	1.37E-06	4.57E-05	3.35E-07	4.74E-05
U-202	1.31E-06	3.44E-05	1.87E-07	3.59E-05
U-203	1.43E-06	2.70E-05	1.24E-07	2.86E-05
U-204	1.53E-06	2.28E-05	9.13E-08	2.44E-05
U-101	5.64E-07	4.61E-05	2.83E-08	4.67E-05
U-102	2.97E-05	8.36E-05	7.38E-06	1.21E-04
U-103	6.87E-06	7.41E-05	8.26E-07	8.18E-05
U-104	5.60E-06	6.14E-05	9.55E-07	6.80E-05
U-105	1.17E-05	1.17E-04	4.16E-06	1.32E-04
U-106	1.90E-05	2.14E-04	8.02E-07	2.34E-04
U-107	9.76E-06	6.15E-05	2.60E-06	7.39E-05
U-108	3.74E-06	5.88E-05	7.95E-06	7.05E-05
U-109	1.05E-05	5.83E-05	4.53E-06	7.33E-05
U-110	5.47E-06	6.59E-05	1.63E-06	7.30E-05
U-111	9.90E-06	6.28E-05	4.65E-06	7.73E-05
U-112	2.06E-06	5.48E-05	5.23E-08	5.69E-05
SX-101	3.07E-06	7.94E-05	3.22E-06	8.57E-05
SX-102	2.74E-06	6.81E-05	1.35E-06	7.22E-05
SX-103	3.88E-06	9.90E-05	1.59E-06	1.04E-04

**Table 7-8. Waste Classification Evaluation for
Solidified/Immobilized Waste Product Based on 10 CFR 61.55
Table 2 Class C Sum of Fractions for Short-Lived
Radionuclides (2 pages)**

10 CFR 61.55 Table 2 Class C Limits Evaluation (all values are fractions of limits)				
Source Tank	Ni-63	Sr-90	Cs-137	Table 2 Class C Sum of Fractions
SX-104	3.76E-06	7.68E-05	2.87E-06	8.35E-05
SX-105	3.50E-06	1.14E-04	2.04E-06	1.20E-04
SX-106	6.89E-06	6.13E-05	2.10E-06	7.03E-05
SX-107	6.42E-06	1.09E-04	2.23E-06	1.17E-04
SX-108	4.00E-06	1.12E-04	2.69E-06	1.19E-04
SX-109	3.57E-06	1.10E-04	3.61E-06	1.17E-04
SX-110	2.94E-06	1.81E-04	7.10E-07	1.85E-04
SX-111	1.86E-06	1.31E-04	5.14E-07	1.34E-04
SX-112	1.43E-06	1.11E-04	4.23E-07	1.12E-04
SX-113	8.45E-07	5.46E-05	2.71E-07	5.57E-05
SX-114	3.36E-06	1.23E-04	1.50E-06	1.28E-04
SX-115	2.91E-06	5.45E-05	2.71E-07	5.77E-05

7.2 PRETREATED LIQUID WASTE TRANSPORTATION CATEGORY EVALUATION

Results for offsite transport of pretreated radioactive liquid waste are shown in Table 7-9 for LSA-II category package. All conditions for shipping pretreated waste in LSA-II category package are met, including A_2 concentration ($<10^{-5} A_2/g$), total A_2 in each package ($< 100 A_2$), and meeting a fissile exempt condition (total fissile materials $< 15 g$).

The maximum allowed volume that can be shipped in an LSA-II package was estimated for each source tank based on the most limiting condition. It was used to confirm the screening results. If the maximum allowed volume is larger than the LSA-II package volume (assumed 5,000 gallons), the liquid waste is permissible to be transported in the LSA-II package at capacity. Otherwise, the LSA-II package cannot be filled to capacity. Fill controls will be needed, or the waste must be transported in a higher transportation category package. The results in Table 7-9 show the maximum allowed volumes are larger than the LSA-II package volume (assumed 5,000 gallons) for all source tanks. It indicates pretreated radioactive liquid waste from all source tanks can be transported in LSA-II package at capacity.

LSA-II is the preferred transportation category since a higher volume of liquid waste can be shipped in LSA-II packages (e.g., 5,000-gallon tankers or portable tanks) as compared to other categories such as Type A or Type B packages (e.g., 375-gallon totes). Since all pretreated liquid waste can be transported to subsequent facility(ies) in LSA-II package, evaluation results for higher transportation categories are omitted.

Table 7-9. Pretreated Liquid Waste Transportation Category LSA-II Evaluation Results (2 pages)

Source Tank	LSA-II Sum of A_2 per gram	$< 10^{-5} A_2/g$ LSA-II Conc. Condition	LSA-II Fissile Materials	< 15 grams Fissile Condition	LSA-II A_2 Inventory	$< 100 A_2$ Condition	Max Allowed Volume
	($\Sigma A_2/g$)	(Pass/Fail)	(g)	(Pass/Fail)	(ΣA_2)	(Pass/Fail)	(gal)
SY-101	1.3E-07	Pass	9.3E-01	Pass	3.1E+00	Pass	80,603
SY-102	1.5E-07	Pass	1.1E+00	Pass	3.7E+00	Pass	68,530
S-101	2.4E-07	Pass	5.2E+00	Pass	5.7E+00	Pass	14,445
S-102	1.0E-07	Pass	4.8E+00	Pass	2.2E+00	Pass	15,668
S-103	9.3E-08	Pass	1.4E+00	Pass	2.1E+00	Pass	53,383
S-104	1.9E-07	Pass	2.7E+00	Pass	4.2E+00	Pass	27,533
S-105	1.1E-07	Pass	3.1E-01	Pass	2.6E+00	Pass	193,358
S-106	7.9E-08	Pass	7.2E-01	Pass	1.8E+00	Pass	104,786
S-107	3.2E-07	Pass	7.2E+00	Pass	6.9E+00	Pass	10,473
S-108	9.8E-08	Pass	2.1E+00	Pass	2.2E+00	Pass	35,273
S-109	9.2E-08	Pass	1.1E+00	Pass	2.2E+00	Pass	66,185
S-110	1.8E-07	Pass	1.1E+01	Pass	4.4E+00	Pass	6,550
S-111	1.1E-07	Pass	4.3E+00	Pass	2.5E+00	Pass	17,315
U-201	6.4E-08	Pass	2.7E+00	Pass	1.4E+00	Pass	27,470
U-202	4.9E-08	Pass	2.0E+00	Pass	1.0E+00	Pass	37,345

**Table 7-9. Pretreated Liquid Waste Transportation Category LSA-II
Evaluation Results (2 pages)**

Source Tank	LSA-II Sum of A ₂ per gram	< 10 ⁻⁵ A ₂ /g LSA-II Conc. Condition	LSA-II Fissile Materials	< 15 grams Fissile Condition	LSA-II A ₂ Inventory	< 100 A ₂ Condition	Max Allowed Volume
	(ΣA ₂ /g)	(Pass/Fail)	(g)	(Pass/Fail)	(ΣA ₂)	(Pass/Fail)	(gal)
U-203	3.9E-08	Pass	1.6E+00	Pass	8.0E-01	Pass	48,124
U-204	3.6E-08	Pass	1.4E+00	Pass	7.3E-01	Pass	53,517
U-101	7.0E-08	Pass	4.1E-01	Pass	1.3E+00	Pass	182,835
U-102	2.2E-07	Pass	3.0E+00	Pass	4.8E+00	Pass	24,696
U-103	2.4E-07	Pass	1.3E+01	Pass	5.3E+00	Pass	5,712
U-104	1.6E-07	Pass	6.2E+00	Pass	3.4E+00	Pass	12,025
U-105	5.2E-07	Pass	8.8E+00	Pass	1.2E+01	Pass	8,551
U-106	9.2E-07	Pass	2.8E+00	Pass	2.0E+01	Pass	24,691
U-107	2.7E-07	Pass	1.5E+00	Pass	5.8E+00	Pass	49,244
U-108	1.4E-07	Pass	2.9E+00	Pass	3.1E+00	Pass	25,547
U-109	1.0E-07	Pass	5.9E-01	Pass	2.3E+00	Pass	126,105
U-110	1.2E-07	Pass	2.4E+00	Pass	2.5E+00	Pass	31,554
U-111	1.5E-07	Pass	1.6E+00	Pass	3.3E+00	Pass	47,653
U-112	8.1E-08	Pass	2.4E-01	Pass	1.6E+00	Pass	315,974
SX-101	2.6E-07	Pass	5.2E+00	Pass	5.9E+00	Pass	14,546
SX-102	1.3E-07	Pass	3.0E+00	Pass	3.1E+00	Pass	25,197
SX-103	1.9E-07	Pass	3.1E+00	Pass	4.4E+00	Pass	24,202
SX-104	1.7E-07	Pass	6.6E+00	Pass	4.1E+00	Pass	11,332
SX-105	3.2E-07	Pass	4.6E+00	Pass	7.4E+00	Pass	16,411
SX-106	2.1E-07	Pass	1.6E+00	Pass	4.6E+00	Pass	47,595
SX-107	3.6E-07	Pass	6.4E+00	Pass	7.8E+00	Pass	11,712
SX-108	3.0E-07	Pass	3.5E+00	Pass	6.5E+00	Pass	21,269
SX-109	2.9E-07	Pass	1.7E+00	Pass	6.2E+00	Pass	43,993
SX-110	3.4E-07	Pass	1.1E+00	Pass	7.4E+00	Pass	66,894
SX-111	2.2E-07	Pass	6.5E-01	Pass	4.6E+00	Pass	108,385
SX-112	1.7E-07	Pass	4.3E-01	Pass	3.5E+00	Pass	141,269
SX-113	8.4E-08	Pass	2.6E-01	Pass	1.7E+00	Pass	286,239
SX-114	4.9E-07	Pass	2.3E+00	Pass	1.0E+01	Pass	31,947
SX-115	6.5E-07	Pass	3.7E+00	Pass	1.3E+01	Pass	20,073

Radioactive activities of fissile materials in the pretreated waste from each source tank are provided in Table 7-10.

Table 7-10. Fissile Material Activities in Pretreated Liquid Waste
(2 pages)

Tank	U-233 (Ci)	U-235 (Ci)	Pu-239 (Ci)	Pu-241 (Ci)
SY-101	1.90E-02	3.04E-04	7.14E-01	3.28E-01
SY-102	2.10E-02	3.56E-04	9.53E-01	4.45E-01
S-101	8.58E-03	1.20E-03	2.83E+00	5.93E-01
S-102	3.80E-03	9.66E-04	6.69E-01	2.23E-01
S-103	3.30E-03	5.65E-04	1.32E+00	4.21E-01
S-104	7.59E-04	6.33E-04	2.56E+00	6.14E-01
S-105	3.08E-03	1.17E-04	8.21E-01	2.78E-01
S-106	1.68E-02	4.44E-04	4.52E-01	1.76E-01
S-107	3.26E-03	1.50E-03	8.53E+00	2.48E+00
S-108	5.17E-02	1.51E-03	1.90E+00	6.61E-01
S-109	8.89E-03	6.17E-04	2.56E+00	5.00E-01
S-110	2.18E-02	5.04E-03	6.95E+00	1.42E+00
S-111	4.51E-02	2.24E-03	1.49E+00	3.71E-01
U-201	3.12E-03	1.15E-04	5.89E-02	1.64E-02
U-202	2.14E-03	7.71E-05	3.90E-02	1.10E-02
U-203	1.11E-03	3.96E-05	1.99E-02	5.61E-03
U-204	6.44E-04	2.50E-05	2.22E-02	5.10E-03
U-101	2.07E-03	1.17E-04	6.47E-01	1.14E-01
U-102	1.48E-02	1.13E-03	9.28E+00	2.38E+00
U-103	1.82E-01	7.96E-03	7.05E+00	2.14E+00
U-104	2.61E-02	1.08E-03	1.08E+00	3.85E-01
U-105	3.74E-02	3.65E-03	2.39E+01	7.95E+00
U-106	4.74E-03	3.74E-04	1.01E+01	3.82E+00
U-107	6.68E-03	4.71E-04	9.53E+00	3.79E+00
U-108	6.87E-03	1.66E-03	7.45E+00	2.73E+00
U-109	3.47E-03	2.64E-04	2.18E+00	8.28E-01
U-110	2.99E-04	3.11E-04	7.76E-01	1.58E-01
U-111	5.70E-03	4.35E-04	4.24E+00	1.22E+00
U-112	1.39E-03	1.14E-04	1.17E+00	3.31E-01
SX-101	4.16E-02	2.51E-03	3.55E+00	8.95E-01
SX-102	3.35E-02	1.26E-03	1.63E+00	5.09E-01
SX-103	4.36E-02	1.81E-03	5.93E+00	1.56E+00
SX-104	2.63E-02	2.53E-03	5.57E+00	1.14E+00
SX-105	2.27E-02	1.75E-03	1.56E+01	3.05E+00
SX-106	1.04E-02	3.92E-04	1.06E+01	3.90E+00
SX-107	9.83E-04	8.08E-04	2.06E+00	6.65E-01
SX-108	3.26E-04	3.27E-04	1.19E+00	3.27E-01

Table 7-10. Fissile Material Activities in Pretreated Liquid Waste
(2 pages)

Tank	U-233 (Ci)	U-235 (Ci)	Pu-239 (Ci)	Pu-241 (Ci)
SX-109	8.79E-04	6.64E-04	1.80E+00	5.08E-01
SX-110	5.28E-05	5.60E-05	1.74E-01	7.23E-02
SX-111	5.06E-05	8.24E-05	4.56E-01	1.51E-01
SX-112	1.22E-05	3.58E-05	2.69E-01	8.48E-02
SX-113	3.56E-06	1.33E-05	5.77E-02	1.49E-02
SX-114	1.50E-04	4.77E-04	8.93E-01	2.48E-01
SX-115	2.10E-05	5.88E-05	1.96E+00	8.54E-01

8.0 REFERENCES

- 10 CFR 61.55, “Waste Classification,” *Code of Federal Regulations*, as amended.
- 49 CFR 173, “Class 7 (Radioactive) Materials,” Code of Federal Regulations, as amended.
- 49 CFR 173.403, “Definitions,” Code of Federal Regulations, as amended.
- 49 CFR 173.411, “Industrial Packages,” Code of Federal Regulations, as amended.
- 49 CFR 173.435, “Table of A1 and A2 Values for Radionuclides,” Code of Federal Regulations, as amended.
- 49 CFR 173.436, “Exempt Material Activity Concentrations and Exempt Consignment Activity Limits for Radionuclides,” Code of Federal Regulations, as amended.
- 49 CFR 173.453, “Fissile Material – Exceptions,” Code of Federal Regulations, as amended.
- DOE Manual 435.1-1, 2021, *Radioactive Waste Management Manual*, Chg. 3, U.S. Department of Energy, Washington, D.C.
- HNF-EP-0182, 2024, *Waste Tank Summary Report for Month End August 31, 2024*, Rev. 440, Washington River Protection Solutions, LLC., Richland, WA.
- RPP-PLAN-65926, 2024, *Software Management Plan for Grade D Utility Calculation Software West Area Flowsheet – Excel Based*, Rev.0, Washington River Protection Solutions, LLC., Richland, WA.
- RPP-RPT-64319, 2025, *Preliminary 200 West Area Flowsheet*, Rev.2A, Washington River Protection Solutions, LLC., Richland, WA.
- VSL-22R5150-1, 2022, *FY22 Development of Improved Grout Waste Forms for Supplemental Low Activity Waste Treatment*, Vitreous State Laboratory, the Catholic University of America Washington, D.C.

**APPENDIX A. WASTE CLASSIFICATION EVALUATIONS FOR SCENARIO
WITH ASSUMED STRONTIUM-90 REMOVAL EFFICIENCY**

APPENDIX CONTENTS

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This Appendix provides waste classification results for the pretreated liquid waste and solidified waste for a scenario that assumes removal of Sr-90. Specifically, this scenario includes an assumption that Sr-90 will be removed by ion exchange media in the 200 West Area process module (200W PM) based on decontamination factor (DF) of 31, which equates to removal efficiency of 96.8%.

A Sr-90 DF of 31 is the minimum DF that results in highest number of feeds that meet Class A concentration limits in Title 10, *Code of Federal Regulations (CFR)*, Part 61, Subpart D, § 61.55, “Waste Classification” (10 CFR 61.55).

In the calculations that support this supplemental data report, the input value for Sr-90 DF was varied, and the resulting number of feeds that meet Class A concentration limits were observed. The results indicate that increasing the Sr-90 DF above 31 (higher DFs provide better Sr-90 removal efficiency) did not increase the number of feeds meeting Class A concentration limits. Note this removal efficiency applies only to soluble Sr-90 in the liquid waste. Each of the 200W PM has a filtration system to remove entrained solids from the feed stream prior to ion exchange columns. For conservative purpose in this supplemental data report, filter efficiency was assumed to be 0% allowing Sr-90 in solid form to pass through the filtration system. Therefore, increasing the Sr-90 DF does not have any impact on the dose that is contributed by Sr-90 presents in the solid form.

A.1. WASTE CLASSIFICATION EVALUATIONS FOR PRETREATED LIQUID WASTE

This section provides waste classification results for pretreated liquid waste with the assumption that Sr-90 can be removed by ion exchange media in the WARM process module using a Sr-90 DF of 31. Table A-1 provides the waste classification results for pretreated liquid waste against Class A concentration limits in 10 CFR 61.55 Table 1 using the sum of fractions method. Based on these results, the pretreated waste from three tanks (U-105, U-106, and SX-115) exceed Class A concentration limits. The sum of fractions results that exceed 1 are highlighted in red.

Table A-1. Waste Classification Evaluation for Pretreated Liquid Based on 10 CFR 61.55 Table 1 Class A Sum of Fractions for Long-Lived Radionuclides with Assumed Sr-90 Removal Efficiency of 96.8% (2 pages)

10 CFR 61.55 Table 1 Class A Limits Evaluation (all values are fractions of limits)							
Source Tank	C-14	I-129	Tc-99	Pu-241	Cm-242	Total Alpha	Table 1 Class A Sum of Fractions
SY-101	8.21E-04	1.20E-02	4.00E-01	2.42E-04	3.14E-05	1.40E-01	5.53E-01
SY-102	8.86E-04	1.49E-02	5.12E-01	3.18E-04	4.27E-05	1.87E-01	7.16E-01
S-101	1.20E-03	5.23E-03	2.46E-01	6.15E-04	1.44E-05	2.38E-01	4.91E-01
S-102	1.09E-03	3.04E-03	9.94E-02	3.02E-04	1.02E-05	6.92E-02	1.73E-01
S-103	1.35E-03	4.72E-03	1.28E-01	2.71E-04	4.68E-06	6.11E-02	1.96E-01
S-104	9.59E-04	2.92E-03	8.08E-02	6.54E-04	1.32E-06	1.70E-01	2.55E-01
S-105	2.58E-03	7.64E-03	2.06E-01	1.53E-04	1.93E-06	1.27E-01	3.43E-01
S-106	1.63E-03	4.82E-03	1.29E-01	7.40E-05	1.39E-06	4.66E-02	1.82E-01

Table A-1. Waste Classification Evaluation for Pretreated Liquid Based on 10 CFR 61.55 Table 1 Class A Sum of Fractions for Long-Lived Radionuclides with Assumed Sr-90 Removal Efficiency of 96.8% (2 pages)

10 CFR 61.55 Table 1 Class A Limits Evaluation (all values are fractions of limits)							
Source Tank	C-14	I-129	Tc-99	Pu-241	Cm-242	Total Alpha	Table 1 Class A Sum of Fractions
S-107	1.25E-03	1.81E-03	5.61E-02	2.82E-03	1.65E-06	5.55E-01	6.17E-01
S-108	1.61E-03	4.92E-03	1.33E-01	2.40E-04	4.60E-06	8.76E-02	2.27E-01
S-109	2.41E-03	7.53E-03	2.01E-01	2.04E-04	1.19E-06	6.67E-02	2.78E-01
S-110	2.18E-03	6.44E-03	1.74E-01	7.98E-04	4.87E-06	2.74E-01	4.58E-01
S-111	1.24E-03	4.37E-03	1.16E-01	1.94E-04	1.30E-06	5.83E-02	1.81E-01
U-201	9.21E-04	3.38E-03	8.99E-02	1.10E-04	5.51E-07	2.89E-02	1.23E-01
U-202	6.99E-04	2.52E-03	6.71E-02	8.26E-05	4.02E-07	2.16E-02	9.21E-02
U-203	5.59E-04	1.97E-03	5.26E-02	6.51E-05	3.12E-07	1.70E-02	7.22E-02
U-204	4.68E-04	1.61E-03	4.31E-02	8.42E-05	2.54E-07	2.31E-02	6.84E-02
U-101	1.29E-04	4.05E-04	9.58E-03	1.07E-04	7.49E-08	3.26E-02	4.28E-02
U-102	1.03E-03	3.37E-03	8.05E-02	1.40E-03	5.44E-06	3.28E-01	4.14E-01
U-103	1.39E-03	4.21E-03	1.11E-01	9.53E-04	1.05E-05	4.19E-01	5.37E-01
U-104	8.63E-04	2.65E-03	6.83E-02	6.19E-04	4.99E-06	2.31E-01	3.03E-01
U-105	1.54E-03	4.45E-03	1.49E-01	4.26E-03	4.08E-05	1.05E+00	1.21E+00
U-106	1.53E-03	4.49E-03	1.31E-01	4.11E-03	6.95E-05	1.85E+00	1.99E+00
U-107	1.28E-03	5.24E-03	1.44E-01	2.02E-03	2.62E-05	5.24E-01	6.76E-01
U-108	1.47E-03	5.32E-03	1.43E-01	1.15E-03	7.63E-06	1.83E-01	3.35E-01
U-109	1.36E-03	4.76E-03	1.28E-01	4.06E-04	3.47E-06	9.84E-02	2.33E-01
U-110	8.53E-04	2.63E-03	7.04E-02	3.24E-04	1.51E-06	1.02E-01	1.76E-01
U-111	1.20E-03	4.19E-03	1.13E-01	9.30E-04	7.22E-06	2.03E-01	3.22E-01
U-112	2.22E-04	7.32E-04	2.01E-02	1.59E-04	1.39E-06	3.45E-02	5.58E-02
SX-101	1.05E-03	4.05E-03	9.04E-02	4.79E-04	1.92E-05	4.65E-01	5.61E-01
SX-102	1.31E-03	4.69E-03	1.18E-01	3.06E-04	1.71E-05	1.61E-01	2.85E-01
SX-103	1.68E-03	5.69E-03	1.48E-01	6.20E-04	2.83E-05	2.15E-01	3.72E-01
SX-104	1.60E-03	5.70E-03	1.44E-01	7.23E-04	9.44E-06	2.41E-01	3.93E-01
SX-105	1.49E-03	4.66E-03	1.21E-01	1.63E-03	1.39E-05	5.34E-01	6.63E-01
SX-106	1.22E-03	4.80E-03	1.27E-01	2.28E-03	2.26E-05	3.79E-01	5.14E-01
SX-107	7.97E-04	2.80E-03	8.03E-02	1.40E-03	1.22E-05	6.40E-01	7.26E-01
SX-108	6.04E-04	1.79E-03	5.72E-02	8.90E-04	1.76E-05	4.57E-01	5.18E-01
SX-109	6.57E-04	1.59E-03	5.96E-02	3.38E-04	4.49E-06	4.39E-01	5.01E-01
SX-110	6.20E-04	2.67E-03	6.79E-02	3.70E-04	5.52E-06	3.73E-01	4.44E-01
SX-111	4.68E-04	2.80E-03	5.41E-02	2.91E-04	5.54E-06	1.80E-01	2.37E-01
SX-112	3.87E-04	2.51E-03	4.44E-02	2.42E-04	5.38E-06	1.09E-01	1.57E-01
SX-113	3.21E-04	2.02E-03	3.48E-02	7.74E-05	3.89E-06	5.09E-02	8.81E-02
SX-114	4.13E-04	1.42E-03	3.89E-02	3.42E-04	3.71E-06	9.42E-01	9.83E-01
SX-115	3.84E-04	1.35E-03	3.72E-02	7.54E-03	5.78E-06	1.59E+00	1.64E+00

The results for pretreated liquid waste against 10 CFR 61.55 Table 2 Class A concentration limits are shown in Table A-2. The majority of source tanks have a sum of fractions exceeding Class A concentration limits, and activity from Sr-90 present in the solids is the main

contributing factor. This supplemental data calculation assumes 0% filter efficiency, so all Sr-90 present in the entrained solids are assumed to pass through the filtration system in the 200W PM and contribute dose to the pretreated waste. The sum of fractions that exceed 1 are highlighted in red.

Table A-2. Waste Classification Evaluation for Pretreated Liquid Based on 10 CFR 61.55 Table 2 Class A Sum of Fractions for Short-Lived Radionuclides with Assumed Sr-90 Removal Efficiency of 96.8% (2 pages)

10 CFR 61.55 Table 2 Class A Limits Evaluation (all values are fractions of limits)							
Source Tank	H-3	Co-60	Ni-63	Sr-90	Cs-137	Total Rad w/ half-life < 5 years	Table 2 Class A Sum of Fractions
SY-101	1.25E-06	8.25E-08	3.24E-03	6.06E-01	1.25E-02	5.27E-05	6.22E-01
SY-102	1.37E-06	1.06E-07	4.22E-03	6.56E-01	1.52E-02	5.95E-05	6.75E-01
S-101	6.31E-05	4.44E-08	2.30E-03	2.26E+01	2.69E-02	1.33E-03	2.26E+01
S-102	4.46E-05	1.36E-08	2.41E-03	2.58E+00	1.47E-02	1.67E-04	2.60E+00
S-103	3.04E-05	2.35E-08	1.33E-03	1.46E+00	5.48E-03	9.09E-05	1.47E+00
S-104	2.38E-05	8.69E-09	1.03E-03	1.55E+01	1.84E-02	9.13E-04	1.56E+01
S-105	4.46E-05	2.92E-08	1.30E-03	7.56E-01	2.71E-02	8.00E-05	7.84E-01
S-106	2.72E-05	6.32E-09	6.98E-04	8.15E-01	1.15E-02	6.21E-05	8.28E-01
S-107	2.09E-04	2.46E-08	1.10E-03	1.09E+01	5.51E-02	6.96E-04	1.09E+01
S-108	5.55E-05	7.35E-09	8.61E-04	1.33E+00	1.39E-02	9.45E-05	1.34E+00
S-109	4.30E-05	1.74E-08	1.08E-02	2.85E+00	2.84E-02	2.01E-04	2.89E+00
S-110	4.96E-05	2.17E-08	3.23E-03	6.84E+00	1.37E-02	4.09E-04	6.86E+00
S-111	3.05E-05	5.75E-09	6.78E-04	6.41E+00	6.30E-02	4.52E-04	6.48E+00
U-201	2.91E-05	2.25E-09	4.12E-04	3.87E-01	2.32E-03	2.53E-05	3.89E-01
U-202	3.00E-05	1.63E-09	3.94E-04	2.86E-01	1.29E-03	1.82E-05	2.88E-01
U-203	3.06E-05	1.28E-09	4.28E-04	2.23E-01	8.53E-04	1.39E-05	2.24E-01
U-204	3.11E-05	1.06E-09	4.56E-04	1.86E-01	6.27E-04	1.15E-05	1.87E-01
U-101	1.16E-05	6.04E-10	1.67E-04	3.84E-01	1.93E-04	2.22E-05	3.84E-01
U-102	3.00E-05	3.80E-08	8.94E-03	5.92E+00	5.12E-02	4.07E-04	5.98E+00
U-103	2.55E-05	2.62E-08	2.07E-03	1.65E+00	5.72E-03	1.02E-04	1.65E+00
U-104	1.85E-05	4.50E-08	1.68E-03	9.16E-01	6.61E-03	6.14E-05	9.25E-01
U-105	4.56E-05	8.49E-08	3.52E-03	2.61E+00	2.89E-02	1.88E-04	2.64E+00
U-106	3.15E-05	3.71E-07	5.65E-03	4.42E+00	5.48E-03	2.60E-04	4.43E+00
U-107	3.40E-05	7.58E-08	2.94E-03	1.42E+00	1.80E-02	1.06E-04	1.44E+00
U-108	4.48E-05	2.52E-08	1.13E-03	5.15E-01	5.50E-02	1.04E-04	5.71E-01
U-109	3.81E-05	4.02E-08	3.17E-03	5.83E-01	3.15E-02	7.60E-05	6.18E-01
U-110	1.88E-05	1.96E-08	1.65E-03	3.18E+00	1.13E-02	1.97E-04	3.20E+00
U-111	2.35E-05	2.86E-08	2.98E-03	2.07E+00	3.22E-02	1.62E-04	2.10E+00
U-112	1.19E-05	5.29E-09	6.12E-04	5.70E-01	3.57E-04	3.31E-05	5.71E-01
SX-101	5.30E-05	4.80E-09	9.20E-04	7.05E+00	2.21E-02	4.33E-04	7.08E+00
SX-102	3.23E-05	4.90E-09	8.33E-04	4.19E+00	9.49E-03	2.52E-04	4.20E+00
SX-103	3.68E-05	8.06E-09	1.18E-03	1.25E+01	1.12E-02	7.30E-04	1.25E+01
SX-104	4.23E-05	9.34E-09	1.14E-03	6.53E+00	2.00E-02	4.00E-04	6.55E+00
SX-105	3.61E-05	2.55E-08	1.06E-03	1.64E+01	1.42E-02	9.54E-04	1.64E+01

Table A-2. Waste Classification Evaluation for Pretreated Liquid Based on 10 CFR 61.55 Table 2 Class A Sum of Fractions for Short-Lived Radionuclides with Assumed Sr-90 Removal Efficiency of 96.8% (2 pages)

10 CFR 61.55 Table 2 Class A Limits Evaluation (all values are fractions of limits)							
Source Tank	H-3	Co-60	Ni-63	Sr-90	Cs-137	Total Rad w/ half-life < 5 years	Table 2 Class A Sum of Fractions
SX-106	2.26E-05	2.34E-08	2.07E-03	7.60E-01	1.45E-02	6.31E-05	7.77E-01
SX-107	5.95E-05	1.10E-08	1.92E-03	1.32E+01	1.53E-02	7.77E-04	1.33E+01
SX-108	7.88E-05	5.07E-09	1.19E-03	1.51E+01	1.85E-02	8.86E-04	1.51E+01
SX-109	8.01E-05	2.84E-09	1.06E-03	1.47E+01	2.46E-02	8.71E-04	1.47E+01
SX-110	1.23E-04	1.73E-09	8.74E-04	3.32E+01	4.85E-03	1.90E-03	3.32E+01
SX-111	1.16E-04	7.85E-10	5.53E-04	2.03E+01	3.51E-03	1.17E-03	2.03E+01
SX-112	1.05E-04	4.40E-10	4.26E-04	1.49E+01	2.89E-03	8.58E-04	1.50E+01
SX-113	8.13E-05	2.50E-10	2.51E-04	4.58E-01	1.85E-03	2.87E-05	4.60E-01
SX-114	8.05E-05	5.23E-09	9.99E-04	1.82E+01	1.03E-02	1.06E-03	1.82E+01
SX-115	7.84E-05	6.24E-09	8.67E-04	4.58E-01	1.85E-03	2.87E-05	4.61E-01

A.2. WASTE CLASSIFICATION EVALUATION FOR SOLIDIFIED WASTE

This section provides waste classification results for the solidified waste compared against 10 CFR 61.55 Table 1 and Table 2 for Class A concentration limits. Table A-3 provides the sum of fractions results for long-lived radionuclides in 10 CFR 61.55 Table 1. Based on the volume increase that occurs when the pretreated liquid is solidified, all solidified waste meets Class A concentration limits (i.e., the sum of fractions is less than 1).

Table A-3. Waste Classification Evaluation for Solidified Waste Based on 10 CFR 61.55 Table 1 Class A Sum of Fractions for Long-Lived Radionuclides with Assumed Sr-90 Removal Efficiency of 96.8% (2 pages)

10 CFR 61.55 Table 1 Class A Limits Evaluation (all values are fractions of limits)							
Source Tank	C-14	I-129	Tc-99	Pu-241	Cm-242	Total Alpha	Table 1 Class A Sum of Fractions
SY-101	5.44E-04	7.93E-03	2.65E-01	1.10E-04	1.43E-05	6.35E-02	3.37E-01
SY-102	5.85E-04	9.83E-03	3.38E-01	1.48E-04	1.99E-05	8.74E-02	4.36E-01
S-101	7.91E-04	3.45E-03	1.62E-01	2.82E-04	6.58E-06	1.09E-01	2.75E-01
S-102	7.27E-04	2.02E-03	6.60E-02	1.30E-04	4.36E-06	2.97E-02	9.86E-02
S-103	8.97E-04	3.15E-03	8.53E-02	1.17E-04	2.02E-06	2.63E-02	1.16E-01
S-104	6.49E-04	1.97E-03	5.47E-02	2.84E-04	5.72E-07	7.37E-02	1.31E-01
S-105	1.75E-03	5.18E-03	1.40E-01	7.29E-05	9.21E-07	6.04E-02	2.07E-01
S-106	1.08E-03	3.21E-03	8.60E-02	3.27E-05	6.16E-07	2.06E-02	1.11E-01

**Table A-3. Waste Classification Evaluation for Solidified Waste Based on 10 CFR 61.55
Table 1 Class A Sum of Fractions for Long-Lived Radionuclides with
Assumed Sr-90 Removal Efficiency of 96.8% (2 pages)**

10 CFR 61.55 Table 1 Class A Limits Evaluation (all values are fractions of limits)							
Source Tank	C-14	I-129	Tc-99	Pu-241	Cm-242	Total Alpha	Table 1 Class A Sum of Fractions
S-107	8.35E-04	1.21E-03	3.74E-02	1.19E-03	6.96E-07	2.35E-01	2.75E-01
S-108	1.06E-03	3.25E-03	8.79E-02	1.06E-04	2.03E-06	3.87E-02	1.31E-01
S-109	1.60E-03	5.00E-03	1.34E-01	9.63E-05	5.64E-07	3.15E-02	1.72E-01
S-110	1.44E-03	4.28E-03	1.16E-01	3.71E-04	2.27E-06	1.28E-01	2.49E-01
S-111	8.19E-04	2.89E-03	7.70E-02	8.35E-05	5.59E-07	2.51E-02	1.06E-01
U-201	6.11E-04	2.25E-03	5.97E-02	4.59E-05	2.30E-07	1.21E-02	7.47E-02
U-202	4.66E-04	1.68E-03	4.47E-02	3.37E-05	1.64E-07	8.83E-03	5.58E-02
U-203	3.73E-04	1.32E-03	3.51E-02	2.61E-05	1.25E-07	6.83E-03	4.37E-02
U-204	3.13E-04	1.08E-03	2.89E-02	3.35E-05	1.01E-07	9.17E-03	3.95E-02
U-101	8.70E-05	2.74E-04	6.48E-03	4.09E-05	2.86E-08	1.24E-02	1.93E-02
U-102	6.82E-04	2.24E-03	5.34E-02	5.98E-04	2.32E-06	1.40E-01	1.97E-01
U-103	9.25E-04	2.79E-03	7.34E-02	4.10E-04	4.50E-06	1.80E-01	2.58E-01
U-104	5.74E-04	1.76E-03	4.54E-02	2.58E-04	2.08E-06	9.61E-02	1.44E-01
U-105	1.02E-03	2.95E-03	9.86E-02	1.87E-03	1.79E-05	4.59E-01	5.64E-01
U-106	1.03E-03	3.02E-03	8.78E-02	1.78E-03	3.01E-05	8.00E-01	8.93E-01
U-107	8.53E-04	3.48E-03	9.59E-02	8.65E-04	1.12E-05	2.24E-01	3.25E-01
U-108	9.74E-04	3.53E-03	9.52E-02	5.03E-04	3.35E-06	8.05E-02	1.81E-01
U-109	9.01E-04	3.14E-03	8.48E-02	1.73E-04	1.49E-06	4.21E-02	1.31E-01
U-110	5.66E-04	1.74E-03	4.67E-02	1.33E-04	6.20E-07	4.19E-02	9.11E-02
U-111	7.97E-04	2.78E-03	7.47E-02	3.96E-04	3.07E-06	8.65E-02	1.65E-01
U-112	1.50E-04	4.93E-04	1.36E-02	6.14E-05	5.36E-07	1.33E-02	2.76E-02
SX-101	6.99E-04	2.70E-03	6.04E-02	2.11E-04	8.46E-06	2.05E-01	2.69E-01
SX-102	8.58E-04	3.08E-03	7.74E-02	1.36E-04	7.65E-06	7.19E-02	1.53E-01
SX-103	1.10E-03	3.73E-03	9.73E-02	2.84E-04	1.29E-05	9.86E-02	2.01E-01
SX-104	1.06E-03	3.76E-03	9.52E-02	3.30E-04	4.31E-06	1.10E-01	2.10E-01
SX-105	9.81E-04	3.07E-03	7.96E-02	7.22E-04	6.15E-06	2.37E-01	3.21E-01
SX-106	8.13E-04	3.19E-03	8.42E-02	9.72E-04	9.65E-06	1.62E-01	2.51E-01
SX-107	5.33E-04	1.87E-03	5.38E-02	5.87E-04	5.14E-06	2.69E-01	3.26E-01
SX-108	4.05E-04	1.20E-03	3.84E-02	3.81E-04	7.51E-06	1.96E-01	2.36E-01
SX-109	4.43E-04	1.07E-03	4.01E-02	1.46E-04	1.94E-06	1.89E-01	2.31E-01
SX-110	4.18E-04	1.80E-03	4.57E-02	1.60E-04	2.38E-06	1.60E-01	2.09E-01
SX-111	3.15E-04	1.88E-03	3.64E-02	1.22E-04	2.32E-06	7.51E-02	1.14E-01
SX-112	2.61E-04	1.69E-03	2.99E-02	9.94E-05	2.21E-06	4.48E-02	7.67E-02
SX-113	2.16E-04	1.36E-03	2.35E-02	3.12E-05	1.57E-06	2.05E-02	4.55E-02
SX-114	2.77E-04	9.55E-04	2.61E-02	1.40E-04	1.52E-06	3.85E-01	4.13E-01
SX-115	2.58E-04	9.09E-04	2.50E-02	3.07E-03	2.35E-06	6.46E-01	6.75E-01

Table A-4 provides sum of fractions results for short-lived radionuclide concentrations in the solidified waste when compared to 10 CFR 61.55 Table 2 limits for Class A waste using the sum of fractions method. The sum of fractions values that exceed 1 are highlighted in red indicating solidified waste exceeds Class A concentration limits. Radioactivity from Sr-90 presents in the solids not removed by filtration in the 200W PM is the main contributing factor for solidified waste that exceed Class A concentration limits.

Table A-4. Waste Classification Evaluation for Solidified Waste Based on 10 CFR 61.55 Table 2 Class A Sum of Fractions for Short-Lived Radionuclides with Assumed Sr-90 Removal Efficiency of 96.8% (2 pages)

10 CFR 61.55 Table 2 Class A Limits Evaluation (all values are fractions of limits)							
Source Tank	H-3	Co-60	Ni-63	Sr-90	Cs-137	Total Rad w/ half-life < 5 years	Table 2 Class A Sum of Fractions
SY-101	8.26E-07	5.46E-08	2.15E-03	4.01E-01	8.29E-03	3.49E-05	4.12E-01
SY-102	9.05E-07	6.99E-08	2.79E-03	4.33E-01	1.01E-02	3.93E-05	4.46E-01
S-101	4.15E-05	2.92E-08	1.52E-03	1.49E+01	1.77E-02	8.73E-04	1.49E+01
S-102	2.96E-05	9.04E-09	1.60E-03	1.71E+00	9.80E-03	1.11E-04	1.72E+00
S-103	2.02E-05	1.56E-08	8.88E-04	9.72E-01	3.65E-03	6.05E-05	9.77E-01
S-104	1.61E-05	5.88E-09	6.98E-04	1.05E+01	1.24E-02	6.18E-04	1.05E+01
S-105	3.02E-05	1.98E-08	8.80E-04	5.13E-01	1.84E-02	5.43E-05	5.32E-01
S-106	1.81E-05	4.21E-09	4.65E-04	5.43E-01	7.66E-03	4.13E-05	5.51E-01
S-107	1.39E-04	1.64E-08	7.31E-04	7.25E+00	3.68E-02	4.64E-04	7.29E+00
S-108	3.67E-05	4.86E-09	5.69E-04	8.77E-01	9.17E-03	6.25E-05	8.87E-01
S-109	2.86E-05	1.16E-08	7.14E-03	1.89E+00	1.88E-02	1.34E-04	1.92E+00
S-110	3.30E-05	1.44E-08	2.14E-03	4.54E+00	9.13E-03	2.72E-04	4.55E+00
S-111	2.01E-05	3.80E-09	4.49E-04	4.24E+00	4.17E-02	2.99E-04	4.29E+00
U-201	1.93E-05	1.50E-09	2.73E-04	2.57E-01	1.54E-03	1.68E-05	2.58E-01
U-202	2.00E-05	1.09E-09	2.63E-04	1.91E-01	8.59E-04	1.21E-05	1.92E-01
U-203	2.05E-05	8.53E-10	2.86E-04	1.49E-01	5.70E-04	9.30E-06	1.50E-01
U-204	2.08E-05	7.07E-10	3.05E-04	1.25E-01	4.20E-04	7.72E-06	1.25E-01
U-101	7.82E-06	4.08E-10	1.13E-04	2.60E-01	1.30E-04	1.50E-05	2.60E-01
U-102	1.99E-05	2.52E-08	5.93E-03	3.93E+00	3.40E-02	2.70E-04	3.97E+00
U-103	1.70E-05	1.74E-08	1.37E-03	1.09E+00	3.80E-03	6.76E-05	1.10E+00
U-104	1.23E-05	2.99E-08	1.12E-03	6.09E-01	4.39E-03	4.08E-05	6.15E-01
U-105	3.03E-05	5.63E-08	2.34E-03	1.73E+00	1.92E-02	1.25E-04	1.75E+00
U-106	2.12E-05	2.49E-07	3.80E-03	2.97E+00	3.69E-03	1.75E-04	2.98E+00
U-107	2.26E-05	5.04E-08	1.95E-03	9.44E-01	1.20E-02	7.02E-05	9.58E-01
U-108	2.98E-05	1.68E-08	7.48E-04	3.42E-01	3.66E-02	6.90E-05	3.80E-01
U-109	2.52E-05	2.65E-08	2.09E-03	3.85E-01	2.08E-02	5.02E-05	4.08E-01
U-110	1.25E-05	1.30E-08	1.09E-03	2.11E+00	7.51E-03	1.31E-04	2.12E+00
U-111	1.56E-05	1.90E-08	1.98E-03	1.37E+00	2.14E-02	1.07E-04	1.39E+00
U-112	8.02E-06	3.56E-09	4.12E-04	3.84E-01	2.41E-04	2.23E-05	3.85E-01
SX-101	3.54E-05	3.21E-09	6.15E-04	4.71E+00	1.48E-02	2.89E-04	4.73E+00
SX-102	2.12E-05	3.22E-09	5.47E-04	2.75E+00	6.23E-03	1.66E-04	2.76E+00

**Table A-4. Waste Classification Evaluation for Solidified Waste Based on 10 CFR 61.55
Table 2 Class A Sum of Fractions for Short-Lived Radionuclides with
Assumed Sr-90 Removal Efficiency of 96.8% (2 pages)**

10 CFR 61.55 Table 2 Class A Limits Evaluation (all values are fractions of limits)							
Source Tank	H-3	Co-60	Ni-63	Sr-90	Cs-137	Total Rad w/ half-life < 5 years	Table 2 Class A Sum of Fractions
SX-103	2.42E-05	5.29E-09	7.76E-04	8.21E+00	7.33E-03	4.79E-04	8.22E+00
SX-104	2.79E-05	6.16E-09	7.53E-04	4.31E+00	1.32E-02	2.64E-04	4.32E+00
SX-105	2.38E-05	1.68E-08	6.99E-04	1.08E+01	9.37E-03	6.28E-04	1.08E+01
SX-106	1.50E-05	1.55E-08	1.38E-03	5.05E-01	9.64E-03	4.20E-05	5.17E-01
SX-107	3.98E-05	7.34E-09	1.28E-03	8.85E+00	1.02E-02	5.20E-04	8.87E+00
SX-108	5.28E-05	3.40E-09	7.99E-04	1.01E+01	1.24E-02	5.94E-04	1.01E+01
SX-109	5.40E-05	1.91E-09	7.14E-04	9.88E+00	1.66E-02	5.87E-04	9.90E+00
SX-110	8.29E-05	1.17E-09	5.88E-04	2.23E+01	3.27E-03	1.28E-03	2.23E+01
SX-111	7.78E-05	5.28E-10	3.72E-04	1.37E+01	2.37E-03	7.85E-04	1.37E+01
SX-112	7.04E-05	2.96E-10	2.86E-04	1.01E+01	1.94E-03	5.77E-04	1.01E+01
SX-113	5.48E-05	1.68E-10	1.69E-04	3.08E-01	1.24E-03	1.93E-05	3.10E-01
SX-114	5.40E-05	3.51E-09	6.71E-04	1.22E+01	6.91E-03	7.09E-04	1.22E+01
SX-115	5.27E-05	4.19E-09	5.82E-04	3.08E-01	1.25E-03	1.93E-05	3.10E-01

The following Table A-5 provides a summary of total activity of key radionuclides in the feed stream and pretreated waste that generated from each source tank.

Table A-5. Total Activity of Key Radionuclides in Feed and Pretreated Waste with Assumed Sr-90 Removal Efficiency of 96.8% (2 pages)

Source Tank	Feed Total Activity (Ci)	Pretreated Waste Total Activity (Ci)	Percent Removed (%)
SY-101	2.03E+05	5.35E+02	99.7%
SY-102	2.57E+05	6.73E+02	99.7%
S-101	1.27E+05	2.24E+03	98.2%
S-102	4.99E+04	2.89E+02	99.4%
S-103	1.03E+05	4.20E+02	99.6%
S-104	4.33E+04	1.56E+03	96.4%
S-105	4.74E+04	5.32E+02	98.9%
S-106	1.05E+05	5.01E+02	99.5%
S-107	4.99E+04	1.16E+03	97.7%
S-108	1.64E+05	7.50E+02	99.5%
S-109	4.78E+04	1.34E+03	97.2%
S-110	7.99E+04	1.45E+03	98.2%
S-111	6.84E+04	1.68E+03	97.6%
U-201	4.14E+03	1.82E+01	99.6%

Table A-5. Total Activity of Key Radionuclides in Feed and Pretreated Waste with Assumed Sr-90 Removal Efficiency of 96.8% (2 pages)

Source Tank	Feed Total Activity (Ci)	Pretreated Waste Total Activity (Ci)	Percent Removed (%)
U-202	2.80E+03	1.25E+01	99.6%
U-203	1.45E+03	6.59E+00	99.5%
U-204	8.44E+02	3.97E+00	99.5%
U-101	8.08E+03	5.94E+01	99.3%
U-102	9.58E+04	1.47E+03	98.5%
U-103	1.44E+05	6.56E+02	99.5%
U-104	2.70E+04	1.16E+02	99.6%
U-105	1.34E+05	9.30E+02	99.3%
U-106	7.87E+04	6.12E+02	99.2%
U-107	8.59E+04	6.37E+02	99.3%
U-108	1.34E+05	7.35E+02	99.5%
U-109	1.07E+05	5.43E+02	99.5%
U-110	1.34E+04	2.09E+02	98.4%
U-111	5.98E+04	5.32E+02	99.1%
U-112	2.39E+04	1.87E+02	99.2%
SX-101	1.09E+05	1.54E+03	98.6%
SX-102	1.38E+05	8.54E+02	99.4%
SX-103	2.23E+05	3.25E+03	98.5%
SX-104	1.06E+05	1.21E+03	98.9%
SX-105	1.11E+05	3.17E+03	97.2%
SX-106	1.06E+05	4.13E+02	99.6%
SX-107	2.59E+04	7.05E+02	97.3%
SX-108	2.11E+04	5.97E+02	97.2%
SX-109	5.93E+04	2.39E+03	96.0%
SX-110	1.15E+04	6.62E+02	94.2%
SX-111	3.25E+04	1.12E+03	96.6%
SX-112	2.16E+04	5.66E+02	97.4%
SX-113	8.83E+03	1.82E+01	99.8%
SX-114	3.27E+04	1.46E+03	95.5%
SX-115	4.41E+03	1.72E+01	99.6%

A.3. REFERENCES

10 CFR 61.55, "Waste Classification", *Code of Federal Regulations*, as amended.

