Comparison of Waste Estimates from Recycling and Fuel Fabrication

Fuel Cycle Research & Development

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SUMMARY

The projected volumes and characteristics of waste generated by a future recycling facility for used nuclear fuel (UNF) in the U.S. can have a large degree of variance depending on the industrial technology deployed, operational approach, and related assumptions. To accurately plan for a future repository for disposition of UNF and high level waste (HLW), other future facilities required for radioactive waste management, and to evaluate impacts of reprocessing and fuel fabrication, an accurate determination of waste generation from recycle of UNF is needed. Such projections have been made by various Department of Energy (DOE) contractors, but the results have exhibited large variability for some wastes.

The goals of this activity are to reduce the variability in waste estimates for reprocessing and fabricating particular fuel types based on industrial experience, and to better understand the cause of any remaining variability in waste estimates. This information may be used later to support the development of waste estimates for future fuel cycle options by the DOE and its laboratories.

To support the activity, DOE contracted with two industrial partners using the advice and assistance contract. Under Task Order 9, AREVA and Energy *Solutions* were tasked to develop volumes, masses, radionuclide concentrations, and other characteristics of both process waste and secondary waste produced during reactor fuel reprocessing and subsequent fuel fabrication facilities. The industrial estimates are compared to estimates developed by the Used Fuel Disposition Campaign (UFDC) within the DOE Office of Nuclear Energy (DOE-NE).

Since the largest source of waste estimate uncertainty is expected to be derived from the different waste management approaches assumed by the organization completing the estimate, a set of key assumptions (see Section 2.3) was provided and used by the industrial teams. These assumptions include items such as the reprocessing method (co-extraction and recovery of uranium and a uranium/plutonium mixture), and recycling facility capacity (800 metric tons heavy metal per year (MTHM/yr)).

When applying the common set of assumptions, the three estimates for the expected volume and mass of process and secondary waste establish a reasonable range for the aqueous reprocessing waste. The range for process waste from aqueous reprocessing is provided in Table ES-1 and for some waste streams the range reflects the potential waste reduction from technological improvements. The range for secondary waste from recycling, MOX fuel fabrication and fast reactor fuel fabrication is shown in Table ES-2. There are no process wastes from MOX fuel fabrication and fast reactor fuel fabrication. The ranges shown in Tables ES-1 and ES-2 for recycling are all representative of 50GWd/MT, 5 year cooled, light water reactor (LWR) used fuel. Values for recycling are shown normalized to one metric ton (MT) of UNF processed from an 800 MTHM/year facility. Values shown for MOX fuel fabrication and fast reactor fuel fabrication are estimated from processing 800 MT of UNF per year.

Table ES-1 Aqueous Reprocessing Process Waste Estimate Range Summary

Waste Stream	Waste V (liters/	olume	Observation				
waste Stream	Low Range	High Range	Observation				
Fission Product Waste	210	246	When applying the same assumptions to a common waste form, the three unit volume estimates vary by less than 15% and the unit mass estimates vary by less than 7% (see Section 3.1).				
Tritium	4	4,000	The three order of magnitude range reflects differences in the tritium management approach selected by the three organizations. The range is established when tritium is allowed to enter the aqueous separations process and must be captured and treated from excess process water. The high range results from the solidification of the excess water into a grouted waste form while the low range is established by using a very energy intensive treatment process to concentrate the tritium in a small volume. Successful development of a voloxidation process to capture and treat the tritium before entering the aqueous system will provide a substantial volume reduction (43 liters/MT) without using a highly energy intensive process and should continue to be pursued.				
Krypton -85	1	3.7	Krypton is assumed to be separated from the other off-gas components by cryogenic methods and stored in compressed gas cylinders. The range is established by the assumed allowable storage pressure. A gas storage facility safety basis is required to narrow the range to less than the factor of 4 indicated.				
Iodine -129	0.6	11	The final waste form for the captured iodine has not been established and the range includes evaluation of seven potential waste forms.				
Carbon-14	1e-6	75	This extremely wide range reflects the impact of normal carbon (12) dioxide has on the capture of C-14. All estimates assume a caustic scrub capture and grouted waste form. The low range is established by use of standard industrial process for the removal of CO ₂ from the dissolver sparge air which otherwise becomes the primary carbon source in the final waste form.				

June 30, 2013

Table ES-2 Secondary Waste Estimate Range Summary

Functional	Waste	Waste V	Volume	
Area	Classification	Low Range	High Range	Observation
	Class A	2.96	3.86	The classification of some waste streams is not
	Class B	0	1.73	consistent for some individual waste streams making
	Class C	0.12	1.45	some ranges appear large. For instance a waste
	Total Class	3.59	7.59	stream considered Class C waste from one source
	$A/B/C^2$			(e.g. AREVA, EnergySolutions, UFD/EAS, UFD
	GTCC	0.02	1.04	2012) may be considered GTCC waste by another
Recycling ¹	Mixed Class	0	0.08	source.
Recycling	A/B/C			Many individual waste streams are in close
		0	0.06	agreement among the various sources. The low to
				high range appears to be primarily driven by
	Mixed GTCC			assumptions regarding facility design and operating
	Mineu or ee			philosophy (e.g. remote operation versus dark cells).
				Neither AREVA nor EnergySolutions estimated any
	CI. A	0.10	0.16	Mixed Class A/B/C or GTCC waste.
	Class A	0.12	0.16	• The range for Total Class A/B/C waste is reasonable.
	Class B			• The wide range for GTCC waste is driven by
	Class C	0.10	0.64	assumptions regarding facility design and operating
MOX Fuel	Total Class A/B/C ²	0.12	0.64	philosophy as well as waste disposal requirements.
Fabrication ¹		0.02	2.70	Assuming a reasonable waste acceptance criteria for
	GTCC	0.03	2.79	disposal, the isotopic distribution of Pu recovered
	Mixed Class A/B/C	0	0	from commercial UNF significantly affects the classification of waste and the volume of waste.
	Mixed GTCC	0	0	classification of waste and the volume of waste.
	Class A	0.08	0.09	• The Class A weste volumes are in class component
	Class B	0.08	0.09	 The Class A waste volumes are in close agreement. The reason for the two orders of magnitude
	Class C			difference in GTCC waste is unknown.
Fast Reactor	Total Class	0.08	0.09	uniciciet in 0100 waste is ulikilowii.
Fuel	A/B/C ²	0.00	0.09	
Fabrication ¹	GTCC	0.006	0.17	
	Mixed Class	5.000	0.17	
	A/B/C			
	Mixed GTCC	0	0.006	

- 1. The values for recycling are normalized to units of m³/MT based on a recycling facility capacity of 800 MT/year. The values for MOX fuel fabrication and fast reactor fuel fabrication are normalized to the same recycling capacity of 800 MT/year. Actual capacity of the fuel fabrication plants are lower and are based on the processing the quantity of Pu recovered from 800 MT of UNF (see Section 3.2.11 and 3.2.12).
- 2. The individual values shown for Class A, B and C waste volumes do not total to the value shown for Total Class A/B/C waste since the minimum and maximum for each waste classification are chosen to represent the low and high range values. The low and high range values are not obtained consistently from one particular source (e.g. AREVA, EnergySolutions, UFD/EAS, UFD 2012).

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CONTENTS

SUN	MMAR	Υ		iii
ACI	RONYI	MS		xi
1.	Intro	duction		1
2.	Back	kground		2
	2.1	Global	Nuclear Energy Partnership	2
	2.2	Used F	uel Disposition Campaign	3
	2.3		rder 9	
3.	Com	nparison o	f Waste Estimates	7
	3.1	-	Waste	
	0.1	3.1.1	Fission Product Waste.	
		3.1.2	Compacted Metal	
		3.1.3	Tritium	8
		3.1.4	Carbon-14	9
		3.1.5	Iodine-129	9
		3.1.6	Krypton-85	9
	3.2	Second	ary Waste	13
		3.2.1	Receipt and Storage	
		3.2.2	Head End	20
		3.2.3	Separations	23
		3.2.4	Solidification	
		3.2.5	Acid Recovery	
		3.2.6	Liquid Effluent Processing	
		3.2.7	Vitrification	
		3.2.8	Offgas	
		3.2.9	Balance of Plant	
		3.2.10	Summary of Secondary Wastes from Recycling	
		3.2.11	MOX Fuel Fabrication	
		3.2.12	Fast Reactor Fuel Fabrication	53
1	Dofo	rancas		55

June 30, 2013

CONTENTS (continued)

Appendices

Α	Receipt and Storage Functional Area Detailed Waste Comparison
В	Head End Functional Area Detailed Waste Comparison

- C Separations Functional Area Detailed Waste ComparisonD Solidification Functional Area Detailed Waste Comparison
- E Acid Recovery Functional Area Detailed Waste Comparison
- F Liquid Effluent Processing Functional Area Detailed Waste Comparison
- G Vitrification Functional Area Detailed Waste Comparison
- H Offgas Functional Area Detailed Waste Comparison
- I Balance of Plant Functional Area Detailed Waste Comparison
- J MOX Fuel Fabrication Functional Area Detailed Waste Comparison
- K Fast Reactor Fuel Fabrication Functional Area Detailed Waste Comparison

TABLES

Table ES-1 Aqueous Reprocessing Process Waste Estimate Range Summaryiv
Table ES-2 Secondary Waste Estimate Range Summary
Table 3.1-1 Process Waste Comparison Summary
Table 3.2-1 Secondary Waste Packages
Table 3.2.1-1 Receipt and Storage - Summary of Secondary Waste Estimates by Waste Classification
Table 3.2.1-2 Receipt and Storage - Summary of Secondary Waste Estimates by Waste Type for UNF1
Table 3.2.1-3 Receipt and Storage - Summary of Secondary Waste Estimates by Waste Type for UNF2
Table 3.2.1-4 Receipt and Storage - Summary of Secondary Waste Estimates by Waste Type for UNF4
Table 3.2.2-1 Head End - Summary of Secondary Waste Estimates by Waste Classification
Table 3.2.2-2 Head End - Summary of Secondary Waste Estimates by Waste Type for UNF121
Table 3.2.2-3 Head End - Summary of Secondary Waste Estimates by Waste Type for UNF221
Table 3.2.2-4 Head End - Summary of Secondary Waste Estimates by Waste Type for UNF422
Table 3.2.3-1 Separations - Summary of Secondary Waste Estimates by Waste Classification
Table 3.2.3-2 Separations - Summary of Secondary Waste Estimates by Waste Type for UNF124
Table 3.2.3-3 Separations - Summary of Secondary Waste Estimates by Waste Type for UNF224
Table 3.2.3-4 Separations - Summary of Secondary Waste Estimates by Waste Type for UNF425
Table 3.2.4-1 Solidification - Summary of Secondary Waste Estimates by Waste Classification26
Table 3.2.4-2 Solidification - Summary of Secondary Waste Estimates by Waste Type for UNF1 27
Table 3.2.4-3 Solidification - Summary of Secondary Waste Estimates by Waste Type for UNF227
Table 3.2.4-4 Solidification - Summary of Secondary Waste Estimates by Waste Type for UNF428
Table 3.2.5-1 Acid Recovery - Summary of Secondary Waste Estimates by Waste Classification29
Table 3.2.5-2 Acid Recovery - Summary of Secondary Waste Estimates by Waste Type for UNF130
Table 3.2.5-3 Acid Recovery - Summary of Secondary Waste Estimates by Waste Type for UNF230
Table 3.2.5-4 Acid Recovery - Summary of Secondary Waste Estimates by Waste Type for UNF431
Table 3.2.6-1 Liquid Effluent Processing - Summary of Secondary Waste Estimates by Waste Classification
Table 3.2.6-2 Liquid Effluent Processing - Summary of Secondary Waste Estimates by Waste Type for UNF1

TABLES (continued)

Type for UNF2	34
Table 3.2.6-4 Liquid Effluent Processing - Summary of Secondary Waste Estimates by Waste Type for UNF4	35
Table 3.2.7-1 Vitrification - Summary of Secondary Waste Estimates by Waste Classification	36
Table 3.2.7-2 Vitrification - Summary of Secondary Waste Estimates by Waste Type for UNF1	37
Table 3.2.7-3 Vitrification - Summary of Secondary Waste Estimates by Waste Type for UNF2	37
Table 3.2.7-4 Vitrification - Summary of Secondary Waste Estimates by Waste Type for UNF4	38
Table 3.2.8-1 Offgas - Summary of Secondary Waste Estimates by Waste Classification	39
Table 3.2.8-2 Offgas - Summary of Secondary Waste Estimates by Waste Type for UNF1	40
Table 3.2.8-3 Offgas - Summary of Secondary Waste Estimates by Waste Type for UNF2	40
Table 3.2.8-4 Offgas - Summary of Secondary Waste Estimates by Waste Type for UNF4	41
Table 3.2.9-1 Balance of Plant - Summary of Secondary Waste Estimates by Waste Classification	42
Table 3.2.9-2 Balance of Plant - Summary of Secondary Waste Estimates by Waste Type for UNF1	43
Table 3.2.9-3 Balance of Plant - Summary of Secondary Waste Estimates by Waste Type for UNF2	43
Table 3.2.9-4 Balance of Plant - Summary of Secondary Waste Estimates by Waste Type for UNF4	44
Table 3.2.10-1 Overall Summary of Secondary Waste Estimates from Recycling by Waste Classification	45
Table 3.2.10-2 Overall Summary of Secondary Waste Estimates from Recycling by Functional Area	45
Table 3.2.10-3 Overall Summary of Secondary Waste Estimates from Recycling by Waste Type for UNF1	46
Table 3.2.10-4 Overall Summary of Secondary Waste Estimates from Recycling by Waste Type for UNF2	47
Table 3.2.10-5 Overall Summary of Secondary Waste Estimates from Recycling by Waste Type for UNF4	48
Table 3.2.11-1 MOX Fuel Fabrication - Summary of Secondary Waste Estimates by Waste Classification	49
Table 3.2.12-1 Fast Reactor Fuel Fabrication - Summary of Secondary Waste Estimates by Waste Classification	53

June 30, 2013 xi

ACRONYMS

BWR Boiling Water Reactor
CFR Code of Federal Regulations
COCA Cobroyage Cadarache

CFTC Consolidated Fuel Treatment Center

DOE Department of Energy

DOE-NE Department of Energy - Office of Nuclear Energy

EAS Engineering Alternative Studies
EIS Environmental Impact Statement
EPA Environmental Protection Agency

FGE Fissile Gram Equivalent

FOEAS Follow-On Engineering Alternative Studies

GFI Government Furnished Information
GNEP Global Nuclear Energy Partnership

GTCC Greater Than Class C

GW Giga-watt GW/d Giga-watt days

HEPA High Efficiency Particulate Air

HLW High Level Waste
HT High Tritium
LLW Low Level Waste
LT Low Tritium

LWR Light Water Reactor

MC&A Material Control and Accountability
MFFF MOX Fuel Fabrication Facility

MOX Mixed Oxide fuel MPC Multi-Purpose Canister

MT Metric Ton

MTHM Metric Ton Heavy Metal MTIHM Metric Ton Initial Heavy Metal

PA Performance Assessment
PE-Ci Plutonium Equivalent Curie
PWR Pressurized Water Reactor
SFR Sodium Fast Reactor
SRS Savannah River Site

TRU Transuranic

UC-C Universal Canister – for Compacted waste UC-V Universal Canister – for Vitrified waste

U.S. United States

UFD Used Fuel Disposition

UFDC Used Fuel Disposition Campaign

UNF Used Nuclear Fuel
UOX Uranium Oxide fuel
UREX Uranium Extraction
WAC Waste Acceptance C

WAC Waste Acceptance Criteria WIPP Waste Isolation Pilot Plant

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1. Introduction

The projected volumes and characteristics of waste generated by a future recycling facility for used nuclear fuel (UNF) in the U.S. can have a large degree of variance depending on the industrial technology deployed, operational approach, and related assumptions. To accurately plan for a future repository for disposition of UNF and high level waste (HLW), and other facilities required for radioactive waste management, and to evaluate impacts of reprocessing and fuel fabrication, an accurate determination of waste generation from recycle of UNF is needed. Such projections have been made by various Department of Energy (DOE) contractors, but the results have exhibited large variability for some wastes.

The goals of this activity are to reduce the variability in waste estimates for reprocessing and fabricating particular fuel types based on industrial experience, and to better understand the cause of any remaining variability in waste estimates. This information may be used later to support the development of waste estimates for future fuel cycle options by the DOE and its laboratories.

To support the activity, DOE contracted with two industrial partners using an advisory and assistance contract. Under Task Order 9, AREVA and Energy*Solutions* were tasked to develop volumes, masses, radionuclide concentrations, and other characteristics of both process waste and secondary waste produced during reactor fuel reprocessing and subsequent fuel fabrication facilities [DOE-NE]. The industrial estimates are compared to estimates developed by the Used Fuel Disposition Campaign (UFDC) within the DOE Office of Nuclear Energy (DOE-NE).

2. Background

Prior estimates of process and secondary waste from recycling and fuel fabrication have been developed by the UFDC and several industrial partners including AREVA and EnergySolutions. The UFDC waste estimates are based largely on work conducted for the Global Nuclear Energy Partnership (GNEP) program. In the past, these UFDC waste estimates have been compared primarily to data also developed by industrial partners for the GNEP program. Details of the GNEP waste estimates produced by the industrial partners are protected as proprietary information; however, summary data is available publicly in documents such as presentations made to the Nuclear Waste Technology Review Board (NWTRB) [Davidson 2009, EnergySolutions 2009]. The lack of access to the details of this work has inhibited the comparison of waste estimates prepared by the industrial partners to each other and to the waste estimates prepared by the UFDC.

The following sections provide background on the development of the GNEP, UFDC and Task Order 9 waste estimates.

2.1 Global Nuclear Energy Partnership

The GNEP program was a comprehensive program to increase national and global energy security, reduce the risk of nuclear proliferation, encourage clean energy development around the world, and improve the management of nuclear waste. As part of the GNEP program, several industrial teams were engaged to develop proposals for a Consolidated Fuel Treatment Center (CFTC) incorporating recycle of UNF and transmutation of actinides in advanced burner reactors with the goal of reducing the amount of wastes requiring geologic disposal. DOE also requested the Savannah River Site (SRS) to conduct studies, the Engineering Alternative Studies (EAS), to provide a comprehensive assessment of a commercial-scale UNF separations facility in support of the GNEP program.

The EAS was based on processing 3,000 MTHM/year of light water reactor (LWR) UNF using the Uranium Extraction (UREX)+1a flowsheet at a greenfield site. Although a 3,000 MTHM/year plant supports the current domestic fuel recycling needs, it is unprecedented in size and complexity and a formidable challenge for a first of a kind facility. Accordingly, subsequent studies, the Follow-On Engineering Alternative Studies (FOEAS), were conducted to provide revised cost, schedule and technical data for an 800 MTHM/year plant using the UREX+1b process as the technical basis.

Identification of unit operations and detailed development of process flow diagrams and material balances provided the basis for estimating process wastes for both the EAS and FOEAS processes. This work in turn supported development of equipment lists and general building and equipment arrangements, which along with other inputs such as facility staffing estimates provided the basis for a bottoms-up estimate of secondary waste.

The EAS and FOEAS provided DOE with a better understanding of the separations process and the unresolved technology issues associated with construction and operation of a separation facility. The waste estimates developed as part of the FOEAS ultimately provided input to the Environment Impact Statement (EIS) for the GNEP program.

2.2 Used Fuel Disposition Campaign

In 2010, after the GNEP program was suspended, the UFDC was established to evaluate alternative fuel cycles, including those involving recycling. Under the UFDC two work packages were created, (1) to estimate process waste inventories from recycling and (2) to estimate secondary waste inventories from recycling and mixed oxide (MOX) fuel fabrication. In subsequent years the two work packages were combined into a single "Inventory" work package.

The UFDC developed process and secondary waste estimates for a variety of recycling processes involving a variety of process waste forms. The processes evaluated include UREX+1b, co-extraction, new-extraction and electrochemical. Alternate process waste forms evaluated for HLW include borosilicate glass, phosphate glass, glass ceramic and bentonite clay (Cs and Sr only). The prior GNEP work was used as a basis to develop material balances for these processes which were in turn used to estimate process wastes. The process waste estimates are documented in a report along with current and projected used fuel inventory estimates [Carter 2012b].

The secondary waste estimates for recycling used the GNEP/FOEAS data developed for the UREX+1b process as a basis for developing waste estimates for other aqueous recycling processes, i.e. co-extraction and new-extraction. The estimates were modified by deleting waste streams associated with functional areas not applicable to the process being evaluated. For instance, the UREX+1b process involves an operation to separate Cs and Sr from other HLW constituents. This operation is not part of co-extraction or new-extraction; therefore, the waste streams associated with this functional area are deleted to derive the waste estimate for co-extraction and new-extraction. On the other hand, all of the processes evaluated involve HLW vitrification operations; accordingly, the waste streams associated with these operations are included in the waste estimates for co-extraction and new-extraction. The results are documented in a report which also includes a variation of the waste estimates for recycling sodium fast reactor (SFR) UNF [Jones 2011].

Secondary waste estimates for MOX fuel fabrication were also developed by the UFDC in 2011 [Jones 2011b]. These estimates are based on the waste balance data for the MOX Fuel Fabrication Facility (MFFF) under construction at SRS. The MFFF is designed to receive, handle and process weapons grade Pu to produce MOX fuel for use in commercial LWRs. The MFFF data was adjusted to delete waste streams from operations not considered applicable to a commercial MOX fuel fabrication facility such as the Aqueous Polishing operations. The MFFF data was also adjusted to account for impacts associated with processing Pu recovered from commercial LWR UNF on repository waste acceptance criteria. In particular, Pu equivalent Curie (PE-Ci) limits on individual waste packages significantly affect the volume of final packaged waste. In the absence of a commercial GTCC disposal facility in the U.S., the Waste Isolation Pilot Plant (WIPP) Waste Acceptance Criteria (WAC) PE-Ci limit of 80 PE-Ci/55 gallon drum (²³⁹Pu basis) is used to set allowable waste concentrations for final packaged waste for the UFDC MOX fabrication facility waste estimate.

In 2010, a separate UFDC work package was also established to investigate disposal options for low level waste (LLW) from alternative fuel cycles. To support this work a task was initiated to determine the radionuclide content of the waste streams identified by the UFDC waste inventory estimates to support waste treatment studies being conducted by the Separations and Waste Forms Campaign and the Fuel Cycle Options Campaign [Jones 2012]. As a result of the radionuclide inventory work, the waste streams from the UFDC waste estimates could be more definitively classified. The prior UFDC waste estimates did not consider the radionuclide content of the waste streams and waste classifications were determined arbitrarily based on the source of the waste stream (i.e. functional area).

2.3 Task Order 9

One of the objectives for Task Order 9 was to ensure that waste estimates were based on actual data from operations and present day technology capabilities to the extent possible and the contractors selected have extensive experience in aqueous reprocessing technologies.

Since the largest source of waste estimate uncertainty is expected to be derived from the different waste management approaches assumed by the organization completing the estimate, Task Order 9 defined key assumptions used by all participants:

- Assume the LWR UNF reprocessing capacity is 800 MTIHM/yr using aqueous reprocessing techniques.
- Only uranium and a uranium/plutonium mixture are assumed to be recovered (assume an initial
 product material of 35 percent Pu and 65 percent U). Recovered uranium should be sufficiently
 clean for chemical conversion and storage for possible future use in reactor fuel. Other
 transuranic (TRU) elements were not to be recovered and were combined into a single fission
 product waste form.
- Fission product wastes (e.g., vitrified wastes) are assumed to be packaged in 2' diameter x 15' tall canisters with an internal volume of 1.2m³. Heat generating waste cannot exceed 14,000 watts per canister at the time of production. Waste loading assumptions were identified by the individual study participants. The study team also considered the impact of using the Universal Canister Vitrification (UC-V) containers used at current reprocessing facilities.
- Metal wastes are assumed to be packaged in 2' diameter x 10' tall canisters with a waste weight limit of 3,600 kg of waste. Compaction factors and waste loading assumptions were identified by the individual participants. The study team also considered the impact of using the Universal Canister Compacted (UC-C) containers used at current reprocessing facilities.
- Off-gas is assumed to have H-3, C-14, Kr-85, Ru-99 and I-129 captured and treated for disposal in accordance with U.S. regulations. Capture technology, waste form, and waste packaging were identified and capture efficiency was provided by individual participants. Waste treatment technology (including decay storage requirements if any) was identified and waste loading/density assumptions were provided by the individual participants.
- Waste estimates are based on normal operations. Off-normal and/or accident conditions and decommissioning wastes are not part of this activity.
- Water management is a key consideration for accurate waste estimates. Liquid effluent discharge
 is an accepted practice by DOE and nuclear utility operations and is assumed to continue.
 Wastewater from reprocessing and refabrication should be assumed to be decontaminated and
 recovered for reuse and excess water discharged. For estimate consistency, liquid effluent
 discharges should be assumed to meet U.S. Environmental Protection Agency (EPA) drinking
 water standards. Secondary wastes resulting from treatment processes required to yield
 acceptable effluents should be included in the secondary waste estimates.

- Secondary waste should be classified as either Class A/B/C LLW or Greater than Class C LLW. For this study, routine operations and maintenance activities which do not breach process confinement are assumed to result in Class A/B/C LLW. Activities which breach confinement and become contaminated with process materials are assumed to result in waste characteristics similar to the process materials. GTCC waste will result from operations and maintenance activities associated with processing material with high fission product or TRU concentrations. Class A/B/C LLW will result from other operations and maintenance activities.
- Secondary waste volumes should be reported "as-generated" and "as-packaged" to illustrate the volume reductions expected. Packaging for GTCC waste will assume packages similar to WIPP approved containers for contact handled waste. Class A/B/C LLW containers are assumed to use 4 cubic meter steel boxes.
- Intentional waste blending solely to change the classification of waste (e.g. blending greater than Class C (GTCC) with class A/B/C LLW) is prohibited.

The waste estimates used the UNF composition data associated with reprocessing two reference LWR uranium oxide (UOX) fuels and a LWR MOX fuel which were labeled Used Nuclear Fuel (UNF) 1, 2 and 3 respectively:

UNF-1: 50 GWd/MT burnup, 5 year cooled

UNF-2: 50 GWd/MT burnup, 50 year cooled

UNF-3: 50 GWd/MT burnup, 5 year cooled

The isotopic composition of these fuels was provided to the industrial contractors as government furnished information (GFI) [Carter 2012].

During the course of conducting Task Order 9, the industrial participants identified concerns with reprocessing UNF-3. The Task Order 9 team agreed to reprocess a blend of UNF-1 and UNF-3 designated as UNF-4:

UNF-4: A blend of 90MT/yr of UNF-3 and 710 MT/yr of UNF-1

The isotopic content of the blend was calculated by the individual participants.

The participants also developed waste estimates associated with fabricating reactor fuel from the U/Pu mixture recovered from UNF-1 into LWR MOX fuel consistent with the provided GFI composition data. The industrial participants also developed waste estimates associated with fabricating fast reactor fuel from the U/Pu mixture recovered from UNF-1 and UNF-3.

June 30, 2013

The waste estimate for reprocessing included a description of the as-generated and as-packaged waste form and its associated volume and mass, radionuclide mass composition, and volumetric and/or mass flow rate per MTIHM of UNF processed for each LLW and HLW stream (including separately identified mixed waste) generated by the following functions/ activities (i.e. functional areas):

- 1. Receipt and Storage
- 2. Head End (shearing and dissolution including any dissolver solution adjustment and solids removal)
- 3. Separations (including solvent cleanup)
- 4. Product Solidification
- 5. Acid Recovery
- 6. Liquid Effluent Processing
- 7. Vitrification
- 8. Offgas treatment and stabilization of retained materials (Volume and characteristics of each waste were identified individually (e.g. C-14, H-3, Kr-85, I-129). A management strategy for tritium and Kr separation for each reference fuel type was developed by each participant.)
- 9. MOX Fuel Fabrication
- 10. Fast Reactor Fuel Fabrication
- 11. Balance of Plant

Each of the industrial teams prepared final reports documenting their waste estimates [AREVA 2013, Willis 2013].

3. Comparison of Waste Estimates

This study provides a comparison of the waste estimates provided by the two industrial teams under Task Order 9 and the UFDC for reprocessing UNF-1, 2, and 4 and the fabrication of MOX and fast reactor fuels. The estimates include both process and secondary waste. Process waste, for this study, is defined as wastes that contain a portion of the UNF assembly being reprocessed without consideration for the waste classification (e.g. High-Level or Low-Level Waste) as defined by current U.S. regulations. Examples of process waste include: fission products, captured volatile isotopes, hulls and hardware.

Secondary wastes are those resulting from the act of handling radioactive materials. Examples of secondary waste include: operations, maintenance, and job control waste.

The wastes were identified by the functional areas defined above. In many cases, a waste stream is generated in one functional area but is then transferred to another functional area for treatment. In these cases only the final waste form is discussed in this report. Additional waste stream information by functional areas is contained in the reference reports.

3.1 Process Waste

Table 3.1-1 summarizes each participant's results for process waste in the study. For each of the three fuels used in this study, Table 3.1-1 provides the bulk density, unit mass (kg/MT of UNF), volume (liters/MT) of each final process waste stream. The container selected and the number of containers produced annually for an 800MT/yr reprocessing facility is also provided. A short description of the basis or other notes is contained in the far right column. Data in the table is coded for each participant, information in red was supplied by Energy*Solutions*, data in black was supplied by AREVA, and data in tan was supplied by the UFDC.

Table 3.1-1 uses the UNF-1 reprocessing waste as a reference case. If the waste estimate does not vary with UNF composition the corresponding quantities for UNF-2 and 4 are marked "n/c" for no change with respect to the reference fuel. Missing data is marked with an "--".

None of the participants identified any process waste from the fuel fabrication facilities. Therefore all the process wastes in Table 3.1-1 are aqueous reprocessing waste.

Observations on each waste stream are provided in the following sections.

3.1.1 Fission Product Waste

All participants selected borosilicate glass as the final waste form for the combined fission product and minor actinide waste stream. The task order specified a 2 ft diameter x 15 ft canister with a decay heat limit of 14,000 watts per canister. Using these parameters, participant's estimates agree to within 7%. For example for the reprocessing UNF-1 the estimates were 567, 572, and 535 kg of glass per MT of fuel reprocessed. For UNF-1 the fission product waste loading is limited by the total decay heat.

For UNF-2 which is 50 year cooled fuel, the decay heat limit is not reached and other factors limit the maximum waste loading. Energy *Solutions* and AREVA used total waste loadings of 19 and 18.5 weight percent oxide loading respectively. The UFDC used a total MoO_3 loading of 2.5%. While the limits applied are slightly different, the waste estimates are almost identical at 302, 305, and 305 kg/MT respectively.

June 30, 2013

The study also examined the potential impact of the 2 ft diameter canister, which limits the amount of decay heat that can be transferred to an air cooled storage vault when maintaining the glass canister centerline temperature below the glass transition temperature (510°C or 950°F). The participants used the smaller diameter universal canister – vitrification (UC-V) deployed at commercial reprocessing facilities as an alternative canister. The waste stream mass from reprocessing UNF-1 is decreased between 45 and 65% by using this smaller canister; however, the canisters produced are increased by a factor of between 4 and 5.6 since the volume of each canister is considerably smaller. Each participant determined their own basis for the waste loading limitation when using the UC-V container. Energy Solutions used a maximum decay heat of approximately 2,500 watts per UC-V or the maximum loading of 19 wt%, whichever was most limiting. AREVA continued to use the 18.5 % waste loading which allowed the decay heat for a UC-V to reach a maximum of about 3,450 watts per UC-V. Using the methods established for the UFDC, the decay heat limit for a UC-V canister was determined to be approximately 2,500 to 3,300 watts per UC-V. The values range based on the storage design assumptions being used. The lower value results from only natural convection while the higher value can be obtained by using heat transfer coefficients associated with forced convection during storage or higher canister centerline temperatures. Should the UC-V be selected as a canister for reprocessing waste, additional investigation into the decay heat or maximum waste loading should be conducted to reduce this uncertainty.

Table 3.1-1 also provides UFDC information on two alternative fission product waste forms. The table indicates little incentive to pursue a phosphate glass where the unit mass and volume is similar to the borosilicate glass. The glass ceramic waste form does offer some incentive as the unit mass and volume is a little less than 50% of the borosilicate glass waste form.

3.1.2 Compacted Metal

The hulls and hardware are washed and compressed into 2 ft diameter x 10 ft tall canisters and participants used a similar process although the final density varies among the participants. The mass of this waste stream was specified in the task order supplied information and does not vary for the fuels investigated. However the number of canisters varies as result of the bulk density differences.

3.1.3 Tritium

The approach to tritium management selected by the individual participants results in a 3 order of magnitude variation in this waste stream. Energy *Solutions* and AREVA followed the current reprocessing practice of allowing the tritium to enter the aqueous separations process. AREVA separated the liquid effluents into high and low tritium bearing streams. AREVA assumed the low tritium liquid effluent would meet applicable drinking water standards and could be released to the environment. AREVA grouted the high tritium liquid effluent stream resulting in the bounding waste form estimate. Energy *Solutions* allowed the tritium to accumulate in a single liquid effluent which they treated with an energy intensive process to concentrate the tritium into a considerable smaller volume. This waste stream was then grouted for disposal.

The UFDC estimate is based on a head-end voloxidation process prior to aqueous processing of the UNF. Tritium is captured in a small liquid volume for grouting as a final waste form. This estimate is 2 orders of magnitude less than the high estimate without employing an energy intensive process. The benefit for continued development of a voloxidation and tritium capture process is illustrated in this estimate.

3.1.4 Carbon-14

All participants used a caustic scrub solution to capture the C-14 and other carbon compounds from the head-end processes and all participants grouted the caustic solution for a final waste form, yet the waste estimates vary by 8 orders of magnitude. This difference illustrates the effect that a commercially available technology can have on the waste estimate. The UFDC assumed that dissolver sparge air is treated by molecular sieves for the removal of naturally occurring carbon dioxide. The resulting waste volume is essentially the C-14 from the fuel. Without this pretreatment process the waste estimate increases by 6 orders of magnitude.

It should also be noted that the participants used various C-14 release assumptions depending upon fuel dissolver residence time with longer residence time resulting in higher release efficiency. If C-14 capture is selected to be a part of the head-end off-gas system the dissolver designs must consider the release of the volatile radionuclides of interest.

3.1.5 Iodine-129

All participants used a silver mordenite as the capture media for I-129 but recognized that the final waste form is still under active investigation. Table 3.1-1 provides seven alternative waste forms which vary by less than 2 orders of magnitude.

3.1.6 Krypton-85

All participants used a cryogenic separations process for recovery of the Kr-85 which is subsequently stored in high pressure gas cylinders awaiting final disposition. The container count estimates vary by a factor of 5 due to varying assumptions regarding the storage pressure which ranged from 2,400 psi (163 atm) to 35 atm. A storage facility safety analysis is necessary to determine the maximum storage pressure and to reduce the uncertainty for this waste stream.

Table 3.1-1 Process Waste Comparison Summary

Table 3.1-1 Proc	ess Waste Comparison Summary	<u> </u>			-	_				ı				7
		UNF-1 50 GWd/MT 5yr			UNF-2 50 GWd/MT 50yr			UNF-4 UOX/MOX Blend						
				Volume Container				Volume		Bulk		Volume		
Waste	Description	Density	(kg/MT)	(Liters/MT) Description	Container / yr	Density	(kg/MT)	(Liters/MT)	Container / yr	Density	(kg/MT)	(Liters/MT)	Container / yr	Basis Decription and other notes
Borosilicate Glass	Fission Products including minor actinides	2.70	567	210 2' dia 15' tall	144	2.70	302	112	77.3	2.70	639	237	163	UNF-1 is limited to 14,000 watts per can ~10 to 12 wt % Waste Loading UNF-2 is limited to 19 wt% waste loading
	-	2.70	294	108 UC-V (180 liters)	806	2.70	302	112	597	2.70	298	109	922	UC-V cans limited to 2,500 watts per canister or 19% WL
		2.60	572	220 2' dia 15' tall	147	2.60	296	114	76	2.60	637	245	163	14,000 watts per can ~10 to 12 wt % Waste Loading
		2.60										135		UC-V limited to 18.5 wt% oxide waste loading = 3,450 watts per can for UNF-1 and 2 UNF-4 limited to 15.7 wt % to limit the alpha
														14,000 watts per can ~10 to 12 wt % Waste Loading,
		2.75	535	246 2' dia 15' tall	148	2.75	305	140	84	2.75	593	272	164	UNF-2 limited to 2.5 wt% MoO ₃ loading
		2.75	354	139 UC-V (180 liters)	616	2.75	305	113	531	2.75	392	145	683	UNF-1 and 3 limited to 3,500 watts/canister, UNF-4 limited to 2.5 wt% MoO ₃
		2.75	553	211 2' dia 15' tall	126	·	424	160	96		622	236	142	UNF-1 and 4 Phosphate Glass limited to 16,300 watts/canister, UNF-2 limited to 4 wt% Noble metals
		2.75	249	105 2' dia 15' tall	64		192	81	48		282	120	72	glass ceramic limited to 24,700 watts/can (K=1.2, p=3.2)
Compacted Metal	Hulls and Hardware - compacted	1.80	302	168 26" dia 10' tall	158	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	
		4.50	300	98 24"dia 10' tall	98	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	:
		4.50	300	98 UC-C (180 liters)	520	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	
		4.00	300	74 24" dia 10' tall	67	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	60% of the base metal density
Grouted H-3	Tritiated water - grouted	2.00	4	4 55 gal drum	18.4	n/c		n/c	n/c	n/c		n/c		44 wt% waste , 56 wt% grout
		2.00		4,000 4 m³ boxes	1,000	n/c		n/c	n/c	n/c		n/c	n/c	
		2.30	35	43 1 ft ³ (28.3 liter)	1,200	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	;
Grouted C-14	Caustic captured C - grouted	2.30	11	9.7 55 gal drum	43	n/c		n/c	n/c	n/c		n/c	n/c	44 wt% slurry
		2.00	150	75 4 m ³ boxes	15	n/c		n/c	n/c	n/c		n/c	n/c	
		2.30	2E-06	1E-06 55 gal drum	4E-06	n/c			n/c	n/c				UFD assumed CO ₂ free process air
Compressed Gas	Cryogenic separated Kr	0.57							14.8	0.57	0.52	0.9	14.7	2400 psi, containing 680 watts per cylinder
					77	<u></u>					,		,	35 Bar
			0.70	3.7 type A Cylinder	6/		n/c	n/c	n/c		n/c	n/c	n/c	50 atm 142mg I/g mordenite 57.4% loading but no waste
I-129	I-129 on Mordenite	0.94	4.3	4.6 55 gal drum	18.5	n/c		n/c	n/c	4.4		4.7	19.1	form identified
		1.80	20.0	11 55 gal drum	43	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	grouted mordenite
		7.00			2	n/c								BiPBO glass
		4.00	2.5	0.625 55 gal drum	3	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	Synroc HIP
		2.30	9.0	4 55 gal drum	15.4	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c	grouted mordenite
			44.0	10 55 gal drum	38.6		n/c	n/c	n/c		n/c	n/c	n/c	Bi Phospahte glass encapsulating mordenite
					3.3		7 -				n/c			functional aerogels
			0.7	0.23 55 gal drum	0.9		n/c	n/c	n/c		n/c	n/c	n/c	Chalcogenids

Table 3.1-1 (continued)

Legend							
Red	Energy solu	ıtions					
Black	Areva						
Tan	UFD						
n/c	No Change	No Change from the UFD-1 Fuel Waste					
	No Informa	No Information found in report					

3.2 Secondary Waste

Secondary waste estimates for recycling and fuel fabrication from four sources are compared in this section. The four sources are identified as follows:

- <u>AREVA</u> estimates of secondary waste from recycling and fabrication of MOX and fast reactor fuel provided by AREVA for Task Order 9.
- <u>EnergySolutions</u> estimates of secondary waste from recycling and fabrication of MOX and fast reactor fuel provided by EnergySolutions for Task Order 9.
- <u>UFD/EAS</u> estimates of secondary waste from recycling and fabrication of MOX reactor fuel provided by the UFDC. Recycling wastes are based on the EAS/FOEAS information developed for the GNEP program (see Section 2.1); hence, the "UFD/EAS" designation. MOX fuel fabrication waste estimates are not based on EAS or FOEAS data; therefore, a designation of simply "UFD" is used for MOX fuel fabrication waste estimates. There are no UFD waste estimates for fast reactor fuel fabrication.
- <u>UFD 2012</u> estimates of waste from recycling based on work conducted by the UFDC in FY 2012. The as-generated waste volumes are identical to the as-generated waste volumes from the UFD/EAS waste estimates; however, final waste volumes differ due to the reclassification of waste based on radionuclide content derived from representative fuel types and process material balances. There are no UFD-2012 waste estimates for MOX fuel fabrication or fast reactor fuel fabrication.

Although the intent of Task Order 9 was to provide a common basis for the waste estimates provided by AREVA and Energy *Solutions* and to allow comparison to the prior UFD secondary waste estimates, several differences still exist that complicate a direct comparison to the UFD estimates. These differences are discussed below.

Used nuclear fuel type/characteristics

As requested in Task Order 9, estimates of secondary waste are provided by AREVA and Energy Solutions for recycling UNF1, UNF2 and UNF4 used nuclear fuel. Energy Solutions also provided estimates of waste for recycling UNF3 fuel even though UNF3 fuel was replaced by UNF4 fuel as work on the task order progressed. Energy Solutions' waste estimates based on UNF4 are not included in this report.

The UFD/EAS secondary waste estimates for recycling [Jones 2011] were not based on any particular used fuel; however, work conducted in FY 2012 [Jones 2012] reclassified the waste streams identified by the UFD/EAS estimates based on specific fuel characteristics (i.e. burnup and cooling time) and similar waste treatment assumptions (e.g. compaction). Unfortunately, the fuel types used for the UFD 2012 work are not the same as the fuel types specified in Task Order 9 (e.g. UNF1, UNF2, etc.). Two used fuel types were chosen to correspond to the UNF1, UNF2 and UNF4 used fuel types specified in Task Order 9. The used fuel chosen to correspond to UNF1 and UNF4 is a fuel with a burnup of 60 GWd/MT and a cooling time of 5 years (versus 50 GWd/MT and 5 years for UNF1 and UNF4). The used fuel chosen to correspond to UNF2 is a fuel with a burnup of 60 GWd/MT and a cooling time of 30 years (versus 50 GWd/MT and 50 years for UNF1).

Waste packaging

The type of final waste packages specified by AREVA, EnergySolutions and UFD are not all the same, making a comparison of the waste estimates based on waste package quantity difficult. Because of the different waste packages assumed for each waste estimate, the waste package quantity is converted to volume (m³) to provide a common basis for comparison. Table 3.2-1 shows the various waste packages used in the waste estimates.

Table 3.2-1 Secondary Waste Packages

Waste	Waste	AREVA	Energy Solutions	UFD/EAS and
Classification	Characteristic			UFD 2012
	Non-	4 m ³ box		
	compactable			
	Compactable	4 m ³ box	3 compacted 55	
Class A			gallon drums in	
Cluss 11			one 110 gallon	
			drum	
	Resins		High integrity	
		2	container	
	Non-	4 m³ box		
	compactable	2		
Class C	Compactable	4 m ³ box		
Class C	Encapsulated		55 gallon drum	
	Grouted		High integrity	
			container	3
	Non-			$2.5 \text{ m}^3 \text{ box}$
	compactable			3 -
	Compactable			$2.5 \text{ m}^3 \text{ box}$
Class A/B/C ¹	Grouted			1.2 m ³ box
	Resins			High integrity
				container
	Large items			Engineered
	YY 101 1			container
	Unspecified			55 gallon drum or WIPP
				standard waste
				standard waste box
-	Non-TRU	High integrity		UUX
	Non-TKO	container		
	TRU	55 gallon drum		
GTCC	Contact handled	33 ganon arani	3 compacted 55	
	compactable		gallon drums in	
	compactable		one 110 gallon	
			drum	
	Remote handled		Special overpack	
	Large items			Engineered
	<i>S</i>			container

^{1.} The original UFD waste estimates for recycling do not distinguish between Class A, B and C waste. The original UFD waste estimates combine these waste classifications together, i.e. Class A/B/C. The UFD 2012 waste estimates do distinguish between Class A, B and C waste; however, in general the same waste package is used regardless of whether the waste is classified a Class A, B or C.

Receipt of short cooled versus long cooled fuel

As work progressed on Task Order 9, the assumptions regarding receipt of used fuel at the recycling facility were clarified. Short cooled fuel (e.g. UNF1) is assumed to be received in reusable, bolted-lid casks; therefore, no waste resulting from opening multi-purpose canisters (MPCs) is generated. Long cooled fuel is assumed to be received in MPCs. One hundred percent of the MPCs opened are assumed to be unsuitable for reuse; therefore, all MPCs are regarded as waste. Both AREVA's and EnergySolutions' waste estimates reflect these assumptions.

The original UFD/EAS and UFD 2012 estimates assumed that all used fuel was received in MPCs and that only 10% of the MPCs were disposed (i.e. 90% were reusable). For consistency with Task Order 9, the UFD/EAS and UFD 2012 estimates were modified to reflect the Task Order 9 assumptions regarding receipt of used fuel in MPCs. The UFD/EAS waste estimate is not based on any specific used fuel type; however, two separate UFD/EAS waste estimates are presented. The only difference between the two UFD/EAS estimates of waste volume is the volume associated with MPCs. In other words, if the waste volume for UNF1 is subtracted from the waste volume for UNF2, the difference is entirely attributable to MPCs. This is not the case for the UFD 2012 waste estimates. Although the as-generated waste volumes for the UFD/EAS and UFD 2012 waste estimates are identical, other assumptions regarding waste classification and waste treatment methods affect the volumes of other waste streams. For this reason, one cannot simply subtract the UFD 2012 UNF1 waste estimate from the UFD 2012 UNF2 estimate to determine the volume of waste attributable to the disposal of MPCs. Nevertheless, the UFD 2012 waste estimates were also modified to reflect the Task Order 9 assumptions regarding receipt of used fuel in MPCs [Jones 2013b].

Classification of waste

The classification of wastes identified by AREVA and Energy Solutions is based on their experience and interpretation of the regulatory requirements contained in 10 CFR 61. AREVA and Energy Solutions both identify waste as either Class A, Class B, Class C or GTCC (Note: Neither AREVA nor Energy Solutions identified any Class B secondary waste streams).

The UFD/EAS waste estimates did not distinguish between Class A, Class B and Class C waste. The UFD/EAS waste estimates combine these wastes into a single Class A/B/C waste classification. The UFD/EAS waste estimates quantify GTCC waste separately. The UFD/EAS waste classifications are arbitrarily assigned based on the source of the waste (i.e. functional area).

The UFD 2012 waste estimates provide separate Class A, Class B, Class C and GTCC waste estimates. The UFD 2012 waste classifications are based on the content of specific radionuclides as defined in 10 CFR 61.

UFD waste volume

During the course of preparing this report comparing estimates of secondary waste from recycling, it was realized that the original UFD/EAS waste estimate [Jones 2011] and consequently the UFD 2012 secondary waste estimate [Jones 2012] contained several oversights that produced an overly conservative estimate. These oversights were corrected and are documented in a revision to the original UFD report [Jones 2013]. The UFD/EAS and UFD 2012 waste estimates presented in this report reflect these corrections.

June 30, 2013

In Sections 3.2.1 through 3.2.9 that follow, the AREVA, EnergySolutions, UFD/EAS and UFD 2012 estimates of waste from recycling are compared by process function. The first table in each section compares the waste estimates by waste classification (i.e. Class A, Class B, Class C, Class A/B/C, GTCC, Mixed Class A/B/C and Mixed GTCC). The next three tables in each section compare the waste estimates by waste type (e.g. operational waste streams, job control waste, maintenance waste, etc.) for UNF1, UNF2 and UNF3 used fuel. Observations are provided after the tables. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

An overall summary of wastes from all process functions related to recycling is provided in Section 3.2.10. The first table compares the waste estimates by waste classification similar to the first table in Sections 3.2.1 through 3.2.9. The second table summarizes the comparison by functional area. The next three tables compare the waste estimates by waste type similar to the tables in Sections 3.2.1 through 3.2.9. Observations are provided after the tables.

Appendices A through I provide greater detail regarding the waste streams from recycling for each of the four sources (i.e. AREVA, EnergySolutions, UFD/EAS and UFD 2012). The UFD waste estimates were originally developed based on a "bottoms up" approach; therefore, a great amount of detail is inherent in the UFD waste estimates. The UFD estimates group the waste streams into sub categories: operational waste, job control waste and maintenance waste. The AREVA and EnergySolutions waste estimates are based on their operational experience; however, the method of data collection and record keeping relevant to individual waste streams and their source does not allow for a level of detail consistent with the UFD data. AREVA does, however, distinguish a combined job control and maintenance waste stream by functional area. With a couple of exceptions, EnergySolutions combines all job control and maintenance waste ("ad hoc" waste in their terminology) and reports this waste in the Balance of Plant functional area. Both AREVA and EnergySolutions provide estimates of individual operational waste streams (e.g. MPCs, solvent residue, ion exchange resins, etc.).

Sections 3.2.11 and 3.2.12 compare the estimates of waste from MOX fuel fabrication and fast reactor fuel fabrication respectively. Unlike the waste estimates for recycling, there is only one UFD estimate for MOX fuel fabrication. There is no UFD waste estimate for fast reactor fuel fabrication. Similar to the waste estimates for recycling, all volumes shown are final packaged waste volumes in cubic meters. Appendices J and K provide greater detail regarding the waste streams from MOX Fuel Fabrication and Fast Reactor Fuel Fabrication respectively.

3.2.1 Receipt and Storage

The Receipt and Storage functional area receives used fuel in either reusable, bolted-lid casks (short cooled fuel) or MPCs (long cooled fuel). Operations conducted in the Receipt and Storage functional area include unloading of casks, fuel transfer, interim storage, decontamination of casks, and cask maintenance.

AREVA based their waste volumes from this functional area on wet storage of used fuel. The storage pool is assumed to have a capacity of 660 baskets to contain a 3 year supply of used fuel; split between 65% PWR used fuel assemblies and 35% BWR assemblies. The water in the pool is cooled, treated and continuously filtered.

Energy*Solutions* assumes dry storage of used fuel in casks on outdoor dry storage pads. A used fuel pool is provided primarily for cask unloading and fuel transfer operations. The pool size is minimized to limit water processing operations.

The UFD waste estimates assume two fuel storage pools and interconnecting canals with a total capacity equivalent to one year supply of used fuel. An additional one year supply of used fuel is assumed to be stored dry.

Table 3.2.1-1 below compares the secondary waste estimates for the Receipt and Storage functional area of recycling by waste classification. Tables 3.2.1-2 through 3.2.1-4 compare the secondary waste estimates for the Receipt and Storage functional area by waste type. Observations are provided after the tables.

Table 3.2.1-1 Receipt and Storage -	Summary of	Secondary Waste	Estimates hy	Waste Classification
Table 5.2.1-1 Receibt and Storage -	Summary of a	secondary waste	Esumates by	waste Classification

Receipt and Storage - Summary of Secondary Waste Estimates by Waste Classification											
	UNF1						UNF2		UNF4 (Blended UNF)		
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy <i>Solutions</i>	UFD/EAS	UFD 2012	AREVA	Energy <i>Solutions</i>	UFD/EAS	AREVA	Energy <i>Solutions</i>
Class A	,	198.73		<u> </u>	,	200.73	762.2	872.0		102.2	<u> </u>
Class B		2.63				0.00					
Class C		16.29	5.7			16.29	5.7			5.7	
Class A/B/C	277.2	217.7	107.9		877.2	217.0	767.9	872.0	277.2	107.9	
GTCC		13.5				613.5					
Mixed Class A/B/C	0.4	0.5			0.4	0.5			0.4		
Mixed GTCC		0.0				0.0					
Total All Wastes	277.5	231.6	107.9		877.5	831.0	767.9	872.0	277.5	107.9	

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.1-2 Receipt and Storage - Summary of Secondary Waste Estimates by Waste Type for UNF1

Receipt and Storage	- Summary of S	Secondary	y Waste	Estimates by	Waste Typ	e for U	NF1	
Waste Type	UF	D/EAS		Į.	AREVA		Energy <i>Solutions</i>	
Used Multi-Purpose Canisters (MPCs)		•	0.0			0.0		
Machining chips from MPCs			0.1	Similar wa			Similar waste streams are	
Fuel cask and canister decontamination wipes			36.0				assumed to be included in the	
Fuel cask and canister decontamination filters	14.1			assumed to be included in the totals below for Other Secondary Waste			totals for Balance of Plant	
Filtered solids	6.3							
Pool sludge		18.6			uary wast	e	Other Secondary Waste	
Dewatered resin			12.8			7.2	See Note 1	
Other Class A/B/C Secondary Waste	Job Control Maintenance	173.3 16.1	189.4	Class A Class C	95.0 5.7	100.7		
Other GTCC Secondary Waste	Job Control	0.0	0.0		3.7			
Other Gree Secondary Waste	Maintenance	0.0	0.0			0.0	See Balance of Plant	
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.4				See Balance of Plant	
Other Mixed Class A/B/C Secondary Waste	Maintenance	0.4	0.4			0.0		
Other Mixed GTCC Secondary Waste	Job Control	Job Control 0.0				•		
United Wilked GTCC Secondary Waste	Maintenance	0.0	0.0	0.0			<u> </u>	
Total			277.5			107.9		

- 1. Energy Solutions reports all resins in the Liquid Effluent Processing functional area as Spent Ion Exchange Resins.
- 2. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.1-3 Receipt and Storage - Summary of Secondary Waste Estimates by Waste Type for UNF2

Receipt and Storage	- Summary of S	econdary	y Waste	Estimates by	Waste Ty	e for U	NF2	
Waste Type	UF	D/EAS			AREVA		Energy <i>Solutions</i>	
Used Multi-Purpose Canisters (MPCs)			600.0			660.0	872.0	
Machining chips from MPCs			0.1	Cimpilantus			Similar waste streams are	
Fuel cask and canister decontamination wipes			36.0	assumed to	iste strean		assumed to be included in the	
Fuel cask and canister decontamination filters			14.1				totals for Balance of Plant	
Filtered solids	6.3			totals below for Other Secondary Waste				
Pool sludge		18.6			idary wast	e	Other Secondary Waste	
Dewatered resin			12.8			7.2	See Note 1	
Other Class A/B/C Secondary Waste	Job Control	173.3	189.4	Class A	95.0	100.7		
Other class A/B/C Secondary Waste	Maintenance	16.1	169.4	Class C	5.7	100.7		
Other CTCC Secondary Waste	Job Control	0.0	0.0					
Other GTCC Secondary Waste	Maintenance	0.0	0.0			0.0	See Balance of Plant	
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.4				See Balance of Plant	
Other Mixed Class A/B/C Secondary Waste	Maintenance	0.4	0.4			0.0		
Other Mixed CTCC Secondary Waste	Job Control	0.0	0.0					
Other Mixed GTCC Secondary Waste	Maintenance	0.0	0.0	0.0)	
Total		·	877.5			767.9	872.0	

- 1. Energy Solutions reports all resins in the Liquid Effluent Processing functional area as Spent Ion Exchange Resins.
- 2. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Receipt and Storage - Sumi	mary of Seconda	ary Waste	Estimat	es by Waste	Type for U	NF4 (Ble	ended UNF)
Waste Type	UF	D/EAS		Į.	AREVA		Energy <i>Solutions</i>
Used Multi-Purpose Canisters (MPCs)			0.0			0.0	0.0
Machining chips from MPCs			0.1	Similar wa	cta ctraam	nc aro	Similar waste streams are
Fuel cask and canister decontamination wipes		36.0			be include		assumed to be included in the
Fuel cask and canister decontamination filters	14.1				low for Ot		totals for Balance of Plant
Filtered solids		6.3			dary Wast		Other Secondary Waste
Pool sludge		18.6			uary wast		Other Secondary Waste
Dewatered resin			12.8			7.2	See Note 1
Other Class A/B/C Secondary Waste	Job Control	173.3	189.4	Class A	95.0	100.7	
Other class Ayb/c Secondary Waste	Maintenance	16.1	105.4	Class C	5.7	100.7	
Other GTCC Secondary Waste	Job Control	0.0	0.0				
other dice secondary waste	Maintenance	0.0	0.0			0.0	See Balance of Plant
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.4				See Balance of Flant
Other Mixed Class A/B/C Secondary Waste	Maintenance	0.4	0.4	0.0			
Other Mixed GTCC Secondary Waste	Job Control	0.0					
Cities winked Gree Secondary Waste	Maintenance					0.0	o <u> </u>
Total			277.5			107.9	

Table 3.2.1-4 Receipt and Storage - Summary of Secondary Waste Estimates by Waste Type for UNF4

- 1. Energy Solutions reports all resins in the Liquid Effluent Processing functional area as Spent Ion Exchange Resins.
- 2. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Observations

- The differences between the Class A waste estimates (Class A/B/C for UFD/EAS) for the UNF1/UNF4 and UNF2 scenarios for AREVA, EnergySolutions and UFD/EAS are primarily attributable to the assumptions regarding receipt of short cooled fuel in reusable, bolted-lid casks and long cooled fuel in MPCs. AREVA provides a packaged waste volume of 660 m³ for MPCs. EnergySolutions provides a waste volume of 872 m³. UFD/EAS provides a volume of 600 m³. The difference in waste volume is probably attributable to the specific MPC assumed, the ratio of PWR fuel to BWR fuel received and the final disposal configuration.
- The UFD 2012 waste estimate also provides an MPC waste volume of 600 m³ as expected (same as UFD/EAS); however, the classification provided by UFD 2012 is GTCC instead of Class A for all others (Class A/B/C for UFD/EAS). The difference in classification is explained by the assumption in the UFD 2012 waste estimates that the MPCs are contaminated with the full distribution of radionuclides present in the used fuel. AREVA on the other hand only assumes the presence of ⁶⁰Co and ⁶³Ni from the corrosion of fuel cladding. It is planned to revise the UFD 2012 waste estimates to incorporate AREVA's approach; however, this was not done prior to the completion of this report.
- The UFD and AREVA waste estimates are fairly close. A functional area comparison to Energy *Solutions* is not possible since Energy *Solutions* includes all job control and maintenance waste (i.e "ad hoc" waste in Energy *Solutions* terminology) from the Receipt and Storage functional area in the Balance of Plant functional area.
- Only the UFD/EAS and UFD 2012 waste estimates identify any GTCC or Mixed Class A/B/C waste.

3.2.2 Head End

The Head End functional area receives used fuel from the Receipt and Storage functional area. The used fuel is cut into segments and transferred to the dissolver. The used fuel is dissolved leaving behind the cladding and other fuel hardware which is washed, compacted and disposed as process waste. The undissolved solids are removed from the dissolved used fuel solution and are ultimately combined in the vitrified high level waste. The dissolved used fuel is transferred to the Separations functional area for further processing.

Basic process operations assumed by AREVA, EnergySolutions and UFD are essentially the same. The only major difference is that AREVA assumes the use of continuous dissolvers; whereas, EnergySolutions and UFD assume the use of batch dissolvers.

Table 3.2.2-1 below compares the secondary waste estimates for the Head End functional area of recycling by waste classification. Tables 3.2.2-2 through 3.2.2-4 compare the secondary waste estimates for the Head End functional area by waste type. Observations are provided after the tables.

Table 3.2.2-1 Head End - Summary of Secondar	y Waste Estimates by	Waste Classification
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		Hea	d End - Su	mmary of Secon	dary Waste	Estimates l	by Waste C	lassification			
	UNF1						UNF2	UNF4 (Blended UNF)			
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy Solutions	UFD/EAS	UFD 2012	AREVA	Energy <i>Solutions</i>	UFD/EAS	AREVA	Energy Solutions
Class A		66.20	103.0			66.20	103.0			103.0	
Class B		0.00				0.00					
Class C		24.50	17.2	2.8		32.69	17.2	2.8		22.9	2.8
Class A/B/C	154.9	90.7	120.2	2.8	154.9	98.9	120.2	2.8	154.9	125.9	2.8
GTCC	0.4	124.5	16.6		0.4	118.3	16.6		0.4	16.6	
Mixed Class A/B/C	8.7	1.6			8.7	1.6			8.7		
Mixed GTCC		0.0				0.0					
Total All Wastes	164.0	216.7	136.7	2.8	164.0	218.7	136.7	2.8	164.0	142.4	2.8

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.2-2 Head End - Summary of Secondary Waste Estimates by Waste Type for UNF1

Table 3.2.2-2 Head End - Summar						<u> </u>	IOI UNFI
Head End - S	Summary of Secon	dary Was	te Estim	ates by Wast	e Type for	UNF1	
Waste Type	UF	UFD/EAS			AREVA		Energy <i>Solutions</i>
Other Class A/B/C Secondary Waste	Job Control Maintenance	120.3 34.6	154.9	Class A Class C	103.0 17.2	120.2	
Other GTCC Secondary Waste	Job Control Maintenance	0.0	0.4		•	16.6	
Other Mixed Class A/B/C Secondary Waste	Job Control Maintenance	0.0 8.7	8.7			0.0	See Balance of Plant
Other Mixed GTCC Secondary Waste	Job Control Maintenance	0.0	0.0			0.0	
Total		0.01	164.0			136.7	

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.2-3 Head End - Summary of Secondary Waste Estimates by Waste Type for UNF2

Head End - S	ummary of Secon	ary of Secondary Waste Estimates by Waste Type for UNF2							
Waste Type	UF	D/EAS		AREVA			Energy <i>Solutions</i>		
Other Class A/B/C Secondary Waste	Job Control Maintenance	120.3 34.6	154.9	Class A Class C	103.0 17.2	120.2			
Other GTCC Secondary Waste	Job Control Maintenance	0.0 0.4	0.4		,	16.6			
Other Mixed Class A/B/C Secondary Waste	Job Control Maintenance	0.0 8.7	8.7			0.0	See Balance of Plant		
Other Mixed GTCC Secondary Waste	Job Control Maintenance	0.0	0.0			0.0			
Total			164.0			136.7	0.		

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

June 30, 2013

Head End - Summary	y of Secondary Wa	aste Estin	nates by	Waste Type	for UNF4 (Blended	UNF)	
Waste Type	UF	D/EAS		AREVA			EnergySolutions	
	Job Control	120.3		Class A	103.0			
Other Class A/B/C Secondary Waste	Maintenance	34.6	154.9	Class A Class C	22.9	125.9		
Other GTCC Secondary Waste	Job Control Maintenance	0.0 0.4	0.4			16.6		
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	8.7				See Balance of Plant	
Other Mixed Class A/B/C Secondary Waste	Maintenance	8.7	8.7			0.0		
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0					
other wince of co secondary waste	Maintenance	0.0	0.0	0.0				
Total			164.0			142.4		

Table 3.2.2-4 Head End - Summary of Secondary Waste Estimates by Waste Type for UNF4

Observations

- No specific operational waste streams are identified by AREVA, EnergySolutions, UFD/EAS or UFD 2012.
- EnergySolutions identifies shear blades as a specific maintenance waste (not specifically indicated in the tables above, see Appendix B).
- AREVA, UFD/EAS and UFD 2012 Class A/B/C waste estimates are fairly close. The UFD 2012 GTCC waste volume is substantially greater than the UFD/EAS and AREVA waste estimates. Total waste for AREVA, UFD/EAS and UFD 2012 is comparable even with the large discrepancy in GTCC waste between the UFD 2012 estimate and the AREVA and UFD /EAS estimates.
- A functional area comparison to Energy Solutions is not possible since Energy Solutions includes all job control and maintenance waste (i.e "ad hoc" waste in Energy Solutions terminology) except shear blades from the Head End functional area in the Balance of Plant functional area.
- Only the UFD/EAS and UFD 2012 waste estimates identify any Mixed Class A/B/C waste.

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

3.2.3 Separations

The Separations functional area separates fission products and actinides from U and Pu, partially separates U from Pu and purifies the U and U/Pu streams to comply with product specifications. The Separations functional area encompasses the solvent recovery operations and high activity waste handling operations.

Basic process operations assumed by AREVA, EnergySolutions and UFD are essentially the same; however, one major difference is in how tritium contamination is managed in the process. AREVA segregates the separation process into high tritium (HT) and low tritium (LT) zones to control the concentration of tritium in liquid effluents. EnergySolutions allows the tritium to pass through to the liquid waste stream where it is concentrated using a combined electrolysis and catalytic process (see the Liquid Effluent Processing functional area, Section 3.2.6). The UFD waste estimates minimize the presence of tritium by using voloxidation in the Head End functional area to drive off and capture tritium before aqueous processing is initiated. See Section 3.1.3 for more information regarding tritium management.

Table 3.2.3-1 below compares the secondary waste estimates for the Separations functional area of recycling by waste classification. Tables 3.2.3-2 through 3.2.3-4 compare the secondary waste estimates for the Separations functional area by waste type. Observations are provided after the tables.

Table 3.2.3-1 Separations - Summary of Secondary Waste Estimates by Waste Classification

14010 21212 1 21	Separations - Summary of Secondary Waste Estimates by Waste Classification											
		Sepa	rations - Si	ummary of Secor	ndary Wast	e Estimates	by Waste	Classification				
			UNF1				UNF2	UNF4 (Blended UNF)				
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy <i>Solutions</i>	UFD/EAS	UFD 2012	AREVA	Energy <i>Solutions</i>	UFD/EAS	AREVA	Energy <i>Solutions</i>	
Class A		88.16	78.9	85.6		145.79	78.9	85.6		78.9	86.1	
Class B		66.58				22.97						
Class C		250.65	12.8			289.88	12.8			17.7		
Class A/B/C	571.5	405.4	91.7	85.6	571.5	458.6	91.7	85.6	571.5	96.6	86.1	
GTCC		226.0	1.7			160.8	1.7			1.7		
Mixed Class A/B/C	2.4	2.0			2.4	2.0			2.4			
Mixed GTCC		0.0				0.0						
Total All Wastes	573.9	633.4	93.4	85.6	573.9	621.5	93.4	85.6	573.9	98.3	86.1	

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.3-2 Separations - Summary of Secondary Waste Estimates by Waste Type for UNF1

Table 5.2.5-2 Separations - Summ							TOT OTNITI		
Separations -	Summary of Seco	ndary Wa	aste Esti	mates by Wa	iste Type for	UNF1			
Waste Type	UF	UFD/EAS AREVA					Energy <i>Solutions</i>		
Solvent residue						12.0	85.6		
	Job Control	321.3		Class A	66.9				
Other Class A/B/C Secondary Waste	Maintenance	250.3	571.5	Class C	12.8	79.7			
	Job Control	0.0			12.0				
Other GTCC Secondary Waste	Maintenance	0.0	0.0			1.7			
	Job Control	0.0	2.4				See Balance of Plant		
Other Mixed Class A/B/C Secondary Waste	Maintenance	2.4	2.4			0.0			
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0						
Other winxed GTCC Secondary Waste	Maintenance	0.0	0.0	0.0					
Total			573.9			93.4	85.6		

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.3-3 Separations - Summary of Secondary Waste Estimates by Waste Type for UNF2

Separations -	Summary of Seco	ndary Wa	r UNF2					
Waste Type	UF	D/EAS			AREVA		Energy <i>Solutions</i>	
Solvent residue						12.0	85.6	
						+		
Other Class A/B/C Secondary Waste	Job Control Maintenance	321.3 250.3	571.5	Class A Class C	66.9 12.8	79.7		
Other GTCC Secondary Waste	Job Control Maintenance	0.0	0.0			1.7		
Other Mixed Class A/B/C Secondary Waste	Job Control Maintenance	0.0 2.4	2.4			0.0	See Balance of Plant	
Other Mixed GTCC Secondary Waste	Job Control Maintenance	0.0	0.0			0.0		
Total			573.9			93.4	85.6	

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Separations - Summary							
Waste Type	UI	FD/EAS			AREVA		Energy Solutions
Solvent residue						12.0	86.1
Other Class A/B/C Secondary Waste	Job Control	321.3 250.3	571.5	Class A Class C	66.9 17.7	84.6	
	Maintenance			Class C	17.7		
Other GTCC Secondary Waste	Job Control	0.0	0.0				
,	Maintenance					1.7	See Balance of Plant
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	2.4				
Other Mixed class Typy & Secondary Waste	Maintenance	2.4	2.7			0.0	
Other Mixed CTCC Secondary Wests	Job Control	0.0	0.0				
Other Mixed GTCC Secondary Waste	Maintenance	0.0	0.0			0.0	
Total			573.9			98.3	86.1

Table 3.2.3-4 Separations - Summary of Secondary Waste Estimates by Waste Type for UNF4

- The only operational waste stream identified is solvent residue. Both AREVA and Energy Solutions utilize pyrolysis to treat a solvent purge waste stream; however, the final waste form for this waste stream differs. AREVA uses cementation of the resulting ash to stabilize the waste for disposal. Energy Solutions uses compaction to produce the final waste form. There is no solvent residue waste stream identified for the UFD waste estimates. The UFD estimates assume that solvent is reconditioned and fresh solvent additions replenish normal solvent losses to the aqueous streams.
- AREVA and UFD 2012 Class A waste estimates are fairly close (even without consideration of
 the solvent residue waste stream reported by AREVA); however, the UFD/EAS and UFD 2012
 waste estimates differ significantly from a total Class A/B/C and overall total waste perspective.
 probable explanation for these significant differences is the basis for operations inherent in the
 UFD waste estimates which assumes remote operation and maintenance of high maintenance
 solvent extraction equipment (e.g. centrifugal contactors rotating machinery) versus AREVA
 and EnergySolutions use of highly reliable equipment (e.g. pulse columns no moving parts).
- A functional area comparison of job control and maintenance waste to Energy *Solutions* is not possible since Energy *Solutions* includes all job control and maintenance waste (i.e "ad hoc" waste in Energy *Solutions* terminology) from the Separations functional area in the Balance of Plant functional area.
- The UFD 2012 waste estimate allocates a substantial portion of the waste streams considered Class A/B/C waste in the UFD/EAS waste estimates to GTCC waste.
- Only the UFD/EAS and UFD 2012 waste estimates identify any Mixed Class A/B/C waste.

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

3.2.4 Solidification

The Solidification functional area converts the aqueous U and U/Pu product streams to a solid phase for fuel fabrication or interim storage.

Basic process operations assumed by AREVA, Energy *Solutions* and UFD are essentially the same. The U product solution is converted to UO₃ by thermal denitration. The U/Pu product solution is converted to an oxide by oxalate precipitation and calcination.

Table 3.2.4-1 below compares the secondary waste estimates for the Solidification functional area of recycling by waste classification. Tables 3.2.4-2 through 3.2.4-4 compare the secondary waste estimates for the Solidification functional area by waste type. Observations are provided after the tables.

Table 3.2.4-1 Solidification - Summary of Secondary Waste Estimates by Waste Classification

		Solidi	ification - S	ummary of Seco	ndary Was	te Estimate	s by Waste	Classification			
			UNF1				UNF2	UNF4 (Blended UNF)			
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy <i>Solutions</i>	UFD/EAS	UFD 2012	AREVA	Energy <i>Solutions</i>	UFD/EAS	AREVA	Energy Solutions
Class A		142.96	61.6			142.96	61.6			61.6	
Class B		0.00				0.00					
Class C		65.29	49.3			65.29	49.3			76.2	
Class A/B/C	189.5	208.2	110.9		189.5	208.2	110.9		189.5	137.8	
GTCC	252.1	73.8	23.0		252.1	73.8	23.0		252.1	40.0	
Mixed Class A/B/C	0.8	1.0			0.8	1.0			0.8		
Mixed GTCC		0.1				0.1					
Total All Waste	442.4	283.2	133.9		442.4	283.2	133.9		442.4	177.8	

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.4-2 Solidification - Summary of Secondary Waste Estimates by Waste Type for UNF1

Solidification - S	ummary of Seco	ndary W	aste Esti	mates by Wa	ste Type f	or UNF1			
Waste Type	UF	D/EAS		ļ	AREVA		Energy <i>Solutions</i>		
Inner containers (bagless transfer stub pieces)			0.6						
Inner containers (bagless transfer stub pieces)			9.8	Similarwa	cta ctraan	nc aro	Similar waste streams are		
Outer containers			0.01	assumed to be included in the			assumed to be included in the totals for Balance of Plant		
Inner containers (including convenience cans)			0.04						
					dary Wast		Other Secondary Waste		
				Secon	uary vvast	C	Other Secondary Waste		
Other Class A/B/C Secondary Waste	Job Control	148.6	188.9	Class A	61.6	110.9			
Other class Ay by & Secondary Waste	Maintenance	40.3	100.5	Class C	49.3	110.5			
Other GTCC Secondary Waste	Job Control	224.7	242.3						
Other Gree Secondary Waste	Maintenance	17.5	242.3	23.0			See Balance of Plant		
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.8				See balance of Plant		
Other Mixed Class A/B/C Secondary Waste	Maintenance	0.8	0.8			0.0			
Other Mixed CTCC Secondary Waste	Job Control	0.0	0.0						
Other Mixed GTCC Secondary Waste	Maintenance	0.0	0.0	0.0			j		
Total	,		442.4			133.9			

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.4-3 Solidification - Summary of Secondary Waste Estimates by Waste Type for UNF2

Solidification - S	ummary of Seco	ndary W	aste Esti	mates by Wa	ste Type f	or UNF2			
Waste Type	UF	D/EAS			AREVA		Energy <i>Solutions</i>		
Inner containers (bagless transfer stub pieces)			0.6						
Inner containers (bagless transfer stub pieces)			9.8	Cimaila aa	ste stream		Similar waste streams are		
Outer containers			0.01						
Inner containers (including convenience cans)			0.04	assumed to be included in the totals below for Other Secondary Waste			assumed to be included in the totals for Balance of Plant Other Secondary Waste		
				Secor	luary wast	е	Other Secondary Waste		
Other Class A/B/C Secondary Waste	Job Control	148.6	188.9	Class A	61.6	110.9			
Other class A/B/C Secondary Waste	Maintenance	40.3	100.5	Class C	49.3	110.9			
Other GTCC Secondary Waste	Job Control	224.7	242.3						
Other GTCC Secondary waste	Maintenance	17.5	242.5			23.0	See Balance of Plant		
Other Mixed Class A/B/C Secondary Mosts	Job Control	0.0	0.0				See Balance of Plant		
Other Mixed Class A/B/C Secondary Waste	Maintenance	0.8	0.8			0.0			
Other Mixed CTCC Secondary Wests	Job Control	0.0	0.0						
Other Mixed GTCC Secondary Waste	Maintenance	0.0	0.0			0.0			
Total	'	•	442.4			133.9			

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Solidification - Summary of Secondary Waste Estimates by Waste Type for UNF4 (Blended UNF) UFD/EAS AREVA **Energy** Solutions **Waste Type** 0.6 Inner containers (bagless transfer stub pieces) Inner containers (bagless transfer stub pieces) 9.8 Similar waste streams are Similar waste streams are 0.01 Outer containers assumed to be included in the assumed to be included in the Inner containers (including convenience cans) 0.04 totals below for Other totals for Balance of Plant Secondary Waste Other Secondary Waste 148.6 Class A Other Class A/B/C Secondary Waste 188.9 137.8 40.3 Maintenance Class C 224.7 Job Control Other GTCC Secondary Waste 242.3 Maintenance 17.5 40.0 See Balance of Plant Job Control 0.0 0.8 Other Mixed Class A/B/C Secondary Waste 0.8 0.0 Maintenance 0.0 Job Control Other Mixed GTCC Secondary Waste 0.0 0.0 Maintenance 0.0 Total 442.4 177.8

Table 3.2.4-4 Solidification - Summary of Secondary Waste Estimates by Waste Type for UNF4

- Operational waste streams identified pertain to canning of U/Pu product oxide. Only the UFD estimates specifically identify waste from canning operations. AREVA assumes the use of reusable product cans. Presumably, EnergySolutions assumes the use of reusable cans or either includes canning waste in their "ad hoc" operational waste reported in the Balance of Plant functional area. The canning waste reported by the UFD estimates is relatively minor.
- AREVA and UFD Class A/B/C waste estimates are fairly close; however, the UFD/EAS and UFD 2012 waste estimates differ somewhat in regards to GTCC waste (UFD/EAS more so than UFD 2012). The UFD 2012 estimates for GTCC waste are in closer agreement with AREVA's; however, the UFD/EAS estimates differ by an order of magnitude. The UFD/EAS waste estimate does not consider compaction of GTCC waste; however, the UFD 2012 waste estimate does incorporate compaction of GTCC waste. This along with some reclassification of waste in the UFD 2012 estimate (relative to the UFD/EAS estimate) is a likely explanation for the difference in GTCC waste volumes identified by the UFD/EAS and UFD 2012 estimates.
- The UFD/EAS waste estimate arbitrarily assumes a high fraction of the waste streams from the Solidification functional area is GTCC waste. This assumption is not supported by the UFD 2012 waste estimate which uses actual fuel radionuclide distributions and material balance data to characterize the waste streams.
- A functional area comparison of job control and maintenance waste to Energy *Solutions* is not possible since Energy *Solutions* includes all job control and maintenance waste (i.e "ad hoc" waste in Energy *Solutions* terminology) from the Solidification functional area in the Balance of Plant functional area.
- Only the UFD/EAS and UFD 2012 waste estimates identify any Mixed Class A/B/C waste. The UFD 2012 waste estimate reclassifies some of the Mixed Class A/B/C waste as Mixed GTCC waste.

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

3.2.5 Acid Recovery

The Acid Recovery functional area recovers nitric acid from liquid waste streams from the Separations and Solidification functional areas.

Basic process operations assumed by AREVA, EnergySolutions and UFD are essentially the same. AREVA does divide their liquid waste streams into high tritium and low tritium streams as part of their tritium management plan.

Table 3.2.5-1 below compares the secondary waste estimates for the Acid Recovery functional area of recycling by waste classification. Tables 3.2.5-2 through 3.2.5-4 compare the secondary waste estimates for the Solidification functional area by waste type. Observations are provided after the tables.

Table 3.2.5-1 Acid Recovery - Summary of Secondary Waste Estimates by Waste Classification

		Acid R	ecovery - S	Summary of Seco	ondary Was	te Estimate	es by Waste	Classification			
			UNF1				UNF2	UNF4 (Blended UNF)			
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy <i>Solutions</i>	UFD/EAS	UFD 2012	AREVA	Energy <i>Solutions</i>	UFD/EAS	AREVA	Energy <i>Solutions</i>
Class A		55.26	1060.4			55.26	1060.4			1060.4	
Class B		12.00				12.00					
Class C		0.00				0.00					
Class A/B/C	56.0	67.3	1060.4		56.0	67.3	1060.4		56.0	1060.4	
GTCC		0.0				0.0					
Mixed Class A/B/C	0.6	0.5			0.6	0.5			0.6		
Mixed GTCC		0.0				0.0					
Total All Wastes	56.6	67.8	1060.4		56.6	67.8	1060.4		56.6	1060.4	

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.5-2 Acid Recovery - Summary of Secondary Waste Estimates by Waste Type for UNF1

Acid Recovery	- Summary of Seco	ndary W	aste Est	imates by W	aste Type fo	or UNF1	
Waste Type	UFI	D/EAS			AREVA		Energy <i>Solutions</i>
Excess nitrates	See	See Note 1				1060.4	
				a	1 00		
Other Class A/B/C Secondary Waste	Job Control	26.5	56.0	Class A	0.0	0.0	
	Maintenance	29.5		Class C	0.0		
Other GTCC Secondary Waste	Job Control	0.0	0.0				
•	Maintenance	0.0				0.0	See Balance of Plant
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.6				
Other Wince Class Ay by C Secondary Waste	Maintenance	0.6	0.0			0.0	
Other Mixed CTCC Casendary Mosts	Job Control	0.0	0.0		·		
Other Mixed GTCC Secondary Waste	Maintenance	0.0	0.0	0.0			
Total			56.6		·	1060.4	

^{1.} The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes excess nitrates in the solidified waste water stream reported in the Liquid Effluent Processing functional area.

Table 3.2.5-3 Acid Recovery - Summary of Secondary Waste Estimates by Waste Type for UNF2

Acid Recovery	- Summary of Seco	ndary W	aste Est	imates by V	aste Type fo	r UNF2			
Waste Type	UFC	D/EAS			AREVA		Energy <i>Solutions</i>		
Excess nitrates	See	Note 1							
Other Class A/B/C Secondary Waste	Job Control	26.5	56.0	Class A	0.0	0.0			
Other Class A/B/C Secondary Waste	Maintenance	29.5	36.0	Class C	0.0	0.0			
Other GTCC Secondary Waste	Job Control	0.0	0.0						
Other GTCC Secondary waste	Maintenance	0.0	0.0			0.0	See Balance of Plant		
Other Mixed Class A/D/C Secondary Wests	Job Control	0.0	0.6				See Balance of Plant		
Other Mixed Class A/B/C Secondary Waste	Maintenance	0.6	0.6			0.0			
Other Mixed CTCC Secondary Wests	Job Control	0.0	0.0						
Other Mixed GTCC Secondary Waste	Maintenance	0.0	0.0	0.0					
Total			56.6			1060.4			

^{1.} The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes excess nitrates in the solidified waste water stream reported in the Liquid Effluent Processing functional area.

^{2.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

^{2.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Acid Recovery - Summar	y of Secondary	Waste Es	timates	by Waste Typ	e for UNF4	(Blende	ed UNF)		
Waste Type		ED/EAS			AREVA		Energy <i>Solutions</i>		
Excess nitrates		UFD/EAS See Note 1				1060.4	Energysolutions		
Excess induces	300	. NOTE I				1000.4			
Other Class A/B/C Secondary Waste	Job Control	26.5	56.0	Class A	0.0	0.0			
outer diasory by o decorately trade	Maintenance	29.5	50.0	Class C	0.0	0.0			
Other GTCC Secondary Waste	Job Control	0.0	0.0						
Other Gree Secondary Waste	Maintenance	0.0	0.0			0.0	See Balance of Plant		
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.6				See Balance of Flant		
Other Mixed Class Ay by C Secondary Waste	Maintenance	0.6	0.0			0.0			
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0						
Other Mixed GTCC Secondary Waste	Maintenance	0.0	0.0	0.0					
Total			56.6		•	1060.4			

Table 3.2.5-4 Acid Recovery - Summary of Secondary Waste Estimates by Waste Type for UNF4

- 1. The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes excess nitrates in the solidified waste water stream reported in the Liquid Effluent Processing functional area.
- 2. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

- The UFD waste estimates identify a solidified waste water stream (in the Liquid Effluent Processing functional area) that includes the equivalent of the excess nitrate waste stream reported here by AREVA. AREVA also identifies a separate salt bearing waste stream (1,232.0 m³) in the Liquid Effluent Processing functional area. AREVA's total solidified waste water stream is, therefore, 2,292.4 m³ (1,060.4 + 1,232.0 = 2,292.4) compared to the UFD/EAS (and UFD 2012) total of 1,200 m³.
- AREVA does not identify any job control or maintenance waste associated with the Acid Recovery functional area. The volume of job control and maintenance wastes identified in the UFD/EAS and UFD 2012 waste estimates are minimal relative to other functional areas.
- A functional area comparison of job control and maintenance waste to Energy *Solutions* is not possible since Energy *Solutions* includes all job control and maintenance waste (i.e "ad hoc" waste in Energy *Solutions* terminology) from the Acid Recovery functional area in the Balance of Plant functional area.
- Only the UFD/EAS and UFD 2012 waste estimates identify any Mixed Class A/B/C waste.

3.2.6 Liquid Effluent Processing

The Liquid Effluent Processing functional area decontaminates waste streams primarily from the Acid Recovery functional area prior to release to the environment. Concentrated active wastes are immobilized for disposal as solid waste.

Basic process operations assumed by AREVA, Energy *Solutions* and UFD are essentially the same (e.g. evaporation, filtration, etc.); however, operations regarding tritium management are substantially different (see Section 3.1.3 for further discussion of tritium management approaches).

Table 3.2.6-1 below compares the secondary waste estimates for the Liquid Effluent Processing functional area of recycling by waste classification. Tables 3.2.6-2 through 3.2.6-4 compare the secondary waste estimates for the Liquid Effluent Processing functional area by waste type. Observations are provided after the tables.

Table 3.2.6-1 Liquid Effluent Processing - Summary of Secondary Waste Estimates by Waste Classification

		iquid Efflu	ent Process	sing - Summary o	f Secondar	y Waste Es	timates by	Waste Classificat	tion		
			UNF1				UNF2		UI	ed UNF)	
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy <i>Solutions</i>	UFD/EAS	UFD 2012	AREVA	Energy <i>Solutions</i>	UFD/EAS	AREVA	Energy <i>Solutions</i>
Class A		76.12	1293.6	1880.1		76.12	1293.6	1880.1		1293.6	1880.1
Class B		1,200.00				1,200.00					
Class C		0.00	1.3	1709.7		0.00	1.3	1709.7		1.3	1692.6
Class A/B/C	1271.8	1276.1	1294.9	3589.8	1271.8	1276.1	1294.9	3589.8	1271.8	1294.9	3572.7
GTCC		0.0				0.0					
Mixed Class A/B/C		0.0				0.0					
Mixed GTCC		0.0				0.0					
Total All Wastes	1271.8	1276.1	1294.9	3589.8	1271.8	1276.1	1294.9	3589.8	1271.8	1294.9	3572.7

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

 $Table \ 3.2.6-2 \ Liquid \ Effluent \ Processing \ - \ Summary \ of \ Secondary \ Waste \ Estimates \ by \ Waste \ Type \ for \ UNF1$

01111									
Liquid Effluent Processing	- Summary of	Seconda	ry Waste	Estimate	s by Wast	е Туре	e for U	NF1	
Waste Type	UI	FD/EAS			AREVA			Energy <i>Solutions</i>	
Solidified waste water			1200.0		See Note	2		See Note 4	
Spent Ion Exchange Resins (including from Fuel Receipt)	See	e Note 1			See Note	3		18	80.1
Salt-bearing waste						1	1232.0	17	09.7
Other Class A/B/C Secondary Waste	Job Control Maintenance	Note 5 71.8	71.8	Class A Class C		1.6 1.3	62.9		
Other GTCC Secondary Waste	Job Control Maintenance	0.0	().()			•	0.0		
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0						See Balance of Plant	
other winked class Ay by C secondary waste	Maintenance	0.0	0.0				0.0		
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0						
· ·	Maintenance	0.0	0.0				0.0		
Total			1271.8			1	1294.9	35	89.8

- 1. The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes spent ion exchange resins in Maintenance waste.
- 2. The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes excess nitrates in the solidified waste water stream. AREVA includes excess nitrates in the Acid Recovery functional area (see Section 3.2.5).
- 3. No specific resin waste streams were identified by AREVA for the Liquid Effluent Processing functional area.
- 4. Other than the salt bearing waste stream identified by Energy*Solutions*, the only other solidified liquid waste stream identified by Energy*Solutions* is tritium waste. Tritium waste is a process waste and not included here as a secondary waste (see Section 3.1.3).
- 5. Job control waste for the Liquid Effluent Processing functional area is included in the job control waste for the Balance of Plant functional area.
- 6. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.6-3 Liquid Effluent Processing - Summary of Secondary Waste Estimates by Waste Type for UNF2

UNIZ								
Liquid Effluent Processing	- Summary of	Seconda	ry Waste	Estimates	s by Wast	e Type fo	or U	NF2
Waste Type	U	FD/EAS			AREVA			Energy <i>Solutions</i>
Solidified waste water			1200.0		See Note	2		See Note 4
Spent Ion Exchange Resins (including from Fuel Receipt)	See	e Note 1			See Note	3		1880.1
Salt-bearing waste						123	32.0	1709.7
Other Class A/B/C Secondary Waste	Job Control Maintenance	Note 5 71.8	71.8	Class A Class C		1.6 1.3	52.9	
Other GTCC Secondary Waste	Job Control	0.0	0.0				0.0	
Other Mixed Class A/B/C Secondary Waste	Maintenance Job Control	0.0					0.0	See Balance of Plant
Other winker class A/D/C secondary waste	Maintenance	0.0	0.0				0.0	
Other Mixed GTCC Secondary Waste	Job Control	0.0	().()					
Sale: Illinea G. 55 5555aal y Waste	Maintenance	0.0	0.0				0.0	
Total			1271.8			129	94.9	3589.8

- 1. The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes spent ion exchange resins in Maintenance waste.
- 2. The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes excess nitrates in the solidified waste water stream. AREVA includes excess nitrates in the Acid Recovery functional area (see Section 3.2.5).
- 3. No specific resin waste streams were identified by AREVA for the Liquid Effluent Processing functional area.
- 4. Other than the salt bearing waste stream identified by EnergySolutions, the only other solidified liquid waste stream identified by EnergySolutions is tritium waste. Tritium waste is a process waste and not included here as a secondary waste (see Section 3.1.3).
- 5. Job control waste for the Liquid Effluent Processing functional area is included in the job control waste for the Balance of Plant functional area.
- 6. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

3572.7

UNF4							
Liquid Effluent Processing - Summ	ary of Second	lary Wast	e Estima	tes by Wa	ste Type for U	NF4 (Ble	ended UNF)
Waste Type	UI	FD/EAS			AREVA		Energy <i>Solutions</i>
Solidified waste water			1200.0		See Note 2		See Note 4
Spent Ion Exchange Resins (including from Fuel Receipt)) Se	e Note 1			See Note 3		1880
Salt-bearing waste						1232.0	1692
Other Class A/B/C Secondary Waste	Job Control	Note 5	71.8	Class A	61.6	62.9	
,	Maintenance			Class C	1.3		
Other GTCC Secondary Waste	Job Control	0.0	0.0				
other dide secondary waste	Maintenance	0.0	0.0			0.0	See Balance of Plant
Other Mixed Class A/R/C Secondary Waste	Job Control	0.0	0.0				See Balance Of Flant
Other Mixed Class A/B/C Secondary Waste	Maintenance	0.0	0.0	0.		0.0	
Other Mixed GTCC Secondary Waste	Job Control	0.0	0.0				
Other winker of the Secondary Waste	Maintananca	0.0	0.0			0.0	

Table 3.2.6-4 Liquid Effluent Processing - Summary of Secondary Waste Estimates by Waste Type for UNF4

1. The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes spent ion exchange resins in Maintenance waste.

1271.8

1294.9

- 2. The UFD/EAS waste estimate (and the UFD 2012 waste estimate) includes excess nitrates in the solidified waste water stream. AREVA includes excess nitrates in the Acid Recovery functional area (see Section 3.2.5).
- 3. No specific resin waste streams were identified by AREVA for the Liquid Effluent Processing functional area.

Maintenance

- 4. Other than the salt bearing waste stream identified by Energy*Solutions*, the only other solidified liquid waste stream identified by Energy*Solutions* is tritium waste. Tritium waste is a process waste and not included here as a secondary waste (see Section 3.1.3).
- 5. Job control waste for the Liquid Effluent Processing functional area is included in the job control waste for the Balance of Plant functional area.
- 6. All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Observations

Total

- Given that different tritium management approaches are taken by AREVA, EnergySolutions and the UFD waste estimates, the total solidified liquid waste streams are in close agreement.
- A comparison of the job control and maintenance waste between the AREVA and the UFD/EAS waste estimates is not possible since job control waste for UFD/EAS is not reported here but in the Balance of Plant functional area.
- A functional area comparison of job control and maintenance waste to Energy *Solutions* is not possible since Energy *Solutions* includes all job control and maintenance waste (i.e "ad hoc" waste in Energy *Solutions* terminology) from the Liquid Effluent Processing functional area in the Balance of Plant functional area.

3.2.7 Vitrification

The Vitrification functional area immobilizes the majority of the radioactivity processed through the facility (e.g. undissolved fines from the Head End functional area, concentrated fission product raffinates from the Separations functional area, etc.).

Basic process operations assumed by AREVA, EnergySolutions and UFD are essentially the same, i.e. production of a borosilicate glass waste form.

Table 3.2.7-1 below compares the secondary waste estimates for the Vitrification functional area of recycling by waste classification. Tables 3.2.7-2 through 3.2.7-4 compare the secondary waste estimates for the Vitrification functional area by waste type. Observations are provided after the tables.

Table 3.2.7-1 Vitrification - Summary of Secondary Waste Estimates by Waste Classification

14010 3.2.7 1 1													
		Vitrif	ication - Si	ummary of Seco	ndary Wast	e Estimates	by Waste	Classification					
			UNF1				UNF2	UNF4 (Blended UNF)					
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy <i>Solutions</i>	UFD/EAS	UFD 2012	AREVA	Energy <i>Solutions</i>	UFD/EAS	AREVA	Energy <i>Solutions</i>		
Class A		16.20	67.8			62.08	67.8			67.8			
Class B		87.50				38.00							
Class C		173.92	6.7			163.02	6.7			9.2			
Class A/B/C	219.3	277.6	74.5		219.3	263.1	74.5		219.3	77.0	1		
GTCC		0.0	28.2	9.8		0.0	28.2	9.8		28.2	9.8		
Mixed Class A/B/C	0.8	43.3			0.8	43.3			0.8				
Mixed GTCC	44.8	0.0			44.8	0.0			44.8				
Total All Wastes	264.9	320.9	102.7	9.8	264.9	306.4	102.7	9.8	264.9	105.2	9.8		

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.7-2 Vitrification - Summary of Secondary Waste Estimates by Waste Type for UNF1

Table 3.2.7-2 Vitrification - Summ						1	oc for OTAL 1
Vitrification -	Summary of Seco	ndary Wa	aste Esti	nates by Was	te Type fo	r UNF1	
Waste Type	UF	D/EAS		,	AREVA	Energy <i>Solutions</i>	
	Job Control	145.0		Class A	67.8		
Other Class A/B/C Secondary Waste	Maintenance		219.3	Class C	6.7	74.5	See Balance of Plant
Other CTCC Secondary Wests	Job Control	0.0	0.0				0
Other GTCC Secondary Waste	Maintenance	0.0	0.0			28.2	9.
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.8				
Cities wiked class A/B/C Secondary Waste	Maintenance	0.8	0.8			0.0	
Other Mixed GTCC Secondary Waste	Job Control	0.0	44.8				
Cities winked of CC Secondary waste	Maintenance	44.8	44.0			0.0	
Total			264.9			102.7	9.

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.7-3 Vitrification - Summary of Secondary Waste Estimates by Waste Type for UNF2

Vitrification -	Summary of Seco	ndary Wa	ste Estir	mates by Wa	ste Type fo	r UNF2	
Waste Type	UF	D/EAS		,	AREVA	Energy <i>Solutions</i>	
Other Class A/B/C Secondary Waste	Job Control Maintenance	145.0 74.3	219.3	Class A Class C	67.8	74.5	See Balance of Plant
Other GTCC Secondary Waste	Job Control Maintenance	0.0	0.0			28.2	9.
Other Mixed Class A/B/C Secondary Waste	Job Control Maintenance	0.0	0.8			0.0	
Other Mixed GTCC Secondary Waste	Job Control Maintenance	0.0 44.8	44.8	0.0			
Total		•	264.9			102.7	9.

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Vitrification - Summary of Secondary Waste Estimates by Waste Type for UNF4 (Blended UNF) **Waste Type** UFD/EAS AREVA **Energy** Solutions 145.0 Class A Job Control Other Class A/B/C Secondary Waste 219.3 77.0 See Balance of Plant 74.3 Maintenance Class C Job Control 0.0 Other GTCC Secondary Waste 0.0 9.8 0.0 Maintenance 28.2 Job Control 0.0 0.8 Other Mixed Class A/B/C Secondary Waste 0.8 0.0 Maintenance 0.0 Job Control Other Mixed GTCC Secondary Waste 44.8 Maintenance 44.8 0.0 Total 264.9 105.2

Table 3.2.7-4 Vitrification - Summary of Secondary Waste Estimates by Waste Type for UNF4

- AREVA and UFD Class A/B/C waste estimates differ by a factor of approximately 3 (UFD/EAS) and 3.7 (UFD 2012).
- AREVA identifies GTCC waste (28.2 m³); however, the UFD waste estimates do not identify any GTCC waste. The UFD waste estimates do, however, identify 43.3 m³ of Mixed Class A/B/C waste (UFD 2012) and 44.8 m³ of Mixed GTCC waste (UFD/EAS). The composition of all these waste streams is probably similar (i.e. failed equipment) and from a volume perspective are in close agreement. The difference, obviously, is in the classification of the waste, particularly in regards to hazardous content. The UFD waste estimates assume that certain failed equipment, particularly equipment incorporating refractory material (e.g. melters), has the potential to contain hazardous constituents, resulting in the mixed waste classifications.
- EnergySolutions identified failed melters as a specific item of failed equipment. The volume reported (9.8 m³ see Appendix G) is substantially less than that reported in the UFD/EAS waste estimate (41.1 m³ see Appendix G).
- Further comparison of job control and maintenance waste to Energy Solutions is not possible since Energy Solutions includes all job control and maintenance waste (i.e "ad hoc" waste in Energy Solutions terminology) from the Vitrification functional area in the Balance of Plant functional area.
- Only the UFD/EAS and UFD 2012 waste estimates identify any Mixed Class A/B/C waste. Only the UFD/EAS waste estimate identifies any Mixed GTCC waste.

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

3.2.8 Offgas

The Offgas functional area captures and immobilizes volatile gases from various functional areas such as the Head End and Separations functional areas.

Some of the process operations assumed by AREVA, Energy *Solutions* and UFD differ substantially in the approach to capture and immobilize the relevant process gases. See Section 3.1 for more discussion on the capture and immobilization of the relevant process gases. The immobilized process gas waste forms are considered process wastes and are not reported here as secondary wastes (see Section 3.1).

Table 3.2.8-1 below compares the secondary waste estimates for the Offgas functional area of recycling by waste classification. Tables 3.2.8-2 through 3.2.8-4 compare the secondary waste estimates for the Offgas functional area by waste type. Observations are provided after the tables.

Table 3.2.8-1 Offgas - Summary of Secondary Waste Estimates by Waste Classification

		Of	fgas - Sum	mary of Seconda	ary Waste E	stimates by	y Waste Cla	ssification			
			UNF1				UNF2	UNF4 (Blended UNF)			
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy Solutions	UFD/EAS	UFD 2012	AREVA	Energy <i>Solutions</i>	UFD	AREVA	Energy Solutions
Class A		10.97				10.97					
Class B		0.00				0.00					
Class C		0.68				0.68					
Class A/B/C	11.0	11.6			11.0	11.6			11.0		
GTCC	0.3	0.0			0.3	0.0			0.3		
Mixed Class A/B/C	0.5	0.5			0.5	0.5			0.5		
Mixed GTCC		0.0				0.0					
Total All Wastes	11.8	12.1			11.8	12.1			11.8		

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.8-2 Offgas - Summary of Secondary Waste Estimates by Waste Type for UNF1

Offgas - Su	mmary of Seconda	ry Waste	Estima	tes by Waste	Type for UN	IF1	
Waste Type	UFC	D/EAS			AREVA	Energy <i>Solutions</i>	
Other Class A/B/C Secondary Waste	Job Control Maintenance	8.4	11.0	Class A Class C	0.0	0.0	
Other GTCC Secondary Waste	Job Control Maintenance	0.0	0.3		0.01	0.0	
Other Mixed Class A/B/C Secondary Waste	Job Control Maintenance	0.0	0.5			0.0	See Balance of Plant
Other Mixed GTCC Secondary Waste	Job Control Maintenance	0.0	0.0			0.0	
Total		•	11.8			0.0	

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.8-3 Offgas - Summary of Secondary Waste Estimates by Waste Type for UNF2

Offgas - Su	mmary of Seconda	ry Waste	e Estima	tes by Waste	Type for UI	IF2			
Waste Type	UFI	D/EAS			AREVA	Energy <i>Solutions</i>			
Other Class A/B/C Secondary Waste	Job Control Maintenance	8.4 2.6	11.0	Class A Class C	0.0	0.0			
Other GTCC Secondary Waste	Job Control	0.0	0.3						
Other Gree Secondary Waste	Maintenance	0.3	0.3			0.0	See Balance of Plant		
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	0.5				See Balance Of Flant		
Other winker class Ay by C Secondary Waste	Maintenance	0.5	0.5	0.0					
Other Mixed CTCC Secondary Wests	Job Control	0.0	0.0						
Other Mixed GTCC Secondary Waste	Maintenance	0.0	0.0	0.0					
Total			11.8			0.0			

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Offgas - Summary of Secondary Waste Estimates by Waste Type for UNF4 (Blended UNF) UFD/EAS AREVA **Waste Type Energy** Solutions Job Control 8.4 Class A 0.0 Other Class A/B/C Secondary Waste 11.0 0.0 Maintenance 2.6 Class C Job Control 0.0 Other GTCC Secondary Waste 0.3 0.3 Maintenance 0.0 See Balance of Plant 0.0 Job Control Other Mixed Class A/B/C Secondary Waste 0.5 Maintenance 0.5 0.0 Job Control 0.0 Other Mixed GTCC Secondary Waste 0.0 Maintenance 0.0 0.0

Table 3.2.8-4 Offgas - Summary of Secondary Waste Estimates by Waste Type for UNF4

11.8

0.0

Observations

Total

- AREVA does not identify any job control or maintenance waste for the Offgas functional area.
- A comparison of job control and maintenance waste to EnergySolutions is not possible since Energy Solutions includes all job control and maintenance waste (i.e "ad hoc" waste in EnergySolutions terminology) from the Offgas functional area in the Balance of Plant functional area.
- The volume of job control and maintenance wastes identified in the UFD waste estimates is minor relative to other functional areas.
- Only the UFD/EAS and UFD 2012 waste estimates identify any Mixed Class A/B/C waste.

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

3.2.9 Balance of Plant

The Balance of Plant functional area includes operations that support the main process operations such as analytical laboratories, waste handling, maintenance shops and other facility infrastructure services.

Basic process operations assumed by AREVA, Energy Solutions and UFD are essentially the same. Where possible, compaction is used to reduce the volume of wastes processed through the waste handling facilities. Filtration of facility ventilation air is accomplished with HEPA filters prior to discharge to the atmosphere. The UFD waste estimates probably incorporate a greater number of radiologically controlled maintenance shops due to the operating approach inherent in the UFD waste estimates (i.e. remote operation and maintenance of mechanical process equipment in a canyon-like environment versus a dark cell approach to equipment operation and maintenance).

Table 3.2.9-1 below compares the secondary waste estimates for the Balance of Plant functional area of recycling by waste classification. Tables 3.2.9-2 through 3.2.9-4 compare the secondary waste estimates for the Balance of Plant functional area by waste type. Observations are provided after the tables.

Table 3.2.9-1 Balance of Plant - Summary of Secondary Waste Estimates by Waste Classification

		Balance	e of Plant -	Summary of Sec	ondary Wa	aste Estimat	tes by Was	te Classification			
	UNF1						UNF2	UNF4 (Blended UNF)			
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy <i>Solutions</i>	UFD/EAS	UFD 2012	AREVA	Energy <i>Solutions</i>	UFD/EAS	AREVA	Energy <i>Solutions</i>
Class A		2,436.45	11.9	406.0		2,912.93	11.9	406.0		11.9	406.0
Class B		17.00				0.00					
Class C		625.39	2.2	0.8		173.64	2.2	0.8		3.1	0.8
Class A/B/C	3317.0	3078.8	14.1	406.8	3317.0	3086.6	14.1	406.8	3317.0	15.0	406.8
GTCC	6.4	394.3		8.4	6.4	266.3		8.4	6.4		8.4
Mixed Class A/B/C	13.8	11.7			13.8	11.7			13.8		
Mixed GTCC		0.0				0.0					
Total All Wastes	3337.2	3484.9	14.1	415.2	3337.2	3364.6	14.1	415.2	3337.2	15.0	415.2

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of $800 \ \mathrm{MT}$ used fuel.

Table 3.2.9-2 Balance of Plant - Summary of Secondary Waste Estimates by Waste Type for UNF1

Balance of Plant	t - Summary of Se	condary	Waste Es	timates by W	aste Type	for UNI	1				
Waste Type	UF	UFD/EAS AREVA							Energy <i>Solutions</i>		
Packaging waste (low activity)			33.9								
Packaging waste (high activity)			6.4			d in the her	assumed to totals for	aste strean be include Balance of condary W	d in the Plant		
Other Class A/B/C Secondary Waste	Job Control Maintenance	1923.6 1359.6	3283.2	Class A Class C	11.9 2.2	14.1	Class A Class C	406.0 0.8	406.8		
Other CTCC Secondary Wests	Job Control	0.0	0.0		l				0.4		
Other GTCC Secondary Waste	Maintenance	0.0	0.0			0.0			8.4		
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	13.8	,					0		
Other wined class Ay by C Secondary waste	Maintenance	13.8	15.0			0.0			U		
Other Mixed GTCC Secondary Waste	Job Control Maintenance	0.0	0.0	0.0					0		
Total			3337.2			14.1			415.2		

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.9-3 Balance of Plant - Summary of Secondary Waste Estimates by Waste Type for UNF2

Balance of Plant - S	ummary of Se	condary	Waste Es	timates by W	aste Type	for UNF	2		
Waste Type	UI	-D/EAS		£.	AREVA		Energy <i>Solutions</i>		
Packaging waste (low activity)	33.9								
Packaging waste (high activity)			6.4	assumed to totals be		d in the her	assumed to totals for	aste stream be included Balance of condary Wa	d in the Plant
Other Class A/B/C Secondary Waste	Job Control	1923.6	3283.2	Class A	11.9	14.1	Class A	406.0	406.8
Other Class A/B/C Secondary Waste	Maintenance	1359.6	3203.2	Class C	2.2	14.1	Class C	0.8	400.8
Other GTCC Secondary Waste	Job Control	0.0	0.0						8.4
Other GTCC Secondary Waste	Maintenance	0.0	0.0			0.0			0.4
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	13.8						0
Other Mixed Class A/B/C Secondary Waste	Maintenance	13.8	15.0	0.0					U
Other Mixed CTCC Secondary Waste	Job Control	0.0	0.0						0
Other Mixed GTCC Secondary Waste	Maintenance	0.0	0.0	0.0					U
Total			3337.2			14.1			415.2

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Balance of Plant - Summary of Secondary Waste Estimates by Waste Type for UNF4 (Blended UNF) UFD/EAS ARFVA **Energy** Solutions **Waste Type** Packaging waste (low activity) 33.9 Packaging waste (high activity) 6.4 Similar waste streams are Similar waste streams are assumed to be included in the assumed to be included in the totals below for Other totals for Balance of Plant Secondary Waste Other Secondary Waste 406.0 Job Control 1923.6 Class A Class A 3283.2 15.0 406.8 Other Class A/B/C Secondary Waste Maintenance 1359.6 Class C Class C 0.8 Job Control 0.0 Other GTCC Secondary Waste 0.0 Maintenance 0.0 Job Control 0.0 13.8 0 Other Mixed Class A/B/C Secondary Waste Maintenance 13.8 0.0 Job Control 0.0 Other Mixed GTCC Secondary Waste 0.0 Maintenance 0.0 0.0 3337.2

Table 3.2.9-4 Balance of Plant - Summary of Secondary Waste Estimates by Waste Type for UNF4

- The volume of waste identified by the UFD/EAS and UFD 2012 waste estimates far exceeds the volume identified by AREVA. The volume of waste identified by the UFD waste estimates even exceeds the volume identified by EnergySolutions even though the EnergySolutions waste estimate is a rollup of job control and maintenance waste from all other functional areas. The majority of the difference, over 3,000 m³ of job control and maintenance waste, is comprised of job control waste from radiologically controlled maintenance shops and filters from facility ventilation systems. A likely explanation for the difference in job control waste may be the operating and facility design approach inherent in the UFD waste estimates, i.e. remote operation and maintenance of mechanical process equipment in a canyon-like environment versus a dark cell approach to equipment operation and maintenance. This same operating and facility design approach could also account for some of the difference in facility ventilation filter waste; however, it doesn't seem likely that such a large difference could be expected from the two different approaches. Without actually knowing whether AREVA and Energy Solutions included facility ventilation filter waste and knowing the assumptions pertaining to the generation of filter waste (e.g. facility air flow, filter operational life, filter configuration, etc.), it is impossible to compare the waste estimates.
- The volume of waste associated with job control waste from radiologically controlled maintenance shops and facility ventilation filters (over 3,000 m³ see above) accounts for the majority of the difference between the UFD total waste estimates and the AREVA and Energy*Solutions* total waste estimates (see Section 3.2.10).
- A comparison of job control and maintenance waste to Energy *Solutions* is not possible since Energy *Solutions* includes all job control and maintenance waste (i.e "ad hoc" waste in Energy *Solutions* terminology) from all other functional areas in the Balance of Plant functional area. A comparison of job control and maintenance waste to the Energy *Solutions* waste estimates can only be compared on a total basis, see Section 3.2.10.
- Only the UFD/EAS and UFD 2012 waste estimates identify any Mixed Class A/B/C waste.

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

3.2.10 Summary of Secondary Wastes from Recycling

Table 3.2.10-1 below compares the total secondary waste estimates for recycling by waste classification similar to the first table in Sections 3.2.1 through 3.2.9. Table 3.2.10-2 compares the total secondary waste estimates for recycling by functional area. Tables 3.2.10-3 through 3.2.10-5 compare the total secondary waste estimates for recycling by waste type similar to the tables in Sections 3.2.1 through 3.2.9. Observations are provided after the tables.

Table 3.2.10-1 Overall Summary of Secondary Waste Estimates from Recycling by Waste Classification

	Overall Summary of Secondary Waste Estimates from Recycling by Waste Classification												
			UNF1				UNF2	UNF4 (Blended UNF)					
Waste Classification	UFD/EAS	UFD 2012	AREVA	Energy Solutions	UFD/EAS	UFD 2012	AREVA	Energy Solutions	UFD/EAS	AREVA	Energy Solutions		
Class A		3091.0	2779.4	2371.7		3673.0	3439.4	3243.7		2779.4	2372.2		
Class B		1385.7	0.0	0.0		1273.0	0.0	0.0		0.0	0.0		
Class C		1156.7	95.2	1713.3		741.5	95.2	1713.3		136.1	1696.2		
Class A/B/C	6068.3	5633.5	2874.6	4085.0	6668.3	5687.5	3534.6	4957.0	6068.3	2915.5	4068.4		
GTCC	259.1	832.1	69.5	18.2	259.1	1232.7	69.5	18.2	259.1	86.5	18.2		
Mixed Class A/B/C	27.9	61.1	0.0	0.0	27.9	61.1	0.0	0.0	27.9	0.0	0.0		
Mixed GTCC	44.8	0.1	0.0	0.0	44.8	0.1	0.0	0.0	44.8	0.0	0.0		
Total All Wastes	6400.1	6526.8	2944.0	4103.2	7000.1	6981.4	3604.0	4975.2	6400.1	3002.0	4086.6		

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.10-2 Overall Summary of Secondary Waste Estimates from Recycling by Functional Area

			Overall Sur	nmary of Second	ary Waste	Estimates b	y Function	al Area			
			UNF1				UNF2	UNF4 (Blended UNF)			
Functional Area	UFD/EAS	UFD 2012	AREVA	Energy Solutions	UFD/EAS	UFD 2012	AREVA	Energy Solutions	UFD/EAS	AREVA	Energy Solutions
Receipt and Storage	277.5	231.6	107.9		877.5	831.0	767.9	872.0	277.5	107.9	
Head End	164.0	216.7	136.7	2.8	164.0	218.7	136.7	2.8	164.0	142.4	2.8
Separations	573.9	633.4	93.4	85.6	573.9	621.5	93.4	85.6	573.9	98.3	86.1
Solidification	442.4	283.2	133.9		442.4	283.2	133.9		442.4	177.8	
Acid Recovery	56.6	67.8	1060.4		56.6	67.8	1060.4		56.6	1060.4	
Liquid Effluent Processing	1271.8	1276.1	1294.9	3589.8	1271.8	1276.1	1294.9	3589.8	1271.8	1294.9	3572.7
Vitrification	264.9	320.9	102.7	9.8	264.9	306.4	102.7	9.8	264.9	105.2	9.8
Offgas	11.8	12.1			11.8	12.1			11.8		
Balance of Plant	3337.2	3484.9	14.1	415.2	3337.2	3364.6	14.1	415.2	3337.2	15.0	415.2
Total	6400.1	6526.8	2944.0	4103.2	7000.1	6981.4	3604.0	4975.2	6400.1	3002.0	4086.6

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

Table 3.2.10-3 Overall Summary of Secondary Waste Estimates from Recycling by Waste Type for UNF1 $\,$

Overall Summary of Seco	ondary Waste	Estimate	s from R	ecycling by V	Vaste Type	e for UN	F1				
Waste Type	UF	D/EAS			AREVA		Energy Solutions				
Used Multi-Purpose Canisters (MPCs)			0.0			0.0			0.0		
Machining chips from MPCs			0.1								
Fuel cask and canister decontamination wipes			36.0								
Fuel cask and canister decontamination filters			14.1								
Filtered solids			6.3								
Pool sludge			18.6								
Dewatered resin			12.8			7.2					
Solvent residue						12.0			85.6		
Inner containers (bagless transfer stub pieces)			0.6								
Inner containers (bagless transfer stub pieces)			9.8								
Outer containers			0.01								
Inner containers (including convenience cans)			0.04								
Excess nitrates						1060.4					
Solidified waste water			1200.0								
Salt-bearing waste						1232.0			1709.7		
Spent Ion Exchange Resins (including from Fuel Receipt)									1880.1		
Packaging waste (low activity)			33.9								
Packaging waste (high activity)			6.4								
Subtotal			1338.5			2311.6			3675.4		
Other Class A/B/C Secondary Waste	Job Control	2866.8	4746.0	Class A	467.8	563.0	Class A	406.0	409.6		
Other Class A/B/C Secondary Waste	Maintenance	1879.1	4740.0	Class C	95.2	303.0	Class C	3.6	409.6		
Other GTCC Secondary Waste	Job Control	224.7	242.9			69.5		10:			
Other GTCC Secondary waste	Maintenance	18.2	242.9			09.5	18.2				
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	27.9			0.0		0.0			
Other Mixed Class Ay By C Secondary Waste	Maintenance	27.9	27.5			0.0			0.0		
Other Mixed GTCC Secondary Waste	Job Control	44.8			0.0		0.0				
Other Mixed GTCC Secondary Waste	Maintenance	Maintenance 44.8				0.0	0.				
Total			6400.1			2944.0			4103.2		

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

 ${\it Table~3.2.10-4~Overall~Summary~of~Secondary~Waste~Estimates~from~Recycling~by~Waste~Type~for~UNF2}$

Overall Summary of Seco			S IIOIII K			TOT UN				
Waste Type	UF	D/EAS			AREVA			ergySolutions		
Used Multi-Purpose Canisters (MPCs)			600.0			660.0			872.0	
Machining chips from MPCs			0.1							
Fuel cask and canister decontamination wipes			36.0							
Fuel cask and canister decontamination filters			14.1							
Filtered solids			6.3							
Pool sludge			18.6							
Dewatered resin			12.8			7.2				
Solvent residue						12.0			85.6	
Inner containers (bagless transfer stub pieces)			0.6							
Inner containers (bagless transfer stub pieces)			9.8							
Outer containers			0.01							
Inner containers (including convenience cans)			0.04							
Excess nitrates						1060.4				
Solidified waste water			1200.0							
Salt-bearing waste						1232.0			1709.7	
Spent Ion Exchange Resins (including from Fuel Receipt)									1880.1	
Packaging waste (low activity)			33.9							
Packaging waste (high activity)			6.4							
Subtotal			1938.5			2971.6			4547.4	
	Job Control	2866.8	.=	Class A	467.8		Class A	406.0		
Other Class A/B/C Secondary Waste	Maintenance	1879.1	4746.0	Class C	95.2	563.0	Class C	3.6	409.6	
OIL OTOO S I W I	Job Control	224.7	242.0		•	60.5			40.3	
Other GTCC Secondary Waste	Maintenance	18.2	242.9			69.5			18.2	
	Job Control	0.0								
Other Mixed Class A/B/C Secondary Waste	Maintenance	27.9	27.9			0.0			0.0	
	Job Control 0.0 Maintenance 44.8									
Other Mixed GTCC Secondary Waste			44.8	0.0			0.0			
Total			7000.1			3604.0			4975.2	

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

June 30, 2013

Table 3.2.10-5 Overall Summary of Secondary Waste Estimates from Recycling by Waste Type for UNF4

Overall Summary of Secondary			Recycling		,,	F4 (Bien					
Waste Type	UF	D/EAS			AREVA		Energy				
Used Multi-Purpose Canisters (MPCs)			0.0			0.0			0.0		
Machining chips from MPCs			0.1								
Fuel cask and canister decontamination wipes			36.0								
Fuel cask and canister decontamination filters			14.1								
Filtered solids			6.3								
Pool sludge			18.6								
Dewatered resin			12.8			7.2					
Solvent residue						12.0			86.1		
Inner containers (bagless transfer stub pieces)			0.6								
Inner containers (bagless transfer stub pieces)			9.8								
Outer containers			0.01								
Inner containers (including convenience cans)			0.04								
Excess nitrates						1060.4					
Solidified waste water			1200.0								
Salt-bearing waste						1232.0			1692.6		
Spent Ion Exchange Resins (including from Fuel Receipt)									1880.1		
Packaging waste (low activity)			33.9								
Packaging waste (high activity)			6.4								
Subtotal			1338.5			2311.6			3658.8		
Other Class A/B/C Secondary Waste	Job Control	2866.8	4746.0	Class A	467.8	603.9	Class A	406.0	409.6		
Other Class A/B/C Secondary Waste	Maintenance	1879.1	4740.0	Class C	136.1	603.9	Class C	3.6	409.6		
Other GTCC Secondary Waste	Job Control	224.7	242.9			86.46	·		18.2		
Other GTCC Secondary waste	Maintenance	18.2	242.9			80.40			10.2		
Other Mixed Class A/B/C Secondary Waste	Job Control	0.0	27.9			0.0		0.0			
Other Mixed Class A/B/C Secondary Waste	Maintenance	27.9	27.9			0.0			0.0		
Other Mixed CTCC Coorden, Weste	Job Control 0.0					0.0					
Other Mixed GTCC Secondary Waste	Maintenance	44.8	44.8			0.0		0.0			
Total			6400.1			3002.0	408				

^{1.} All volumes shown represent final packaged waste volumes in cubic meters for a recycling facility with an annual capacity of 800 MT used fuel.

- Specific observations are provided in Sections 3.2.1 through 3.2.9.
- The volume of waste associated with job control waste from radiologically controlled maintenance shops and facility ventilation filters (over 3,000 m³) accounts for the majority of the difference between the UFD total waste estimates and the AREVA and EnergySolutions total waste estimates (see Section 3.2.9).
- Excluding the waste volume associated with job control waste from radiologically controlled maintenance shops and facility ventilation filters from the UFD waste estimates (see prior observation), the "Other Class A/B/C Secondary Waste" volumes plus the specific waste streams listed are in close agreement.
- "Other GTCC Secondary Waste" volumes vary by an order of magnitude with the UFD waste estimate the highest, the Energy Solutions estimate the lowest and AREVA in between.
- Only the UFD/EAS and UFD 2012 waste estimates identify any Mixed Class A/B/C or Mixed GTCC waste.

3.2.11 MOX Fuel Fabrication

The MOX Fuel Fabrication functional area produces mixed oxide (MOX) fuel assemblies from the products of the recycling facility.

Basic process operations assumed by AREVA, EnergySolutions and UFD are essentially the same. The process blends the U/Pu oxide product from recycling with additional uranium oxide to produce MOX fuel pellets. The pellets are then loaded into fuel rods and assembled into a MOX fuel assembly. The AREVA waste estimates are based on operating experience at the MELOX plant. The EnergySolutions waste estimate is based on the Sellafield plant. The UFD waste estimate is based on the waste balance data for the MOX Fuel Fabrication Facility (MFFF) under construction at the Savannah River Site. The MFFF waste balance data is itself based on the MELOX plant but adjusted for the unique operating, design and regulatory requirements of the MFFF.

Table 3.2.11-1 below compares the secondary waste estimates for the MOX Fuel Fabrication functional area by waste classification. Observations are provided after the tables.

MOX Fuel Fabrication - Summary of Secondary Waste Estimates by Waste Classification											
Waste Classification	UFD	AREVA	Energy <i>Solutions</i>								
Class A		99.0	130.0								
Class B											
Class C											
Class A/B/C	510.0	99.0	130.0								
бтсс	2229.1	237.8	23.7								
Mixed Class A/B/C											
Mixed GTCC											
Total All Wastes	2739.1	435.8	283.7								

- 1. All volumes shown represent final packaged waste volumes in cubic meters for MOX fuel fabrication facilities with the following capacities:
 - AREVA 9.3 MT Pu/year, 77.8 MT U/year
 - Energy Solutions 100 MTHM/year
 - UFD 5.25 MT Pu/year

Observations

- Credible estimates of GTCC waste appears to be problematic. AREVA's estimate of GTCC waste
 is an order of magnitude higher than EnergySolutions' estimate of GTCC waste. The UFD
 estimate of GTCC waste is even an order of magnitude higher than AREVA's estimate of GTCC
 waste.
- An explanation for the order of magnitude difference in the AREVA and EnergySolutions estimates of GTCC waste is unclear. Both estimates are based on operating experience; however, the Sellafield plant never operated at its design capacity. Nevertheless, EnergySolutions used actual waste data from Sellafield from the period which Sellafield operated. EnergySolutions stated during the review of their estimates that no adjustments were made to the actual waste volumes to account for the less than full capacity of the plant during the period of operation. Instead, EnergySolutions stated that the Sellafield plant operated with a significant amount of recycle (above design rates) during that time and that they felt that the volume of waste generated from plant operations during the time of high recycle bounded the volume of waste that could be expected from a plant operating at design capacity with normal recycle rates. This assumption by EnergySolutions appears to be reasonable for Class A/B/C waste since there is relatively close agreement with AREVA; however, the order of magnitude difference in GTCC waste (relative to AREVA) raises doubts about the validity of this assumption for GTCC waste.
- The order of magnitude difference between the AREVA and UFD estimates of GTCC waste and the significant difference in Class A/B/C waste are probably due to a variety of reasons including:
 - The MFFF waste balance data reflects MELOX's experience approximately 15 years ago. The AREVA waste estimates are based on the most recent data from the MELOX plant. The AREVA data reflects improvements to the fuel fabrication processes which have resulted in significant reductions to the quantities of LLW produced since the MFFF waste balance report was produced.
 - AREVA's estimate does not reflect the use of disposable containers (e.g. DOE Standard 3013 containers) for transferring product material from the recycling facility to the fuel fabrication facility as currently practiced for La Hague and MELOX. AREVA assumes that the recycling facility and the fuel fabrication facility are co-located and that reusable containers can be used for product transfer. The MFFF waste data, and hence the UFD waste estimates, include convenience cans, inner cans, and outer cans associated with receipt of the PuO₂ product.
 - The MFFF does not employ significant, if any, compaction of secondary wastes. This
 ensures the WIPP-WAC are not exceeded; therefore, a larger volume of secondary waste
 streams can be expected.
 - The secondary waste from the MFFF laboratories, which are for both the aqueous polishing and the fuel fabrication processes, will be performing a proportionally (relative to throughput) larger number of analyses than performed at MELOX (due to feedstock verification, inclusion of aqueous polishing sampling activities, material control and accountability (MC&A), etc.); hence, a larger volume and mass of secondary wastes can be attributed to the MFFF laboratories relative to the MELOX laboratories.

Note: The MFFF includes an aqueous polishing process that is not relevant to the UFD MOX fuel fabrication waste estimate. The UFD waste estimate deleted waste streams specifically associated with aqueous polishing; however, adjustments were not made to the analytical laboratory waste streams to account for the deletion of aqueous polishing.

- The MELOX facility is designed with a filter recovery glovebox to reduce the material loading in filters prior to disposal. The design of the MFFF deleted this capability; therefore, filter waste from the MFFF can have a significant quantity of Pu contamination present. The amount of Pu present can significantly affect the final volume of packaged GTCC waste due to the need to meet waste acceptance criteria at the disposal site. In the absence of a commercial GTCC waste disposal facility in the United States, the UFD waste estimate assumes that the Waste Acceptance Criteria for the Waste Isolation Pilot Plant (WIPP-WAC) is relevant to GTCC waste. The WIPP-WAC establishes acceptance criteria that waste packages must meet to be disposed at WIPP. Some of these criteria limit the amount of Pu that can be contained in each waste package. The UFD waste estimate considered both fissile gram equivalent (FGE) and plutonium equivalent Curie (PE-Ci) limits in determining the quantity of waste packages. The UFD waste estimate determined that FGE limits would not increase the volume of packaged GTCC waste; however, the PE-Ci limits could significantly impact the final packaged volume. This is especially true for Pu recovered from commercial reactor used fuel which is significantly more active than the weapons grade Pu that the MFFF is designed to process. The activity of Pu recovered from commercial used fuel is dependent on fuel burnup (and cooling time) and readily challenges the PE-Ci limits for any heavily contaminated waste stream, especially waste items such as filters with a heavy material loading.
- The MFFF waste data conservatively assumes each glovebox will require filter change outs and fails to credit gloveboxes which are connected to one another and share filters, thereby, reducing the actual number of filters requiring disposal. In addition, the MFFF secondary waste stream estimate includes the gloveboxes in the aqueous process units in this total count of gloveboxes; hence, this conservative assumption results in additional (volume and mass) secondary wastes relative to the MELOX plant.
- The MFFF waste data includes spent cartridge filters from the aqueous polishing process which is not included in the secondary wastes from the MELOX plant. These cartridge filters were deleted from the UFD waste estimates.
- The MELOX plant uses waste drums approximately 30 gallons in size for GTCC waste disposal. The MFFF waste data converts the quantity of 30 gallon drums to equivalent 55-gallon drums. Since the drums are usually not completely filled, a larger volume of secondary waste can be expected with the larger air gaps potentially found in the 55 gallon drums. The final waste volumes reflected in the MFFF waste data do reflect a slightly larger value than would be obtained by simply multiplying the reference MELOX drum quantity by drum volume (i.e. 30 gallons).
- If a simple proportional increase in the MFFF waste stream volumes/masses relative to capacity is utilized to scale up the MFFF to a commercial size reprocessing facility, then an overestimation of the size of the secondary waste streams for a MOX fuel fabrication facility may occur because many of the values are not proportional and the MFFF is oversized for its given Pu input capacity (e.g. it is difficult to proportionally downsize the fuel fabrication process). For instance, there is not a proportional increase in the number of spent filters because there is not a proportional increase in the number of gloveboxes for a larger facility as the core gloveboxes (e.g., primary dosing, secondary dosing, grinding, etc.) are required for any fuel fabrication facility. The change in filters is likely a step factor after a certain throughput increase as opposed to a proportional increase (i.e., by adding another fuel fabrication line).

Note: The UFD waste estimate provides an estimate of waste from facility capacities other than the design capacity of the MFFF. The waste volumes were not scaled up directly proportional to capacity. A step wise approach was used for some waste streams to derive the waste volumes for other plant capacities; however, the exact approach that AREVA would recommend was probably not taken. Although some waste streams were scaled proportionally to capacity, the scaling philosophy advocated by AREVA was considered in producing the UFD waste estimates. The UFD waste estimates did not extrapolate waste volume estimates for facility capacities greater than ±50% from the nominal MFFF plant capacity. Extrapolation beyond this range was not deemed appropriate.

3.2.12 Fast Reactor Fuel Fabrication

The Fast Reactor Fuel Fabrication functional area produces fuel assemblies from the products of UNF4 recycling.

Basic process operations assumed by AREVA and EnergySolutions are essentially the same. The processes produce oxide fuel pellets loaded into fuel rods and assembled into fuel assemblies similar to the MOX fuel fabrication process. The AREVA waste estimates are based on the Cobroyage Cadarache (COCA) process. The EnergySolutions waste estimate is based on the fuel fabrication process that was developed in the U.S. during the 1980s and 1990s for supporting the needs of the Fast Reactor Development Program. Fast reactor fuel fabrication waste estimates have not been developed by the UFD Campaign.

Table 3.2.12-1 below compares the secondary waste estimates for the Fast Reactor Fuel Fabrication functional area by waste classification. Observations are provided after the tables.

Table 3.2.12-1 Fast Reactor Fuel Fabrication - Summary of Secondary Waste Estimates by Waste Classification

Fast Reactor Fuel Fabrication - Sumn	nary of Secondary Waste Estimate	es by Waste Classification
Waste Classification	AREVA	Energy <i>Solutions</i>
Class A	70.4	66.0
Class B		
Class C		
Class A/B/C	70.4	66.0
GTCC	132.9	4.4
Mixed Class A/B/C		
Mixed GTCC		4.7
Total All Wastes	203.3	75.2

- 1. All volumes shown represent final packaged waste volumes in cubic meters for fast reactor fuel fabrication facilities with the following capacities:
 - AREVA 7.0 MT Pu/year, 21.0 MT U/year
 - EnergySolutions 40 MTHM/year

- The Class A low level waste estimates for AREVA and Energy *Solutions* are in very close agreement.
- As with MOX Fuel Fabrication, there is a significant difference (two orders of magnitude difference) in GTCC waste volume estimates for AREVA and Energy *Solutions*. The reason for this difference is unclear.
- EnergySolutions designated operational waste streams from Process Enclosures (i.e. Gloves and Transfer Bags and Decontamination Wipes and Smears) as Mixed GTCC waste in Table 4-13 of their final report. These waste streams appear to be included in the GTCC total shown in Table 5-8 of the EnergySolutions final report. The Mixed GTCC waste streams are shown separately in Table 3.2.12-1 above.
- EnergySolutions designated the waste streams from Pin Welding, Auto Sampling, Auto Sending and Fuel Assembly as LLW (i.e. Class A, B or C) in Table 4-13 of their final report. It appears that EnergySolutions included these waste streams in their GTCC total presented in Table 5-8 of their final report. These waste streams are designated as GTCC waste in Table 3.2.12-1 above. The total waste volume for these waste streams is relatively low and would not have a significant impact regardless of the waste classification.

4. References

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Appendix A
Receipt and Storage Functional Area
Detailed Waste Comparison

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					Receipt an	d Storage - De	tailed Summan	of Secondary	Waste Estimat	tes for UNF1												
	UFD/EAS							tailed Summary of Secondary Waste Estimates for UNF1 AREVA							Energy Solutions Energy Solutions							
	As Generated Volume		,	Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume		3,	Container	Packaged Volume	Waste				
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification				
Operational Waste			<u> </u>									·						<u> </u>				
Used Multi-Purpose Canisters (MPCs)			Not Applicab	le to UNF1					Not Applica	able to UNF1					Not Applica	ble to UNF1						
Machining chips from MPCs	0.3	Compaction	LLW box	0.03		Class A/B/C			Similar wast	e streams are			Similar waste streams are									
Fuel cask and canister decontamination wipes Fuel cask and canister decontamination filters	144.0 9.0	Compaction None	LLW box HIC	14.4 56.3		Class A/B/C Class A/B/C	_		assumed to be						assumed to be							
Filtered solids	9.0 4.0	None	HIC	25.0	6.3		1			w for Other					totals for Bal							
Pool sludge	11.9	None	HIC	74.4	18.6		1		Seconda	ry Waste					Other Secon	ndary Waste						
Dewatered resin	8.2	None	HIC	51.3	12.8	Class A/B/C	3.1	Cementation	55 gallon drum	31	7.2	Class A	Resins	are included in	"Spent Ion Exchai	nge Resins" in Li	quid Effluent Pro	ocessing				
Operational Waste Subtotal Class A							3.1				7.2											
Operational Waste Subtotal Class B							0				0											
Operational Waste Subtotal Class C							0				0											
Operational Waste Subtotal Class A/B/C	177.4				87.8		3.1				7.2	!										
Operational Waste Subtotal GTCC	0.0				0.0		0				0											
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0											
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0											
<u>Job Control Waste</u>																						
Gloves	122.6	Compaction	LLW box	12.3		Class A/B/C																
Shoe covers Laundered protective clothing	122.6 10.3	Compaction Compaction	LLW box	12.3 1.0	30.7 2.6	Class A/B/C Class A/B/C				e streams are					Similar waste							
Step-off pads	2.6	Compaction	LLW box	0.3	0.7	Class A/B/C	1		assumed to be						assumed to be							
Disposable protective clothing	172.8	Compaction	LLW box	17.3	43.2	Class A/B/C			totals belo						totals for Bal							
Plastic suits	247.7	Compaction	LLW box	24.8	61.9	Class A/B/C			Seconda	ry Waste					Otner Secon	ndary Waste						
Containment hut material	14.4	Compaction	LLW box	1.4	3.6	Class A/B/C				1								1				
Job Control Waste Subtotal Class A																						
Job Control Waste Subtotal Class B																						
Job Control Waste Subtotal Class C																						
Job Control Waste Subtotal Class A/B/C	693.0				173.3																	
Job Control Waste Subtotal GTCC	0.0				0.0																	
Job Control Waste Subtotal Mixed Class A/B/C					0.0																	
Job Control Waste Subtotal Mixed GTCC	0.0				0.0																	
<u>Maintenance Waste</u>																						
Failed instruments and electronic equipment Filter cartridges	0.3 8.0	None None	55 gallon drum HIC	1.8 50.0	0.4 12.5	Mixed A/B/C Class A/B/C	4		Similar waste assumed to be	e streams are				Similar waste streams are assumed to be included in the totals								
Ultraviolet lights	4.5	Compaction	LLW box	0.5	12.5		1			w for Other					alance of Plant O							
Failed piping and valves	10.0	Compaction	LLW box	1.0	2.5					ry Waste						•						
Maintenance Waste Subtotal Class A																						
Maintenance Waste Subtotal Class B																						
Maintenance Waste Subtotal Class C																						
Maintenance Waste Subtotal Class A/B/C					16.1																	
Maintenance Waste Subtotal GTCC	0.0				0.0																	
Maintenance Waste Subtotal Mixed Class A/B/C	0.3				0.4																	
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0																	
Other Secondary Waste									1	1												
Compactable Class A							148.1		4 m3 box	20.6			4									
Non-compactable Class A Compactable Class C							4.0 5.1	None Compacted	4 m3 box 4 m3 box	1.0			-									
Non-compactable Class C							0.5		4 m3 box	0.3			1		See Balan	ce of Plant						
GTCC-NT (non-TRU)							0.0			5.5	2.5											
Non-compactable GTCC-T (TRU)							0.0															
Compactable GTCC-T (TRU)							0.0															
Other Secondary Waste Subtotal Class A							152.1				95.0											
Other Secondary Waste Subtotal Class B							0.0				0.0											
Other Secondary Waste Subtotal Class C							5.6				5.7											
Other Secondary Waste Subtotal Class A/B/C							157.7				100.7											
Other Secondary Waste Subtotal GTCC							0.0				0.0											
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0											
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0											
Total Class A							155.2				102.2		0.0				0.0					
Total Class B							0.0				0.0		0.0				0.0					
							5.6				5.7		0.0				0.0					
Total Class C							1000				107.9		0.0)]			0.0					
Total Class A/B/C	892.9				277.2		160.8															
Total Class A/B/C Total GTCC	0.0				0.0		0.0				0.0		0.0)			0.0					
Total Class A/B/C))				

					Receipt and	d Storage - De	tailed Summary	of Secondary	Waste Estimat	es for UNF2									
			UFD/E	EAS	neceiptun	a ottorage De		y or secondary	ARI			EnergySolutions							
	As		2.2/-				As						As			-			
	Generated				Packaged		Generated				Packaged		Generated				Packaged		
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	
Operational Waste																			
Used Multi-Purpose Canisters (MPCs)	480	None	LLW Engineered	Unknown		Class A/B/C	575	None	4 m3 box	150	660	Class A	872	None	Direct	80	872	Class A	
Machining chips from MPCs	0.3	Compaction	LLW box	0.03	0.1	Class A/B/C			Similar wast	e streams are					Similar wast	e streams are			
Fuel cask and canister decontamination wipes Fuel cask and canister decontamination filters	144.0 9.0	Compaction None	LLW box HIC	14.4 56.3	14.1	Class A/B/C Class A/B/C			assumed to be	included in the					assumed to be	included in the			
Filtered solids	4.0	None	HIC	25.0	6.3	Class A/B/C	1		totals belo						totals for Bal				
Pool sludge	11.9	None	HIC	74.4	18.6	Class A/B/C			Seconda	ry Waste					Other Secon	ndary Waste			
Dewatered resin	8.2	None	HIC	51.3	12.8	Class A/B/C		Cementation	55 gallon drum	31		Class A			"Spent Ion Exchai	nge Resins" in Li			
Operational Waste Subtotal Class A							578.1				667.2		872	2			872	2	
Operational Waste Subtotal Class B							0				0		C)			0)	
Operational Waste Subtotal Class C							0				0		C)			0		
Operational Waste Subtotal Class A/B/C	657.4				687.8		578.1				667.2		872	2			872	2	
Operational Waste Subtotal GTCC	0.0				0.0		0				0		C	9			0		
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0		C)			0)	
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0		C	יו			0)	
<u>Job Control Waste</u>		•				01 1-1-													
Gloves Shoo covers	122.6 122.6	Compaction	LLW box	12.3	30.7 30.7														
Shoe covers Laundered protective clothing	122.6	Compaction Compaction	LLW box	12.3 1.0		Class A/B/C				e streams are						e streams are			
Step-off pads	2.6	Compaction	LLW box	0.3	0.7		1		assumed to be						assumed to be				
Disposable protective clothing	172.8	Compaction	LLW box	17.3	43.2	Class A/B/C			totals belo						totals for Bal				
Plastic suits	247.7	Compaction	LLW box	24.8	61.9	Class A/B/C			Seconda	y waste					Other Secon	iuai y waste			
Containment hut material	14.4	Compaction	LLW box	1.4	3.6	Class A/B/C				1	1						•	1	
Job Control Waste Subtotal Class A																			
Job Control Waste Subtotal Class B																			
Job Control Waste Subtotal Class C																			
Job Control Waste Subtotal Class A/B/C	693.0				173.3														
Job Control Waste Subtotal GTCC	0.0				0.0														
Job Control Waste Subtotal Mixed Class A/B/C					0.0														
Job Control Waste Subtotal Mixed GTCC	0.0				0.0														
Maintenance Waste																			
Failed instruments and electronic equipment Filter cartridges	0.3 8.0	None None	55 gallon drum HIC	1.8 50.0	12.5	Mixed A/B/C Class A/B/C								Similar waste	streams are assu	med to be includ	ded in the totals		
Ultraviolet lights	4.5	Compaction	LLW box	0.5	1.1	Class A/B/C	1		totals belo				Similar waste streams are assumed to be included in the totals for Balance of Plant Other Secondary Waste						
Failed piping and valves	10.0	Compaction	LLW box	1.0	2.5					ry Waste						•			
Maintenance Waste Subtotal Class A																			
Maintenance Waste Subtotal Class B																			
Maintenance Waste Subtotal Class C																			
Maintenance Waste Subtotal Class A/B/C	22.5				16.1														
Maintenance Waste Subtotal GTCC	0.0				0.0														
Maintenance Waste Subtotal Mixed Class A/B/C	0.3				0.4														
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0														
Other Secondary Waste																			
Compactable Class A							148.1		4 m3 box	20.6									
Non-compactable Class A							4.0	None	4 m3 box	1.0			-						
Compactable Class C Non-compactable Class C							5.1 0.5	_	4 m3 box 4 m3 box	1.0			1		See Balan	ce of Plant			
GTCC-NT (non-TRU)							0.0		4 1113 000	0.3	1.3	Class C	1		See Daraill	oc of Fruit			
Non-compactable GTCC-T (TRU)							0.0												
Compactable GTCC-T (TRU)							0.0												
Other Secondary Waste Subtotal Class A							152.1				95.0								
Other Secondary Waste Subtotal Class B							0.0				0.0								
Other Secondary Waste Subtotal Class C							5.6				5.7								
Other Secondary Waste Subtotal Class A/B/C							157.7				100.7								
Other Secondary Waste Subtotal GTCC							0.0				0.0								
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0								
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0								
Total Class A							730.2				762.2		872.0				872.0		
Total Class A							0.0				0.0		0.0				0.0)	
Total Class B							5.0				5.7		0.0				0.0		
							5.6				5.7		0.0	1			0.0		
Total Class B	1372.9				877.2		735.8				767.9		872.0)			872.0)	
Total Class B Total Class C	1372.9 0.0				877.2 0.0)					
Total Class B Total Class C Total Class A/B/C							735.8				767.9		872.0)			872.0)	

				Rece	ipt and Storag	e - Detailed Si	ummary of Seco	ondary Waste	Estimates for II	NF4 (Blended	UNF)							-
			UFD/E		pt and storag	Detailed 30	ammary or sect	ondary waste	ARE		J.11 j				EnergyS	olutions		
	As Generated Volume		3.5/1	Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity		vv aste Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification		Treatment	Container	Quantity	(m³)	Classification
Operational Waste	• •				· / _	,	` '				<u>` </u>		, <i>'</i>				<u>`</u>	1 22.00
Used Multi-Purpose Canisters (MPCs)			Not Applicab						Not Applica	ble to UNF1					Not Applica	ble to UNF1		
Machining chips from MPCs	0.3		LLW box	0.03		Class A/B/C			Similar waste	e streams are					Similar wast	e streams are		
Fuel cask and canister decontamination wipes Fuel cask and canister decontamination filters	144.0 9.0	Compaction None	LLW box HIC	14.4 56.3	36.0 14.1	Class A/B/C Class A/B/C	-		assumed to be							included in the		
Filtered solids	4.0	None	HIC	25.0	6.3				totals below							ance of Plant		
Pool sludge	11.9	None	HIC	74.4	18.6				Seconda							ndary Waste		
Dewatered resin	8.2	None	HIC	51.3	12.8	Class A/B/C		Cementation	55 gallon drum	31			Resins	are included in	"Spent Ion Excha	nge Resins" in Li	quid Effluent Pr	ocessing
Operational Waste Subtotal Class A							3.1				7.2							
Operational Waste Subtotal Class B Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	177.4				87.8		3.1				7.2	,						
Operational Waste Subtotal GTCC	0.0				0.0		0				7.2							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste																		
Gloves	122.6		LLW box	12.3		Class A/B/C												
Shoe covers	122.6	Compaction	LLW box	12.3	30.7				Similar waste	streams are					Similar wast	e streams are		
Laundered protective clothing Step-off pads	10.3 2.6	Compaction Compaction	LLW box	1.0	2.6	Class A/B/C Class A/B/C			assumed to be						assumed to be	included in the		
Disposable protective clothing	172.8	Compaction	LLW box	17.3	43.2		1		totals belov							ance of Plant		
Plastic suits	247.7	Compaction	LLW box	24.8	61.9	Class A/B/C			Seconda	ry Waste					Other Secor	ndary Waste		
Containment hut material	14.4	Compaction	LLW box	1.4	3.6	Class A/B/C										1	1	
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	693.0				173.3													
Job Control Waste Subtotal Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste		•							•									
Failed instruments and electronic equipment	0.3		55 gallon drum	1.8		Mixed A/B/C			Similar waste	streams are								
Filter cartridges	8.0	None	HIC LLW box	50.0 0.5	12.5				assumed to be						streams are assu			
Ultraviolet lights Failed piping and valves	4.5 10.0		LLW box	1.0		Class A/B/C Class A/B/C			totals belov Secondar					TOT Be	alance of Plant C	other secondary	wasie	
Maintenance Waste Subtotal Class A										7								
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	22.5				16.1													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	0.3				0.4													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													
Other Secondary Waste Compactable Class A		1	1	<u> </u>			140.1	C	4 m3 box	20.6	00.5	Clara A						
Non-compactable Class A							148.1 4.0	Compacted None	4 m3 box	20.6			1					
Compactable Class C							5.1		4 m3 box	1.0			_					
Non-compactable Class C							0.5	None	4 m3 box	0.3	1.3	Class C			See Balan	ce of Plant		
GTCC-NT (non-TRU) Non-compactable GTCC-T (TRU)							0.0						4					
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							152.1				95.0							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							5.6				5.7	'						
Other Secondary Waste Subtotal Class A/B/C							157.7				100.7							
Other Secondary Waste Subtotal GTCC							0.0				0.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							155.2				102.2		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C	002.0				277.2		5.6				5.7		0.0				0.0	
Total Class A/B/C Total GTCC	892.9 0.0				277.2 0.0		160.8 0.0				107.9 0.0		0.0				0.0	
Total Mixed Class A/B/C	0.0				0.0		0.0				0.0		0.0				0.0	
Total Mixed Class A/B/C	0.0				0.4		0.0				0.0		0.0				0.0	
Total Wilked OTCC	0.0				0.0		0.0				0.0		0.0			<u> </u>	0.0	1

Appendix B
Head End Functional Area
Detailed Waste Comparison

					Head	End - Detailed	I Summary of Se	econdary Wast	e Estimates for	r UNF1								-
			UFD/	EAS				•	ARE						EnergyS	olutions		
	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume		3,	Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m ³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
<u>Operational Waste</u>																		
											1							
Operational Waste Subtotal Class A							0											
Operational Waste Subtotal Class B Operational Waste Subtotal Class C							0											
Operational Waste Subtotal Class A/B/C	0.0				0.0		0) 						
Operational Waste Subtotal GTCC	0.0				0.0		0											1
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0											
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0											
Job Control Waste																		
Gloves	91.1	Compaction	LLW box	9.1	22.8													
Shoe covers	91.1	Compaction	LLW box	9.1	22.8				Similar waste	e streams are					Similar wast	e streams are		
Laundered protective clothing Step-off pads	7.5 1.7	Compaction Compaction	LLW box	0.8	1.9 0.4	Class A/B/C Class A/B/C	-		assumed to be							included in the		
Disposable protective clothing	115.2	Compaction	LLW box	11.5	28.8		1		totals belov							ance of Plant		
Plastic suits	165.1	Compaction	LLW box	16.5	41.3		i		Seconda	ry Waste					Other Secor	ndary Waste		
Containment hut material	9.6	Compaction	LLW box	1.0	2.4	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C	404.2				420.2													
Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal GTCC	481.3 0.0				120.3 0.0													
Job Control Waste Subtotal Gree Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													1
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Maintenance Waste	0.0				0.0													
Failed instruments and electronic equipment	0.8	None	Mixed drum	7.7	1.6	Mixed A/B/C												
														_				1
Shear Blades Manipulator counterweights	0.3	None None	GTCC box Mixed drum	0.2	0.4	GTCC Mixed A/B/C	4						2.7	Encapsulate	55 gallon drum	13.4	2.8	Class C
Manipulator boots		Compaction	LLW box	0.3		Class A/B/C	1											
Manipulator arms	2.0	Compaction	LLW box	0.2	0.5	Class A/B/C	Ī											
Glovebox gloves	0.1		LLW box	0.0	0.0													
Glovebox filters Shear assembly	0.2	Compaction None	LLW box LLW Engineered	0.0	0.1	Class A/B/C Class A/B/C												
Voloxidizer	3.5		Mixed engineered			Mixed A/B/C			6: 11									
Voloxidizer heaters	7.3	None	LLW Engineered	Unknown	9.1	Class A/B/C			Similar waste									
Dissolver vessel	1.8	None	LLW Engineered		2.3				totals below							e streams are		
Dissolver condenser Dissolver heating coils	0.7		LLW Engineered LLW Engineered		0.9	Class A/B/C Class A/B/C				ry Waste						included in the ance of Plant		
Process vessel (various sizes)	0.4		LLW Engineered	Unknown	0.5	Class A/B/C									Other Secon			
Vessel cooling coils	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Pump - Transfer (remote)	0.5	None	LLW Engineered			Class A/B/C												
Centrifuge Jumper - Piping	1.3 7.6	None None	LLW Engineered LLW Engineered			Class A/B/C Class A/B/C												
Jumper - Electrical and Instrument	6.7	None	LLW Engineered		8.4													
Agitator	0.3	None	LLW Engineered	Unknown	0.4	Class A/B/C												
0	0.0		0	0.0	0.0													
Maintenance Waste Subtotal Class A	0.0	None	0	0.0	0.0	0							0					
Maintenance Waste Subtotal Class B													0					
Maintenance Waste Subtotal Class C													2.7				2.8	3
Maintenance Waste Subtotal Class A/B/C	30.0				34.6								2.7				2.8	
Maintenance Waste Subtotal GTCC	0.3				0.4								0				(,
Maintenance Waste Subtotal Mixed Class A/B/C	4.3				8.7								0				(
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0								0				()

					Head	End - Detailed	Summary of S	econdary Wast	e Estimates fo	r UNF1								
			UFD/	EAS					ARI	EVA					EnergyS	olutions		
	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	_	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Other Secondary Waste	` ,						,						, ,				, ,	
Compactable Class A							127.1	Compacted	4 m3 box	17.7	77.9	Class A						
Non-compactable Class A							22.7	None	4 m3 box	5.7	25.1							
Compactable Class C							7.3	Compacted	4 m3 box	1.0	4.4	Class C						
Non-compactable Class C							5.7	None	4 m3 box	2.9	12.8	Class C			See Balan	e of Plant		
GTCC-NT (non-TRU)							3.0	None	55 gallon drum	13.8	16.6	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							149.8				103.0)						
Other Secondary Waste Subtotal Class B	3						0.0				0.0							
Other Secondary Waste Subtotal Class C							13.0				17.2	!						
Other Secondary Waste Subtotal Class A/B/C							162.8				120.2	!						
Other Secondary Waste Subtotal GTCC							3.0				16.6	j						
Other Secondary Waste Subtotal Mixed Class A/B/C	+						0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							149.8				103.0)	0.0				0.0	b
Total Class B							0.0				0.0		0.0				0.0	5
Total Class C							13.0				17.2		2.7				2.8	8
Total Class A/B/C					154.9		162.8				120.2		2.7				2.8	3
Total GTCC	0.3				0.4		3.0				16.6		0.0				0.0	
Total Mixed Class A/B/C					8.7		0.0				0.0		0.0				0.0	
Total Mixed GTCC					0.0		0.0				0.0		0.0				0.0	

					Head	End - Detailed	Summary of So	econdary Wast	e Estimates for	r UNF2								
			UFD/E	AS				•	ARI	EVA					EnergyS	olutions		
	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
<u>Operational Waste</u>																		
Operational Waste Subtotal Class A							0				(0				0	
Operational Waste Subtotal Class B							0				()	0				0	
Operational Waste Subtotal Class C							0				()	0				0	
Operational Waste Subtotal Class A/B/C	0.0				0.0		0				()	0				0	
Operational Waste Subtotal GTCC	0.0				0.0		0				()	0				0	
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				(0				0	
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				()	0				0	
<u> Job Control Waste</u>																		
Gloves	91.1		LLW box	9.1		Class A/B/C												
Shoe covers Laundered protective clothing	91.1 7.5		LLW box	9.1 0.8	22.8 1.9	Class A/B/C Class A/B/C			Similar waste	e streams are					Similar wast	e streams are		
Step-off pads	1.7	Compaction	LLW box	0.8	0.4	Class A/B/C			assumed to be	included in the						included in the		
Disposable protective clothing	115.2	Compaction	LLW box	11.5	28.8	Class A/B/C			totals belo							ance of Plant		
Plastic suits	165.1	Compaction	LLW box	16.5	41.3	Class A/B/C			Seconda	ry Waste					Other Secon	ndary Waste		
Containment hut material	9.6	Compaction	LLW box	1.0	2.4	Class A/B/C												
Job Control Waste Subtotal Class A		·																
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	481.3				120.3													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
<u>Maintenance Waste</u>																		
Failed instruments and electronic equipment	0.8	None	Mixed drum	7.7	1.6	Mixed A/B/C								1	1			1
Shear Blades	0.3	None	GTCC box	0.2	0.4	GTCC							2.7	Encapsulate	55 gallon drum	13.4	2.8	Class C
Manipulator counterweights	0.0	None	Mixed drum	0.3		Mixed A/B/C							2.7	Encapsarate	33 garron arani	13.4	2.0	Ciuss C
Manipulator boots	0.6		LLW box	0.1	0.2													
Manipulator arms	2.0		LLW box	0.2	0.5	Class A/B/C												
Glovebox gloves Glovebox filters	0.1		LLW box	0.0	0.0	Class A/B/C Class A/B/C												
Shear assembly	0.2		LLW box LLW Engineered		0.1													
Voloxidizer	3.5		Mixed engineered	Unknown		Mixed A/B/C												
Voloxidizer heaters	7.3	None	LLW Engineered	Unknown	9.1	Class A/B/C			Similar waste									
Dissolver vessel	1.8		LLW Engineered		2.3				assumed to be							e streams are		
Dissolver condenser Dissolver heating coils	0.7		LLW Engineered LLW Engineered			Class A/B/C Class A/B/C			totals below Secondar							included in the		
Process vessel (various sizes)	0.2		LLW Engineered			Class A/B/C			3000	,						lance of Plant		
Vessel cooling coils	0.4		LLW Engineered			Class A/B/C									Otner Secon	ndary Waste		
Pump - Transfer (remote)	0.5	None	LLW Engineered	Unknown	0.6	Class A/B/C												
Centrifuge	1.3	None		Unknown	1.6													
Jumper - Piping	7.6		LLW Engineered		9.5													
Jumper - Electrical and Instrument	6.7 0.3		LLW Engineered		8.4 0.4	Class A/B/C Class A/B/C												
Agitator	0.3	None	LLW Engineered	Unknown 0.0	0.4	Class A/B/C 0												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A	0.0	None	U	0.0	0.0	U							0				0	
Maintenance Waste Subtotal Class B													0				0	
Maintenance Waste Subtotal Class C													2.7				2.8	
Maintenance Waste Subtotal Class A/B/C	30.0				34.6								2.7				2.8	
Maintenance Waste Subtotal Class A/B/C Maintenance Waste Subtotal GTCC	0.3				0.4								2.7				2.8	
Maintenance Waste Subtotal GICC Maintenance Waste Subtotal Mixed Class A/B/C	4.3				8.7								0				0	
Maintenance Waste Subtotal Mixed Class A/B/C	0.0				0.0								0				0	
Wantenance waste Subtotal Wines of ICC	0.0				0.0								U				U	

					Head	End - Detailed	Summary of So	condary Wast	e Estimates for	r UNF2								
			UFD/I	EAS						EVA					EnergyS	olutions		
	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Other Secondary Waste			•			•						•		•	•			
Compactable Class A							127.1	Compacted	4 m3 box	17.7	77.9	Class A						
Non-compactable Class A							22.7	None	4 m3 box	5.7	25.1	Class A						
Compactable Class C							7.3	Compacted	4 m3 box	1.0	4.4	Class C						
Non-compactable Class C							5.7	None	4 m3 box	2.9	12.8	Class C			See Balan	ce of Plant		
GTCC-NT (non-TRU)							3.0	None	55 gallon drum	13.8	16.6	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							149.8				103.0							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							13.0				17.2							
Other Secondary Waste Subtotal Class A/B/C							162.8				120.2							
Other Secondary Waste Subtotal GTCC							3.0				16.6							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							149.8				103.0		0.0)			0.0	
Total Class B							0.0				0.0		0.0)			0.0)
Total Class C							13.0				17.2		2.7	1			2.8	3
Total Class A/B/C	511.3				154.9		162.8				120.2	!	2.7	,			2.8	3
Total GTCC	0.3				0.4		3.0				16.6	,	0.0				0.0	
Total Mixed Class A/B/C	4.3				8.7	,	0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

		-	-	-	Head End - De	tailed Summa	ary of Secondar	y Waste Estim	ates for UNF4 (Blended UNF)			-					
			UFD/				1	,	ARE						EnergyS	olutions		
	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume		- 37-	Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Operational Waste				·														
Operational Waste Subtotal Class A							n				(
Operational Waste Subtotal Class B							0				(
Operational Waste Subtotal Class C							0				(
Operational Waste Subtotal Class A/B/C	0.0				0.0		0											
Operational Waste Subtotal GTCC	0.0				0.0		0				()						
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0											
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				(
<u> Job Control Waste</u>																		
Gloves	91.1	Compaction	LLW box	9.1	22.8	Class A/B/C												
Shoe covers	91.1	Compaction	LLW box	9.1	22.8	Class A/B/C			C::I						Ci!/			
Laundered protective clothing	7.5	Compaction	LLW box	0.8	1.9	Class A/B/C			Similar waste							e streams are included in the		
Step-off pads	1.7	Compaction	LLW box	0.2	0.4	Class A/B/C			totals below							ance of Plant		
Disposable protective clothing	115.2	Compaction	LLW box	11.5	28.8	Class A/B/C			Seconda							ndary Waste		
Plastic suits	165.1	Compaction	LLW box	16.5	41.3	Class A/B/C												
Containment hut material	9.6	Compaction	LLW box	1.0	2.4	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	481.3				120.3													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste											•	•			•			•
Failed instruments and electronic equipment	0.8	None	Mixed drum	7.7	1.6	Mixed A/B/C												
Shear Blades Manipulator counterweights	0.3	None None	GTCC box Mixed drum	0.2	0.4	GTCC Mixed A/B/C	-						2./	Encapsulate	55 gallon drum	13.4	2.8	Class C
Manipulator boots	0.6		LLW box	0.1		Class A/B/C												
Manipulator arms	2.0	Compaction	LLW box	0.2	0.5	Class A/B/C												
Glovebox gloves		Compaction	LLW box	0.0		Class A/B/C												
Glovebox filters Shear assembly	0.2	Compaction None	LLW box LLW Engineered	Unknown	0.1	Class A/B/C Class A/B/C												
Voloxidizer	3.5	None	Mixed engineered	Unknown		Mixed A/B/C												
Voloxidizer heaters	7.3	None	LLW Engineered	Unknown	9.1	Class A/B/C			Similar waste									
Dissolver vessel	1.8		LLW Engineered			Class A/B/C			assumed to be						Similar wast	e streams are		
Dissolver condenser Dissolver heating coils	0.7		LLW Engineered LLW Engineered			Class A/B/C Class A/B/C			totals below Secondar						assumed to be	included in the		
Process vessel (various sizes)	0.4		LLW Engineered			Class A/B/C			Secondal	y waste						ance of Plant		
Vessel cooling coils	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C									Other Secor	ndary Waste		
Pump - Transfer (remote)	0.5		LLW Engineered			Class A/B/C												
Centrifuge	1.3	None	LLW Engineered		1.6													
Jumper - Piping	7.6	None	LLW Engineered		9.5	Class A/B/C												
Jumper - Electrical and Instrument	6.7	None	LLW Engineered		8.4	Class A/B/C												
Agitator	0.3	None	LLW Engineered		0.4	Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A	0.0	None	0	0.0	0.0	0							0					
Maintenance Waste Subtotal Class B Maintenance Waste Subtotal Class B													0					
Maintenance Waste Subtotal Class C													2.7				2.8	3
Maintenance Waste Subtotal Class A/B/C	30.0				34.6								2.7				2.8	
Maintenance Waste Subtotal Class A/B/C	0.3				0.4								0				2.0	
Maintenance Waste Subtotal Mixed Class A/B/C					8.7								0				(
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0								0					
	5.0				0.0													

					Hood End C	etailed Summa	n, of Coconda	a. Masta Estim	atos for LINEA /	Plandad LINE\								
			UFD/	EAS	neau Ellu - L	etaneu Summa	ry or secondar	y waste Estilli	ARI						EnergyS	Solutions		
	As		, ,	Ī			As						As					1
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Other Secondary Waste		•						•	•			•		•				
Compactable Class A							127.1	Compacted	4 m3 box	17.7	77.9	Class A						
Non-compactable Class A							22.7	None	4 m3 box	5.7	25.1	Class A						
Compactable Class C							7.3	Compacted	4 m3 box	1.4	6.2	Class C						
Non-compactable Class C							5.7	None	4 m3 box	3.8	16.7	Class C			See Balan	ce of Plant		
GTCC-NT (non-TRU)							3.0	None	55 gallon drum	13.8	16.6	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							149.8				103.0							
Other Secondary Waste Subtotal Class B							0.0				0.0)						
Other Secondary Waste Subtotal Class C							13.0				22.9							
Other Secondary Waste Subtotal Class A/B/C							162.8				125.9							<u> </u>
Other Secondary Waste Subtotal GTCC							3.0				16.6							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							149.8				103.0		0.0				0.0	٥
Total Class B							0.0				0.0)	0.0				0.0	٥
Total Class C							13.0				22.9		2.7				2.8	3
Total Class A/B/C	511.3				154.9	9	162.8				125.9		2.7	'			2.8	3
Total GTCC	0.3				0.4	1	3.0				16.6	<u> </u>	0.0				0.0	<u> </u>
Total Mixed Class A/B/C	4.3				8.7	7	0.0				0.0)	0.0				0.0	٥
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	٥

Appendix C
Separations Functional Area
Detailed Waste Comparison

					Separa	tions - Detaile	d Summary of	Secondary Wa	ste Estimates f	or UNF1								
			UFD/	EAS					ARI	VA					EnergyS	olutions		
	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
<u>Operational Waste</u>																		
Solvent residue							12.8	Distillation/ Pyrolysis/ Cementation	55 gallon drum	52	12	! Class A	122.1	Pyrolysis/ Compaction	3 compacted 55 gallon drums/110 gallon drum	206	85.6	Class A
Operational Waste Subtotal Class A							12.8				12	2	122.1				85.0	6
Operational Waste Subtotal Class B							0				(0	1			(0
Operational Waste Subtotal Class C							0				(0					0
Operational Waste Subtotal Class A/B/C	0.0				0.0		12.8				12		122.1				85.0	6
Operational Waste Subtotal GTCC	0.0				0.0		0						0				03.1	0
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0						0					0
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0) 	0	1				0
·	0.0				0.0		U					<u>′</u>	U	1				υĮ
Job Control Waste	124.7	C	LLW box	12.5	24.2	Class A/R/C												
Gloves Shoe covers	124.7	Compaction Compaction	LLW box	12.5 12.5		Class A/B/C Class A/B/C												
Laundered protective clothing	14.7		LLW box	1.5					Similar wast	e streams are					Similar waste	e streams are		
Step-off pads	6.1	Compaction	LLW box	0.6					assumed to be						assumed to be			
Disposable protective clothing	403.2	Compaction	LLW box	40.3		Class A/B/C			totals belo						totals for Bal			
Plastic suits	578.0	Compaction	LLW box	57.8					Seconda	ry Waste					Other Secon	idary Waste		
Containment hut material	33.6	Compaction	LLW box	3.4	8.4	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	1285.0				321.3													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste	0.0				0.0													
Failed instruments and electronic equipment	1.2	None	Mixed drum	11.5	2.4	Mixed A/B/C												
Process vessel (various sizes)	41.8	None	LLW Engineered	Unknown	52.3		1											
Vessel cooling coils	3.0		LLW Engineered			Class A/B/C	1											
Vessel heating coils	1.9	None	LLW Engineered		2.4													
Pump - Transfer (remote)	11.7	None	LLW Engineered	Unknown	14.6													
Jumper - Piping	95.1	None	LLW Engineered	Unknown	118.9	Class A/B/C												
Jumper - Electrical and Instrument	29.7	None	LLW Engineered		37.1				Similar waste						Similar waste			
Centrifugal contactor	4.8	None	LLW Engineered	Unknown	6.0		-		assumed to be						assumed to be			
Centrifugal contactor/diluant washer bank	1.9	None	LLW Engineered	Unknown	2.4		-		totals belo						totals for Bal			
Evaporator condenser	1.2 3.3		LLW Engineered LLW Engineered		1.5	Class A/B/C Class A/B/C	1		Seconda	y waste					Other Secon	iuary waste		
Evaporator condenser Heat exchanger	0.2		LLW Engineered			Class A/B/C	1											
Agitator	5.2		LLW Engineered			Class A/B/C	1											
Decanter	0.2		LLW Engineered			Class A/B/C												
Mixer settler	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	200.2				250.3													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C					2.4													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													
Manite nance Waste Subtotal Mixed OTCC	0.0				0.0													

					Sonara	ations - Detaile	d Cummany of	Socondani Ma	rta Estimatas f	or LINE1								
	1		UFD/I	FΔS	Зерага	itions - Detaile	u Sullilliary Of	secondary wa		EVA					Fnergy	Solutions		
	As		0.27.	I		1	As		7.11.				As		l			T
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Other Secondary Waste	` ,				, ,						. ,		, ,				. ,	
Compactable Class A							107.0	Compacted	4 m3 box	14.9	65.6	Class A						
Non-compactable Class A							1.0	None	4 m3 box	0.3	1.3		1					
Compactable Class C							13.4	Compacted	4 m3 box	1.9	8.4	Class C						
Non-compactable Class C							2.1	None	4 m3 box	1.0	4.4	Class C			See Balan	ice of Plant		
GTCC-NT (non-TRU)							0.3	None	55 gallon drum	1.4	1.7	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							108.0				66.9)						
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							15.5				12.8	3						
Other Secondary Waste Subtotal Class A/B/C							123.5				79.7	7						
Other Secondary Waste Subtotal GTCC							0.3				1.7	7						
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0)						
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0)						
Total Class A							120.8				78.9		122.1				85.6	5
Total Class B							0.0				0.0		0.0				0.0	0
Total Class C							15.5				12.8	3	0.0				0.0	٥
Total Class A/B/C	1485.2				571.5		136.3				91.7	7	122.1				85.6	6
Total GTCC	0.0				0.0		0.3				1.7	7	0.0				0.0	5
Total Mixed Class A/B/C	1.2				2.4		0.0				0.0		0.0				0.0	5
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	5

					Separa	tions - Detaile	d Summary of S	Secondary Was	ste Estimates fo	or UNF2								
		1	UFD/	EAS	•	1		•		EVA		1			EnergyS	olutions	1	
Waste Stream	As Generated Volume (m³)	Treatment	Container	Container Quantity	Packaged Volume (m³)	Waste Classification	As Generated Volume (m³)	Treatment	Container	Container Quantity	Packaged Volume (m³)	Waste Classification	As Generated Volume (m³)	Treatment	Container	Container Quantity	Packaged Volume (m³)	Waste Classification
Operational Waste	\ <i>/</i>	rreatment	Container	Quarterty	\ <i>/</i>	Ciassification	\ <i>/</i>	Treatment	container	quantity		Ciassification	\ <i>,</i>	Treatment	container	Quarterty	l ()	Ciassification
<u>Operational Waste</u>															3 compacted			
								Distillation/ Pyrolysis/						Pyrolysis/	55 gallon drums/110			
Solvent residue							12.8	Cementation	55 gallon drum	1.9	13	Class A	122.1	Compaction	gallon drum	206	85.6	Class A
O							42.0				1 4		422.4	1			05.4	c
Operational Waste Subtotal Class A							12.8				1	<u> </u>	122.1	-			85.6	6
Operational Waste Subtotal Class B Operational Waste Subtotal Class C							0						0)				0
Operational Waste Subtotal Class A/B/C	0.0				0.0		12.8				1		122.1				85.6	6
Operational Waste Subtotal GTCC	0.0				0.0		0				1	-)	0)			05.0	0
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0						0)			(0
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				(0				(0
<u>Job Control Waste</u>																		•
Gloves	124.7		LLW box	12.5		Class A/B/C												
Shoe covers	124.7	Compaction	LLW box	12.5	31.2				Similar waste	e streams are					Similar waste	e streams are		
Laundered protective clothing Step-off pads	14.7 6.1	Compaction Compaction	LLW box	1.5 0.6	3.7 1.5	Class A/B/C Class A/B/C	-		assumed to be							included in the		
Disposable protective clothing	403.2	Compaction	LLW box	40.3	100.8	Class A/B/C	1		totals belo	w for Other					totals for Bal	ance of Plant		
Plastic suits	578.0	Compaction	LLW box	57.8	144.5	Class A/B/C			Seconda	ry Waste					Other Secon	ndary Waste		
Containment hut material	33.6	·	LLW box	3.4	8.4	Class A/B/C												
Job Control Waste Subtotal Class A		·																
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	1285.0				321.3													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste Failed instruments and electronic equipment	1.2	None	Mixed drum	11.5	2.4	Mixed A/B/C												
Process vessel (various sizes)	41.8	None	LLW Engineered			Class A/B/C												
Vessel cooling coils	3.0	None	LLW Engineered	Unknown	3.8	Class A/B/C												
Vessel heating coils	1.9	None	LLW Engineered		2.4													
Pump - Transfer (remote) Jumper - Piping	11.7 95.1	None None	LLW Engineered LLW Engineered	Unknown Unknown	14.6 118.9	Class A/B/C Class A/B/C												
Jumper - Electrical and Instrument	29.7	None	LLW Engineered	Unknown	37.1				Similar waste	e streams are					Similar waste	e streams are		
Centrifugal contactor	4.8	None	LLW Engineered	Unknown	6.0	Class A/B/C			assumed to be							included in the		
Centrifugal contactor/diluant washer bank	1.9		LLW Engineered		2.4				totals belo	w for Other					totals for Bal	ance of Plant		
Evaporator vessel Evaporator condenser	1.2 3.3		LLW Engineered LLW Engineered			Class A/B/C Class A/B/C			Seconda	ry Waste					Other Secon	ndary Waste		
Heat exchanger	0.2		LLW Engineered			Class A/B/C												
Agitator	5.2		LLW Engineered			Class A/B/C												
Decanter	0.2		LLW Engineered		0.3													
Mixer settler	0.2		LLW Engineered		0.3	Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C	200 -				250													
Maintenance Waste Subtotal Class A/B/C					250.3													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C Maintenance Waste Subtotal Mixed GTCC	1.2 0.0				2.4 0.0													
iviaintenance waste subtotal ivilxed GTCC	0.0				0.0													

					Separa	ations - Detaile	d Summary of	Secondary Wa	te Estimates f	or UNF2								
			UFD/	EAS				_	ARI	EVA					EnergyS	olutions		
	As Generated				Packaged		As Generated				Packaged		As Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Other Secondary Waste																		
Compactable Class A							107.0	<u> </u>	4 m3 box	14.9								
Non-compactable Class A							1.0	None	4 m3 box	0.3	1.3							
Compactable Class C							13.4	Compacted	4 m3 box	1.9	8.4	Class C						
Non-compactable Class C							2.1	None	4 m3 box	1.0	4.4	Class C			See Balan	ce of Plant		
GTCC-NT (non-TRU)							0.3	None	55 gallon drum	1.4	1.7	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							108.0				66.9							/ I
Other Secondary Waste Subtotal Class B							0.0)			0.0)						А
Other Secondary Waste Subtotal Class C							15.5				12.8	3						/
Other Secondary Waste Subtotal Class A/B/C							123.5				79.7	,						
Other Secondary Waste Subtotal GTCC							0.3				1.7	,						
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0)			0.0)						
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0)						
Total Class A							120.8				78.9		122.1				85.	.6
Total Class B							0.0				0.0		0.0				0.0	.0
Total Class C							15.5				12.8		0.0				0.0	.0
Total Class A/B/C					571.5	5	136.3				91.7	,	122.1				85.	
Total GTCC	0.0				0.0		0.3				1.7	,	0.0				0.0	
Total Mixed Class A/B/C					2.4	1	0.0				0.0		0.0				0.0	
Total Mixed Class Ay by C					0.0)	0.0				0.0		0.0				0.0	

					Separations - D	Detailed Summ	ary of Seconda	ry Waste Estir	nates for UNF4	(Blended UNI	F)							
			UFD/I	EAS					ARI	VA					EnergyS	olutions		_
	As Generated Volume (m³)	Trantmant	Container	Container	Packaged Volume (m³)	Waste Classification	As Generated Volume (m³)	Tractment	Container	Container	Packaged Volume (m³)	Waste	As Generated Volume (m³)	Treatment	Container	Container	Packaged Volume (m³)	Waste
Waste Stream	(111)	Treatment	Container	Quantity	(111)	Ciassification	(111.)	Treatment	Container	Quantity		Classification	(1117	Treatment	Container	Quantity	(1111)	Classification
<u>Operational Waste</u>											1				3 compacted		1	
								Distillation/ Pyrolysis/						Pyrolysis/	55 gallon drums/110			
Solvent residue							12.8	Cementation	55 gallon drum	0	12	Class A	122.7	Compaction	gallon drum	207	86.1	Class A
Operational Waste Subtotal Class A							12.8				12	2	122.7				86.:	1
Operational Waste Subtotal Class B							0				(0				(0
Operational Waste Subtotal Class C							0				(0					0
Operational Waste Subtotal Class A/B/C	0.0				0.0		12.8				12		122.7				86.3	1
Operational Waste Subtotal GTCC	0.0				0.0		0				(0				(0
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				()	0				(0
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				(0				(0
Job Control Waste Gloves	124.7	Compaction	LLW box	12.5	21.2	Class A/B/C												
Shoe covers	124.7	Compaction	LLW box	12.5	31.2													
Laundered protective clothing	14.7	Compaction	LLW box	1.5	3.7	Class A/B/C			Similar wast	e streams are					Similar wast	e streams are		
Step-off pads	6.1	Compaction	LLW box	0.6	1.5	Class A/B/C			assumed to be							included in the		
Disposable protective clothing	403.2	Compaction	LLW box	40.3	100.8	Class A/B/C			totals belo Seconda							ance of Plant ndary Waste		
Plastic suits	578.0	Compaction	LLW box	57.8	144.5	Class A/B/C			Seconda	y waste					Other Secon	iddi y vvaste		
Containment hut material	33.6	Compaction	LLW box	3.4	8.4	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	1285.0				321.3													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
<u>Maintenance Waste</u>																		
Failed instruments and electronic equipment Process vessel (various sizes)	1.2 41.8		Mixed drum LLW Engineered	11.5 Unknown	2.4 52.3	Mixed A/B/C Class A/B/C												
Vessel cooling coils	3.0		LLW Engineered			Class A/B/C												
Vessel heating coils	1.9	None	LLW Engineered	Unknown	2.4	Class A/B/C												
Pump - Transfer (remote)	11.7 95.1	None	LLW Engineered	Unknown Unknown	14.6 118.9													
Jumper - Piping Jumper - Electrical and Instrument	29.7	None None	LLW Engineered LLW Engineered			Class A/B/C Class A/B/C												
Centrifugal contactor	4.8	None	LLW Engineered	Unknown	6.0	Class A/B/C			Similar waste assumed to be							e streams are included in the		
Centrifugal contactor/diluant washer bank	1.9		LLW Engineered			Class A/B/C			totals belo							ance of Plant		
Evaporator vessel Evaporator condenser	1.2 3.3	None None	LLW Engineered LLW Engineered			Class A/B/C Class A/B/C			Seconda							ndary Waste		
Heat exchanger	0.2		LLW Engineered		0.3													
Agitator	5.2	None	LLW Engineered		6.5	Class A/B/C												
Decanter	0.2	None	LLW Engineered		0.3	Class A/B/C												
Mixer settler	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
0	0.0	None	0	0.0	0.0	0										1		
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C	200.2				250.0													
Maintenance Waste Subtotal Class A/B/C	200.2				250.3 0.0													
Maintenance Waste Subtotal GTCC Maintenance Waste Subtotal Mixed Class A/B/C	1.2				2.4													
Maintenance Waste Subtotal Mixed Class A/B/C	0.0				0.0													
iviaintenance vvaste subtotal iviixed GTCC	0.0				0.0													

					Congrations	Detailed Summ	any of Cocond	m. Macta Ectin	natos for UNEA	/Plandad LINE	١							
			UFD/I		Separations -	Detailed Summ	ary or second	iry waste Estir		VA)				Fnergy	olutions		
	As		0.27.	I			As		All				As		Lineigys			1
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Other Secondary Waste							, ,				. ,		, ,					
Compactable Class A							107.0	Compacted	4 m3 box	14.9	65.6	Class A						
Non-compactable Class A							1.0	None	4 m3 box	0.3	1.3	Class A						
Compactable Class C							13.4	Compacted	4 m3 box	2.6	11.5	Class C						
Non-compactable Class C							2.1	None	4 m3 box	1.4	6.2	Class C			See Balan	ce of Plant		ļ
GTCC-NT (non-TRU)							0.3	None	55 gallon drum	1.4	1.7	GTCC						, l
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							108.0				66.9							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							15.5				17.7							A
Other Secondary Waste Subtotal Class A/B/C							123.5				84.6							
Other Secondary Waste Subtotal GTCC							0.3				1.7							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							A
Total Class A							120.8				78.9		122.7				86.1	L
Total Class B							0.0				0.0		0.0				0.0	ر
Total Class C							15.5				17.7		0.0				0.0	ال
Total Class A/B/C					571.5	5	136.3				96.6		122.7				86.1	
Total GTCC)			0.0)	0.3				1.7		0.0				0.0)
Total Mixed Class A/B/C					2.4	ļ.	0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	ال

Appendix D
Solidification Functional Area
Detailed Waste Comparison

					Solidifi	ication - Detaile	ed Summary of	Secondary Wa	ste Estimates f	or UNF1								
			UFD/	EAS			,		ARE	VA					EnergyS	olutions		
	As						As						As					
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classificatio
<u>Operational Waste</u>			1															
Inner containers (bagless transfer stub pieces)	2.5		LLW box	0.25	0.6	, , , .			Similar waste									
Inner containers (bagless transfer stub pieces)	7.4	None	GTCC box	5.78	9.8		Į.		assumed to be totals below							med to be include ther Secondary V		
Outer containers	0.03	Compaction	LLW box GTCC box	0.003	0.01		ł		Secondar					IUI Ba	italice of Flailt O	ther secondary v	vaste	
Inner containers (including convenience cans) Operational Waste Subtotal Class A	0.03	None	GICC DOX	0.02	0.04	GTCC	0		Sceniua	, music	0							
Operational Waste Subtotal Class B							0											
Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	2.5				0.6		0				0							
Operational Waste Subtotal GTCC	7.4				9.9		0				0							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste								ı										
Gloves	153.7	Compaction	LLW box	15.4	38.4	Class A/B/C												
Gloves	3.1	None	GTCC box	2.4		GTCC												
Shoe covers	153.7		LLW box	15.4	38.4													
Shoe covers Laundered protective clothing	3.1 12.4	None Compaction	GTCC box LLW box	2.4 1.2					Similar waste	stroams are					Similar wast	e streams are		
Step-off pads	2.6		LLW box	0.3					assumed to be						assumed to be			
Disposable protective clothing	108.0	Compaction	LLW box	10.8	27.0				totals below						totals for Bal			
Disposable protective clothing	64.8	None	GTCC box	50.6					Seconda	ry Waste					Other Secon	ndary Waste		
Plastic suits	154.8	Compaction	LLW box	15.5	38.7													
Plastic suits Containment hut material	92.9 9.0	None	GTCC box LLW box	72.5 0.9	123.3 2.3	GTCC Class A/B/C	ł											
Containment nut material	5.4		GTCC box	4.2														
Job Control Waste Subtotal Class A			0.00.00			0.00												
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	594.2				148.6	5												
Job Control Waste Subtotal GTCC	169.2				224.7	,												
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0)												
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																		
Failed instruments and electronic equipment	0.6		55 gallon drum	3.6		Mixed A/B/C												
Failed piping and valves	10.0		LLW box	1.0		Class A/B/C												
Manipulator counterweights Manipulator boots	0.1 1.5		LLW box	0.0														
Manipulator arms	4.8		LLW box	0.5														
Glovebox gloves	0.1		LLW box	0.0														
Glovebox filters	0.2		LLW box	0.0	0.1													
HEPA filters	1.7	Compaction				Class A/B/C												
HEPA filters Dust collection bags	10.0 1.0		LLW box	0.2	0.4	Class A/B/C												
Process vessel (various sizes)		None	GTCC box	7.8	0.4 13.3	Class A/B/C GTCC												
Process vessel (various sizes)	11.0	None Compaction		7.8 0.1	0.4 13.3	Class A/B/C GTCC Class A/B/C												
		None Compaction None	GTCC box LLW box	7.8 0.1 Unknown	0.4 13.3 0.3	Class A/B/C GTCC Class A/B/C Class A/B/C												
Pump - Process	11.0 2.4 1.0	None Compaction None None None	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered	7.8 0.1 Unknown Unknown Unknown	0.4 13.3 0.3 13.8 3.0	Class A/B/C GTCC Class A/B/C Class A/B/C GTCC Class A/B/C												
Pump - Process Pump - Process	11.0 2.4 1.0 0.3	None Compaction None None None None	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered	7.8 0.1 Unknown Unknown Unknown Unknown	0.4 13.3 0.3 13.8 3.0 1.3	Class A/B/C GTCC Class A/B/C Class A/B/C GTCC Class A/B/C GTCC GTCC			Similar	actroams are					Similaruration	a straams are		
Pump - Process Pump - Process Evaporator vessel	11.0 2.4 1.0 0.3 0.2	None Compaction None None None None None None None	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered LLW Engineered	7.8 0.1 Unknown Unknown Unknown Unknown Unknown	0.4 13.3 0.3 13.8 3.0 1.3 0.4	Class A/B/C GTCC Class A/B/C Class A/B/C GTCC Class A/B/C GTCC Class A/B/C GTCC Class A/B/C			Similar waste							e streams are included in the		
Pump - Process Pump - Process	11.0 2.4 1.0 0.3	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered	7.8 0.1 Unknown Unknown Unknown Unknown Unknown Unknown	0.4 13.3 0.3 13.8 3.0 1.3	Class A/B/C GTCC Class A/B/C			Similar waste assumed to be totals belov	included in the					Similar wastr assumed to be totals for Bal	included in the		
Pump - Process Pump - Process Evaporator vessel Evaporator condenser Evaporator condenser	11.0 2.4 1.0 0.3 0.2 0.1 0.2	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered LLW Engineered LLW Engineered GTCC engineered LLW Engineered	7.8 0.1 Unknown Unknown Unknown Unknown Unknown Unknown Unknown Unknown Unknown	0.4 13.3 0.3 13.8 3.0 1.3 0.4 0.3 0.1 0.3	Class A/B/C GTCC Class A/B/C			assumed to be	included in the w for Other					assumed to be	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator condenser Evaporator condenser Evaporator reboiler	11.0 2.4 1.0 0.3 0.2 0.1 0.2 0.1	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered LLW Engineered LLW Engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 0.4 0.3 0.1 0.3 0.1 0.3	Class A/B/C GTCC Class A/B/C Class A/B/C GTCC Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator condenser Evaporator condenser Evaporator condenser Evaporator reboiler Evaporator cooler	11.0 2.4 1.0 0.3 0.2 0.1 0.2 0.1 0.5	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered LLW Engineered LLW Engineered LLW Engineered LLW Engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 0.4 0.3 0.1 0.3 0.1 0.6 0.6	Class A/B/C GTCC Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator vessel Evaporator condenser Evaporator condenser Evaporator condenser Evaporator cooler Hydrate evaporator	11.0 2.4 1.0 0.3 0.2 0.1 0.2 0.1 0.5 0.1	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 0.4 0.3 0.1 0.3 0.1 0.6 0.1	Class A/B/C GTCC Class A/B/C Class A/B/C GTCC Class A/B/C GTCC Class A/B/C GTCC Class A/B/C Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator condenser Evaporator condenser Evaporator condenser Evaporator reboiler Evaporator cooler	11.0 2.4 1.0 0.3 0.2 0.1 0.2 0.1 0.5	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered LLW Engineered LLW Engineered LLW Engineered LLW Engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 0.4 0.3 0.1 0.3 0.1 0.6 0.6	Class A/B/C GTCC Class A/B/C Class A/B/C Class A/B/C Class A/B/C Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator condenser Evaporator condenser Evaporator condenser Evaporator conderser Evaporator cooler Hydrate evaporator Hydrate evaporator condenser Denitrator Scrubber	11.0 2.4 1.0 0.3 0.2 0.1 0.2 0.1 1.4 0.1 0.5 0.1 1.4 0.1	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 3.0 1.3 0.4 0.3 0.1 0.1 0.6 0.1 1.8 0.1 0.8 13.0	Class A/B/C GTCC Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator vessel Evaporator condenser Evaporator condenser Evaporator condenser Evaporator cooler Hydrate evaporator Hydrate evaporator condenser Denitrator Scrubber Process vacuum unit	11.0 2.4 1.0 0.3 0.2 0.1 0.5 0.1 1.4 0.1 0.6 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 13.8 3.0 0.4 0.3 0.1 0.1 0.3 0.1 1.3 0.1 0.6 0.1 1.8 0.1 0.8 13.0 2.1	Class A/B/C GTCC Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator vessel Evaporator condenser Evaporator condenser Evaporator reboiler Evaporator rooler Hydrate evaporator Hydrate evaporator Denitrator Scrubber Process vacuum unit Heat exchanger	11.0 2.4 1.0 0.3 0.2 0.1 0.5 0.1 0.5 0.1 1.4 0.6 10.4	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 1.3 0.4 0.3 0.1 0.1 0.6 0.1 1.8 0.1 0.8 13.0 2.1 0.3	Class A/B/C GTCC Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator condenser Evaporator condenser Evaporator reboiler Evaporator cooler Hydrate evaporator Hydrate evaporator condenser Scrubber Process vacuum unit Heat exchanger Heat exchanger	11.0 2.4 1.0 0.3 0.2 0.1 0.1 0.5 0.1 1.4 0.1 0.6 10.4 1.7 0.2	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 0.4 0.3 0.1 0.1 0.6 0.1 1.8 0.1 0.8 13.0 2.1 0.8 0.8 0.1 0.8 0.8 0.1 0.8 0.8 0.1 0.8 0.8 0.9 0.8 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	Class A/B/C GTCC Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator vessel Evaporator condenser Evaporator condenser Evaporator reboiler Evaporator rooler Hydrate evaporator Hydrate evaporator Denitrator Scrubber Process vacuum unit Heat exchanger	11.0 2.4 1.0 0.3 0.2 0.1 0.5 0.1 0.5 0.1 1.4 0.6 10.4	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 1.3 0.4 0.3 0.1 0.1 0.6 0.1 1.8 0.1 0.8 13.0 2.1 0.3	Class A/B/C GTCC Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator condenser Evaporator condenser Evaporator reboiler Evaporator cooler Hydrate evaporator Hydrate evaporator Denitrator Scrubber Process vacuum unit Heat exchanger Heat exchanger Agitator Oxidizer Oxidizer	11.0 2.4 1.0 0.3 0.2 0.1 0.5 0.1 1.4 4 0.1 0.6 10.4 1.7 0.2 0.3 0.8 8 0.1	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 1.3 0.4 0.3 0.1 0.1 0.6 0.1 1.8 0.1 0.8 13.0 2.1 0.3 0.4 1.0 0.4 1.0 0.1 0.1 0.3 0.1 0.1 0.1 0.8 0.1 0.1 0.8 0.1 0.1 0.1 0.8 0.1 0.1 0.8 0.1 0.1 0.8 0.1 0.1 0.8 0.1 0.1 0.8 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	Class A/B/C GTCC Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator condenser Evaporator condenser Evaporator condenser Evaporator cooler Hydrate evaporator Hydrate evaporator Hydrate evaporator Scrubber Process vacuum unit Heat exchanger Heat exchanger Agitator Oxidizer Oxidizer Scrubber (critically safe)	11.0 2.4 1.0 0.3 0.2 0.1 0.1 0.5 0.1 1.4 0.1 0.6 10.4 1.7 0.2 0.3 0.8 0.1 0.1 0.1	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 0.4 0.3 0.1 0.5 0.1 0.6 0.1 1.8 13.0 2.1 0.8 13.0 2.1 0.3 0.1 0.1 0.8 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	Class A/B/C GTCC Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator vessel Evaporator condenser Evaporator condenser Evaporator condenser Evaporator cooler Hydrate evaporator Hydrate evaporator condenser Denitrator Scrubber Process vacuum unit Heat exchanger Heat exchanger Agitator Oxidizer Oxidizer Scrubber (critically safe) Scrubber (critically safe)	11.0 2.4 1.0 0.3 0.2 0.1 0.5 0.1 1.4 4 0.1 0.6 10.4 1.7 0.2 0.3 0.8 8 0.1	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 1.3 0.4 0.3 0.1 0.1 0.6 0.1 1.8 0.1 0.8 13.0 2.1 0.3 0.4 1.0 0.4 1.0 0.1 0.1 0.3 0.1 0.1 0.1 0.8 0.1 0.1 0.8 0.1 0.1 0.1 0.8 0.1 0.1 0.8 0.1 0.1 0.8 0.1 0.1 0.8 0.1 0.1 0.8 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	Class A/B/C GTCC Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator condenser Evaporator condenser Evaporator condenser Evaporator cooler Hydrate evaporator Hydrate evaporator condenser Denitrator Scrubber Process vacuum unit Heat exchanger Heat exchanger Agitator Oxidizer Oxidizer Oxidizer Scrubber (critically safe) Scrubber (critically safe) Maintenance Waste Subtotal Class A	11.0 2.4 1.0 0.3 0.2 0.1 0.1 0.5 0.1 1.4 0.1 0.6 10.4 1.7 0.2 0.3 0.8 0.1 0.1 0.1	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 0.4 0.3 0.1 0.5 0.1 0.6 0.1 1.8 13.0 2.1 0.8 13.0 2.1 0.3 0.1 0.1 0.8 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	Class A/B/C GTCC Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator vessel Evaporator condenser Evaporator condenser Evaporator condenser Evaporator cooler Hydrate evaporator Hydrate evaporator Hydrate evaporator condenser Denitrator Scrubber Process vacuum unit Heat exchanger Heat exchanger Agitator Oxidizer Oxidizer Oxidizer Scrubber (critically safe) Scrubber (critically safe) Maintenance Waste Subtotal Class A	11.0 2.4 1.0 0.3 0.2 0.1 0.1 0.5 0.1 1.4 0.1 0.6 10.4 1.7 0.2 0.3 0.8 0.1 0.1 0.1	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 0.4 0.3 0.1 0.5 0.1 0.6 0.1 1.8 13.0 2.1 0.8 13.0 2.1 0.3 0.1 0.1 0.8 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	Class A/B/C GTCC Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator condenser Evaporator condenser Evaporator reboiler Evaporator coller Hydrate evaporator Hydrate evaporator Hydrate evaporator Scrubber Process vacuum unit Heat exchanger Heat exchanger Heat exchanger Gxidizer Oxidizer Oxidizer Scrubber (critically safe) Scrubber (critically safe) Maintenance Waste Subtotal Class B Maintenance Waste Subtotal Class B	11.0 2.4 1.0 0.3 0.2 0.1 0.2 0.1 0.5 0.1 1.4 0.1 0.6 10.4 1.7 0.2 0.3 0.8 0.1 0.1 0.1 0.1 0.1	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 1.3.8 3.0 1.4 0.3 0.1 0.1 0.6 0.1 1.8 0.1 0.8 13.0 0.4 1.0 0.1 0.1 0.3 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	Class A/B/C GTCC Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator condenser Evaporator condenser Evaporator coler Hydrate evaporator Hydrate evaporator Hydrate evaporator Hydrate evaporator Heat exchanger Heat exchanger Heat exchanger Heat exchanger Hoxidizer Oxidizer Scrubber (critically safe) Scrubber (critically safe) Maintenance Waste Subtotal Class A Maintenance Waste Subtotal Class C	11.0 2.4 1.0 0.3 0.2 0.1 0.1 0.5 0.1 1.4 0.1 0.6 10.4 1.7 0.2 0.3 0.8 0.1 0.1 0.1 0.1 0.4 47.8	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 0.4 0.3 0.1 0.1 0.3 0.1 0.6 0.1 1.8 13.0 1.0 0.8 13.0 0.4 1.0 0.1 0.1 0.3 0.4 1.0 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	Class A/B/C GTCC Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator condenser Evaporator condenser Evaporator condenser Evaporator cooler Hydrate evaporator Hydrate evaporator Hydrate evaporator Frocess vacuum unit Heat exchanger Heat exchanger Heat exchanger Agitator Oxidizer Oxidizer Scrubber (critically safe) Scrubber (critically safe) Maintenance Waste Subtotal Class B Maintenance Waste Subtotal Glass C Maintenance Waste Subtotal GTCC	11.0 2.4 1.0 0.3 0.2 0.1 0.5 0.1 1.4 0.1 0.6 10.4 1.7 0.2 0.3 0.8 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 0.4 0.3 0.1 0.1 0.3 0.1 0.6 0.1 1.8 0.1 0.8 0.1 0.3 0.4 1.0 0.1 0.1 0.3 0.4 1.0 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	Class A/B/C GTCC Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		
Pump - Process Pump - Process Evaporator vessel Evaporator vessel Evaporator condenser Evaporator condenser Evaporator condenser Evaporator cooler Hydrate evaporator Hydrate evaporator Hydrate evaporator Hydrate evaporator Oscrubber Process vacuum unit Heat exchanger Heat exchanger Heat exchanger Gyidizer Oxidizer Oxidizer Scrubber (critically safe) Scrubber (critically safe) Maintenance Waste Subtotal Class A Maintenance Waste Subtotal Class C Maintenance Waste Subtotal Class A/B/C	11.0 2.4 1.0 0.3 0.2 0.1 0.1 0.5 0.1 1.4 0.1 0.6 10.4 1.7 0.2 0.3 0.8 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	None Compaction None None None None None None None No	GTCC box LLW box LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered GTCC engineered LLW Engineered	7.8 0.1 Unknown	0.4 13.3 0.3 13.8 3.0 1.3 0.4 0.3 0.1 0.1 0.3 0.1 0.6 0.1 1.8 13.0 1.0 0.8 13.0 0.4 1.0 0.1 0.1 0.3 0.4 1.0 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	Class A/B/C GTCC Class A/B/C GTCC Class A/B/C GTCC Class A/B/C GTCC Class A/B/C			assumed to be totals below	included in the w for Other					assumed to be totals for Bal	included in the ance of Plant		

					Solidifi	cation - Detaile	d Summary of	Secondary Wa	ste Estimates f	or UNF1								
			UFD/	EAS			•	•	ARI	EVA					EnergyS	Solutions		
	As						As						As					
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Other Secondary Waste				•												•		
Compactable Class A							105.0	Compacted	4 m3 box	14.0	61.6	Class A						
Non-compactable Class A							0.0											
Compactable Class C							66.4	Compacted	4 m3 box	9.2	40.5	Class C						
Non-compactable Class C							3.9	None	4 m3 box	2.0	8.8	Class C			See Balan	ce of Plant		
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							20.6	None	55 gallon drum	100.0	23.0	GTCC						
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							105.0				61.6	5						
Other Secondary Waste Subtotal Class B							0.0				0.0)						
Other Secondary Waste Subtotal Class C							70.3				49.3	8						
Other Secondary Waste Subtotal Class A/B/C							175.3				110.9							
Other Secondary Waste Subtotal GTCC							20.6				23.0)						
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0)						
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							105.0				61.6	5	0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							70.3				49.3	1	0.0				0.0	
Total Class A/B/C	644.5				189.5		175.3				110.9		0.0				0.0	
Total GTCC	190.0				252.1		20.6				23.0		0.0				0.0	
Total Mixed Class A/B/C	0.6				0.8		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

					Solidifi	cation - Detaile	ed Summary of	Secondary Wa	ste Estimates	for UNF2								
			UFD/I	AS	-5.14.11					EVA					EnergyS	olutions		
	As		,-				As						As					
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
<u>Operational Waste</u>																		
Inner containers (bagless transfer stub pieces)	2.5		LLW box	0.25	0.6				Similar waste									
Inner containers (bagless transfer stub pieces) Outer containers	7.4 0.03	None Compaction	GTCC box LLW box	5.78 0.003	9.8	GTCC Class A/B/C				included in the						imed to be includ Other Secondary \		
Inner containers (including convenience cans)	0.03	None	GTCC box	0.003	0.01				totals belo Seconda	ry Waste				101 B	arance or France	other secondary i	waste	
Operational Waste Subtotal Class A	0.03	None	Gree box	0.02	0.01	0.00	0		Seconda	l vuste	(C				(ol
Operational Waste Subtotal Class B							0				C		C				(
Operational Waste Subtotal Class C							0				C		C				(
Operational Waste Subtotal Class A/B/C	2.5				0.6		0				C		C				(
Operational Waste Subtotal GTCC	7.4				9.9		0				C		C)			()
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				C		C				()
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				C		C				()
Job Control Waste																		
Gloves	153.7		LLW box	15.4	38.4													
Gloves	3.1	None	GTCC box	2.4	4.1													
Shoe covers Shoe covers	153.7 3.1	Compaction None	LLW box GTCC box	15.4 2.4	38.4 4.1	Class A/B/C GTCC												
Laundered protective clothing	12.4	Compaction	LLW box	1.2	3.1	Class A/B/C			Similar wast	e streams are					Similarwast	e streams are		
Step-off pads	2.6	Compaction	LLW box	0.3	0.7				assumed to be							included in the		
Disposable protective clothing	108.0	Compaction	LLW box	10.8	27.0				totals belo							lance of Plant		
Disposable protective clothing	64.8	None	GTCC box	50.6	86.1	GTCC			Seconda	ry Waste					Other Secon	ndary Waste		
Plastic suits Plastic suits	154.8 92.9	Compaction None	LLW box GTCC box	15.5 72.5	38.7 123.3	Class A/B/C GTCC												
Containment hut material	92.9	Compaction	LLW box	0.9	2.3	Class A/B/C												
Containment hut material	5.4	None	GTCC box	4.2	7.2	GTCC												
Job Control Waste Subtotal Class A	5.4	None	GICC BOX	4.2	7.2	dicc												
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	594.2				148.6													
Job Control Waste Subtotal GTCC	169.2				224.7													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste									ı	ı				•	•	•		•
Failed instruments and electronic equipment	0.6	None	55 gallon drum	3.6	0.8	Mixed A/B/C												
Failed piping and valves	10.0		LLW box	1.0	2.5													
Manipulator counterweights	0.1	Compaction	LLW box	0.0	0.0													
Manipulator boots Manipulator arms	1.5 4.8	Compaction Compaction	LLW box	0.2	0.4 1.2													
Glovebox gloves	0.1		LLW box	0.0	0.0													
Glovebox filters	0.2		LLW box	0.0	0.1	Class A/B/C												
HEPA filters	1.7	Compaction	LLW box	0.2	0.4													
HEPA filters	10.0 1.0	None	GTCC box LLW box	7.8 0.1	13.3	GTCC												
Dust collection bags Process vessel (various sizes)	11.0	Compaction None	LLW Engineered	Unknown	13.8													
Process vessel (various sizes)	2.4	None	GTCC engineered	Unknown	3.0	GTCC												
Pump - Process	1.0	None	LLW Engineered	Unknown	1.3	Class A/B/C												
Pump - Process	0.3	None	GTCC engineered		0.4													
Evaporator vessel	0.2	None	LLW Engineered	Unknown	0.3	0700			Similar wast							e streams are		
Evaporator vessel Evaporator condenser	0.1	None None	LLW Engineered		0.1				assumed to be							included in the		
Evaporator condenser	0.1		GTCC engineered		0.1	GTCC			totals belo Seconda							lance of Plant ndary Waste		
Evaporator reboiler	0.5	None	LLW Engineered	Unknown		Class A/B/C			5000.100	,					2 3000	,		
Evaporator cooler	0.1	None	LLW Engineered			Class A/B/C												
Hydrate evaporator Hydrate evaporator condenser	1.4 0.1	None None	LLW Engineered LLW Engineered	Unknown Unknown		Class A/B/C Class A/B/C												
Denitrator	0.6	None	LLW Engineered	Unknown	0.1													
Scrubber	10.4	None	LLW Engineered	Unknown	13.0													
Process vacuum unit	1.7	None	LLW Engineered	Unknown	2.1													
Heat exchanger	0.2	None	LLW Engineered		0.3													
Heat exchanger Agitator	0.3	None None	GTCC engineered LLW Engineered	Unknown Unknown	0.4 1.0													
Oxidizer	0.8	None	LLW Engineered	Unknown	0.1													
Oxidizer	0.1	None	GTCC engineered	Unknown	0.1													
Scrubber (critically safe)	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Scrubber (critically safe)	0.1	None	GTCC engineered	1	0.1	GTCC												
Maintenance Waste Subtotal Class A			<u> </u>															
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C					40.3													
Maintenance Waste Subtotal GTCC					17.5													
Maintenance Waste Subtotal Mixed Class A/B/C					0.8													
Maintenance Waste Subtotal Mixed GTCC					0.0													
iviaintenance waste Subtotal Mixed G ICC																		

					Colidifi	cation - Detaile	d Cummanı of	Sacandani Mi	sto Estimatos f	for LINE2								
			UFD/	FΔS	30110111	cation - Detaile	u Summary Of	Secondary Wa		EVA					Fnergy	Solutions		
	As		010/1	Ī			As						As		Literays	10.00.00		\top
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m ³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Other Secondary Waste						•			•			•		•		•		
Compactable Class A							105.0	Compacted	4 m3 box	14.0	61.6	Class A						
Non-compactable Class A							0.0											
Compactable Class C							66.4	Compacted	4 m3 box	9.2	40.5	Class C						
Non-compactable Class C							3.9	None	4 m3 box	2.0	8.8	Class C			See Balan	ice of Plant		
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							20.6	None	55 gallon drum	100.0	23.0	GTCC						
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							105.0				61.6							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							70.3				49.3							
Other Secondary Waste Subtotal Class A/B/C							175.3				110.9							4
Other Secondary Waste Subtotal GTCC							20.6				23.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							<u> </u>
Total Class A							105.0				61.6		0.0				0.0	ر
Total Class B							0.0				0.0		0.0				0.0)
Total Class C							70.3				49.3		0.0				0.0	٥
Total Class A/B/C					189.5		175.3				110.9		0.0				0.0	ו
Total GTCC	190.0				252.1		20.6				23.0		0.0				0.0	٥
Total Mixed Class A/B/C					0.8		0.0				0.0		0.0				0.0	ו
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	٥

				S	olidification -	Detailed Sumr	nary of Second	dary Waste Esti	mates for UNF	4 (Blended UN	F)							
			UFD/I					•	ARI	-	•				EnergyS	Solutions		
	As						As						As					
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
<u>Operational Waste</u>																		
Inner containers (bagless transfer stub pieces)	2.5		LLW box	0.25	0.6		ļ		Similar wast	e streams are								
Inner containers (bagless transfer stub pieces)	7.4	None	GTCC box	5.78	9.8	GTCC			assumed to be							imed to be includ		-
Outer containers	0.03	Compaction	LLW box	0.003	0.01	Class A/B/C			totals belo					for B	alance of Plant (Other Secondary \	Waste	
Inner containers (including convenience cans)	0.03	None	GTCC box	0.02	0.04	GTCC			Seconda	ry Waste	_							
Operational Waste Subtotal Class A							0)			0							
Operational Waste Subtotal Class B							0)			0							
Operational Waste Subtotal Class C Operational Waste Subtotal Class A/B/C	2.5				0.6		0	<u>'</u>			0				-			_
Operational Waste Subtotal Class A/B/C	7.4				9.9		0)										+
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0)			0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0				1			
Job Control Waste	0.0				0.0			4							1			
Gloves	153.7	Compaction	LLW box	15.4	38.4	Class A/B/C												
Gloves	3.1	None	GTCC box	2.4	4.1	GTCC]											
Shoe covers	153.7	Compaction	LLW box	15.4	38.4													
Shoe covers	3.1	None	GTCC box	2.4	4.1	GTCC												
Laundered protective clothing Step-off pads	12.4 2.6	Compaction Compaction	LLW box	1.2 0.3	3.1 0.7	Class A/B/C Class A/B/C			Similar wast							e streams are		
Disposable protective clothing	108.0	Compaction	LLW box	10.8	27.0	Class A/B/C			assumed to be							included in the		
Disposable protective clothing	64.8	None	GTCC box	50.6	86.1	GTCC			totals belo							lance of Plant		
Plastic suits	154.8	Compaction	LLW box	15.5	38.7	Class A/B/C			Seconda	y waste					Other Seco	ndary Waste		
Plastic suits	92.9	None	GTCC box	72.5	123.3	GTCC												
Containment hut material	9.0	Compaction	LLW box	0.9	2.3	Class A/B/C												
Containment hut material	5.4	None	GTCC box	4.2	7.2	GTCC	1											
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	594.2				148.6													
Job Control Waste Subtotal GTCC	169.2				224.7													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
<u>Maintenance Waste</u>																		
Failed instruments and electronic equipment	0.6	None	55 gallon drum	3.6		Mixed A/B/C												
Failed piping and valves	10.0	Compaction	LLW box	1.0 0.0	2.5													
Manipulator counterweights Manipulator boots	0.1 1.5	Compaction Compaction	LLW box	0.0	0.0													
Manipulator arms	4.8	Compaction	LLW box	0.5	1.2		1											
Glovebox gloves	0.1	Compaction	LLW box	0.0	0.0	Class A/B/C												
Glovebox filters	0.2	Compaction	LLW box	0.0	0.1		l											
HEPA filters HEPA filters	1.7 10.0	Compaction None	LLW box GTCC box	0.2 7.8	0.4 13.3													
Dust collection bags	1.0	Compaction	LLW box	0.1	0.3	Class A/B/C												
Process vessel (various sizes)	11.0	None	LLW Engineered	Unknown	13.8													
Process vessel (various sizes)	2.4	None	GTCC engineered	Unknown	3.0	GTCC												
Pump - Process	1.0	None	LLW Engineered	Unknown	1.3	Class A/B/C												
Pump - Process Evaporator vessel	0.3	None	GTCC engineered		0.4	GTCC Class A/R/C												
Evaporator vessel Evaporator vessel	0.2	None None	GTCC engineered		0.3	GTCC			Similar wast							e streams are		
Evaporator vesser Evaporator condenser	0.2		LLW Engineered			Class A/B/C			assumed to be							included in the lance of Plant		
Evaporator condenser	0.1	None	GTCC engineered	Unknown	0.1				totals belo Seconda	w for Other ry Waste						lance of Plant ndary Waste		
Evaporator reboiler	0.5	None	LLW Engineered		0.6				Scconda	,					Suici Seco	,		
Evaporator cooler Hydrate evaporator	0.1 1.4	None None	LLW Engineered LLW Engineered	Unknown		Class A/B/C Class A/B/C												
Hydrate evaporator Hydrate evaporator condenser	0.1	None	LLW Engineered	Unknown	0.1													
Denitrator	0.6	None	LLW Engineered	Unknown	0.8													
Scrubber	10.4	None	LLW Engineered	Unknown	13.0													
Process vacuum unit	1.7	None	LLW Engineered	Unknown	2.1													
Heat exchanger	0.2	None	LLW Engineered	Unknown	0.3													
Heat exchanger	0.3	None	GTCC engineered	Unknown	0.4	GTCC												
Agitator	0.8	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Oxidizer Oxidizer	0.1	None None	LLW Engineered	Unknown	0.1	Class A/B/C GTCC												
			GTCC engineered	Unknown														
Scrubber (critically safe)	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Scrubber (critically safe) Maintenance Waste Subtotal Class A	0.1	None	GTCC engineered	OHKHOWH	0.1	GTCC												
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	47.8				40.3													
Maintenance Waste Subtotal Class A/B/C Maintenance Waste Subtotal GTCC	13.4				17.5													
	13.4						-											
	0.6				በ ዩ													
Maintenance Waste Subtotal Mixed Class A/B/C Maintenance Waste Subtotal Mixed GTCC	0.6 0.0				0.8													\vdash

				9	Solidification -	Detailed Sumn	nary of Second	ary Waste Esti	mates for UNF	4 (Blended UNF	=)							
			UFD/I	EAS					AR	EVA					EnergyS	olutions		
	As Generated				Packaged		As Generated				Packaged		As Generated				Packaged	
	Volume	l		Container	Volume	Waste	Volume	l _		Container	Volume	Waste	Volume	l		Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
<u>Other Secondary Waste</u>			ı		1			1	1									
Compactable Class A							105.0	Compacted	4 m3 box	14.0	61.6	Class A						
Non-compactable Class A							0.0											
Compactable Class C							66.4	Compacted	4 m3 box	12.9	56.8	Class C						
Non-compactable Class C							6.6	None	4 m3 box	4.4	19.4	Class C			See Balan	ce of Plant		
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							36.0	None	55 gallon drum	174.0	40.0	GTCC						
Compactable GTCC-T (TRU)							0.0									1		
Other Secondary Waste Subtotal Class A							105.0				61.6							4
Other Secondary Waste Subtotal Class B							0.0				0.0							4
Other Secondary Waste Subtotal Class C							73.0				76.2							<u> </u>
Other Secondary Waste Subtotal Class A/B/C							178.0				137.8							4
Other Secondary Waste Subtotal GTCC							36.0				40.0							<u> </u>
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							A
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							A .
Total Class A							105.0				61.6		0.0				0.0	١
Total Class B							0.0				0.0		0.0				0.0	١
Total Class C							73.0				76.2		0.0				0.0)
Total Class A/B/C	644.5				189.5	5	178.0				137.8		0.0				0.0)
Total GTCC	190.0				252.1	L	36.0				40.0		0.0				0.0)
Total Mixed Class A/B/C	0.6				0.8	3	0.0				0.0		0.0				0.0)
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	ال

Appendix E

Acid Recovery Functional Area

Detailed Waste Comparison

					Acid Red	overy - Detail	ed Summary of	Secondary W	aste Estimates	for UNF1								
			UFD/	FAS	710.0 110	erer, zetani		occonducty st		EVA					Fnergy.	Solutions		
	As		310/	 	I		As		l Ain				As		Lineigys	1	1	
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume				-						_		Volume					
				Container	Volume	Waste	Volume			Container	Volume	Waste				Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
<u>Operational Waste</u>																		
Excess nitrates		See Liquio	d Effluent Processin	g - Solidified Was	ste Water		481	Cementation	4 m3 box	241	1060.4	Class A						
Operational Waste Subtotal Class A							481				1060.4							
Operational Waste Subtotal Class B							0				0							
Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	0.0				0.0		481				1060.4							
Operational Waste Subtotal GTCC	0.0				0.0		0				0							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste							-								1			
Gloves	15.8	Compaction	LLW box	1.6	4.0	Class A/B/C												
Shoe covers	15.8		LLW box	1.6		Class A/B/C												
Laundered protective clothing	1.4		LLW box	0.1	0.4				Similar waste							e streams are		
Step-off pads	0.4	Compaction	LLW box	0.0	0.1	Class A/B/C			assumed to be totals belo							included in the lance of Plant		
Disposable protective clothing	28.8	Compaction	LLW box	2.9		Class A/B/C			Seconda							ndary Waste		
Plastic suits	41.3		LLW box	4.1		Class A/B/C			Seconda	iy waste					Other Seco	idary waste		
Containment hut material	2.4	Compaction	LLW box	0.2	0.6	Class A/B/C			1		1						•	_
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	105.9				26.5													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste												-				•		
Failed instruments and electronic equipment	0.3	None	Mixed drum	2.9	0.6	Mixed A/B/C												
Failed piping and valves	10.0	Compaction	LLW box	1.0		Class A/B/C												
Process vessel (various sizes)	10.4	None	LLW Engineered		13.0													
Pump - Process	1.1	None	LLW Engineered		1.4				Similar waste							e streams are		
Evaporator condenser	0.3	None	LLW Engineered			Class A/B/C			assumed to be							included in the		
Evaporator reboiler	1.1	None None	LLW Engineered	Unknown Unknown	1.4 0.3	Class A/B/C Class A/B/C			totals belo Seconda							lance of Plant ndary Waste		
Heat exchanger Agitator	0.2	None	LLW Engineered LLW Engineered	Unknown	0.3				Seconda	ry waste					Other Seco	iuary waste		
Preheater	0.4	None	LLW Engineered	Unknown	0.5													
Distillation column	8.0	None	LLW Engineered		10.0													
Maintenance Waste Subtotal Class A						, , ,												
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	31.6				29.5													
Maintenance Waste Subtotal Class A/ B/C	0.0				0.0													
Maintenance Waste Subtotal Gree Maintenance Waste Subtotal Mixed Class A/B/C	0.0				0.6													
	0.3																	
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

					Acid Re	covery - Detail	ed Summary o	f Secondary W	ste Estimates	for UNF1								
			UFD/	EAS					ARI	EVA					EnergyS	olutions		
	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classificatio
Other Secondary Waste																		
Compactable Class A																		
Non-compactable Class A																		
Compactable Class C																		
Non-compactable Class C															See Balan	ce of Plant		
GTCC-NT (non-TRU)																		
Non-compactable GTCC-T (TRU)																		
Compactable GTCC-T (TRU)																		
Other Secondary Waste Subtotal Class A																		
Other Secondary Waste Subtotal Class B																		
Other Secondary Waste Subtotal Class C																		
Other Secondary Waste Subtotal Class A/B/C																		
Other Secondary Waste Subtotal GTCC																		
Other Secondary Waste Subtotal Mixed Class A/B/C																		
Other Secondary Waste Subtotal Mixed GTCC																		
Total Class A							481.0				1060.4	1	0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							0.0				0.0		0.0				0.0	
Total Class A/B/C	137.5				56.0		481.0				1060.4	1	0.0				0.0	
Total GTCC	0.0				0.0		0.0				0.0		0.0				0.0	
Total Mixed Class A/B/C	0.3				0.6	5	0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

					Acid Re	overy - Detail	ed Summary of	Secondary Wa	aste Estimates	for UNF2								
			UFD/I	EAS		, 2000				VA					EnergyS	Solutions		
Waste Stream	As Generated Volume (m³)	Treatment	Container	Container Quantity	Packaged Volume (m³)	Waste Classification	As Generated Volume (m³)	Treatment	Container	Container Quantity	Packaged Volume (m³)	Waste Classification	As Generated Volume (m³)	Treatment	Container	Container Quantity	Packaged Volume (m³)	Waste Classification
<u>Operational Waste</u>																		
Excess nitrates								Cementation	4 m3 box	0	1060.4	Class A						
Operational Waste Subtotal Class A							481				1060.4	l .	0				(0
Operational Waste Subtotal Class B							0				(0)			(0
Operational Waste Subtotal Class C							0						0				(0
Operational Waste Subtotal Class A/B/C	0.0				0.0		481				1060.4	1	0)			(0
Operational Waste Subtotal GTCC	0.0				0.0		0				(0					0
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				(0				(0
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				(0				(0
Job Control Waste																•		•
Gloves	15.8	Compaction	LLW box	1.6	4.0	Class A/B/C												
Shoe covers	15.8	Compaction	LLW box	1.6	4.0	Class A/B/C												
Laundered protective clothing	1.4		LLW box	0.1		Class A/B/C			Similar wast							te streams are		
Step-off pads	0.4	Compaction	LLW box	0.0	0.1				assumed to be totals belo							included in the lance of Plant		
Disposable protective clothing	28.8		LLW box	2.9	7.2				Seconda							ndary Waste		
Plastic suits	41.3	Compaction	LLW box	4.1	10.3	Class A/B/C			Seconda	y wuste					Other Secon	ndary waste		
Containment hut material	2.4	Compaction	LLW box	0.2	0.6	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	105.9				26.5													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
0	0.0	None	0	0.0	0.0	0												
0	0.0		0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Process vessel (various sizes) Pump - Process	10.4 1.1		LLW Engineered LLW Engineered	Unknown Unknown	13.0	Class A/B/C Class A/B/C			Similar waste	e streams are					Similar wast	te streams are		
Evaporator condenser	0.3	None None	LLW Engineered	Unknown	0.4				assumed to be							included in the		
Evaporator reboiler	1.1	None	LLW Engineered		1.4				totals belo						totals for Ba	lance of Plant		
Heat exchanger	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C			Seconda	ry Waste					Other Secon	ndary Waste		
- 0	0.0		0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0		0	0.0	0.0	0												
Maintenance Waste Subtotal Class A	3.0			3.0	3.0													
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	31.6				29.5													
Maintenance Waste Subtotal Class A/b/C	0.0				0.0													
Maintenance Waste Subtotal GTCC Maintenance Waste Subtotal Mixed Class A/B/C	0.0				0.6													
, ,	0.3				0.0													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

					Acid Re	covery - Detail	ed Summary o	f Secondary Wa	ste Estimates	for UNF2								
			UFD/	EAS					ARI	EVA					EnergyS	olutions		
	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Other Secondary Waste			•			•		•				•						
Compactable Class A																		
Non-compactable Class A																		
Compactable Class C																		
Non-compactable Class C															See Balan	ce of Plant		
GTCC-NT (non-TRU)																		
Non-compactable GTCC-T (TRU)																		
Compactable GTCC-T (TRU)																		
Other Secondary Waste Subtotal Class A																		Л
Other Secondary Waste Subtotal Class B																		
Other Secondary Waste Subtotal Class C																		
Other Secondary Waste Subtotal Class A/B/C																		
Other Secondary Waste Subtotal GTCC																		
Other Secondary Waste Subtotal Mixed Class A/B/C																		
Other Secondary Waste Subtotal Mixed GTCC																		
Total Class A							481.0				1060.4	1	0.0				0.0	5
Total Class B							0.0				0.0)	0.0				0.0	٥
Total Class C							0.0				0.0)	0.0				0.0	o l
Total Class A/B/C	137.5				56.0		481.0				1060.4	1	0.0				0.0	5
Total GTCC	0.0				0.0		0.0				0.0		0.0				0.0	b
Total Mixed Class A/B/C	0.3				0.6	i	0.0				0.0		0.0				0.0	5
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	o l

				Α	cid Recovery -	Detailed Sumr	nary of Second	ary Waste Est	mates for UNF	4 (Blended UN	IF)							
			UFD/E				,	,	ARI	•	,				EnergyS	Solutions		
	As						As						As					
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
<u>Operational Waste</u>																		
Excess nitrates							481	Cementation	4 m3 box	0	1060.4	Class A						
Operational Waste Subtotal Class A							481				1060.4							
Operational Waste Subtotal Class B							481				1060.4							
Operational Waste Subtotal Class B Operational Waste Subtotal Class C							0				0							
Operational Waste Subtotal Class A/B/C	0.0				0.0		481				1060.4							
Operational Waste Subtotal Crass A/b/C	0.0				0.0		461				1000.4							
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0							
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste	0.0				0.0													
Gloves	15.8	Compaction	LLW box	1.6	4.0	Class A/B/C												
Shoe covers	15.8	Compaction	LLW box	1.6	4.0													
Laundered protective clothing	1.4	Compaction	LLW box	0.1	0.4	Class A/B/C			Similar waste							e streams are		
Step-off pads	0.4	Compaction	LLW box	0.0	0.1	Class A/B/C			assumed to be							included in the		
Disposable protective clothing	28.8	Compaction	LLW box	2.9	7.2	Class A/B/C			totals belo Seconda							lance of Plant ndary Waste		
Plastic suits	41.3	Compaction	LLW box	4.1	10.3	Class A/B/C			Seconda	ly waste					Other Secon	iuary waste		
Containment hut material	2.4	Compaction	LLW box	0.2	0.6	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	105.9				26.5													
0	0.0	None	0	0.0	0.0	0												
0	0.0	None None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0			Similar waste	e streams are					Similar wast	e streams are		
Process vessel (various sizes) Pump - Process	10.4 1.1	None None	LLW Engineered LLW Engineered	Unknown Unknown	13.0 1.4				assumed to be	included in the					assumed to be	included in the		
rump - riocess	0.0	None	n LLW Engineered	Unknown 0.0	0.0	O Class A/B/C			totals belo							lance of Plant		
0	0.0	None	0	0.0	0.0	0			Seconda	ry Waste					Other Seco	ndary Waste		
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A					3.0													
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	31.6				29.5													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	0.3				0.6													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

Acid Recovery - Detailed Summary of Secondary Waste Estimates for UNF4 (Blended UNF)																					
	UFD/EAS							AREVA						Energy <i>Solutions</i>							
	As						As						As								
	Generated				Packaged		Generated				Packaged		Generated				Packaged				
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste			
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification			
Other Secondary Waste			•	•		•		•						•	•	•					
Compactable Class A																					
Non-compactable Class A																					
Compactable Class C																					
Non-compactable Class C													See Balance of Plant								
GTCC-NT (non-TRU)																					
Non-compactable GTCC-T (TRU)																					
Compactable GTCC-T (TRU)																					
Other Secondary Waste Subtotal Class A																					
Other Secondary Waste Subtotal Class B																					
Other Secondary Waste Subtotal Class C																					
Other Secondary Waste Subtotal Class A/B/C																					
Other Secondary Waste Subtotal GTCC																					
Other Secondary Waste Subtotal Mixed Class A/B/C																					
Other Secondary Waste Subtotal Mixed GTCC																					
Total Class A							481.0				1060.4	1	0.0				0.0	٥			
Total Class B							0.0				0.0		0.0				0.0	٥			
Total Class C							0.0				0.0		0.0				0.0	٥			
Total Class A/B/C	137.5				56.0		481.0				1060.4	1	0.0				0.0	٥			
Total GTCC	0.0				0.0		0.0				0.0		0.0				0.0	٥			
Total Mixed Class A/B/C	0.3				0.6	j	0.0				0.0		0.0				0.0	٥			
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	٥			

Appendix F
Liquid Effluent Processing Functional Area
Detailed Waste Comparison

					Liquid Effluer	nt Processing -	Detailed Summ	nary of Second	ary Waste Estir	nates for UNF	Ĺ							
			UFD/E	AS					ARI	EVA					EnergyS	olutions		1
	As						As						As					
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Operational Waste						•			•			•		•				•
Solidified waste water	1200.0	Cementation	Solid LLW box	1000.00	1200.0	Class A/B/C		See Acid	Recovery - Exces	s Nitrates			Se	e Process Waste	- Tritium Waste	(Not considered	d secondary was	ste)
				•		,	N	lo resin waste id	lentified specific	ally for Liquid E	fluent Processi	ng					1	I
Spent Ion Exchange Resins (including from Fuel Receipt)		Included	in Ion Exchange Ves	sel below					Receipt and Stora				1696	None	HIC 210-Liner	331	1880.1	L Class A
Salt-bearing waste							560	Cementation	4 m3 box	280	1232	Class A	1251.2	Cementation	HIC 210-Liner	301	1709.7	7 Class C
Operational Waste Subtotal Class A							560				1232		1696				1880.1	1
Operational Waste Subtotal Class B							0				(0				10001)
Operational Waste Subtotal Class C							0						1251.2				1709.7	7
Operational Waste Subtotal Class A/B/C	1200.0				1200.0		560				1232	,	2947.2				3589.8	1
Operational Waste Subtotal Class A/B/C	0.0				0.0		300				1232		2347.2				3303.0	
Operational Waste Subtotal GTCC Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0						0					
Operational Waste Subtotal Mixed Class A/B/C Operational Waste Subtotal Mixed GTCC	0.0				0.0		0						0					7
·	0.0				0.0	/	U					<u>' </u>	U					7
<u>Job Control Waste</u>																		
Gloves																		
Shoe covers Laundered protective clothing									Similar wast							e streams are		
Step-off pads			Included in Bala	nce of Plant					assumed to be							included in the		
Disposable protective clothing			meradea m Bare						totals belo							ance of Plant		
Plastic suits									Seconda	ry Waste					Other Secor	ndary Waste		
Containment hut material																		
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C																		
Job Control Waste Subtotal GTCC																		
Job Control Waste Subtotal Mixed Class A/B/C																		
Job Control Waste Subtotal Mixed GTCC																		
Maintenance Waste												•			ı			
Ion exchange vessel	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Micro-filtration housing	0.0		LLW Engineered	Unknown		Class A/B/C												
Carbon bed filter vessels	0.7		LLW Engineered	Unknown	0.9													
Reverse osmosis housing	0.2		LLW Engineered	Unknown	0.3				Similar waste							e streams are		
Evaporator	0.4	None	LLW Engineered	Unknown	0.5				assumed to be							included in the		
Condenser	4.5		LLW Engineered	Unknown Unknown	5.6				totals belo							ance of Plant		
Heat exchanger Process vessels	0.1 47.5	None None	LLW Engineered LLW Engineered	Unknown Unknown	0.1 59.4				Seconda	iy waste					Outer Secon	ndary Waste		
Agitator	1.5	None	LLW Engineered	Unknown	1.9													
Pump	2.3	None	LLW Engineered	Unknown	2.9													
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	57.4				71.8													
Maintenance Waste Subtotal Class A/ b/C	0.0				0.0													
Maintenance Waste Subtotal GTCC Maintenance Waste Subtotal Mixed Class A/B/C	0.0				0.0													
• • •					0.0													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0	/												

					Liquid Effluer	nt Processing - I	Detailed Sumn	nary of Seconda	ry Waste Estin	nates for UNF1								
			UFD/E	AS					ARE	VA					Energy <i>S</i>	olutions		
	As						As						As					
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Other Secondary Waste																		
Compactable Class A							100.5	Compacted	4 m3 box	14.0	61.6	Class A						
Non-compactable Class A							0.0											
Compactable Class C							1.7	Compacted	4 m3 box	0.3	1.3	Class C						
Non-compactable Class C							0.0								See Balan	ce of Plant		
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							100.5				61.6							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							1.7				1.3							
Other Secondary Waste Subtotal Class A/B/C							102.2				62.9							
Other Secondary Waste Subtotal GTCC							0.0				0.0)						4
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							660.5				1293.6	5	1696.0)			1880.1	1
Total Class B							0.0				0.0		0.0				0.0	٥
Total Class C							1.7				1.3		1251.2				1709.7	7
Total Class A/B/C	1257.4				1271.8		662.2				1294.9		2947.2				3589.8	3
Total GTCC	0.0				0.0		0.0				0.0		0.0				0.0)
Total Mixed Class A/B/C	0.0				0.0		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0)			0.0)

					Liquid Effluen	t Processing - I	Detailed Summ	ary of Second	ary Waste Estin	nates for UNF	2							
			UFD/I					,	ARI		_				EnergyS	olutions		
	As						As						As					
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Operational Waste	. , ,	l.			<u>, , , , , , , , , , , , , , , , , ,</u>							ı	, ,				·	· L
Solidified waste water	1200.0	Cementation	Solid LLW box	1000.00	1200.0	Class A/B/C		See Acid	Recovery - Excess	Nitrates			Se	ee Process Wasto	e - Tritium Waste	(Not considered	d secondary was	ste)
Spent Ion Exchange Resins (including from Fuel Receipt)		Included	in Ion Exchange Ves	sel below			N				ffluent Processin	g	1696		HIC 210-Liner	331	1880.1	
Salt-bearing waste							560	Cementation	4 m3 box	280	1232	Class A	1251.2	Cementation	HIC 210-Liner	301	1709.7	7 Class C
														•				•
Operational Waste Subtotal Class A							560				1232		1696				1880.1	1
Operational Waste Subtotal Class B							0				0		0				(0
Operational Waste Subtotal Class C							0				0		1251.2				1709.7	
Operational Waste Subtotal Class A/B/C	1200.0				1200.0		560				1232		2947.2				3589.8	8
Operational Waste Subtotal GTCC	0.0				0.0		0				0		0				(0
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0		0				(0
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0		0				(0
<u>Job Control Waste</u>																		
Gloves	0.0		0	0.0	0.0	0												
Shoe covers	0.0		0	0.0	0.0	0			Similar waste						Similar waste			
Laundered protective clothing	0.0	None	0	0.0	0.0	0			assumed to be						assumed to be			
Step-off pads	0.0	None	0	0.0	0.0	0			totals belo						totals for Bal			
Disposable protective clothing	0.0	None	0	0.0	0.0	0			Seconda						Other Secon			
Plastic suits	0.0		0	0.0	0.0	0												
Containment hut material	0.0	None	0	0.0	0.0	0					1	ı		1	1		1	
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	0.0				0.0													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
<u>Maintenance Waste</u>	0.0	N	IIIM Fasines 1	I 1 - 1	0.2	Class A/D/C												
Ion exchange vessel Micro-filtration housing	0.2		LLW Engineered LLW Engineered	Unknown Unknown		Class A/B/C Class A/B/C												
Carbon bed filter vessels	0.0	None	LLW Engineered	Unknown	0.1	, , ,												
Reverse osmosis housing	0.2		LLW Engineered	Unknown	0.3				Similar waste	e streams are					Similar waste	e streams are		
Evaporator	0.4	None	LLW Engineered	Unknown	0.5	Class A/B/C			assumed to be	included in the					assumed to be	included in the		
Condenser	4.5		LLW Engineered	Unknown	5.6	0.000.7270			totals belo						totals for Bal			
Heat exchanger	0.1	None	LLW Engineered	Unknown		Class A/B/C			Seconda	ry Waste					Other Secon	idary Waste		
Process vessels	47.5	None	LLW Engineered	Unknown	59.4	Class A/B/C												
Agitator Pump	1.5 2.3	None None	LLW Engineered LLW Engineered	Unknown	1.9 2.9													
Maintenance Waste Subtotal Class A	2.3	None	2244 Engineered	C.IKIIOWII	2.3	ciass Ayb/c												
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	57.4				71.8													
Maintenance Waste Subtotal Class A/B/C	0.0				0.0													
Maintenance Waste Subtotal GTCC Maintenance Waste Subtotal Mixed Class A/B/C	0.0				0.0													
	0.0				0.0													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

					Liquid Effluer	nt Processing - I	Detailed Sumn	nary of Second:	arv Waste Estir	mates for LINE2	1							
			UFD/I		Liquiu Lilluci	it i roccoomg	Je tane a Janin	idiy or second	•	EVA	·				EnergyS	olutions		
	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume		9,	Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Other Secondary Waste					•										•	•	•	
Compactable Class A							100.5	Compacted	4 m3 box	14.0	61.6	Class A						
Non-compactable Class A							0.0											
Compactable Class C							1.7	Compacted	4 m3 box	0.3	1.3	Class C						
Non-compactable Class C							0.0								See Balan	ce of Plant		
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							100.5				61.6	3						A a
Other Secondary Waste Subtotal Class B	3						0.0				0.0							A a
Other Secondary Waste Subtotal Class C							1.7				1.3							A a
Other Secondary Waste Subtotal Class A/B/C							102.2				62.9)						A T
Other Secondary Waste Subtotal GTCC							0.0				0.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0)						A T
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							660.5				1293.6		1696.0				1880.1	
Total Class B							0.0				0.0		0.0				0.0)
Total Class C							1.7				1.3		1251.2				1709.7	/
Total Class A/B/C	1257.4				1271.8		662.2				1294.9		2947.2				3589.8	3
Total GTCC	0.0				0.0)	0.0				0.0)	0.0				0.0	J .
Total Mixed Class A/B/C	0.0				0.0		0.0				0.0		0.0				0.0)
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	J.

				Liquid E	ffluent Proces	sing - Detailed	Summary of S	econdary Was	te Estimates fo	r UNF4 (Blend	led UNF)							
			UFD/E	AS		Ĭ		•	ARI	VA					Energy <i>S</i>	olutions		
	As						As						As					
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
<u>Operational Waste</u>																		
Solidified waste water	1200.0	Cementation	Solid LLW box	1000.00	1200.0	Class A/B/C	N	See Acid	Recovery - Excess	Nitrates	muent Processir			e Process Wast	e - Tritium Waste		secondary wa	ste)
Spent Ion Exchange Resins (including from Fuel Receipt)		Included	in Ion Exchange Ves	sel below			IN .	U Testii waste it	Possint and Store	any lor Liquiu Li	Posin\	15	1696	None	HIC 210-Liner	331	1880.	
Salt-bearing waste							560	Cementation	4 m3 box	280	1232	Class A	1240	Cementation	HIC 210-Liner	298	1692.6	Class C
Operational Waste Subtotal Class A							560				1232		1696				1880.:	1
Operational Waste Subtotal Class B							0				С		0				(D
Operational Waste Subtotal Class C							0				C		1240				1692.0	-
Operational Waste Subtotal Class A/B/C	1200.0				1200.0		560				1232		2936				3572.	7
Operational Waste Subtotal GTCC	0.0				0.0		0				C		0				(0
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				C		0				(O
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				C		0					O .
<u>Job Control Waste</u>																		
Gloves	0.0	None	0	0.0	0.0	0												
Shoe covers	0.0		0	0.0	0.0	0			c:						6: 11			
Laundered protective clothing	0.0	None	0	0.0	0.0	0			Similar waste assumed to be						Similar wast assumed to be			
Step-off pads	0.0	None	0	0.0	0.0	0			totals belo						totals for Bal			
Disposable protective clothing	0.0	None	0	0.0	0.0	0			Seconda						Other Secon			
Plastic suits	0.0		0	0.0	0.0	0												
Containment hut material	0.0	None	0	0.0	0.0	0												_
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	0.0				0.0													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
<u>Maintenance Waste</u>				L. I		21 1/2/2												
Ion exchange vessel Micro-filtration housing	0.2		LLW Engineered LLW Engineered			Class A/B/C Class A/B/C												
Carbon bed filter vessels	0.7		LLW Engineered	Unknown	0.9													
Reverse osmosis housing	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C			Similar wast	e streams are					Similar wast	e streams are		
Evaporator	0.4		LLW Engineered	Unknown	0.5				assumed to be	included in the					assumed to be	included in the		
Condenser	4.5		LLW Engineered	Unknown		Class A/B/C			totals belo						totals for Bal			
Heat exchanger	0.1	None	LLW Engineered	Unknown	0.1				Seconda	ry Waste					Other Secon	ndary Waste		
Process vessels Agitator	47.5 1.5	None None	LLW Engineered LLW Engineered	Unknown Unknown	59.4 1.9													
Pump	2.3	None	LLW Engineered		2.9													
Maintenance Waste Subtotal Class A	2.3	None	zzvv zngmeered	C.IKIIOWII	2.3	Siddy Ay by C												
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	57.4				71.8													
Maintenance Waste Subtotal Class A/B/C	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													
Wallitellance Waste Subtotal Mixed GTCC	0.0				0.0													

				Liquid I	Effluent Proces	ssing - Detailed	Summary of S	econdary Was	e Estimates fo	r UNF4 (Blende	ed UNF)							
			UFD/I		- Tracile Tocc	John Betained	Summary or s	cconduity was		EVA	zu Oiti j				EnergyS	Solutions		
	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Wasta
Waste Stream	(m³)	Treatment	Container	Quantity	_	Waste Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification		Treatment	Container	Quantity	(m³)	Waste Classification
Other Secondary Waste	, ,									, ,	. ,							
Compactable Class A							100.5	Compacted	4 m3 box	14.0	61.6	Class A						
Non-compactable Class A							0.0											
Compactable Class C							1.7	Compacted	4 m3 box	0.3	1.3	Class C						
Non-compactable Class C							0.0								See Balan	ice of Plant		
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							100.5				61.6	5						
Other Secondary Waste Subtotal Class B							0.0				0.0)						
Other Secondary Waste Subtotal Class C							1.7				1.3	3						
Other Secondary Waste Subtotal Class A/B/C							102.2				62.9							
Other Secondary Waste Subtotal GTCC							0.0				0.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0)						
Total Class A							660.5				1293.6	5	1696.0				1880.1	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							1.7				1.3		1240.0				1692.6	
Total Class A/B/C					1271.8		662.2				1294.9		2936.0				3572.7	
Total GTCC	0.0				0.0		0.0				0.0		0.0				0.0	
Total Mixed Class A/B/C					0.0		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

Appendix G
Vitrification Functional Area
Detailed Waste Comparison

104

Comparison of Waste Estimates from Recycling and Fuel Fabrication June 30, 2013

					Vitrific	ation - Detaile	d Summary of	Secondary Wa	ste Estimates f	or UNF1								
			UFD/	EAS					ARI	EVA					EnergyS	olutions		•
	As Generated Volume	Turaturant	Contrino	Container	Packaged Volume	Waste	As Generated Volume	Turaturant	Cantainan	Container	Packaged Volume	Waste	As Generated Volume	T	Comtainen	Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
<u>Operational Waste</u>																		
On austinual Masta Cultivatal Class A		ı	l		1		0	l	l			\			1	1		
Operational Waste Subtotal Class A							0					7					-	
Operational Waste Subtotal Class B Operational Waste Subtotal Class C							0											
Operational Waste Subtotal Class A/B/C	0.0				0.0		0					7					1	+
Operational Waste Subtotal Class A/B/C Operational Waste Subtotal GTCC	0.0				0.0		0					וו						
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0					ין ח						
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0											
Job Control Waste	0.0				0.0		U					<u> </u>						
Gloves	103.4	Compaction	LLW box	10.3	25.9	Class A/B/C												
Shoe covers	103.4	Compaction	LLW box	10.3		Class A/B/C			c:						6: 11			
Laundered protective clothing	8.7	Compaction	LLW box	0.9					Similar waste assumed to be							e streams are included in the		
Step-off pads	2.2	Compaction	LLW box	0.2					totals belo							ance of Plant		
Disposable protective clothing	144.0	Compaction	LLW box	14.4					Seconda							ndary Waste		
Plastic suits Containment hut material	206.4 12.0	Compaction Compaction	LLW box	20.6		Class A/B/C Class A/B/C												
Job Control Waste Subtotal Class A	12.0	Compaction	LLVV DOX	1.2	3.0	Class Ay b/C												
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	580.1				145.0													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste																	•	
Failed instruments and electronic equipment	0.3	None	Mixed drum	2.9	0.6	Mixed A/B/C												
Manipulator counterweights	0.1	None	Mixed drum	1.0	0.2	Mixed A/B/C												
Manipulator boots	2.4		LLW box	0.2														
Manipulator arms	8.0 0.1		LLW box	0.8		Class A/B/C Class A/B/C												
Glovebox gloves Glovebox filters	0.1		LLW box	0.0			1											
Process vessel (various sizes)	6.3	None	LLW Engineered		7.9		1								e: .:			
Vessel cooling coils	0.6	None	LLW Engineered	Unknown	0.8	Class A/B/C			Similar wast	a streams are						e streams are included in the		
vessel heating coils	0.6	None	LLW Engineered	Unknown	0.8				assumed to be							ance of Plant		
Pump - Transfer	7.2	None	LLW Engineered		9.0		-		totals belo							ndary Waste		
Jumper - Piping Jumper - Electrical and Instrument	23.7 14.5	None None	LLW Engineered LLW Engineered		29.6 18.1		1		Seconda									
Agitator	1.5		LLW Engineered		18.1		1											
Cooler	0.6	None	LLW Engineered			Class A/B/C]											
Condesner	1.1		LLW Engineered	Unknown	1.4	Class A/B/C												
Calciner	2.8	None	Mixed engineered			Mixed GTCC												
Scrubber Melter	0.6 31.3	None	LLW Engineered		0.8	Class A/B/C Mixed GTCC	4						3.00	None	Overne -!:	0.2		.8 GTCC
Meiter Absorber	0.6	None None	Mixed engineered LLW Engineered			Class A/B/C	1						2.90	Inone	Overpack	0.2	9.	اعادد
Maintenance Waste Subtotal Class A	0.0		zerr engineereu	2111110 2411	5.8	5.455 Fy b/ C							0					0
Maintenance Waste Subtotal Class B													0					0
													0					0
Maintenance Waste Subtotal Class C													0					n
Maintenance Waste Subtotal Class C Maintenance Waste Subtotal Class A/B/C	68.0				74.3								U					
	68.0 0.0				74.3								2.9				9.	8
Maintenance Waste Subtotal Class A/B/C													2.9				9.	8

					Vitrific	cation - Detaile	d Summary of	Secondary Wa	ste Estimates fo	or UNF1								
			UFD/I	AS					ARE	VA					EnergyS	olutions		
	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Other Secondary Waste		•													•	•	•	
Compactable Class A							83.0	Compacted	4 m3 box	11.5	50.6	Class A						
Non-compactable Class A							15.6	None	4 m3 box	3.9	17.2	Class A						
Compactable Class C							9.5	Compacted	4 m3 box	1.3	5.8	Class C						
Non-compactable Class C							0.5	None	4 m3 box	0.2	0.9	Class C			See Balan	ce of Plant		
GTCC-NT (non-TRU)							5.2	None	55 gallon drum	23.5	28.2	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							98.6				67.8	3						
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							10.0				6.7	7						
Other Secondary Waste Subtotal Class A/B/C							108.6				74.5	5						
Other Secondary Waste Subtotal GTCC							5.2				28.2	2						
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0)						
Total Class A							98.6				67.8	3	0.0				0.0)
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							10.0				6.7	,	0.0				0.0)
Total Class A/B/C	648.1				219.3		108.6				74.5	5	0.0				0.0	
Total GTCC	0.0				0.0		5.2				28.2	2	2.9				9.8	\$
Total Mixed Class A/B/C	0.4				0.8		0.0				0.0		0.0				0.0	
Total Mixed GTCC	34.1				44.8		0.0				0.0		0.0				0.0	

					Vitrific	ation - Detaile	d Summary of	Secondary Wa	ste Estimates f	or UNF2								
			UFD/	EAS			,			VA					EnergyS	Solutions	1	
	As Generated Volume		O	Container	Packaged Volume	Waste	As Generated Volume		C	Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
<u>Operational Waste</u>																		
Operational Waste Subtotal Class A							0				(0				(0
Operational Waste Subtotal Class B							0				(0				(0
Operational Waste Subtotal Class C							0				()	0				(0
Operational Waste Subtotal Class A/B/C	0.0				0.0		0				()	0				(0
Operational Waste Subtotal GTCC	0.0				0.0		0				(0					0
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				(0					0
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				()	0				(0
<u>Job Control Waste</u>		•							•		,	•		•				
Gloves	103.4	Compaction	LLW box	10.3	25.9	Class A/B/C												
Shoe covers	103.4	Compaction	LLW box	10.3	25.9	Class A/B/C												
Laundered protective clothing	8.7	Compaction	LLW box	0.9		Class A/B/C				e streams are						te streams are		
Step-off pads	2.2	Compaction	LLW box	0.2		Class A/B/C			assumed to be totals belo							included in the lance of Plant		
Disposable protective clothing	144.0	Compaction	LLW box	14.4	36.0	Class A/B/C				ry Waste						ndary Waste		
Plastic suits	206.4	Compaction	LLW box	20.6	51.6	Class A/B/C			Seconda	y waste					Other Secon	ildary waste		
Containment hut material	12.0	Compaction	LLW box	1.2	3.0	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	580.1				145.0													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
<u>Maintenance Waste</u>																		
Failed instruments and electronic equipment	0.3		Mixed drum	2.9		Mixed A/B/C												
Manipulator counterweights	0.1		Mixed drum	1.0		Mixed A/B/C												
Manipulator boots	2.4		LLW box	0.2		Class A/B/C												
0	0.0		0	0.0	0.0	0												
0	0.0		0	0.0														
Process vessel (various sizes)	6.3		LLW Engineered		7.9										Similar wast	te streams are		
Vessel cooling coils	0.6	None	LLW Engineered	Unknown	0.8											included in the		
vessel heating coils	0.6	None	LLW Engineered	Unknown	0.8				Similar wast						totals for Ba	lance of Plant		
Pump - Transfer	7.2	None	LLW Engineered	Unknown	9.0				assumed to be						Other Seco	ndary Waste		
Jumper - Piping	23.7	None	LLW Engineered		29.6				totals belo									
Jumper - Electrical and Instrument	14.5		LLW Engineered			Class A/B/C			Seconda	iy waste								
Agitator Cooler	1.5 0.6		LLW Engineered LLW Engineered		1.9 0.8	Class A/B/C Class A/B/C												
Cooler	1.1	None	LLW Engineered			Class A/B/C												
Calciner	2.8		Mixed engineered			Mixed GTCC												
Absorber	0.6	None	LLW Engineered		0.8													
0	0.0	None	0	0.0	0.0	0												
0	0.0		0	0.0	0.0	0												
Maintenance Waste Subtotal Class A	3.0		Ü	5.0	5.0	<u> </u>							0	1			T .	ol
Maintenance Waste Subtotal Class B													0					0
Maintenance Waste Subtotal Class C													0					0
Maintenance Waste Subtotal Class C	68.0				74.3								0					0
					0.0								0				9.8	0
Maintenance Waste Subtotal GTCC					0.0								2.9				9.8	0
Maintenance Waste Subtotal Mixed Class A/B/C													0					0
Maintenance Waste Subtotal Mixed GTCC	34.1				44.8								0					U

As Gener Volui Waste Stream (m² Other Secondary Waste Compactable Class A Non-compactable Class A Compactable Class C Non-compactable Class C STCC-NT (non-TRU)	rated me	ent (UFD/EA Container	Container Quantity	Packaged Volume (m³)	Waste Classification	As Generated Volume (m³)	Treatment	ARE Container	Container Quantity	Packaged Volume (m³)	Waste	As Generated Volume		EnergyS	olutions Container	Packaged Volume	Waste
Waste Stream (minus Stream Stream (minus Stream Str	rated me	ent (Container		Volume		Generated Volume	Treatment	Container		Volume		Generated Volume			Container	Volume	Waste
Waste Stream (mi Other Secondary Waste Compactable Class A Non-compactable Class A Compactable Class C Non-compactable Class C		ent (Container		_			Treatment	Container							Container		Waste
Other Secondary Waste Compactable Class A Non-compactable Class A Compactable Class C Non-compactable Class C	3) Treatn	ent (Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	/ ³ \		, 3,					
Compactable Class A Non-compactable Class A Compactable Class C Non-compactable Class C										Qualitity	(m)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classificatio
Non-compactable Class A Compactable Class C Non-compactable Class C																		
Compactable Class C Non-compactable Class C							83.0	Compacted	4 m3 box	11.5	50.6							
Non-compactable Class C							15.6	None	4 m3 box	3.9	17.2	Class A						
							9.5	Compacted	4 m3 box	1.3	5.8	Class C						
GTCC-NT (non-TRU)							0.5	None	4 m3 box	0.2	0.9	Class C			See Baland	ce of Plant		
							5.2	None	55 gallon drum	23.5	28.2	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							98.6				67.8							1
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							10.0				6.7							
Other Secondary Waste Subtotal Class A/B/C							108.6				74.5							
Other Secondary Waste Subtotal GTCC							5.2				28.2							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							98.6				67.8		0.0				0.0	5
Total Class B							0.0				0.0		0.0				0.0	5
Total Class C							10.0				6.7		0.0				0.0	5
	648.1				219.3		108.6				74.5		0.0				0.0	
Total GTCC	0.0				0.0		5.2				28.2		2.9				9.8	8
Total Mixed Class A/B/C	0.4				0.8		0.0				0.0		0.0				0.0	
Total Mixed GTCC	34.1				44.8		0.0				0.0		0.0				0.0	

					Vitrification - [Detailed Summ	nary of Seconda	ary Waste Estir	nates for UNF4	1 (Blended UN	F)							
			UFD/E	EAS					AR	EVA		_			EnergyS	olutions		,
W. d. St	As Generated Volume (m³)	Treatment	Container	Container Quantity	Packaged Volume (m³)	Waste Classification	As Generated Volume (m³)	Treatment	Container	Container Quantity	Packaged Volume (m³)	Waste Classification	As Generated Volume (m³)	Treatment	Container	Container Quantity	Packaged Volume (m³)	Waste Classification
Waste Stream	(111)	Heatment	Container	Qualitity	(111)	Classification	(111)	Heatment	Container	Quantity		Classification	(1117	Treatment	Container	Qualitity	(1117	Ciassification
<u>Operational Waste</u>																		
Operational Waste Subtotal Class A							0)			(
Operational Waste Subtotal Class B							0)			(
Operational Waste Subtotal Class C							0)			(
Operational Waste Subtotal Class A/B/C	0.0				0.0		0)			(
Operational Waste Subtotal GTCC	0.0				0.0		0)			(
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0)			()						
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0)			(
<u>Job Control Waste</u>																		
Gloves	103.4	Compaction	LLW box	10.3		Class A/B/C												
Shoe covers	103.4	Compaction	LLW box	10.3	25.9	Class A/B/C												
Laundered protective clothing	8.7	Compaction	LLW box	0.9	2.2	Class A/B/C				e streams are						e streams are		
Step-off pads	2.2	Compaction	LLW box	0.2	0.6	Class A/B/C				included in the w for Other					assumed to be totals for Bal			
Disposable protective clothing	144.0	Compaction	LLW box	14.4	36.0	Class A/B/C				ry Waste						ndary Waste		
Plastic suits	206.4	Compaction	LLW box	20.6	51.6	Class A/B/C				,						,		
Containment hut material	12.0	Compaction	LLW box	1.2	3.0	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	580.1				145.0													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
<u>Maintenance Waste</u>																		
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0		0												
0	0.0	None None	0	0.0	0.0	0												
0	0.0	None	0	0.0														
Process vessel (various sizes)	6.3	None	LLW Engineered		7.9											e streams are		
Vessel cooling coils	0.6	None	LLW Engineered	Unknown	0.8										assumed to be			
vessel heating coils	0.6	None	LLW Engineered	Unknown	0.8	, ,				e streams are						ance of Plant ndary Waste		
Pump - Transfer	7.2	None	LLW Engineered		9.0					included in the					Other Secor	iuai y Waste		
Jumper - Piping	23.7	None	LLW Engineered LLW Engineered		29.6	Class A/B/C Class A/B/C				w for Other								
Jumper - Electrical and Instrument Agitator	14.5 1.5	None None	LLW Engineered LLW Engineered			Class A/B/C			Seconda	ry Waste								
Calciner	2.8	None	Mixed engineered			Mixed GTCC												
Scrubber	0.6	None	LLW Engineered		0.8		1											
Melter	31.3	None	Mixed engineered		41.1	Mixed GTCC							2.0	None	Overpack	0.2	0.0	в стсс
Absorber	0.6	None	LLW Engineered		0.8								2.9	1.40110	Overpack	0.2	J.0	7,5100
United the last the l	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0														
Maintenance Waste Subtotal Class A	0.0	None	U	0.0	0.0	U												า
																		1
Maintenance Waste Subtotal Class B Maintenance Waste Subtotal Class C																		2
					74.0													
Maintenance Waste Subtotal Class A/B/C					74.3												(
Maintenance Waste Subtotal GTCC					0.0								2.9				9.8	0
Maintenance Waste Subtotal Mixed Class A/B/C	0.4				0.8												()
Maintenance Waste Subtotal Mixed GTCC	34.1				44.8													J

					Vitrification -	Detailed Summ	any of Second	ny Wasta Estir	nates for LINEA	/Blanded LINE	:1							
			UFD/I		vitilitation -	Detailed Sullill	ary or second	ily waste Estil		EVA	1				FnergyS	olutions		
	As		0.27.	1			As		7				As					T
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Other Secondary Waste		•				•			•			•		•				
Compactable Class A							83.0	Compacted	4 m3 box	11.5	50.6	Class A						
Non-compactable Class A							15.6	None	4 m3 box	3.9	17.2	Class A						
Compactable Class C							9.5	Compacted	4 m3 box	1.8	7.9	Class C						
Non-compactable Class C							0.5	None	4 m3 box	0.3	1.3	Class C			See Balan	ce of Plant		
GTCC-NT (non-TRU)							5.2	None	55 gallon drum	23.5	28.2	GTCC						
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							98.6				67.8	3						
Other Secondary Waste Subtotal Class B							0.0				0.0)						
Other Secondary Waste Subtotal Class C							10.0				9.2	2						
Other Secondary Waste Subtotal Class A/B/C							108.6				77.0)						
Other Secondary Waste Subtotal GTCC							5.2				28.2	2						
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0)						
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0)						
Total Class A							98.6				67.8	3	0.0)			0.0	<u> </u>
Total Class B							0.0				0.0)	0.0)			0.0	
Total Class C							10.0				9.2		0.0)			0.0	
Total Class A/B/C	648.1				219.3		108.6				77.0)	0.0				0.0	
Total GTCC	0.0				0.0		5.2				28.2	2	2.9				9.8	<u> </u>
Total Mixed Class A/B/C					0.8		0.0				0.0)	0.0				0.0	
Total Mixed GTCC	34.1				44.8		0.0				0.0		0.0				0.0	

Appendix H
Offgas Functional Area
Detailed Waste Comparison

					Offs	as - Detailed S	ummary of Sec	ondary Waste	Estimates for	UNF1								
			UFD/I	EAS	Oni	, Detailed 3	ar y or sec	.c.iaaiy waste		EVA					FnergyS	Solutions		
	As		J. 5, 5, 1				As		AN AN				As		Litergys			
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Operational Waste	(111)	Treatment	Container	Qualitity	(/	Classification	(111)	reatment	Container	Quantity	(/	Classification	(111)	Treatment	Container	Qualitity	(111)	Classification
<u>Operational Waste</u>																		
			1	1						1				1				
Operational Waste Subtotal Class A							0				()						
Operational Waste Subtotal Class B							0				()						
Operational Waste Subtotal Class C							0				()						
Operational Waste Subtotal Class A/B/C	0.0				0.0		0				()						
Operational Waste Subtotal GTCC	0.0				0.0		0				()						
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				(
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0											
<u>Job Control Waste</u>			1	1		= 1												
Gloves	15.3		LLW box	1.5 1.5		Class A/B/C												
Shoe covers Laundered protective clothing	15.3 2.1		LLW box	0.2		Class A/B/C Class A/B/C										e streams are		
Step-off pads	0.9		LLW box	0.1		Class A/B/C										included in the		
Disposable protective clothing	0.0		LLW box	0.0												lance of Plant		
Plastic suits		Compaction	LLW box	0.0		Class A/B/C									Other Secon	ndary Waste		
Containment hut material	0.0	Compaction	LLW box	0.0	0.0	Class A/B/C				1				1				
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		4
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	33.6				8.4													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
<u>Maintenance Waste</u>			1	•														
Failed instruments and electronic equipment	0.3		Mixed drum	2.4		Mixed A/B/C									Cimilarunat			
Jumper - Piping Jumper - Electrical and Instrument	1.4 0.5		LLW Engineered LLW Engineered	Unknown Unknown	1.8	Class A/B/C Class A/B/C									assumed to be	e streams are		
Offgas filter vessel	0.2		GTCC engineered	Unknown	0.3	GTCC										lance of Plant		
Iodine reactor vessel	0.1		LLW Engineered	Unknown	0.1											ndary Waste		
Ruthenium filter vessel	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C					2.6													
Maintenance Waste Subtotal GTCC					0.3													
Maintenance Waste Subtotal Mixed Class A/B/C					0.5													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													
Other Secondary Waste																		
Compactable Class A																		
Non-compactable Class A Compactable Class C																		
Non-compactable Class C									None Io	lentified					See Balan	ce of Plant		
GTCC-NT (non-TRU)																		
Non-compactable GTCC-T (TRU)																		
Compactable GTCC-T (TRU)																		
Other Secondary Waste Subtotal Class A							0.0				0.0							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							0.0				0.0							
Other Secondary Waste Subtotal Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal GTCC							0.0				0.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0							
Total Class A							0.0				0.0		0.0				0.0	
Total Class B							0.0				0.0		0.0				0.0	
Total Class C							0.0				0.0		0.0				0.0	
Total Class A/B/C	35.7				11.0		0.0				0.0		0.0				0.0	
Total GTCC	0.2				0.3		0.0				0.0		0.0				0.0	
Total Mixed Class A/B/C	0.3				0.5		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

					Offe	as - Detailed S	Summary of Sec	condary Waste	Estimates for U	JNF2								
			UFD/I	EAS	JII E	, = cturieu c			ARE						Energy	Solutions		
	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume		,	Container	Packaged Volume	Waste	As Generated Volume		2.10.87	Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
<u>Operational Waste</u>				-	•											•		
Operational Waste Subtotal Class A							0				0		0)			0)
Operational Waste Subtotal Class B							0				0		0				0)
Operational Waste Subtotal Class C Operational Waste Subtotal Class A/B/C	0.0				0.0		0				0		0)			0)
Operational Waste Subtotal Class A/B/C Operational Waste Subtotal GTCC	0.0				0.0		0				0)	0)			0	
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				0		0				0	
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0		0)			0)
<u>Job Control Waste</u>																		
Gloves Shoe covers	15.3 15.3	Compaction Compaction	LLW box	1.5 1.5														
Laundered protective clothing	2.1	Compaction	LLW box	0.2					Similar waste							te streams are		
Step-off pads	0.9	Compaction	LLW box	0.1		Class A/B/C			assumed to be i							included in the lance of Plant		
Disposable protective clothing Plastic suits	0.0	Compaction Compaction	LLW box	0.0	0.0	Class A/B/C Class A/B/C			Secondar							ndary Waste		
Containment hut material	0.0	Compaction	LLW box	0.0														
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C Job Control Waste Subtotal Class A/B/C	33.6				8.4													
Job Control Waste Subtotal Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
<u>Maintenance Waste</u>				1														
Failed instruments and electronic equipment Jumper - Piping	0.3 1.4	None None	Mixed drum LLW Engineered	2.4 Unknown	0.5 1.8	Mixed A/B/C Class A/B/C			Similar waste	streams are					Similar was	te streams are		
Jumper - Electrical and Instrument	0.5	None	LLW Engineered	Unknown	0.6				assumed to be i	included in the					assumed to be	included in the		
Offgas filter vessel lodine reactor vessel	0.2 0.1	None None	GTCC engineered LLW Engineered	Unknown Unknown	0.3	GTCC Class A/B/C			totals below Secondar							lance of Plant ndary Waste		
Ruthenium filter vessel	0.1	None	LLW Engineered	Unknown	0.1	Class A/B/C			Secondar	y waste					Other Seco	iluary waste		
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C	2.1				2.6													
Maintenance Waste Subtotal Class A/B/C Maintenance Waste Subtotal GTCC	2.1 0.2				0.3													
Maintenance Waste Subtotal Mixed Class A/B/C	0.2				0.5													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													
Other Secondary Waste																		
Compactable Class A Non-compactable Class A							0.0											
Compactable Class C							0.0											
Non-compactable Class C							0.0								See Balar	nce of Plant		
GTCC-NT (non-TRU) Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU)							0.0											
Other Secondary Waste Subtotal Class A							0.0				0.0							
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C Other Secondary Waste Subtotal Class A/B/C							0.0				0.0							
Other Secondary Waste Subtotal Class A/B/C Other Secondary Waste Subtotal GTCC							0.0				0.0							
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0)						
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0	1						
7 10 4							0.0				0.0		0.0				0.0	
Total Class A																		
Total Class B							0.0				0.0		0.0				0.0	
Total Class B Total Class C	25.7				11.0		0.0				0.0)	0.0)			0.0)
Total Class B	35.7 0.2				11.0 0.3)))
Total Class B Total Class C Total Class A/B/C							0.0				0.0		0.0)			0.0)

					Offgas - Det	ailed Summar	y of Secondary	Waste Estimat	es for LINF4 (R	lended LINE)								
			UFD/I	EAS	Ongas - Det	anea Janiinar	, or secondary	·· aste Estinidi		EVA					EnergyS	olutions		
	As		5.5/1				As		7.30				As					
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Operational Waste																		
	1																	
			1								_							
Operational Waste Subtotal Class A							0				C							
Operational Waste Subtotal Class B							0				C							
Operational Waste Subtotal Class C	0.0				0.0		0				0							
Operational Waste Subtotal Class A/B/C Operational Waste Subtotal GTCC	0.0				0.0		0											
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0											
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				0							
Job Control Waste	3.0				0.0													
Gloves	15.3	Compaction	LLW box	1.5	3.8	Class A/B/C												
Shoe covers	15.3	Compaction	LLW box	1.5	3.8	Class A/B/C			Similar waste	e streams are					Similar wast	e streams are		
Laundered protective clothing	2.1		LLW box	0.2	0.5				assumed to be						assumed to be			
Step-off pads Disposable protective clothing	0.9		LLW box	0.1	0.2	Class A/B/C Class A/B/C			totals belo	w for Other					totals for Bal	ance of Plant		
Plastic suits	0.0		LLW box	0.0	0.0				Seconda	ry Waste					Other Secon	ndary Waste		
Containment hut material		Compaction	LLW box	0.0	0.0													
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	33.6				8.4													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste Failed instruments and electronic equipment	0.3	None	Baissad dussa	2.4	0.5	Adirect A/D/C												
Jumper - Piping	1.4		Mixed drum LLW Engineered	Unknown	1.8	Mixed A/B/C Class A/B/C			Similar waste	e streams are					Similar wast	e streams are		
Jumper - Electrical and Instrument	0.5		LLW Engineered	Unknown		Class A/B/C			assumed to be						assumed to be			
Offgas filter vessel	0.2		GTCC engineered		0.3	GTCC			totals belo							ance of Plant		
lodine reactor vessel Ruthenium filter vessel	0.1		LLW Engineered LLW Engineered	Unknown Unknown	0.1				Seconda	ry Waste					Other Secor	ndary Waste		
Maintenance Waste Subtotal Class A	0.1	None	LLW Engineered	OTIKITOWIT	0.1	Class Ayb/C												
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	2.1				2.6													
Maintenance Waste Subtotal GTCC	0.2				0.3													
Maintenance Waste Subtotal Mixed Class A/B/C	0.3				0.5													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													
Other Secondary Waste																		
Compactable Class A							0.0											
Non-compactable Class A Compactable Class C							0.0											
Non-compactable Class C							0.0								See Balan	ce of Plant		
GTCC-NT (non-TRU)							0.0											
Non-compactable GTCC-T (TRU)							0.0											
Compactable GTCC-T (TRU) Other Secondary Waste Subtotal Class A							0.0				0.0							
Other Secondary waste Subtotal Class A							0.0											
Other Secondary Masta Subtatal Class B							0.0											
Other Secondary Waste Subtotal Class B							0.0				0.0							
Other Secondary Waste Subtotal Class C							0.0 0.0				0.0							
Other Secondary Waste Subtotal Class C Other Secondary Waste Subtotal Class A/B/C							0.0				0.0 0.0 0.0							
Other Secondary Waste Subtotal Class C Other Secondary Waste Subtotal Class A/B/C Other Secondary Waste Subtotal GTCC							0.0 0.0 0.0				0.0							
Other Secondary Waste Subtotal Class C Other Secondary Waste Subtotal Class A/B/C							0.0 0.0 0.0 0.0				0.0 0.0 0.0 0.0							
Other Secondary Waste Subtotal Class O Other Secondary Waste Subtotal Class A/B/C Other Secondary Waste Subtotal GTCC Other Secondary Waste Subtotal Mixed Class A/B/C							0.0 0.0 0.0 0.0 0.0				0.0 0.0 0.0 0.0		0.0				0.0	
Other Secondary Waste Subtotal Class C Other Secondary Waste Subtotal Class A/B/C Other Secondary Waste Subtotal GTCC Other Secondary Waste Subtotal Mixed Class A/B/C Other Secondary Waste Subtotal Mixed GTCC							0.0 0.0 0.0 0.0 0.0 0.0				0.C 0.C 0.C 0.C 0.C		0.0				0.0	
Other Secondary Waste Subtotal Class O Other Secondary Waste Subtotal Class A/B/C Other Secondary Waste Subtotal GTCC Other Secondary Waste Subtotal Mixed Class A/B/C Other Secondary Waste Subtotal Mixed GTCC Total Class A							0.0 0.0 0.0 0.0 0.0 0.0 0.0				0.C 0.C 0.C 0.C 0.C)
Other Secondary Waste Subtotal Class C Other Secondary Waste Subtotal Class A/B/C Other Secondary Waste Subtotal GTCC Other Secondary Waste Subtotal Mixed Class A/B/C Other Secondary Waste Subtotal Mixed GTCC Total Class A	35.7				11.0		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0				0.C 0.C 0.C 0.C 0.C 0.C		0.0				0.0)
Other Secondary Waste Subtotal Class C Other Secondary Waste Subtotal Class A/B/C Other Secondary Waste Subtotal GTCC Other Secondary Waste Subtotal Mixed Class A/B/C Other Secondary Waste Subtotal Mixed GTCC Total Class A Total Class B					11.0		0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0				0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0		0.0				0.0)
Other Secondary Waste Subtotal Class Of Other Secondary Waste Subtotal Class A/B/C Other Secondary Waste Subtotal GTCC Other Secondary Waste Subtotal Mixed Class A/B/C Other Secondary Waste Subtotal Mixed GTCC Total Class A Total Class B Total Class A/B/C	35.7						0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0				0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0		0.0 0.0 0.0				0.0 0.0 0.0)))

Appendix I

Balance of Plant Functional Area

Detailed Waste Comparison

					Balance o	of Plant - Deta	iled Summary	of Secondary W	aste Estimates	for UNF1			_					
			UFD/	'EAS				1	ARI	EVA					EnergyS	olutions		1
	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classificatio
<u>Operational Waste</u>		,																
Packaging waste (low activity)	135.5	Compaction	LLW box	13.55	33.9		_											
Packaging waste (high activity)	4.8	None	GTCC box	3.75	6.4	GTCC	_		Similar waste	e streams are					Similar wast	e streams are		
							-		assumed to be	included in the					assumed to be	included in the		
							_		totals belo							ance of Plant		
									Seconda	ry Waste					Other Secon	ndary Waste		
Operational Waste Subtotal Class A							0)			(
Operational Waste Subtotal Class B							0)										
Operational Waste Subtotal Class C							0				(
Operational Waste Subtotal Class A/B/C	135.5				33.9		0				(
Operational Waste Subtotal GTCC	4.8				6.4		0)			(
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0				(
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0				(
Job Control Waste	3.0				3.0													
Gloves	633.8	Compaction	LLW box	63.4	158.4	Class A/B/C												
Shoe covers	633.8	Compaction	LLW box	63.4	158.4	Class A/B/C												
Laundered protective clothing	50.4	Compaction	LLW box	5.0	12.6				Similar waste							e streams are included in the		
Step-off pads	13.3	Compaction	LLW box	1.3	3.3	Class A/B/C			assumed to be totals below							lance of Plant		
Disposable protective clothing	2571.4	Compaction	LLW box	257.1	642.8	Class A/B/C			Seconda							ndary Waste		
Plastic suits	3685.6	Compaction	LLW box	368.6	921.4	Class A/B/C			50001144	., waste					ounce occor	idaily traste		
Containment hut material	106.1	Compaction	LLW box	10.6	26.5	Class A/B/C												
Job Control Waste Subtotal Class A																		
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	7694.3				1923.6													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
<u>Maintenance Waste</u>																		
Failed instruments and electronic equipment	5.3		Mixed drum	50.5		Mixed A/B/C												
Manipulator counterweights	0.1		Mixed drum	0.6		Mixed A/B/C												
Manipulator boots	1.5		LLW box	0.2	0.4		_											
Manipulator arms Glovebox gloves	4.8 1.7	Compaction Compaction	LLW box	0.5	1.2 0.4													
Glovebox gloves Glovebox gloves - leaded	0.2	None	Mixed drum	1.9		Mixed A/B/C												
Glovebox filters	4.7		LLW box	0.5		Class A/B/C												
Fume hood filters	1.0	None	Mixed drum	9.6		Mixed A/B/C												
HVAC exhaust air filters (HEPA)	3700.2	Compaction	LLW box	370.0	925.1	Class A/B/C			Similar waste	e streams are								
HVAC exhaust air filters (roughing)	1284.5	Compaction	LLW box	128.5	321.1	Class A/B/C			assumed to be							imed to be included		5
Contaminated mop heads	32.0	Compaction	LLW box	3.2	8.0	, , , .			totals belo					for Ba	lance of Plant C	Other Secondary	Waste	
Fluorescent lamps	11.0	Compaction	LLW box	1.1	2.8	Class A/B/C			Seconda	ry Waste								
Batteries	0.4	None	Mixed drum	3.8		Mixed A/B/C	-											
Jumper - Piping Jumper - Electrical and Instrument	13.8 12.0		LLW Engineered LLW Engineered			Class A/B/C Class A/B/C												
Vessel vent fan	13.6		LLW Engineered			Class A/B/C												
Vessel vent condenser	0.3	None	LLW Engineered			Class A/B/C												
Vessel vent filter	38.7	None	LLW Engineered		48.4	Class A/B/C												
Vessel vent heater	1.0		LLW Engineered	Unknown	1.3	Class A/B/C												
Vessel vent separator	0.2	None	LLW Engineered	Unknown	0.3	Class A/B/C												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	5120.0				1359.6													
Maintenance Waste Subtotal GTCC	0.0				0.0													
Maintenance Waste Subtotal Mixed Class A/B/C	6.9				13.8													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

					Ralance	of Plant - Detai	led Summany	of Secondary M	acta Ectimatas	for LINE1								
			UFD/I	EAS	Datatice	oi Fiailt - Detai	ieu Sullillary (n secondary w		EVA					EnergySo	olutions		
	As		0.2,				As						As					
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Other Secondary Waste					-							•					-	
Compactable Class A							19.4	Compacted	4 m3 box	2.7	11.9	Class A	578	Compacted	4 m3 box	975	406	6 Class A
Non-compactable Class A							0.0						0					
Compactable Class C							3.4	Compacted	4 m3 box	0.5	2.2	Class C	0					
Non-compactable Class C							0.0						0.78	None	4 m3 box	4	0.8	B Class C
GTCC-NT (non-TRU)							0.0						0					/
Non-compactable GTCC-T (TRU)							0.0						4.8	None	55 gallon drum	24.6	5.1	1 GTCC
Compactable GTCC-T (TRU)							0.0						4.8	Compacted	55 gallon drum	8	3.3	GTCC
Other Secondary Waste Subtotal Class A							19.4				11.9		578				406	j i
Other Secondary Waste Subtotal Class B							0.0				0.0		0				C)
Other Secondary Waste Subtotal Class C							3.4				2.2		0.78				0.8	3
Other Secondary Waste Subtotal Class A/B/C							22.8				14.1		578.78				406.8	3
Other Secondary Waste Subtotal GTCC							0.0				0.0)	9.6				8.4	1
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0)	0				C)
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0		0				C)
Total Class A							19.4				11.9		578.0				406.0)
Total Class B							0.0				0.0		0.0				0.0)
Total Class C							3.4				2.2		0.8				0.8	3
Total Class A/B/C	12949.8				3317.0		22.8				14.1		578.8				406.8	3
Total GTCC	4.8				6.4		0.0				0.0		9.6				8.4	Į.
Total Mixed Class A/B/C	6.9				13.8		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

					Balance o	of Plant - Detai	led Summary o	of Secondary W	aste Estimates	for UNF2								
			UFD/	EAS						VA					EnergyS	Solutions		
	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
<u>Operational Waste</u>				1														
Packaging waste (low activity)	135.5	Compaction	LLW box	13.55	33.9													
Packaging waste (high activity)	4.8	None	GTCC box	3.75	6.4	GTCC			Similar waste	e streams are					Similar wast	e streams are		-
									assumed to be totals below							included in the lance of Plant		
									Seconda							ndary Waste		
										,						,		
Operational Waste Subtotal Class A							0				()	0				C)
Operational Waste Subtotal Class B							0				(0				C	
Operational Waste Subtotal Class C							0				()	0				C)
Operational Waste Subtotal Class A/B/C					33.9		0				(0				C	
Operational Waste Subtotal GTCC	4.8				6.4		0				(1	0				C	
Operational Waste Subtotal Mixed Class A/B/C					0.0		0				(0				(
Operational Waste Subtotal Mixed GTCC	0.0				0.0		0					1	0				(
<u> Job Control Waste</u>			1			•												
Gloves	633.8		LLW box	63.4	158.4													
Shoe covers Laundered protective clothing	633.8 50.4	Compaction Compaction	LLW box	63.4 5.0	158.4 12.6	Class A/B/C Class A/B/C			Similar waste	e streams are					Similar wast	e streams are		
Step-off pads	13.3	Compaction	LLW box	1.3	3.3	Class A/B/C			assumed to be	included in the					assumed to be	included in the		
Disposable protective clothing	2571.4	Compaction	LLW box	257.1	642.8	Class A/B/C			totals belo							lance of Plant		
Plastic suits	3685.6	Compaction	LLW box	368.6	921.4	Class A/B/C			Seconda	ry Waste					Other Seco	ndary Waste		
Containment hut material	106.1	Compaction	LLW box	10.6	26.5	Class A/B/C												
Job Control Waste Subtotal Class A	100:1	compaction	LETT DOX	10.0	20.5	0.03374270												
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	7694.3				1923.6													
Job Control Waste Subtotal GTCC					0.0													
Job Control Waste Subtotal Mixed Class A/B/C					0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
Maintenance Waste		•										•			•			<u>'</u>
Failed instruments and electronic equipment	5.3	None	Mixed drum	50.5	10.5	Mixed A/B/C												
Manipulator counterweights	0.1	None	Mixed drum	0.6		Mixed A/B/C												
Manipulator boots	1.5		LLW box	0.2		Class A/B/C												
Manipulator arms	4.8		LLW box	0.5		Class A/B/C												
Glovebox gloves Glovebox gloves - leaded	1.7 0.2		LLW box Mixed drum	0.2 1.9		Class A/B/C Mixed A/B/C												
Glovebox gloves - leaded Glovebox filters	4.7		LLW box	0.5		Class A/B/C												
Fume hood filters	1.0	None	Mixed drum	9.6	2.0	Mixed A/B/C												
HVAC exhaust air filters (HEPA)	3700.2	Compaction	LLW box	370.0	925.1	Class A/B/C			Similar waste	e streams are								
HVAC exhaust air filters (roughing)	1284.5	Compaction	LLW box	128.5	321.1				assumed to be					Similar waste s	streams are assu	imed to be includ	led in the totals	
Contaminated mop heads	32.0		LLW box	3.2	8.0				totals belo							Other Secondary \		
Fluorescent lamps	11.0		LLW box	1.1 3.8		Class A/B/C Mixed A/B/C			Seconda	ry Waste								
Batteries Jumper - Piping	0.4 13.8		Mixed drum LLW Engineered		U.8 17 3	Class A/B/C												
Jumper - Electrical and Instrument	12.0		LLW Engineered			Class A/B/C												
Vessel vent fan	13.6		LLW Engineered			Class A/B/C												
Vessel vent condenser	0.3	None	LLW Engineered		0.4	Class A/B/C												
0	0.0	None	0	0.0	0.0													
0	0.0	None	0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C	5120.0				1359.6													
Maintenance Waste Subtotal GTCC					0.0													
Maintenance Waste Subtotal Mixed Class A/B/C					13.8													
Maintenance Waste Subtotal Mixed GTCC					0.0													
The state of the s	5.0				5.0													

					Ralance	of Plant - Detai	led Summany	of Secondary M	asta Estimata	s for LINE2								
			UFD/I	EAS	Datatice	OI FIAIIL - Detai	ieu Julilliai y C	n secondary w		EVA					EnergyS	olutions		
	As		J. 2,				As						As					
	Generated				Packaged		Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Other Secondary Waste																		
Compactable Class A							19.4	Compacted	4 m3 box	2.7	11.9	Class A	578	Compacted	4 m3 box	975	406	Class A
Non-compactable Class A							0.0						0					
Compactable Class C							3.4	Compacted	4 m3 box	0.5	2.2	Class C	0					
Non-compactable Class C							0.0						0.78	None	4 m3 box	4	0.8	Class C
GTCC-NT (non-TRU)							0.0						0					
Non-compactable GTCC-T (TRU)							0.0						4.8	None	55 gallon drum	24.6	5.1	GTCC
Compactable GTCC-T (TRU)							0.0						4.8	Compacted	55 gallon drum	8	3.3	GTCC
Other Secondary Waste Subtotal Class A							19.4				11.9		578				406	5
Other Secondary Waste Subtotal Class B							0.0				0.0		0				C	
Other Secondary Waste Subtotal Class C							3.4				2.2		0.78				0.8	
Other Secondary Waste Subtotal Class A/B/C							22.8				14.1		578.78				406.8	
Other Secondary Waste Subtotal GTCC							0.0				0.0		9.6				8.4	
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0		0				C)
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0		0				C)
Total Class A							19.4				11.9		578.0				406.0	
Total Class B							0.0				0.0		0.0				0.0)
Total Class C							3.4				2.2		0.8				0.8	3
Total Class A/B/C	12949.8				3317.0		22.8				14.1		578.8				406.8	3
Total GTCC	4.8				6.4	l l	0.0				0.0		9.6				8.4	
Total Mixed Class A/B/C	6.9				13.8	3	0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		0.0				0.0		0.0				0.0	

				Ba	lance of Plant	- Detailed Sun	mary of Secon	dary Waste Est	imates for UN	F4 (Blended U	NF)							
			UFD/I				, , , , , , , , , , , , , , , , , , , ,	,		VA	•				EnergyS	Solutions		
	As Generated Volume		-	Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume		3,7	Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Operational Waste		•																
Packaging waste (low activity)	135.5	Compaction	LLW box	13.55	33.9													
Packaging waste (high activity)	4.8	None	GTCC box	3.75	6.4	GTCC			Similar waste	a stroams aro					Similar wast	te streams are		
									assumed to be							included in the		
									totals belo							lance of Plant		
									Seconda	ry Waste					Other Secon	ndary Waste		
Operational Waste Subtotal Class A							0				1 (,						
Operational Waste Subtotal Class B							0) 						
Operational Waste Subtotal Class C							0) 						
Operational Waste Subtotal Class A/B/C	135.5				33.9		0) 						
Operational Waste Subtotal Class A/B/C	4.8				6.4		0					1						
Operational Waste Subtotal Mixed Class A/B/C					0.0		0											
Operational Waste Subtotal Mixed Class A/B/C	0.0				0.0		0											
Job Control Waste	0.0				0.0		U					<u>′1</u>						
Gloves	633.8	Compaction	LLW box	63.4	158.4	Class A/B/C												
Shoe covers	633.8	Compaction	LLW box	63.4	158.4	Class A/B/C												
Laundered protective clothing	50.4	Compaction	LLW box	5.0	12.6	Class A/B/C			Similar waste	e streams are					Similar wast	te streams are		
Step-off pads	13.3	Compaction	LLW box	1.3	3.3	Class A/B/C			assumed to be							included in the		
Disposable protective clothing	2571.4	Compaction	LLW box	257.1	642.8	Class A/B/C			totals belo							lance of Plant		
Plastic suits	3685.6	Compaction	LLW box	368.6	921.4	Class A/B/C			Seconda	ry Waste					Other Secon	ndary Waste		
Containment hut material	106.1	Compaction	LLW box	10.6	26.5	Class A/B/C												
Job Control Waste Subtotal Class A						2.222.72												
Job Control Waste Subtotal Class B																		
Job Control Waste Subtotal Class C																		
Job Control Waste Subtotal Class A/B/C	7694.3				1923.6													
Job Control Waste Subtotal GTCC	0.0				0.0													
Job Control Waste Subtotal Mixed Class A/B/C	0.0				0.0													
Job Control Waste Subtotal Mixed GTCC	0.0				0.0													
<u>Maintenance Waste</u>																		
Failed instruments and electronic equipment	5.3		Mixed drum	50.5		Mixed A/B/C												
Manipulator counterweights	0.1		Mixed drum	0.6		Mixed A/B/C												
Manipulator boots Manipulator arms	1.5 4.8	Compaction Compaction	LLW box	0.2 0.5		Class A/B/C Class A/B/C												
Glovebox gloves	1.7	Compaction	LLW box	0.2		Class A/B/C												
Glovebox gloves - leaded	0.2		Mixed drum	1.9	0.4													
Glovebox filters	4.7	Compaction	LLW box	0.5		Class A/B/C												
Fume hood filters	1.0	None	Mixed drum	9.6		Mixed A/B/C												
HVAC exhaust air filters (HEPA) HVAC exhaust air filters (roughing)	3700.2 1284.5	Compaction Compaction	LLW box	370.0 128.5	925.1 321.1	Class A/B/C Class A/B/C			Similar waste	e streams are								
Contaminated mop heads	32.0		LLW box	3.2	8.0				assumed to be							umed to be includ		
Fluorescent lamps		Compaction	LLW box	1.1		Class A/B/C			totals belo					for Ba	alance of Plant C	Other Secondary	Waste	ľ
Batteries	0.4		Mixed drum	3.8		Mixed A/B/C			Seconda	ry Waste								
Jumper - Piping	13.8		LLW Engineered			Class A/B/C												
0	0.0	None	0	0.0	0.0	0												
0	0.0		0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
0	0.0		0	0.0	0.0	0												
0	0.0		0	0.0	0.0	0												
0	0.0	None	0	0.0	0.0	0												
Maintenance Waste Subtotal Class A																		
Maintenance Waste Subtotal Class B																		
Maintenance Waste Subtotal Class C																		
Maintenance Waste Subtotal Class A/B/C					1359.6													
Maintenance Waste Subtotal GTCC					0.0													
Maintenance Waste Subtotal Mixed Class A/B/C					13.8													
Maintenance Waste Subtotal Mixed GTCC	0.0				0.0													

				Ва	alance of Plant	- Detailed Sum	mary of Secon	dary Waste Est	imates for UN	IF4 (Blended U	NF)							
			UFD/	EAS					AR	EVA					EnergyS	olutions		
	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste	As Generated Volume			Container	Packaged Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classificatio
Other Secondary Waste				•						•					•		•	
Compactable Class A							19.4	Compacted	4 m3 box	2.7	11.9	Class A	578	Compacted	4 m3 box	975	406	Class A
Non-compactable Class A							0.0						0					
Compactable Class C							3.4	Compacted	4 m3 box	0.7	3.1	Class C	0					
Non-compactable Class C							0.0						0.78	None	4 m3 box	4	0.8	Class C
GTCC-NT (non-TRU)							0.0						0					
Non-compactable GTCC-T (TRU)							0.0						4.8	None	55 gallon drum	24.6	5.1	GTCC
Compactable GTCC-T (TRU)							0.0						4.8	Compacted	55 gallon drum	8	3.3	GTCC
Other Secondary Waste Subtotal Class A	L						19.4				11.9		578				406	ر ا
Other Secondary Waste Subtotal Class E	3						0.0				0.0		C				C	j
Other Secondary Waste Subtotal Class C							3.4				3.1		0.78				0.8	5
Other Secondary Waste Subtotal Class A/B/C							22.8				15.0		578.78				406.8	\$
Other Secondary Waste Subtotal GTCC							0.0				0.0		9.6				8.4	4
Other Secondary Waste Subtotal Mixed Class A/B/C							0.0				0.0		C				(j
Other Secondary Waste Subtotal Mixed GTCC							0.0				0.0		C				(j
Total Class A							19.4				11.9		578.0				406.0	1
Total Class E							0.0				0.0		0.0				0.0	
Total Class C							3.4				3.1		0.8				0.8	4
Total Class A/B/C					3317.0)	22.8				15.0		578.8				406.8	1
Total GTCC					6.4	1	0.0				0.0		9.6				8.4	4
Total Mixed Class A/B/C	6.9				13.8	3	0.0				0.0		0.0				0.0	1
Total Mixed GTCC	0.0				0.0)	0.0				0.0		0.0				0.0	

Appendix J

MOX Fuel Fabrication Functional Area

Detailed Waste Comparison

Waste Stream Waste Waste Observational Waste Waste Operational Waste Subtotal Class A Ope				MOX	Fuel Fabricati	on - Detailed S	ummary of Sec	ondary Waste	Estimates						
Packaged Volume Waste Stream Volume Waste Vol		U	FD			ARI	EVA	-				Energy <i>S</i>	olutions		
Commitment of any sample 3.0 GTCC		_	Waste	Generated			Container	_	Waste	Generated			Container	_	Waste
22ccontines work and samples 3.0 GTCC	Waste Stream	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Inter-cars	Operational Waste										•				
Date cans 12.0 GTC Similar waste streams are assumed to be included in the assumed to be included in the assumed to be included in the summary of the control of th	Zirconium swarf and samples	3.0	GTCC												
Sample walls (Bassware, crucibles (Basswar	Inner cans	12.0	GTCC												
Sample visils 193.7 GTCC assumed to be included in the Glassware, crucibles 3.8 GTCC to train water (ball to be included in the Glassware, crucibles 4.8.7 GTCC and a sounded to be included in the Glassware, crucibles 4.8.7 GTCC and a sounded to be included in the Glassware (ball to be a sounded to be a sounded to be included in the Glassware (ball to be a sounded to be a sounded to be a sounded to be a sounded to be a soun	Outer cans					Similar wast	e streams are					Similar wast	e streams are		
Glassware, crucibles 838, GTCC Zirconium cladding waste 857, GTCC Zirconium cladding waste 858, GTCC Zirconium cladding waste 858, GTCC Zirconium cladding waste 858, GTCC Xirconium cladding waste (balls, wheels, boats) 90perational Waste Subtotal Class A 90perational Waste Subtotal Class B 90perational Waste Subtotal Class C 90perational Waste Subtotal Grass A/B/C 90perational Waste Subtotal Mixed Glass A/B/C 90perational Waste Subtotal Mixed GTCC 90perational Waste Subtotal Mixed Glass A/B/C 90perational Waste Subtotal Class A/B/C 90perational Waste Sub	•														
Moly boats 27 Conjume Indexing waste 3.8 GTCC Convenience cans 38 10 GTCC Convenience Cans 38 10 GTCC Operational Waste Subtotal Class A Operational Waste Subtotal Class B Operational Waste Subtotal Mixed Class A/B/C Operational Waste Subtotal Class A/B/C Operational Was															
Aground rated only waste 3.8 GTCC															
Non-routine waste (balls, wheels, boats) Operational Waste Subtotal Class A Operational Waste Subtotal Class C Operational Waste Subtotal Class C Operational Waste Subtotal Groc						3 000uu	.,					50001144	.,		
Operational Waste Subtotal Class A Operational Waste Subtotal Class B Operational Waste Subtotal Class C Operational Waste Subtotal Class A/B/C Operational Waste Subtotal GTCC 839.8 Operational Waste Subtotal GTCC Operational Waste Subtotal Mixed Class A/B/C Operational Waste Subtotal Mixed Class A/B/C Operational Waste Subtotal Mixed GTCC Job Control Waste Operational Waste Subtotal Mixed GTCC Operational Waste Subtotal Mixed GTCC Operational Waste Subtotal Mixed GTCC Operational Waste Subtotal GTCC Similar waste streams are Similar waste streams are Similar waste streams are Similar waste streams are Operational Waste Subtotal GTCC Organic waste (low contamination) 40.3 GTCC Organic waste (low contamination) 40.3 GTCC Organic waste from cladding Job Control Waste Subtotal Class A Job Control Waste Subtotal GTass A/B/C Job Control Waste Subtotal GTa															
Operational Waste Subtotal Class B Operational Waste Subtotal Class C Operational Waste Subtotal Class C Operational Waste Subtotal GTCC Operational Waste Subtotal GTCC Operational Waste Subtotal Mixed Class A/B/C Operational Waste Subtotal Mixed Class A/B/C Operational Waste Subtotal Mixed GTCC Operational Waste Subtotal GTCC Operational Waste Subtotal GTCC Operational Waste Subtotal GTCC Operational Waste Subtotal Class A/B/C Organic waste (low contamination) Operational Waste Subtotal Class A/B/C Operational Waste Subtotal C		144.8	GTCC			ı								1	
Operational Waste Subtotal Class K/B/C Operational Waste Subtotal Glass K/B/C Operational Waste Subtotal Groce Operational Waste Subtotal Mixed Class K/B/C Operational Waste Subtotal Mixed Class K/B/C Operational Waste Subtotal Mixed Groce Operational Waste Subtotal Mixed Groce Job Control Waste Potentially contaminated organic waste 13.5 Class K/B/C U02 contaminated organic waste 13.5 Class K/B/C U02 contaminated organic waste 13.5 Class K/B/C U02 contaminated organic waste 13.5 Class K/B/C U02 contaminated organic waste 15.9 Groce Organic waste (low contamination) Groce Organic waste (high contamination) 416.7 Groce Organic waste (high contamination) Job Control Waste Subtotal Class B Job Control Waste Subtotal Class B Job Control Waste Subtotal Class C Job Control Waste Subtotal Class A/B/C	Operational Waste Subtotal Class A														
Operational Waste Subtotal GTCC 839.8 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	Operational Waste Subtotal Class B														
Operational Waste Subtotal Mixed Class A/B/C Operational Waste Subtotal Mixed Class A/B/C Operational Waste Subtotal Mixed GTCC Job Control Waste Potentially contaminated organic waste 13.5 Class A/B/C U02 contaminated organic waste 13.5 Class A/B/C Similar waste streams are Potentially contaminated organic waste 15.9 GTCC assumed to be included in the Organic waste (high contamination) 40.3 GTCC Organic waste (high contamination) 416.7 GTCC Secondary Waste Job Control Waste Subtotal Class A Job Control Waste Subtotal Class A Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Mixed Class A/B/C	Operational Waste Subtotal Class C														
Operational Waste Subtotal Mixed Class A/B/C Operational Waste Subtotal Mixed GTCC Operational Waste Subtotal Class A/B/C Operational Waste Su	Operational Waste Subtotal Class A/B/C	0.0													
Operational Waste Subtotal Mixed GTCC Job Control Waste Potentially contaminated organic waste 13.5 Class A/B/C William waste streams are Potentially contaminated organic waste 15.9 GTCC Organic waste (low contamination) 40.3 GTCC Organic waste (low contamination) 416.7 GTCC Organic waste from cladding 13.4 GTCC Job Control Waste Subtotal Class A Job Control Waste Subtotal Class A Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal GTCC Job Control Waste Subtotal Mixed Class A/B/C	Operational Waste Subtotal GTCC	839.8													
Potentially contaminated organic waste 319.5 Class A/B/C	Operational Waste Subtotal Mixed Class A/B/C	0.0													
Potentially contaminated organic waste 319.5 Class A/B/C UO2 contaminated organic waste 13.5 Class A/B/C Similar waste streams are Similar waste streams are Potentially contaminated organic waste 159.8 GTCC Organic waste (low contamination) 40.3 GTCC Organic waste (high contamination) 416.7 GTCC Secondary Waste Organic waste (high contamination) 416.7 GTCC Secondary Waste Organic waste (high control Waste Subtotal Class A Job Control Waste Subtotal Class A Job Control Waste Subtotal Class C Job Control Waste Subtotal Class C Job Control Waste Subtotal Class A/B/C 333.0 Job Control Waste Subtotal GTCC G30.2 Job Control Waste Subtotal Mixed Class A/B/C 0.0 Job Control Waste Subtotal Class A/	Operational Waste Subtotal Mixed GTCC	0.0													
UO2 contaminated organic waste 13.5 Class A/B/C Potentially contaminated organic waste 159.8 GTCC assumed to be included in the Corganic waste (low contamination) 40.3 GTCC totals below for Other Organic waste (high contamination) 416.7 GTCC Organic waste from cladding 13.4 GTCC Job Control Waste Subtotal Class A Job Control Waste Subtotal Class B Job Control Waste Subtotal Class A/B/C 333.0 Job Control Waste Subtotal GTCC GS0.2 Job Control Waste Subtotal Mixed Class A/B/C 0.0 Job Control Waste Subtotal Class A/B/C 0.0 J	Job Control Waste														
UO2 contaminated organic waste 13.5 Class A/B/C Potentially contaminated organic waste 159.8 GTCC assumed to be included in the Corganic waste (low contamination) 40.3 GTCC totals below for Other Organic waste (high contamination) 416.7 GTCC Organic waste from cladding 13.4 GTCC Job Control Waste Subtotal Class A Job Control Waste Subtotal Class B Job Control Waste Subtotal Class A/B/C 333.0 Job Control Waste Subtotal GTCC GS0.2 Job Control Waste Subtotal Mixed Class A/B/C 0.0 Job Control Waste Subtotal Class A/B/C 0.0 J	Potentially contaminated organic waste	319.5	Class A/B/C												
Organic waste (low contamination) Organic waste (high contamination) Organic waste (high contamination) Organic waste (high contamination) Organic waste from cladding Organic waste from cladding Organic waste from cladding Organic waste Subtotal Class A Organic waste Subtotal Class A Organic waste Subtotal Class A Organic waste From cladding Organic waste From cladding Organic waste From cladding Organic waste Subtotal Class A Organic waste From cladding Organic waste Subtotal Class A Organic waste From cladding Organic waste Fr		13.5	Class A/B/C			Similar wast	e streams are					Similar wast	e streams are		
Organic waste (high contamination) Organic waste (from cladding 13.4 GTCC Job Control Waste Subtotal Class A Job Control Waste Subtotal Class B Job Control Waste Subtotal Class C Job Control Waste Subtotal Class C Job Control Waste Subtotal Class C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal GTCC G30.2 Job Control Waste Subtotal Mixed Class A/B/C Job Control Waste Subtotal Mixed Class A/B/C Occurred Waste Subtotal Mixed Class A/B/C	Potentially contaminated organic waste	159.8	GTCC			assumed to be	included in the					assumed to be	included in the		
Organic waste from cladding Job Control Waste Subtotal Class A Job Control Waste Subtotal Class B Job Control Waste Subtotal Class C Job Control Waste Subtotal Class C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal GTCC G30.2 Job Control Waste Subtotal Mixed Class A/B/C Onumber 13.4 GTCC STOCK	Organic waste (low contamination)	40.3	GTCC			totals belo	w for Other					totals belo	w for Other		
Job Control Waste Subtotal Class A Job Control Waste Subtotal Class B Job Control Waste Subtotal Class C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal GTCC G30.2 Job Control Waste Subtotal Mixed Class A/B/C 0.0	Organic waste (high contamination)					Seconda	ry Waste					Seconda	ry Waste		
Job Control Waste Subtotal Class B Job Control Waste Subtotal Class C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal GTCC G30.2 Job Control Waste Subtotal Mixed Class A/B/C 0.0	Organic waste from cladding	13.4	GTCC												
Job Control Waste Subtotal Class C Job Control Waste Subtotal Class A/B/C Job Control Waste Subtotal GTCC Job Control Waste Subtotal GTCC Job Control Waste Subtotal Mixed Class A/B/C O.0	Job Control Waste Subtotal Class A														
Job Control Waste Subtotal Class A/B/C 333.0	Job Control Waste Subtotal Class B														
Job Control Waste Subtotal GTCC 630.2 Job Control Waste Subtotal Mixed Class A/B/C 0.0	Job Control Waste Subtotal Class C														
Job Control Waste Subtotal Mixed Class A/B/C 0.0 0.0	Job Control Waste Subtotal Class A/B/C	333.0													
		630.2													
Job Control waste Subtotal Mixed GTCC 0.0	Job Control Waste Subtotal Mixed GTCC	0.0													

			MOX	Fuel Fabricat	on - Detailed S	ummary of Sec	ondary Waste	Estimates						
	UI	FD			ARE		, , , , , , , , , , , , , , , , , , ,				EnergySo	olutions		
	Packaged Volume	Waste	As Generated Volume		744	Container	Packaged Volume	Waste	As Generated Volume		Energy	Container	Packaged Volume	Waste
Waste Stream	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Maintenance Waste								•			•			
Potentially contaminated miscellaneous waste	43.5	Class A/B/C												
HEPA filters from building ventilation	129.8	Class A/B/C												
Filters from other rooms	2.2	Class A/B/C												
Miscellaneous LLW	1.5	Class A/B/C												
Potentially contaminated miscellaneous waste	21.8	GTCC												
HEPA filters from building ventilation	64.9	GTCC												
Filters from other rooms	1.1	GTCC												
Miscellaneous	0.8	GTCC			Similar waste						Similar waste			
Miscellaneous waste (low contamination)	16.1	GTCC			assumed to be						assumed to be			
Miscellaneous waste (high contamination)	251.6	GTCC			totals below						totals belo			
Stainless steel	1.9	GTCC			Secondar	y Waste					Seconda	ry Waste		
Glovebox filters (grinding unit)	78.8 18.3	GTCC GTCC												
Glovebox filters (large) Glovebox filters (Small)	0.8	GTCC												
Process filters (woven metallic)	2.6	GTCC												
Process filters (metallic)	17.9	GTCC												
Dust filters	279.3	GTCC												
Pneumatic transfer filters	3.2	GTCC												
Maintenance Waste Subtotal Class A	5.2	0.00												
Maintenance Waste Subtotal Class B														
Maintenance Waste Subtotal Class C														
Maintenance Waste Subtotal Class A/B/C	177.0													
Maintenance Waste Subtotal GTCC	759.1													
Maintenance Waste Subtotal Mixed Class A/B/C	0.0													
Maintenance Waste Subtotal Mixed GTCC	0.0													
Other Secondary Waste														
											3 compacted 55 gallon drums/110			
Compactable Class A			162.0	Compacted	4 m3 box	22.5	99.0	Class A	195.0	Compacted	gallon drum	313.0	130.0	Class A
											55 gallon			
Non-compactable Class A			0.0			0.0	0.0		12.0	None	drum	60.7	12.6	Class A
Compactable Class C			0.0			0.0	0.0		0.0			0.0	0.0	
Non-compactable Class C			0.0			0.0			0.0			0.0	0.0	
GTCC-NT (non-TRU)			0.0			0.0	0.0		0.0			0.0	0.0	
											55 gallon			
Non-compactable GTCC-T (TRU)			227.0	None	55 gallon drum	1034.0	237.8	GTCC	22.5	None	drum	114.0	23.7	GTCC
Compactable GTCC-T (TRU)			0.0			0.0			0.0			0.0	0.0	
Total Class A			162.0				99.0		195.0			, ,	130.0	
Total Class B			0.0				0.0		0.0				0.0	
Total Class C			0.0				0.0		0.0				0.0	
Total Class A/B/C	510.0		162.0				99.0		195.0				130.0	
Total GTCC	2229.1		227.0				237.8		22.5				23.7	
Total Mixed Class A/B/C	0.0		0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0		0.0				0.0		0.0				0.0	

Appendix K Fast Reactor Fuel Fabrication Functional Area Detailed Waste Comparison

130

Comparison of Waste Estimates from Recycling and Fuel Fabrication June 30, 2013

	Fast	Reactor Fuel I	Fabrication - De	tailed Summa	ry of Secondar	y Waste Estima	ates					
			ARI	EVA					Energy <i>Sc</i>	olutions		
	As						As					
	Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
Operational Waste												
Gloves and Transfer Bags			Cincile a conset				1.49	None	55 gallon drum	7.54	1.57	Mixed GTCC
Decontamination Wipes and Smears				e streams are included in the			3.00	None	55 gallon drum	15.18	3.16	Mixed GTCC
Debinding			totals belo				0.43	None	55 gallon drum	2.20	0.46	
Pellet Grinding				ry Waste			0.01	None	55 gallon drum	0.03	0.01	
Carbon Sulfur & Halides			1	,			0.02	None	55 gallon drum	0.11	0.02	Unknown
Operational Waste Subtotal Class A												
Operational Waste Subtotal Class B												
Operational Waste Subtotal Class C												
Operational Waste Subtotal Class A/B/C												
Operational Waste Subtotal GTCC												
Operational Waste Subtotal Mixed Class A/B/C												
Operational Waste Subtotal Mixed GTCC												
<u>Job Control Waste</u>												
			ontrol waste stre included in the to Wa						control waste stre included in the to Wa	tals below for O		
Job Control Waste Subtotal Class A												
Job Control Waste Subtotal Class B												
Job Control Waste Subtotal Class C												
Job Control Waste Subtotal Class A/B/C												
Job Control Waste Subtotal GTCC												
Job Control Waste Subtotal Mixed Class A/B/C												
Job Control Waste Subtotal Mixed GTCC												

Fast Reactor Fuel Fabrication - Detailed Summary of Secondary Waste Estimates														
	AREVA							Energy Solutions Energy Solutions						
	As Generated Volume		7.11.1	Container	Packaged Volume	Waste	As Generated Volume		Z.iici 8you	Container	Packaged Volume	Waste		
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification		
<u>Maintenance Waste</u>														
Fissile/Fertile Receiving							0.05	None	55 gallon drum	0.26	0.05	GTCC		
Batching							0.02	None	55 gallon drum	0.11	0.02	GTCC		
Blending Milling							0.12	None	55 gallon drum	0.60	0.12	GTCC		
Binder Addition							0.15	None	55 gallon drum	0.78	0.16	GTCC		
Compaction and Granulation							0.33	None	55 gallon drum	1.68	0.35	GTCC		
Lube Addition							0.05	None	55 gallon drum	0.25	0.05	GTCC		
Pressing							0.20	None	55 gallon drum	1.02	0.21	GTCC		
Boat Loading							0.07	None	55 gallon drum	0.33	0.07	GTCC		
Boat Inspection							0.43	None	55 gallon drum	2.18	0.45			
Debinding							0.12	None	55 gallon drum	0.59	0.12	GTCC		
Sintering Furnace							0.50	None	55 gallon drum	2.54	0.53	GTCC		
Property Adjustment							0.04	None	55 gallon drum	0.21	0.04	GTCC		
Boat Unloading							0.04	None	55 gallon drum	0.21	0.04	GTCC		
Pellet Storage							0.07	None	55 gallon drum	0.34	0.07	GTCC		
Boat Transport			Similar wast	e streams are			0.10	None	55 gallon drum	0.52	0.11	GTCC		
Interface Conveyors			assumed to be				0.02	None	55 gallon drum	0.08	0.02	GTCC		
Pellet Surface Inspection			totals belo	w for Other			0.09	None	55 gallon drum	0.43	0.09	GTCC		
Pellet Grinding			Seconda	ry Waste			1.18	None	55 gallon drum	5.95	1.24	GTCC		
Pellet Gaging							0.04	None	55 gallon drum	0.22	0.05	GTCC		
Pellet Transport							0.01	None	55 gallon drum	0.06	0.01	GTCC		
Column Makeup							0.01	None	55 gallon drum	0.03	0.01	GTCC		
Cold Component Makeup							0.00	None	55 gallon drum	0.00	0.00	GTCC		
Pin Loading & Fuel Storage							0.005	None	55 gallon drum	0.02	0.01	GTCC		
Pin End Decontamination							0.01	None	55 gallon drum	0.07	0.01	GTCC		
Pin Welding							0.01	None	55 gallon drum	0.05	0.01	GTCC		
Three Auto Sample Handling Receiving Station Plus One Manual							0.04	None	55 gallon drum	0.19	0.04	GTCC		
Two Auto Sending Station Plus One Manual							0.03	None	55 gallon drum	0.14	0.03	GTCC		
Fuel Assembly							0.0008	None	55 gallon drum	0.004	0.0009	GTCC		
O/M Ratio & Moisture							0.01	None	55 gallon drum	0.04	0.01	GTCC		
Offgas							0.002	None	55 gallon drum	0.01	0.002	GTCC		
Carbon Sulfur & Halides							0.03	None	55 gallon drum	0.15	0.03	GTCC		
Fuel Assembly							0.003	None	55 gallon drum	0.01	0.003	GTCC		
Maintenance Waste Subtotal Class A														
Maintenance Waste Subtotal Class B														
Maintenance Waste Subtotal Class C														
Maintenance Waste Subtotal Class A/B/C														
Maintenance Waste Subtotal GTCC														
Maintenance Waste Subtotal Mixed Class A/B/C														
Maintenance Waste Subtotal Mixed GTCC														

June 30, 2013

Fast Reactor Fuel Fabrication - Detailed Summary of Secondary Waste Estimates												
	AREVA					Energy Solutions						
	As						As					
	Generated				Packaged		Generated				Packaged	
	Volume			Container	Volume	Waste	Volume			Container	Volume	Waste
Waste Stream	(m³)	Treatment	Container	Quantity	(m³)	Classification	(m³)	Treatment	Container	Quantity	(m³)	Classification
<u>Other Secondary Waste</u>												
									3 compacted			
									55 gallon			
									drums/110			
Compactable Class A	113.0	Compacted	4 m3 box	16.0	70.4	Class A	100.0	Compacted	gallon drum	160.0	66.0	Class A
Non-compactable Class A	0.0			0.0	0.0		0.0			0.0	0.0	
Compactable Class C	0.0			0.0	0.0		0.0			0.0	0.0	
Non-compactable Class C	0.0			0.0	0.0		0.0			0.0	0.0	
GTCC-NT (non-TRU)	0.0			0.0	0.0		0.0			0.0	0.0	
Non-compactable GTCC-T (TRU)	127.0	None	55 gallon drum	578.0	132.9	GTCC						
Compactable GTCC-T (TRU)	0.0			0.0	0.0		0.0			0.0	0.0	
Non-compactable Mixed GTCC-T (TRU)	0.0			0.0	0.0							
Total Class A	113.0				70.4		100.0				66.0	
Total Class B	0.0				0.0		0.0				0.0	
Total Class C	0.0				0.0		0.0				0.0	
Total Class A/B/C	113.0				70.4		100.0				66.0	
Total GTCC	127.0				132.9		4.2				4.4	
Total Mixed Class A/B/C	0.0				0.0		0.0				0.0	
Total Mixed GTCC	0.0				0.0		4.5				4.7	1

Notes:

- 1. Energy Solutions designated operational waste streams from Process Enclosures (i.e. Gloves and Transfer Bags and Decontamination Wipes and Smears) as Mixed GTCC waste in Table 4-13 of their final report. These waste streams appear to be included in the GTCC total shown in Table 5-8 of the Energy Solutions final report. The Mixed GTCC waste streams are shown separately above.
- 2. Energy Solutions designated the waste streams from Pin Welding, Auto Sampling, Auto Sending and Fuel Assembly as LLW (i.e. Class A, B or C) in Table 4-13 of their final report. It appears that Energy Solutions included these waste streams in their GTCC total presented in Table 5-8 of their final report. These waste streams are designated as GTCC waste in the table above. The total waste volume for these waste streams is relatively low and would not have a significant impact regardless of the waste classification.