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3013 CONTAINER SURVEILLANCE AND STORAGE CAPABILITY PROJECT - K AREA

HAZARD ANALYSIS (U)

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EXECUTIVE SUMMARY

The Savannah River Site (SRS) K-Area 3013 Container Surveillance and Storage Capability (CSSC) Project will provide unpackaging, storage, surveillance, stabilization, and repackaging capabilities for plutonium-bearing materials stored in DOE-STD-3013 containers. Results from a hazards analysis (HA) of the CSSC Project indicated that the CSSC Facility will be a Hazard Category 2 nonreactor nuclear facility. The HA also indicated that with the credited set of controls implemented, the proposed CSSC activities will not result in undue risk to workers, the public, or the environment.

The CSSC Project will provide the capabilities necessary to meet commitments associated with the storage and disposition of United States Department of Energy (DOE) excess plutonium and highly enriched uranium materials. Upon implementation, the CSSC Facility will provide the capabilities necessary to manage plutonium-bearing materials packaged according to DOE-STD-3013. These capabilities will include unpackaging, storage, surveillances (required by the DOE Integrated Surveillance Program), stabilization and repackaging of the plutonium-bearing material.

Previous PHAs identified a control strategy for the CSSC Project. The initial CSSC Project PHA (Rev. A) was based on an F-Area CSSC Project design. Rev. B to the PHA was prepared to assess hazards associated with project modifications, in particular changing the proposed CSSC Facility location to K-Area. Rev. C to the PHA implemented lessons learned from the K-Area Interim Surveillance (KIS) project.

Revision D of this report was issued to document a HA of proposed modifications to the CSSC Project control strategy. As a result of these modifications, controls that had been designated as Safety Class (SC) may be designated as Safety Significant (SS). These controls include the CSSC fire suppression system, CSSC fire detection and alarms, can puncture device, and ventilation system interlocks.

Revision E of this report is being issued to implement changes associated with elimination of the TRU waste repackaging ventilation enclosure and the bagport enclosure, and to make this report consistent with other CSSC safety basis documents. The TRU waste ventilation enclosure was initially considered to be necessary for protecting workers if material were released from unpackaged TRU waste during a fire. Originally, the potential consequence of such a release was considered to be between moderate and high to workers in the vicinity of the fire. Application of results from the Accident Analysis indicated that the potential consequence of such a release would be low. This conclusion is consistent with similar consequence determinations made during the K-Area Interim Surveillance Facility Hazard Analysis.

The HA for the proposed CSSC Project was performed per the Consolidated Hazards Analysis Process (CHAP). The CSSC CHAP team identified the required SC and SS Systems, Structures and Components (SSCs), and key programmatic/administrative controls required to protect the public, workers and the environment. This HA also provides the basis and scope for Accident Analysis and other supporting analyses required to further evaluate and document bounding consequences scenarios. These analyses were performed according to guidance given in DOE-STD-3009-94.

This HA will be used to support development of other CSSC project safety basis documents including accident analysis calculations and a Preliminary Safety Design Report (PSDR). Once issued, these documents will supersede previous CSSC Project safety basis documents. Additional hazards analyses may be required if there is (1) an increase in facility chemical or radiological inventory above levels assumed in this HA, (2) a change in regulatory requirements, (3) a change in the input or assumptions, or (4) an error or omission identified in the HA bases. Changes or deviations from this HA will be managed through the SRS Management of Safety Bases (MSB) change process.

1.0 DEFINITIONS

3013 Container – The assembled combination of containers required by DOE-STD-3013 (an inner and an outer container) (Ref. 1), the plutonium-bearing materials within these containers and any additional interior convenience containers into which the materials have been placed.

Consequence Level High – A radiological consequence level, for the Offsite receptor greater than 25 REM, or a radiological consequence level for the Onsite receptors greater than 100 REM.

Consequence Level Moderate - A radiological consequence level for the Offsite receptor between 5 and 25 REM, or a radiological consequence level for the Onsite receptors between 25 and 100 REM.

Consequence Level Low - A radiological consequence level for the Offsite receptor between 0.5 and 5 REM, or a radiological consequence level for the Onsite receptors between 5 and 25 REM.

Consequence Level Negligible - A radiological consequence level for the Offsite receptor less than 0.5 REM or a radiological consequence level for the Onsite receptors less than 5 REM.

Shipping Containers – DOT Model 9975 or equivalent Type B shipping containers.

Maximum Offsite Individual (MOI) – A hypothetical maximally-exposed offsite individual located at the site boundary (8.86 km from the CSSC Facility) at the time of the event.

Worker Groups – Three worker groups are defined for this project:

Worker Group 1 (WG1) - Workers located within the CSSC Project Area

Worker Group 2 (WG2) – Workers located outside the CSSC Project Area but within the building.

Worker Group 3 (WG3) – Workers located outside the building at the worst possible location, but no closer than 100 meters to the hazard.

2.0 INTRODUCTION

The purpose of Revision E to this report is to incorporate changes in the control strategy into the K-Area 3013 CSSC Project safety basis. This report includes descriptions of the CSSC Project hazards evaluation and control strategies (including functional classifications and safety functions of the controls). To the extent possible, information has been included to support implementation of the credited safety features and associated specifications into the facility design, startup, and operation (e.g., details needed to support development of SSC design, procurement specifications, and startup and operation procedures).

SRS currently stores plutonium metals and oxides from SRS and other DOE facilities including the Rocky Flats Environmental Technology Site (RFETS). To support this site mission, the CSSC will be part of the SRS K-Area Complex (KAC) and will be located next to the K-Area Material Storage (KAMS) facility. The CSSC Facility will include four areas,

- 3013 Storage Room,
- Packaging Area,
- Non-Destructive Assay Room, and
- Glovebox Processing Area.

The mission of KAC is to provide interim storage for nuclear materials including plutonium-bearing metals and oxides. This mission includes receipt, unpackaging, storage, surveillance, stabilization and repackaging (as needed) of these plutonium materials that are stored in 3013 containers. Once implemented, the CSSC Project will provide these KAC capabilities. Until the CSSC Project capabilities are available, the KIS facility will provide interim non-destructive and destructive surveillance of 3013 containers (Ref. 1) as required by the DOE Integrated Surveillance Program (ISP). Chapter 4.0 Hazards Assessment of this report includes a more detailed description of the planned CSSC Facility and its processes.

The scope of the existing KAC Documented Safety Analysis (DSA) includes analysis of hazards associated with handling and storage of plutonium-bearing materials inside 3013 containers and 9975 shipping containers (Ref. 3 and 4); however, some of the CSSC Project operations and facilities are outside the current KAC Authorization Basis. This report defines the control strategies needed to implement the additional CSSC capabilities.

As the CSSC design has matured, some PHA input, assumptions and controls have changed. To assess the impact of these changes, the CSSC Project has periodically requested the formation of a CHAP team to assess the hazards and update the PHA. In addition to implementation of these project changes, the CHAP teams have incorporated lessons learned from the KIS facility hazards analyses and have performed the PHAs to facilitate incorporation of guidance from the draft standard, DOE-STD-1189-2007 into the resulting CSSC Project safety basis documents.

Revision D of this report was issued to document the most recent HA performed by the CSSC Project CHAP team. The CHAP team evaluated proposed changes in some of the controls that had been identified in the previous PHA. Applying DOE guidance from the draft standard DOE-STD-1189-2007, the CHAP team determined some controls that had been designated as SC are now to be designated as SS. These controls included the CSSC fire suppression system, CSSC fire detection and alarms, and ventilation system interlocks.

Revision E of this report is being issued to implement changes associated with the elimination of the TRU waste repackaging ventilation enclosure as an SS control and to make this document consistent the rest of the CSSC safety basis documents. The TRU waste ventilation enclosure was initially considered to be necessary for protecting workers if material were released from unpackaged TRU waste during a fire. Originally, the

consequence of such a release was considered to be moderate to high to WG1. Application of the Accident Analysis to this release indicated that the consequence of such a release would be low. This conclusion is consistent with similar consequences determinations made during the K-Area Interim Surveillance Facility Hazard Analysis.

Revision E to the CSSC Project HA document is being issued to incorporate these changes into the CSSC Project safety basis. To support the designations used in DOE Order 413.3A, starting with Revision D, HAs performed to support Critical Design 2 (CD-2) and later design phases will no longer be referred to as "preliminary"; however, the CHAP process described in this document is the same process that was used to perform the PHAs.

3.0 INPUTS AND ASSUMPTIONS

The inputs and assumptions listed in this chapter were applicable throughout the HA. This information was not used in each accident scenario; however, it is generally applicable to the HA. For example, the nominal dimensions of the 3013 containers do not change. Although these dimensions are not considered for most accident scenarios, this information is generally applicable. Assumptions that are not generally applicable (assumptions that may vary for different accident scenarios) or that only apply to one or two accident scenarios have been identified in the hazard evaluation tables in Appendix A.

3.1 INPUTS

Items listed in this section are data, specifications, or conditions that had been established and documented prior to issuing of Rev. D to this HA. For each item, the basis document has been referenced. Additional hazards analyses may be required if this input information is changed, revised, or if an error or omission is identified in the information used for this HA. Changes or deviations from this HA and the input information will be managed through the SRS MSB change process as specified in WSRC Manual 11Q (Ref. 5). The following are input items used in this HA:

- The Critical Decision 1 (CD-1) design package (Ref. 6),
- Safety Basis Strategy for 3013 Container Surveillance and Storage Capability Project in the KAC (Ref. 7),
- Current/Existing building DSA (Ref. 3 and 4), TSR (Ref. 8), FHA (Ref. 9), and supporting safety documentation,
- Modification Traveler, 3013 Container Surveillance and Storage Capability Project K-Area, U-MT-K-00020, Rev. 1, (Ref. 10),
- Building 235-F 3013 Container Surveillance and Storage Capability Project Hazard Analysis (U), WSRC-TR-2003-000274, Rev. 1 (Ref. 11),
- Task Requirements and Criteria, 3013 Container Surveillance and Storage Capability Project K-Area, M-TC-K-00010, Rev. 0 (Ref. 12) and draft Rev. 1,
- Input and Assumptions Calculation for CSSC Project (K-Area), S-CLC-K-00207, Rev. B (Ref. 13),
- The following isotopic composition (weight %) of Pu in the 3013 Containers (metallic or oxide Pu from Ref. 14):

Pu-238	0.1002	Pu-241	1.815
Pu-239	76.08	Pu-242	1.385
Pu-240	20.62	Am-241	1.714

- The following dose factors from Radscreen - assumed distribution for releases (Ref. 15):

Radionuclide	3 Minute Release		30 Minute Release	
	DF (REM/Ci) 100 Meter	DF (REM/Ci) 8860 Meter	DF (REM/Ci) 100 Meter	DF (REM/Ci) 8860 Meter
Pu-238	155	0.422	105	0.261
Pu-239	155	0.499	108	0.282
Pu-240	155	0.499	108	0.282
Pu-241	257	0.008	1.80	0.005
Pu-242	120	0.296	120	0.296
Am-241	130	0.430	103	0.260

3.2 ASSUMPTIONS

Items listed in this section are data, specifications, or conditions that were assumed to be generally applicable during CSSC operations. Additional hazards analyses may be required if these assumptions are determined to be invalid, or if an omission or error is identified in any of these assumptions. Changes or deviations from this HA and the input information will be managed through the SRS Management of Safety Bases (MSB) change process (Ref. 5). The following are assumptions used in this HA:

- Fires within the same fire area as the hallway (Assembly Area, 911 Fan Room) are covered under other existing Facility Documentation (Ref. 4).
- Airlock to the Packaging Area is part of the transport corridor.
- Fire area boundaries are assumed to be of sufficient fire barrier rating to maintain their confinement in a fire long enough for the fire suppression agent to extinguish any fire.
- Leak testing for Inner and Outer 3013s will be done using helium.
- The term “3013 container” is used to refer to a 3013 container that is compliant with DOE Standard DOE-STD-3013 unless stated otherwise.
- The term “9975 container” is used to refer to a 9975 Shipping Container that is compliant with the WSRC SARP, WSRC-SA-2002-00008.
- Credited SSCs, identified Facility Controls, and seismic interaction SSCs will be controlled by the SRS Configuration Management Program.
- No electric transport device, e.g., forklift, will be used in the Packaging Area. Manual transport devices will be used in the Packaging Area when they are needed.
- A SS Fire Suppression System is assumed to put out any fire before it becomes a room fire and also prevents HEPA filter pluggage.
- Qualified positions are defined by the Nuclear Criticality Safety Program.
- 3013 Standard precludes pyrophoric metal fires.
- 3013 drop and impact releases are based on pressurized (approximately 300 psi) release from 3013. 3013s pressurized to greater than 300 psi are not expected and if encountered will be handled through the SRS USQ process (Ref. 5).
- All major glovebox maintenance activities that involve breaching the glovebox to a size greater than can be handled by the normal glovebox ventilation system will be performed as routine work control evolutions with the glovebox de-inventoried down to residual contamination levels.
- During the unpackaging or repackaging processes, if a 3013 container is determined to be out of compliance with the DOE-STD-3013 standard, it will be packaged in a 9975 shipping container and dispositioned with a recovery plan or approved procedure.

- If Pu oxide material must be removed from the glovebox before moisture analyses are complete, the material will be packaged into a 3013 container and loaded into a 9975 Shipping Container, which will be dispositioned with a recovery plan or approved procedure.
- No cooling water will be used in the process area, except in small closed-loop systems for welders and digital radiography equipment. No cooling water will be used in the glovebox. No water will be used when material from a 3013 is in the glovebox.
- All Pu oxide material was assumed to be in convenience cans inside 3013 containers.
- Pu metal material may or may not be in convenience cans within 3013 containers.
- This HA only reviewed handling of 9975 shipping containers transferred from KAMS to the CSSC Facility and handling of the material, waste, and samples within the CSSC Facility. No other routes were analyzed for introduction or removal of shipping containers or TRU waste into this project.
- There will be no more than 5.0 kg of plutonium in the glovebox at any time.
- There will be no more than one 3013 container in a transport cart at one time.
- Up to 1,920 3013 containers may be stored in the 3013 storage racks at one time.
- There will not be any chemicals in the facility that could result in an unexpected, energetic chemical reaction.
- 3013 containers are assumed to contain 4.4 kg of plutonium. This is the equivalent of 5.0 kg Pu oxide.
- The project life is assumed to be 20 years.
- Design Basis Threat 2003/2004 modifications were not evaluated in this HA.
- The credited portion of the ventilation exhaust system will meet PC-3 seismic requirements.
- The exterior walls, floors and ceiling of the CSSC Facility and the 3013 Storage Room will meet PC-3 seismic requirements.
- Each Low-Level Waste (LLW) item has no more than 0.5 g of plutonium-239 and unassayed TRU waste 5-gal drums (pails) have no more than 395 g of plutonium.
- 3013 containers may not provide complete confinement in some fire or criticality events.
- All material repackaged by KIS is assumed to be dispositioned prior to this project becoming operational and will not require processing by this project.
- Fire suppression gas does not adversely react with plutonium.
- The only inner containers that will be handled directly (outside of an outer 3013) are assumed to be the newly generated BTCs. Credited controls that were identified for the inner 3013 containers apply only to these BTCs.
- Up to 15 3013 containers per year will be selected for Destructive Examination (DE) surveillance. Additional cans will undergo DE as needed depending on the results of the non-destructive evaluation (NDE) surveillance. The surveillance program and Material Control and Accountability (MC&A) will probably have additional tests to perform before the can is destroyed. This will be part of the recovery plan or will be included in approved procedures
- If the Fan/Filter Building is not constructed, the ventilation system is constructed PC-3 seismic and PC-2 NPH.
- Sealed sources meet the requirements of the DOE standard DOE-STD-1027-92 for consideration as "Sealed Radioactive Sources" and do not contain fissile material. Therefore, sealed sources will not contribute to the MAR and will not contribute to the fissile nuclide inventory.

4.0 HAZARDS ASSESSMENT

The HA was performed according to the WSRC CHAP methodology (Ref. 2). The CHAP was used to identify potential hazardous events applicable to the 3013 CSSC Project in K Area and to select candidate SC controls for public protection, and SS controls for worker protection. Approaches used to develop potential control strategies included eliminating the hazards and resultant hazardous situations, preventing the accidents, reducing the likelihood of an accident, or mitigating the consequences of the postulated accident. The CHAP includes the following steps:

- Hazards Baseline Determination
- Unmitigated Hazards Analysis
- Mitigated Hazards Analysis/Control Strategy Development

Chapter 4.0 is a description of the CHAP team and hazards baseline determination. Chapter 5.0 is a discussion of unmitigated and mitigated hazards analyses and the resulting CSSC control strategy.

4.1 THE CHAP TEAM

In accordance with the WSRC CHAP methodology (Ref. 2) this HA was performed by an integrated multi-discipline CHAP team, which included personnel from Safety Analysis, Project Management, Project Engineering and Design, Fire Protection, Regulatory Programs, Criticality, Radiological Engineering, Accident Analysis, and Operations Integration. Table 1 is a list of the core CHAP team members and key contributors to the CHAP.

Table 1. CSSC CHAP Team for the Rev. D and Rev. E HA

Name	Organization	CSSC Project Responsibility or Area of Expertise
Srikant Mehta	WSMS	CHAP Team Lead*
Carla Witt	WSMS	CHAP Secretary
Tony Robinson	WSMS	CSSC Safety Basis Project Manager*
Bob Bayer	WSRC	Design Authority*
Christine Hadden	WSRC	Operations*
Janice Hearn	WSRC	Regulatory Programs*
Kevin Madden	WSRC	Design Engineering*
Ray Sprankle	WSMS	Fire Protection
Todd Matteson	WSRC	Fire Protection Design Authority
Steve Glover	WSRC	Industrial Hygiene
Steve Kuhl	WSRC	CSSC Project Owner-Operations
Wayne Farrell	WSRC	Radiation Control
David Allison	WSMS	Accident Analysis
Alan Smith	WSRC	Ventilation Design Authority
Tom Reilly	WSMS	Criticality
Rick Oakley	WSMS	Regulatory Programs

* Core Team Members

Results from Rev. C of the PHA were used as input to the CHA process.

4.2 HAZARDS BASELINE DETERMINATION

The first step of the CHAP is a hazards baseline determination. To determine the hazards baseline for the CSSC Project, the CHAP team first defined the HA scope and then reviewed the CSSC processes and facilities to identify applicable hazards. The HA scope was limited to KAC facilities and processes of the CSSC Project. Section 4.2.1 is a description of the CSSC processes that were reviewed. Section 4.2.2 is a description of the facilities and equipment that were evaluated. Section 4.2.3 is a discussion of the hazardous inventory that resulted from the CHAP team hazards baseline determination.

4.2.1 THE CSSC PROCESS

As part of the SRS facilities designated for consolidated storage and disposition of DOE-EM excess plutonium and highly enriched uranium materials, the CSSC Facility will receive DOT 9975 shipping containers, unpackage 3013 containers from the 9975 containers, evaluate the condition of the 3013 containers, and move the 3013 containers into storage. Stored 3013 containers will be monitored through a surveillance program. Up to 15 3013 containers per year will be selected for DE surveillance. Additional cans will undergo DE as needed depending on the results of NDE surveillance. Some containers may be repackaged and if necessary, the plutonium-bearing material will be stabilized. The CSSC Project capacity was based on the following:

- providing secure storage for approximately 1900 3013 containers (this includes unpackaging the 9975 shipping container),
- providing non-destructive surveillance capability for up to 100 3013 containers and 9975 shipping containers annually to detect conditions adverse to safe long-term storage,
- supporting the KAC destructive examination mission by providing capabilities which include puncturing and sampling headspace gases from selected 3013 containers, sampling, sending to the lab for analysis of the contents, and
- providing oxidation, stabilization, and repackaging capabilities (opening 3013 containers, removing the contents, stabilizing and repackaging the material to meet DOE-STD-3013 standards.

4.2.1.1 Receipt, Unpackaging and Storage of Plutonium-Bearing Material in the CSSC Facility

The CSSC Facility will receive 9975 shipping containers from KAMS. Upon receipt, each shipping container will be evaluated, and the 3013 container will be unpackaged from the shipping container. The 3013 container will then be evaluated and moved into storage. Once in the Storage Room, additional container evaluations will be performed as part of a routine surveillance program.

The receipt of 9975 shipping containers and unpackaging of 3013 containers from the 9975 shipping containers will take place in the Packaging Area. This area is currently part of the Final Storage Area. The 9975 shipping containers will be transferred from KAMS into the CSSC Packaging Area through the CSSC Packaging Area airlock. At the Unpackaging/Repackaging Station, each shipping container will be weighed, and the 3013 container will be unpackaged. A contamination survey will then be taken of the 3013 container, and digital photographs will be taken of the container.

After unpackaging the 3013 container from its shipping container, a one-position transport cart will be used to move the container to various NDE stations in the Packaging Area and to the Non-Destructive Assay (NDA) Room. Each 3013 container consists of an outer container which is standard throughout the DOE complex, an inner container, and for oxides, a convenience can. These surveillance activities will be performed without penetrating any of these containers. Surveillances include leak detection, contamination surveys, visual inspections, weighing, and Digital Radiography (DR), and gamma scanning (GIS/PG unit). Additional analysis may be required by MC&A, involving the use of additional equipment including the Neutron Multiplicity Counter (NMC) and calorimeter.

Unless a container is noted to have abnormalities that could affect its structural integrity or safe storage, it will typically be transferred to racks installed in the 3013 Storage Room. Containers selected for DE will be moved to the Glovebox Process Area where further evaluation, stabilization of the contents, and repackaging will be performed as required.

4.2.1.2 Stabilization and Repackaging of Plutonium-Bearing Material in the CSSC Facility

As many as twenty to thirty 3013 containers may be repackaged per year in the CSSC Facility. The CSSC Project will provide glovebox capabilities for stabilizing and packaging plutonium-bearing material according to the requirements of DOE-STD-3013 (Ref. 1). Containers selected for DE will be moved into the CSSC glovebox. In the glovebox, the plutonium-bearing material will be removed from the primary and secondary containers, stabilized if necessary, analyzed, repackaged in a 3013 container, and moved to storage in the 3013 Storage Room.

To remove the plutonium-bearing material from a 3013 container, the outer and inner can will first be punctured using the Can Puncture Device (CPD). During this process, the initial internal pressure will be determined and a sample of the container headspace gas will be sent to the lab for analysis. The outer and inner can will then be opened using a can cutter. If the plutonium-bearing material is in a convenience can, this can will also be punctured and opened. Samples of the plutonium-bearing material will be collected and sent to the lab for analysis at this time.

For plutonium-bearing materials that require stabilization or exceed the allowable moisture limit, the material will be heated in a furnace. Once cooled, a sample will be taken of the stabilized material. This sample will be tested by Thermal Gravimetric Analysis (TGA)-Mass Spectrometry (MS) at the Savannah River National Laboratory (SRNL) to verify compliance with the requirements of DOE-STD-3013 (Ref. 1). The stabilized plutonium oxide material will be kept in a dry environment until it is ready for packaging (e.g., during TGA-MS measurements).

The process used to stabilize the plutonium oxides will be different than the process for stabilizing metals. For plutonium oxides, the temperature of the material will be maintained above 950° C for at least two hours. For plutonium metals, the temperature of the material will first be held between 400° C and 500° C for enough time to completely oxidize the metal to plutonium oxide. The temperature of the resulting plutonium oxide will then be raised to above 950° C and held at this level for at least two hours. For high-chloride and high-fluoride materials, the stabilization temperature will be lower, 750° C.

Upon verification that the plutonium-bearing material is compliant with DOE-STD-3013 (e.g., the moisture content is less than 0.5 weight percent), the material will be repackaged. The plutonium-bearing material will be transferred into a new convenience can. This convenience can will then be placed in an SRNL inner 3013 can (tall bagless type), which will be welded closed. An Automatic Leak Detector (ALD) will be used to verify the integrity of the inner 3013 can weld. The inner 3013 can will be weighed and transferred to an outer 3013 can, which will be welded closed. The outer 3013 can weld will be checked using a second ALD.

The resulting 3013 container (including the outer can, the inner can, the convenience can, and the plutonium-bearing material) will be transferred to the Packaging Area where it will be evaluated using the NDA techniques described in Section 4.2.1.1 of this document. Upon completion of this evaluation, the 3013 container will be transferred to a storage rack in the 3013 Storage Room.

There are 5 inner 3013 container designs in use throughout the DOE complex. The can cutter is capable of cutting through each of these designs. Except when the 3013 containers are first being opened (which occurs in a glovebox), the only inner containers that will be handled directly (outside of an outer 3013) will be the SRS Bagless Transfer Containers (BTCs). Throughout the remainder of this document, "inner 3013 container" or "inner 3013 container" refers to the BTC design.

4.2.2 THE CSSC FACILITY AND EQUIPMENT

To support the objectives of the CSSC Project, the CSSC Facility will be used for activities that have not been evaluated in the current KAC safety basis. The purpose of Section 4.2.2 is to describe the facility modifications and additional equipment that are will be needed to support the CSSC Project. Section 4.2.1 included discussions of the activities that will be performed in these facilities. Hazards assessments for the current facility and activities associated with its current operations have been documented in the KAC Documented Safety Analysis (DSA).

Establishing the CSSC Project capabilities, will require Demolition and Removal (D&R) of SSCs in the Final Storage Area, Presentation Area, and Assembly Area. Upon completion of the D&R phase of the CSSC Project, these areas will be converted to the CSSC Facility which will consist of a Packaging Area, a Non-Destructive Assay Room, a Glovebox Processing Area, and a 3013 Storage Room with storage rack capacity for approximately 1900 3013 containers. In addition, support systems will be installed in the newly-created facility Mezzanine (second floor). Safeguards & Security (S&S) upgrades for 3013 container handling will be made to provide compliance with DOE orders, as documented in the project Safeguards and Security Requirements Identification document (Ref. 15). DBT-2004 upgrades will be performed as a separate project.

Establishing additional CSSC Project capabilities will also require installation of NDA equipment not currently available in the CSSC Facility. A Neutron Multiplicity Counter will be procured to establish radionuclide determination capabilities for 5-gal waste drums and 3013 containers. Several instruments and pieces of equipment will be relocated to the CSSC Project facilities from the K-Area Interim Surveillance (KIS) modification, including

- DR equipment,
- a gamma scanner with prompt gamma counting capabilities,
- a calorimeter,
- a 3013 container scale, and
- 9975 unloading and loading equipment.

The CSSC Project will require glovebox capabilities. These capabilities will be located in the Glovebox Processing Area and will include destructive evaluation, sample collection, stabilization and repackaging of plutonium-bearing materials in the 3013 containers. The associated equipment will include a CPD, a multi-can cutter, a furnace, weighing and material transfer equipment (scales, pans, etc.), and a Bagless Transfer System (i.e. inner can welder) with leak detection equipment (an outer can welder with leak detection is available in the Packaging Area). The glovebox will require a dry air supply, compressed gas service, and a HEPA filtered exhaust tied into the new exhaust system.

A supply ventilation system will also be installed, including fans, filters, ductwork, Heating Ventilation and Air Conditioning (HVAC), etc. The ventilation system will be independent of the existing KAC ventilation systems. An exhaust system will be installed for the CSSC Project Area including HEPA filtration, exhaust fans, a stack, and a standby diesel generator.

Fire detection, alarm, and suppression systems will also be installed in the CSSC Facility. The CSSC Facility will be divided into five separate fire areas. Fire detection, alarm, and suppression capabilities will be established for these areas and for inside the glovebox. Carbon dioxide will be used for the fire suppression agent inside the glovebox, and FM-200 will be used for the CSSC Facility fire suppression agent. A detailed description of the necessary fire protection modifications will be documented in a Fire Hazards Analysis for the CSSC Project.

The proposed activities will require revision of the safety basis supporting documents. The CSSC Project Safety Basis Strategy (Ref. 7) provides the strategy for developing the revised safety basis. The Safety Document Integrated Work Process (SDIWP), as defined in SCD-12 (Ref. 16), will be followed for the development of the safety documents.

4.2.3 THE CSSC FACILITY HAZARDOUS INVENTORY

Table 2 is a list of the maximum material inventory expected in each of the five CSSC Facility fire areas. The description of these process areas is consistent with the fire areas recommended by the Fire Protection Engineer. These maximum material inventories were used by the CHAP team to determine the Material at Risk for events used in the HA. Included in Table 2 is a key to the event numbering protocol used in the hazard evaluation tables included as Appendix A.

Chemicals to be used in the facilities are expected to be present in amounts that are less than applicable reportable quantities or threshold quantities. Introduction of chemicals into the facilities will be controlled through a Hazardous Material Inventory Control Program. As part of this program, prior to introduction of a chemical into the CSSC Facility, the chemical will be checked for compatibility with other materials and chemicals of the vicinity in which the new chemical is to be used or stored.

Table 2. Maximum Anticipated Material Inventory

Fire Area	Process Area	Maximum Material Inventory [1]	Process Description	Comments
1	3013 Storage Room	1920 3013 containers (8448 Kg)	3013 Storage	RS events
2	Glovebox Process Area	Holdup (600 g Pu) plus material from one 3013 container (4.4 kg Pu including material in the waste pail)	Glovebox Operating Room, Glovebox Maintenance Room, Glovebox Control Room, and Gloveboxes	GB events
3	NDA Room	One check standard/source (500 g Pu) plus either four 3013 containers (17.6 kg Pu) or one unassayed 5-gal TRU waste drum (395 g Pu) or seven annual calibration standards (3.7 kg Pu)	NMC & Calorimeter	NDA events
4	Packaging Area	Six unassayed TRU waste 5-gal drums (2.4 kg Pu), three 3013s (13.2 kg Pu), a check standard/source (500 g Pu), five assayed TRU waste drums (1 kg Pu), samples (150 g Pu), seven annual calibration standards (3.7 kg Pu) and 0.5 g Pu in LLW bag(s)	Packaging, Unpackaging, OCW, DR, Gamma scan, Waste Staging	PA events
5	Mezzanine Area	None	Suppression system / HVAC system components	MEZ events
-	Common Areas	Total facility inventory-1920 3013 containers (8448 Kg), holdup (600 g Pu), one check standard/source (500 g Pu), seven annual calibration standards (3.7 kg Pu), samples (150 g Pu), seven unassayed TRU waste drums (2.8 kg Pu), and five assayed TRU waste drums (1 kg Pu).	Multiple Areas	COM events
-	Transport Corridors	One 3013 container in a closed shipping container (4.4 kg Pu)or one assayed TRU waste drum (195 g)	Movement of 3013s into CSSC	HALL events
-	Fan/Filter Building	Residual Pu contamination on filters	Support CSSC Ventilation	OF events

Note 1: Each 3013 container may hold 4.4 Kg metal or 5 Kg oxide.

5.0 HAZARDS ASSESSMENT RESULTS

Evaluation of the hazards associated with the CSSC Project processes and the CSSC facility indicated that the proposed activities would not produce an undue risk to facility workers, other onsite workers, the offsite population, or the environment provided controls are implemented to manage risks associated with some of the hazards. As part of the evaluation, a set of design basis accidents was defined and a control set was developed. The control set included administrative controls, and SC and SS engineered controls.

5.1 HAZARDS EVALUATION

Results from evaluation of hazards associated with the CSSC Project have been summarized in hazard evaluation tables which have been included as Appendix A of this report. Hazards were evaluated to identify potential accident events. Each event was then examined to determine the potential frequency and potential consequences associated with the proposed accident scenario. A set of controls was then identified and applied to the event. The resulting control set has been summarized in Appendix B along with the safety function performed by each control and the credited safety features of the control.

As part of the control set development, SSCs were classified as SC or SS. The DOE Evaluation Guideline (EG) for identify a SSC as SC is based on the dose received by a hypothetical maximally-exposed offsite individual (MOI). If an event causes a MOI exposure that challenges 25 rem, the SSC controls credited with protecting the MOI are to be considered SC.

5.2 CSSC FACILITY HAZARD CATEGORIZATION

The CSSC Facility will be part of an existing Hazard Category 2 nonreactor nuclear facility. Based on the inventory of material to be processed through CSSC, the CSSC Project facilities would also be assigned a Hazard Category 2 designation. Introduction of radionuclide inventory into the CSSC Facility will be controlled through a Hazardous Material Inventory Control Program. Table 2, Chapter 3 input and assumptions, and MAR values given in the Appendix A, *Hazard Evaluation Tables*, are the bases for the radionuclide inventories used in this hazards analysis. Radionuclide inventories exceeding these values are to be evaluated using the SRS MSB change process (Ref. 5).

5.3 DESIGN BASIS ACCIDENTS

A set of design basis accidents was identified from the accident events listed in Appendix A. In assembling the design basis accidents, the risk dominant events were included for each of the event types. Additional accident events were then added to incorporate scenarios which had controls not assigned to events already included as a design basis accident. Events were then reviewed to determine whether any event was not incorporated that might not be adequately represented by the events already included as a design basis accident. Sections 5.3.1 through 5.3.7 are discussions of these design basis accidents.

5.3.1 DESIGN BASIS FIRE ACCIDENTS (E-1 EVENTS)

Design basis fire accidents have been summarized in Table 3. Six fire scenarios were used to bound the fire event consequences and control set. The CHAP team determined no controls needed to be credited for two fire events initially considered. Event RS-1b was an isolated fire starting in the 3013 container storage racks and propagating into a room fire. This event was not considered to be credible. Event MEZ-1 was a fire in the mezzanine ventilation train causing partial loss of facility or glovebox fire suppression capabilities. This was considered to be a Standard Industrial Hazard (SIH) event and did not result in a release of material at risk.

5.3.1.1 Packaging Area Design Basis Fire Accidents

Most of the fire events were bounded by one of the Packaging Area fire events (PA-3). This fire would involve radionuclide inventory from transuranic (TRU) waste drums, Low-Level Radioactive Waste (LLW) bags, 3013 containers, samples, and standards. The proposed control set for this event did not include control of the shipping container design. The shipping container design was identified as a control for other Packaging Area fire events. To capture this control in the design basis control set, a second Packaging Area fire event (PA-1) was included as a design basis accident. The PA-1 fire event is an isolated fire involving radionuclide inventory from one 3013 container.

The PA-3 and PA-1 control sets bound controls associated with the fire events indicated in Table 3 with one exception. Two controls credited in one of the Glovebox Area fires (GB-2) are not included in this control set. These controls (limiting plutonium in the Glovebox Area to five kilograms and periodic assessments to verify glovebox plutonium hold-up quantities) are part of the control set for another design basis accident (COM-27E). Together PA-3 and COM-27e bound the GB-2 event.

5.3.1.2 Storage Room Design Basis Fire Accidents

The Storage Room design basis fire accident (RS-2) would be a fire involving radionuclide inventory from stored 3013 containers, potentially 1,920 containers. This design basis fire accident bounds all Storage Room fire events except an isolated fire outside the storage rack causing a release from standards (RS-1A). The Storage Room design basis fire accident (RS-2) control set does not include controls on containers in which plutonium standards are stored. As indicated in Table 3, RS-1a is bounded by the Packaging Area design basis fire accident (PA-3).

Table 3. CSSC Project Design Basis Fire Accidents

Design Basis Accident Event							Bounded Events[a]
Number	Description	Frequency	Unmitigated Consequence				
			MOI	WG1	WG2	WG3	
PA-1	Isolated fire in Packaging Area (including Glovebox Control Room and airlocks) results in a release from a closed shipping container containing a 3013 container received from/sent to KAMS.	Anticipated	Low	High	High	High	HALL-1
PA-3	Intermediate fire involving multiple combustible packages in the Packaging Area results in a release from SNM containers and TRU waste containers.	Anticipated	Mod	High	High	High	HALL-2, PA-2, PA-2B, PA-2D, PA-2E, PA-2F, PA-3A, RS-1 RS-1A, RS-11[c] GB-1C, GB-1D, GB-1E, GB-2[b], NDA-1, NDA-2, COM-7, COM-29, COM-5
RS-2	Full storage room fire resulting in a release from multiple 3013 containers.	Unlikely	High	High	High	High	RS-1, RS-2A, RS-11[c]
GB-1	Fire in the glovebox breaches a 3013 and results in a release of radiological material. This event is the bounding glovebox fire because of the potential of pressurized release.	Anticipated	Low	High	High	High	GB-1B
OF-2	Fire in the external Fan/Filter Building that damages the supply and exhaust system and causes a release.	Anticipated	Neg	High	Neg	Neg	-
COM-3	Fire external to CSSC that propagates into the CSSC areas.	Anticipated	High	High	High	High	-

[a] Does not include RS-1B or MEZ-1. RS-1B is not a credible scenario. MEZ-1 is a SIH event.
[b] The GB-2 control set is bounded by controls from PA-3 and COM-27E (E-7 design basis accident).
[c] The RS-11 control set is bounded by controls from RS-2, PA-3, and COM-26 (E-5 design basis accident).

5.3.1.3 Glovebox Area Design Basis Fire Accidents

The glovebox design basis fire accident (GB-1) would be a fire within a glovebox that breaches a 3013 container. This fire could involve radionuclide inventory from one 3013 container and glovebox holdup material. This Glovebox Area design basis fire accident bounds all fire accidents that would occur within the glovebox. As indicated in Table 3, the Packaging Area design basis accident PA-3 bounds fire events that would occur in the Glovebox Area outside the glovebox.

5.3.1.4 Fan/Filter Room Design Basis Fire Accidents

The outside facility design basis fire accident (OF-2) would be a fire in the Fan/Filter Room that damages the CSSC supply and exhaust system. This fire could involve radionuclide inventory from one 3013 container and glovebox holdup material. The other outside facility fire event (OF-1) involves radionuclide inventory from residual plutonium on filters. The consequences associated with the OF-1 event are negligible. Therefore, this event was not considered during development of bounding accidents.

5.3.1.5 Design Basis Fire Accidents Applicable to More than One Facility

The design basis accident (COM-3) would be a fire external to CSSC that propagates into the CSSC areas. This fire could involve radionuclide inventory from the Storage Room, the Packaging Area, and the Glovebox Area. The other common area fire events that were evaluated in this HA, started in one of the CSSC areas and propagated to other CSSC areas. As indicated in Table 3, the Packaging Area design basis accident PA-3 bounds these other common area fire events.

5.3.2 DESIGN BASIS EXPLOSION ACCIDENTS (E-2 EVENTS)

Design basis explosion accidents have been summarized in Table 4. The CHAP team evaluated six explosion scenarios. These included three explosion events in the glovebox and three common area explosion events. Because the causes of these accidents are diverse, each event has a unique control set that cannot be bounded by the other scenarios. Therefore, to bound the control set for these events, all six explosion scenarios were included as design basis accidents.

5.3.2.1 Glovebox Area Design Basis Explosion Accidents

The glovebox design basis explosion events include an explosion of an inner or outer 3013 container inside the CPD (GB-4), a pressure release during opening or venting of the CPD (GB-4A), and an explosion in an inner or outer 3013 container during cutting of the can (GB-4B). The GB-4 event would involve the radionuclide inventory inside the container (4.4 kilograms of plutonium). The other two events would involve radionuclide inventory inside the container and glovebox holdup (five kilograms of plutonium).

Table 4. CSSC Project Design Basis Explosion Accidents

Number	Description	Frequency	Unmitigated Consequence			
			MOI	WG1	WG2	WG3
GB-4	Deflagration/detonation inside the CPD or CPD piping during can puncture/gas sampling within the glovebox results in a pressurized release of radioactive material	Anticipated	Low	High	High	High
GB-4A	Deflagration in the glovebox during venting or opening of the CPD results in a release of radiological material.	Anticipated	Neg	High	High	High
GB-4B	Deflagration/detonation inside a 3013 container during can cutting within the GB results in a pressurized release of radioactive material.	Anticipated	Low	High	High	High
COM-40	Deflagration inside one TRU waste drum results in a pressurized release of radioactive material.	Anticipated	Neg	High	High	High
COM-41	Deflagration inside one sample gas vial or oxide sample vial results in a pressurized release of radioactive material.	Anticipated	Neg	High	Mod	Mod
COM-42	Deflagration internal to a 3013/9975, annual calibration and check standards/sources, or inner 3013 container during handling results in a pressurized release of radioactive material.	Unlikely	Neg	High	High	Mod

5.3.2.2 Design Basis Explosion Accidents Applicable to More than One Facility

The design basis accidents for the common area explosion events include an explosion in a TRU waste drum (COM-40). This would involve radionuclide inventory in the drum (395 grams of plutonium). Another common area explosion event is an explosion in a sample vial or sample container (COM-41), which would involve radionuclide inventory in the vial or container (150 grams of plutonium). The third common area explosion event is an explosion in a 3013 container or a standard container (COM-42), which would involve the material in the container (4.4 kilograms of plutonium).

5.3.3 DESIGN BASIS LOSS OF CONFINEMENT ACCIDENTS (E-3 EVENTS)

Design basis loss of confinement accidents have been summarized in Table 5. The CHAP team evaluated sixteen loss of confinement scenarios and determined no controls needed to be credited in four loss of confinement events initially considered. The unmitigated consequence associated with Events GB-9 and COM-11 were low enough that no controls needed to be credited to mitigate these accidents. Events GB-16 and COM-10 were considered to be "Beyond Extremely Unlikely".

Table 5. CSSC Project Design Basis Loss of Confinement Accidents

Design Basis Accident Event							**Bounded**
Number	**Description**	**Frequency**	**Unmitigated Consequence**				**Number**
			MOI	WG1	WG2	WG3	
RS-4	Collapse of one of the 3013 storage racks results in fall of containers and release of material.	Unlikely	High	High	High	High	RS-10
GB-8	Material is released from a pressurized 3013 container in the glovebox, resulting in a release into the room.	Anticipated	Low	High	High	High	COM-14
GB-10	Glovebox over-pressurization results in material released to the room [Glovebox Air Reversal].	Anticipated	Neg	High	Mod	Low	GB-5A
COM-X2	Impact to or drop of a Shipping Container, 3013, or Inner Container, gas or oxide sample vial, annual calibration standard, or check standard/source, resulting in its puncture and the release of its contents.	Anticipated	Low	High	High	High	COM-X1
COM-X3	Concrete spalling or other dropped object impacts 3013, Inner Container, annual calibration standard(s), sample containers, TRU and LL waste containers or shipping container resulting in a release.	Anticipated	Low	High	High	High	COM-18
COM-18	Puncture of a 3013 due to firearm discharge.	Anticipated	Neg	High	High	Mod	-
COM-39	Loss of confinement from a non-tested Inner Container results in a spill/contamination to the facility worker (newly welded).	Anticipated	Neg	High	Mod	Low	GB-5, COM-18

5.3.4 DESIGN BASIS DIRECT EXPOSURE ACCIDENTS (E-4 EVENTS)

Design basis direct exposure accidents have been summarized in Table 6. The CHAP team evaluated five direct exposure scenarios and determined no controls needed to be credited in two of these. Event PA-6 was a direct radiation exposure from the digital radiography equipment. This was considered to be an SIH event. Event COM-X4 was the bounding radiation exposure event for radiation exposure during operations. The unmitigated consequence associated with Event COM-X4 was low enough that no controls needed to be credited to mitigate this accident.

Table 6. CSSC Project Design Basis Direct Exposure Accidents

Design Basis Accident Event							Bounded
Number	Description	Frequency	Unmitigated Consequence				Number
			MOI	WG1	WG2	WG3	
COM-X5	Inadvertent excessive discharge of FM-200 results in overexposure to agent.	Unlikely	Neg	High	Neg	Neg	COM-X6
COM-20	Process gas (liquid and gaseous nitrogen, P-10, CO_2, argon, argon with 2.5% hydrogen, helium) released into the process area resulting in asphyxiation.	Anticipated	None	High	Neg	None	-

[a] Does not include PA-6. PA-6 is a SIH event.

5.3.5 DESIGN BASIS CRITICALITY ACCIDENTS (E-5 EVENTS)

Design basis criticality accidents have been summarized in Table 7. The CHAP team evaluated six criticality scenarios. Three of these events were designated to be design basis accidents (GB-17A, COM-25, and COM-26). The control sets associated with these three events bound controls associated with the other criticality evens with one exception. Two controls credited on one of the Glovebox Area criticality scenarios (GB-14) are not included in this control set. These controls (glovebox HEPA filters and periodic surveys of the exhaust system) are part of the control set for another design basis accident (COM-27E). Together GB-17A, COM-26 and COM-27E bound the GB-14 event.

Table 7. CSSC Project Design Basis Criticality Accidents

Design Basis Accident Event							Bounded
Number	Description	Frequency	Unmitigated Consequence				Number
			MOI	WG1	WG2	WG3	
GB-17A	Introduction of sufficient moderator inside the glovebox results in a criticality.	Unlikely	Neg	High	Mod	Neg	GB-14[a], GB-15, GB-17
COM-25	Operator error results in a criticality from inadvertent assembly of Pu-bearing containers	Anticipated	Low	High	High	High	GB-15
COM-26	Criticality due to moderation and reflection of too many Pu containers.	Unlikely	Low	High	High	High	GB-14[a], RS-11[b]

[a] The GFB-14 control set is bounded by controls from GB-17A, COM-26, and COM-27E (E-6 design basis accident).
[b] The RS-11 (E-1 fire event resulting in criticality) control set is bounded by controls from RS-2, PA-3, and COM-26.

5.3.6 DESIGN BASIS ACCIDENTS INITIATED BY EXTERNAL EVENTS (E-6 EVENTS)

Design basis external event accidents have been summarized in Table 8. The CHAP team evaluated five external event scenarios. One of these scenarios, impact of a large aircraft into the CSSC Facility (Event COM-27C), was determined to be beyond extremely unlikely. Therefore, no control set was developed for this event. One of the external event accidents, loss of normal power (COM-27), was more appropriately bounded by an E-7 (NPH) design basis accident (Event COM-28F).

Table 8. CSSC Project Design Basis External Events Accidents

Design Basis Accident Event							**Bounded**
Number	**Description**	**Frequency**	**Unmitigated Consequence**				**Number**
			MOI	WG1	WG2	WG3	
COM-27A	Small aircraft impact into CSSC results in the release of material.	Extremely Unlikely	High	High	High	High	-
COM-27B	Small aircraft impact into CSSC Fan/Filter Building or Ductwork (outside KAC) results in the release of material.	Extremely Unlikely	Neg	High	Neg	Neg	COM-27E

5.3.7 DESIGN BASIS NATURAL PHENOMENA HAZARDS ACCIDENTS (E-7 EVENTS)

Design basis natural phenomena hazardous event accidents have been summarized in Table 9. The CHAP team evaluated six natural phenomena scenarios. One scenario was release of contamination due to external flooding. This event was determined to be beyond extremely unlikely and a control set was not developed for this scenario. As shown in Table 9, the design basis natural phenomena hazards events include one high wind event, one freezing temperature event, and two seismic events.

Table 9. CSSC Project Design Basis Natural Phenomena Hazards Accidents

Design Basis Accident Event							Bounded
Number	**Description**	**Frequency**	**Unmitigated Consequence**				**Number**
			MOI	WG1	WG2	WG3	
COM-28A	High winds/tornado winds impact the CSSC Facility resulting in a release of radioactive material.	Anticipated	Neg	High	High	High	-
COM-28C	Snow, ice, freezing temperatures impact CSSC Ventilation System resulting in a release of radioactive material.	Anticipated	Neg	High	Neg	Neg	-
COM-28E	Seismic event collapses the CSSC Project Area Structure, Fan/Filter Building, ductwork (outside) and stack resulting in a criticality and pressurized release of radioactive material.	Unlikely	High	High	High	High	GB-14
COM-28F	Seismic event initiates fire in multiple CSSC Project Areas.	Extremely Unlikely	High	High	High	High	COM-27, COM-28D

5.4 CONTROL STRATEGY

To limit the risks associated with the proposed CSSC Project activities, controls were identified for each of the accident events included in the hazard evaluation tables (Appendix A). The resulting control set includes SC engineered controls, SS engineered controls and Programmatic (Administrative) Controls. These controls have been listed in Appendix B along with the safety functions and features that were credited to each control during the hazard evaluation process.

5.4.1 SAFETY CLASS ENGINEERED CONTROLS

Engineered controls were identified for each of the accident events that challenged the limits for unmitigated consequences to offsite personnel. An engineered control was identified as SC if the control would either prevent these accident events or mitigate consequences to offsite personnel. In addition to the SC function these controls fulfill, each control is also credited with SS functions. These controls have been listed in Tables B-1 through B-3 of Appendix B along with the safety functions and features credited to the control.

5.4.2 SAFETY SIGNIFICANT ENGINEERED CONTROLS

Engineered controls were also identified for each of the accident events that challenged the limits for unmitigated consequences to facility or co-located workers. An engineered control was identified as SS if the control would either prevent accident events that could challenge worker limits or mitigate consequences to the workers. These controls have been listed in Table B-4 through B-9 of Appendix B. The SS functions performed by SC controls have been excluded from these tables. Other engineered controls were identified during the CHAP. These facility controls provide an additional layer of protection from the material at risk or controls appropriate for providing worker protection for Standard Industrial Hazards (SIH). These controls have been listed in Table B-10 of Appendix B.

5.4.3 PROGRAMMATIC CONTROLS

Programmatic or administrative controls were also identified for the accident events listed in Appendix A. Some of these administrative controls will be implemented through one of the SRS Safety Management Programs (e.g., the SRS Fire Protection Program). Others will be implemented as Specific Administrative Controls (SACs). The administrative controls have been listed in Table B-11 of Appendix B.

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APPENDIX A

Hazard Evaluation Tables

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: HALL-1 **Event Type:** E-1 **Event Description:** Isolated fire in the transport corridors during shipping container transport results in a release from a closed shipping container containing a 3013 container **Location:** Transport corridors Note**:** This is a pressurized (oxide) or eutectic release. **Causes:** Combustible/flammable material including misc. combustibles AND Ignition sources including electrical shorts (tools, outlets, and wiring) and thermal sources (wiring) **Material At Risk:** One 3013 container in a closed shipping container (4.4 kg Pu) **Form:** Pu oxide or metal **Event Specific Assumptions:** • No waste stored in transport corridors • No simultaneous movement of waste and shipping containers containing 3013 containers	Pressurized release of oxide in a 3013 container For a fire involving metal in a 3013 container, formation of a eutectic will result in a breach of the 3013 prior to pressurization. The consequences of metal in a fire (including additional energy from oxidation) are bounded by the pressurized release of oxide from a 3013 container. Fire could potentially spread to include other materials and other areas	MOI – Low WG1 (in the transport corridors/assembly area) – High WG2 (outside the transport corridor/assembly area but inside the building) – High WG3 (outside the building) – High Anticipated	• NFPA compliant installation of electrical devices • Fire Protection Program – Combustible Control Program – Control of Ignition Sources • Shipping Container Design (contains Celotex™) • Procedures and Training Program – No other work allowed in the transport route during transport of shipping container • Waste Management Program	• Detection by operators (constantly attended) • CSSC Fire Detection System (transport corridor is a minor air source for CSSC) • Air exchange between hall and airlock will allow detection of fire in transport corridor by FD in airlock	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available – Control of Ignition Sources • Building Structure (non-combustible construction) • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained – No 3013 transfer from KAMS to CSSC unless inspection verifies • No waste is stored in the transport corridors • No current 3013 or waste transfer is taking place in the hallway • No hazardous chemicals are stored in the transport corridors • No 2 over 1 hazards exist in the transport route. • Radiological Protection Program • Shipping Container Design – Fire resistant – Double containment • 3013 Outer container design [SF: Able to withstand postulated fire	• PFHA documentation	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program – Fire watch trained – Material handler trained – No 3013 transfer from KAMS to CSSC unless inspection verifies • No waste is stored in the transport corridors • No current 3013 or waste transfer is taking place in the hallway • No hazardous chemicals are stored in the transport corridors • No 2 over 1 hazards exist in the transport route.	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Release from 3013 is prevented. (Combustible controls to limit fire size and intensity to within the capability of an intact shipping container prevents a release from a 3013 container.) Since there is no nuclear material release, the Emergency Preparedness Procedures protect against the Standard Industrial Hazards for a fire to WG1, WG2 and WG3.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
• Limit transient combustibles in the transport corridors • No chemical release postulated • No 2 over 1 hazards for the shipping container within the transport route.					without compromising containment] • Shipping Container Qualification and Storage Surveillance Program		**Engineered:** **SC:** None Required **SS:** **WG1**: • Shipping Container Design [SF: Prevents release in a fire] **WG2**: • Shipping Container Design [SF: Prevents release in a fire] **WG3**: • Shipping Container Design [SF: Prevents release in a fire]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: HALL-2 **Event Type:** E-1 **Event Description:** A fire in the transport corridor to KAMS involving CSSC TRU waste resulting in a pressurized release. **Location:** Transport corridor to KAMS **Causes:** Combustible/flammable material including job control waste, misc. combustibles AND Ignition sources: electrical short (tools, outlets, wiring, heaters) thermal sources (heaters, wiring) **Material At Risk:** One drum of assayed TRU Waste (195 g Pu) **Form:** Pu oxide **Event Specific Assumptions:** • The waste in the transport corridor has been assayed in CSSC and shown to contain no more than 195 g Pu.	Fire could potentially spread to include other materials and other areas	MOI –Neg WG1 – High WG2 – Mod WG3 - Neg Anticipated	• NFPA Compliant installation of electrical devices • Fire Protection Program – Combustible Control Program – Control of Ignition Sources • Procedures and Training Program – No other work allowed in the transport route during transport of waste • Waste Management Program	• Detection by operators • CSSC Fire Detection System (transport corridor is a minor air source for CSSC) • Air exchange between hall and airlock will allow detection of fire in transport corridor by FD in airlock	• Waste container (vented drum to prevent flammable gas buildup) • Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available – Control of Ignition Sources • Building Structure (non-combustible construction) • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained • Radiological Protection Program • Nuclear Criticality Safety Program [SF: establishes the requirements to have an SNM inventory control program] – Inventory limits on amount of material in TRU waste drums. • TRU Waste Drum Design [SF: Closed non-combustible drum provides sufficient delay between fire initiation and container breach to allow safe evacuation]		**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program – Fire watch trained – Material handler trained • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Inventory limits on amount of material in TRU waste drums. **Engineered:** **SC:** None Required **SS:** **WG1:** • Vented TRU Waste	MOI - Neg WG1 – Neg WG2 – Neg WG3 – Neg

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							Drum Design [SF: Closed non-combustible drum provides sufficient delay between fire initiation and container breach to allow safe evacuation] **WG2:** • Vented TRU Waste Drum Design [SF: Closed non-combustible drum provides sufficient delay between fire initiation and container breach to allow safe evacuation] **WG3:** None	

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Event Number: PA-1 **Event Type:** E-1 **Event Description:** Isolated fire in Packaging Area (including Glovebox Control Room) results in a release from a closed shipping container containing a 3013 container received from/sent to KAMS Note**:** This is a pressurized (oxide) release. **Location**: Packaging Area **Causes:** Combustible/flammable material including misc. combustibles, Digital Radiography oil, Celotex™ from open containers, computers, cable insulation, waste, laundry AND Ignition sources including electrical shorts (tools, outlets, wiring, computers, electrical equipment racks), thermal sources (wiring), hot works, mechanical sparking **Material At Risk:** One 3013 container in a closed shipping container (4.4 kg Pu) **Form:** Pu oxide or metal **Event Specific Assumptions:**	Pressurized release of oxide from a 3013 container Fire could potentially spread to include other materials within the Packaging Area	MOI – Low WG1 – High WG2 – High WG3 - High Anticipated	• NFPA compliant installation of electrical devices • Fire Protection Program – Combustible Control Program – Control of Ignition Sources • Shipping Container Design (contains Celotex™) • Procedures and Training Program • Waste Management Program	• Detection by operators • CSSC Fire Detection System	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available • CSSC Fire Suppression System • Building Structure (non-combustible construction) – Gaseous Agent Enclosure (walls, damper, ceiling, etc.) [SF: Maintains concentration of agent over fire] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained • Shipping Container Design – Fire resistant – Containment • 3013 Outer container design [SF: Able to withstand postulated fire without compromising containment] • Shipping Container Qualification and Storage Surveillance Program • Automatic electrical shunt • CSSC Ventilation Normal Exhaust System • CSSC Ventilation Low Flow	• PFHA documentation	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] **Engineered:** **SC:** None Required **SS:** **WG1**: • Shipping Container Design [SF: Prevents release in a fire] • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] **WG2**: • Shipping Container Design [SF: Prevents release in a fire] **WG3**: • Shipping Container Design [SF: Prevents release in a fire]	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Release from 3013 is prevented. Combustible controls to limit fire size and intensity to within the capability of the shipping container design. These controls prevent a release from the 3013 container.

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None					System			

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: PA-2 **Event Type:** E-1 **Event Description:** Isolated fire in Packaging Area results in a release from one 3013 container (outside closed shipping container/container)" Note: This is a pressurized (oxide) release. **Location**: Packaging Area **Causes:** Combustible/flammable material including misc. combustibles, Digital Radiography oil, Celotex™ from open containers, computers, cable insulation, waste, laundry AND Ignition sources including electrical shorts (tools, outlets, wiring, computers, electrical equipment racks), thermal sources (wiring), hot works, mechanical sparking **Material At Risk:** One 3013 container (4.4 kg Pu) **Form:** Pu oxide **Event Specific Assumptions:** • The reason we are crediting the ventilation	Pressurized release of oxide in a 3013 container Fire could potentially spread to include other materials within the Packaging Area	MOI – Low WG1 – High WG2 – High WG3 - High Anticipated	• NFPA compliant installation of electrical devices • Fire Protection Program – Combustible Control Program – Control of Ignition Sources – Qualified Positions – Flame Impingement Controls for Each Qualified Position • Procedures and Training Program	• Detection by Operators • CSSC Fire Detection System	• Fire Protection Program – Combustible Control Program – Fire Department Response – Fire Extinguishers Available – Control of Ignition Sources • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained • Automatic Electrical Shunt • CSSC Ventilation Normal Exhaust System • CSSC Ventilation Low Flow System • Each 3013 shall be in a Qualified Position unless specifically transferring between Qualified Positions (see planned analysis). • 3013 Outer Container Design • Interlocks to close dampers in the affected area and to close	• Flame impingement control Calc for Qualified Position • PFHA	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program – Qualified Positions – Flame Impingement Controls for Each Qualified Position – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program – Fire watch trained – Material handler trained **Engineered:** **SC:** None Required **SS:** **WG1**: • Outer 3013 Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Release from 3013 is prevented

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system for WG2, 3 is to maintain ACVS (i.e. no LPF evaluation) and to comply with Interim Guidance					normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining design basis suppression agent concentration]		container confines the MAR while the worker evacuates] • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] **WG2**: • Outer 3013 Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close	

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							normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] **WG3**: • Outer 3013 Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close	

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							dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration]	

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Event Number: PA-2B **Event Type:** E-1 **Event Description:** Isolated fire in Packaging Area results in a release from one Inner 3013 Container Note: This is a pressurized (oxide) release from an Inner 3013 Container. **Location**: Packaging Area **Causes:** Combustible/flammable material including misc. combustibles, Digital Radiography oil, Celotex™ from open containers, computers, cable insulation, waste, laundry AND Ignition sources including electrical shorts (tools, outlets, wiring, computers, electrical equipment racks), thermal sources (wiring), hot works, mechanical sparking **Material At Risk:** One Inner 3013 Container (4.4 kg Pu) **Form:** Pu oxide **Event Specific Assumptions:** • The reason we are	Pressurized release of oxide in an Inner 3013 Container Fire could potentially spread to include other materials within the Packaging Area resulting in and intermediate fire, Event PA-3.	MOI – Low WG1 – High WG2 – High WG3 - High Anticipated	• NFPA compliant installation of electrical devices • Fire Protection Program – Combustible Control Program – Qualified Positions – Flame Impingement Controls for Each Qualified Position – Control of Ignition Sources • Inner 3013 Container Design • Procedures and Training Program	• Detection by operators • CSSC Fire Detection System	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available – Fire Watch – Control of Ignition Sources • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained • Automatic electrical shunt • CSSC Ventilation Normal Exhaust System • CSSC Ventilation Low Flow System • Each Inner 3013 Container shall be in a Qualified Position unless specifically transferring between Qualified Positions (see planned analysis) • One Inner 3013 Container in the Packaging Area at one time	• Standoff Calc-Qualified Position flame impingement controls • PFHA • Accident Analysis Calc • Time at Risk Argument (qualitative evaluation to support acceptability of risk of a welded inner 3013 container in process outside the glovebox) • Qualify Inner 3013 Container as SC	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program – Qualified Positions – Flame Impingement Controls for Each Qualified Position – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program – Fire watch trained – Material handler trained **Engineered:** **SC:** None Required **SS:** **WG1**: • Inner 3013 Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation]	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg SS ventilation credited as facility controls for worker protection and for reducing the MOI consequences from Low to Neg.

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crediting the ventilation system for WG2, 3 is to maintain ACVS (i.e. no LPF evaluation) and to comply with Interim Guidance • The material in the Inner 3013 Container will be 3013 compliant					• Reduce amount of material in Inner 3013 Container • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure]		• CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] **WG2**: • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust	

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							System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure] **WG3**: • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation	

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							valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: PA-2D **Event Type:** E-1 **Event Description:** An isolated fire in the Packaging Area results in a release from six unassayed 5-gal TRU waste drums. **Location**: Packaging Area **Causes:** Combustible/flammable material including misc. combustibles, Digital Radiography oil, Celotex™ from open containers, computers, cable insulation, waste, laundry, flammable gases including Hydrogen AND Ignition sources including electrical shorts (tools, outlets, wiring, computers, electrical equipment racks), thermal sources (wiring), hot works, mechanical sparking , static electricity **Material At Risk:** 6 unassayed 5-gal TRU waste drums (2.4 kg Pu total) **Form:** Pu oxide **Event Specific Assumptions:** • The reason we are crediting the ventilation	Fire could potentially spread to include other materials within the Packaging Area	MOI – Neg WG1 – High WG2 – Low WG3 – Low Anticipated	• NFPA compliant installation of electrical devices • Waste Management Program • Nuclear Criticality Safety Program • Fire Protection Program – Combustible Control Program – Control of Ignition Sources • Procedures and Training Program – Any TRU waste not in closed drums (5-gal or 55-gal) will be immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum.	• Detection by operators • CSSC Fire Detection System	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained • Automatic electrical shunt • CSSC Ventilation Normal Exhaust System • CSSC Ventilation Low Flow System • Vented TRU Waste Drum Design • Radiological Protection Program • Material Control and Accountability Program • Waste Management Program [SF: Defines allowable waste location and quantity of material in waste containers] • Interlocks to close dampers in the affected area and to close	• 5-gal drum breaching Calc (pressure) • Standoff Calc-Qualified Position flame impingement controls • PFHA • Accident Analysis Calc	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program – Fire watch trained – Material handler trained – Any TRU waste not in closed drums (5-gal or 55-gal) will be immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Inventory limits – Spacing **Engineered:** **SC:** None Required	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

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system for WG2 and WG3 is to maintain ACVS (i.e. no LPF evaluation) and to comply with Interim Guidance • Bounding 5-gal waste drum inventory is 395 g Pu oxide for each unassayed item. The total MAR is based on six drums. • This event assumes that drums will breach at less than 25 PSIG. • Any TRU waste not in closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • An open drum of TRU waste involved in a fire results in Low consequences to WG1					normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure]		**SS:** **WG1**: • Vented TRU Waste Drum Design [SF: Closed non-combustible drum provides sufficient delay between fire initiation and container breach to allow safe evacuation] • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] **WG2**: Not required but listed to mitigate consequences to negligible • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close	

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							normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure] **WG3**: Not required but listed to mitigate consequences to negligible • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls,	

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							floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: PA-2E **Event Type:** E-1 **Event Description:** An isolated fire in the Packaging Area results in a release from five assayed 55-gal TRU waste drums. **Location**: Packaging Area **Causes:** Combustible/flammable material including misc. combustibles, Digital Radiography oil, Celotex™ from open containers, computers, cable insulation, waste, laundry, flammable gases including Hydrogen AND Ignition sources including electrical shorts (tools, outlets, wiring, computers, electrical equipment racks), thermal sources (wiring), hot works, mechanical sparking, static electricity **Material At Risk:** Five 55-gal TRU waste drums (1 kg Pu) **Form:** Pu oxide **Event Specific Assumptions:** • The reason we are crediting the ventilation	Fire could potentially spread to include other materials within the Packaging Area	MOI – Neg WG1 – High WG2 – Low WG3 – Low Anticipated	• NFPA compliant installation of electrical devices • Waste Management Program • Nuclear Criticality Safety Program – Inventory limits • Fire Protection Program – Combustible Control Program – Control of Ignition Sources • Procedures and Training Program – Any TRU waste not in closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum.	• Detection by operators • CSSC Fire Detection System	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available – Control of Ignition Sources • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained • Automatic electrical shunt • CSSC Ventilation Normal Exhaust System • CSSC Ventilation Low Flow System • Vented TRU Waste Drum Design • Radiological Protection Program • Material Control and Accountability Program • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the	• Standoff Calc-Qualified Position flame impingement controls • PFHA • Accident Analysis Calc	**PC** – N/A **Programmatic:** • Fire Protection Program –Combustible Control Program –Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program –Fire watch trained –Material handler trained –Any TRU waste not in closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • Waste Management Program [SF: Defines allowable waste location and quantity of material in waste containers] **Engineered:** **SC:** None Required **SS:** **WG1**: • Vented TRU Waste	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
system for WG2 and WG3 is to maintain ACVS (i.e. no LPF evaluation) and to comply with Interim Guidance • Bounding assayed waste drum inventory is 195 g Pu oxide per drum. The total MAR is based on five drums. • This event assumes that 55 gal drums will breach at 200 PSIG. • Any TRU waste not in closed drums (5-gal or 55-gal) immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • An open drum of TRU waste involved in a fire results in Low consequences to WG1					unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure]		Drum Design [SF: Closed non-combustible drum provides sufficient delay between fire initiation and container breach to allow safe evacuation] • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] **WG2**: Not required but listed to mitigate consequences to negligible. • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF:	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure] **WG3**: Not required but listed to mitigate consequences to negligible. • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							over time, maintains structural integrity] • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: PA-2F **Event Type:** E-1 **Event Description:** Isolated fire in Packaging Area results in a release from up to 500g check standard/source and up to seven annual calibration standards and samples Note: This is a pressurized (oxide) release. **Location**: Packaging Area **Causes:** Combustible/flammable material including misc. combustibles, Digital Radiography oil, Celotex™ from open containers, computers, cable insulation, waste, laundry AND Ignition sources including electrical shorts (tools, outlets, wiring, computers, electrical equipment racks), thermal sources (wiring), hot works, mechanical sparking **Material At Risk:** Pu check standard/source (500 g) and up to seven annual calibration standards (3.7 kg) and Pu samples (150 g) **Form:** Pu oxide	Pressurized release of oxide from standards. Fire could potentially spread to include other materials within the Packaging Area	MOI – Low WG1 – High WG2 – High WG3 - High Anticipated	• NFPA compliant installation of electrical devices • Fire Protection Program – Combustible Control Program – Control of Ignition Sources • Procedures and Training Program • Configuration Management Program	• Detection by operators • CSSC Fire Detection System	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available – Fire Watch • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained • Automatic electrical shunt • CSSC Ventilation Normal Exhaust System • CSSC Ventilation Low Flow System • Check Standard/Source Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Annual Calibration Standard Container Design [SF: Provides sufficient delay between fire initiation and	• Standoff Calc- Qualified Position flame impingement controls • PFHA • Accident Analysis Calc • Time at Risk Argument • Consequence Calc- event specific	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program – Fire watch trained – Material handler trained **Engineered:** **SC:** None Required **SS:** **WG1**: • Check Standard/Source Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Annual Calibration Standard Container Design [SF: Provides sufficient delay between fire initiation and container breach	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg SS ventilation credited as facility controls for worker protection and for reducing the MOI consequences from Low to Neg.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Specific Assumptions: • The reason we are crediting the ventilation system for WG2, 3 is to maintain ACVS (i.e. no LPF evaluation) and to address interpretation of Interim Guidance that active ventilation should be maintained. • These standards are the ones identified in attachment 1 of G-CLC-F-00256.					container breach to allow evacuation] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure]		to allow evacuation] • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] **WG2**: • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure] **WG3**: • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC building structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: PA-3 **Event Type:** E-1 **Event Description:** Intermediate fire involving multiple combustible packages in the Packaging Area results in a release from SNM containers and TRU waste containers (see MAR below) Note: This is a pressurized (oxide) release. This is more than an isolated fire and less than a room fire. **Location**: Packaging Area **Causes:** Isolated fire spreads prior to activation of fire suppression system and involves multiple packages and continuity of combustibles with multiple SNM in close proximity. **Material At Risk:** Room inventory: 6 TRU waste 5-gal drums (2.4 kg Pu), five Outer/Inner 3013s (22 kg Pu), a Check Standard/Source (500 g Pu), five TRU waste drum (1 kg Pu), samples (150 g Pu), 7 Annual Calibration Standards (3.7 kg Pu) and 0.5 g Pu in LLW bag(s) **Form:** Pu oxide	Fire could potentially spread to include other areas within CSSC	MOI – Mod WG1 – High WG2 – High WG3 - High Anticipated	• NFPA compliant installation of electrical devices • Fire Protection Program – Combustible Control Program – Control of Ignition Sources – Qualified Positions – Flame impingement controls for each Qualified Position • Shipping Container Design (contains Celotex™) [SF: Prevents release of 3013 in approved shipping container] • Procedures and Training Program • CSSC Fire Suppression System • Configuration Management Program – TRU Waste Storage Rack Design ▪ Radiant	• Detection by operators • CSSC Fire Detection System • Local fire alarm system • CAMs local alarms	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, prevents propagation of fire to/from other areas, maintains structural integrity] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained – Any TRU waste not in closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • Shipping Container Design – Fire resistant – Containment – 3013 Outer container design • Shipping Container Qualification and Storage	• Standoff Calc-Qualified Position flame impingement controls • PFHA (to include evaluation of soot on HEPA filters) • Accident Analysis Calc this is a design basis fire • Failure evaluation for TRU waste 5-gal and 55-gal drums in fires • Time at risk argument for Inner 3013 container	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program [SF: Limits size, intensity, duration, and location of fire, prevents Deep Seated fire] – Qualified Positions – Flame impingement controls for each Qualified Position – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program – Fire watch trained – Material handler trained – Any TRU waste not in closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program]	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg Strategy for this event is that the Fire Suppression system prevents the full room involvement SS fire suppression and ventilation, and the SC outer 3013 container are credited as facility controls in reducing the MOI consequences from Low to Neg.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Specific Assumptions: • All isolated fires start as incipient fires. All room fires start as isolated fires. The fire suppression system prevents the room fire by extinguishing the isolated fire. • The intermediate fire could involve any combination of the MAR listed above bounded by two 3013s. • Any TRU waste not in closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • An open drum of TRU waste involved in a fire results in Low consequences to WG1 • The CSSC Fire Suppression System terminates postulated fires before generation of significant soot capable of blinding the HEPA filters in the glovebox room (PFHA to include evaluation of the effect of potential soot on HEPA filters).			heat barrier – Electrical shunt (prevent re-ignition due to a short) • Inner 3013 Container Design • Shipping Container Qualification and Storage Surveillance Program (SF: identification of compromised containers prior to use.) • 3013 Outer Container Design		Surveillance Program • Automatic electrical shunt • Interlocks [SF: Signal from fire detection system to isolate normal ventilation supply, shutdown normal exhaust ventilation to support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Ventilation Low Flow System • Vented TRU Waste Drum Design • Material Control and Accountability Program [SF: Limit MAR in TRU drums, inventory control] • Radiological Protection Program (Constant Air Monitoring) • Waste Management Program – Establishes LLW limits. – Limits amount of material in waste drum – TRU waste acceptance criteria • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Each 3013 shall be in a Qualified Position unless specifically transferring between Qualified		– Each 3013 shall be in a Qualified Position unless specifically transferring between Qualified Positions – Limits amount of MAR in TRU waste drums • Waste Management Program [SF: Establishes LLW limits] **Engineered:** **SC:** None Required **SS:** *[Assume WG1 evacuates upon activation of fire alarm]* **WG1**: • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] • 3013 Inner/Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Inner/Outer 3013 container confines the MAR while the worker evacuates] • Vented TRU Waste Drum Design [SF: Vented closed non-combustible drum provides sufficient delay between fire initiation and container breach to	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					Positions – Criticality limits amount of material in waste drums • Check Standard/Source Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Annual Calibration Standard Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Sample Vial Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure]		allow safe evacuation] • Check Standard/Source Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Annual Calibration Standard Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Sample Vial Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] **WG2**: • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							maintaining differential pressure] **WG3**: • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: PA-3A **Event Type:** E-1 **Event Description:** Full room fire involving all MAR in the Packaging Area results in a release from SNM containers and TRU waste containers Note: This is a pressurized (oxide) release. **Location:** Packaging Area **Causes:** Unmitigated intermediate fire spreads and involves multiple packages and continuity of combustibles with multiple SNM in close proximity. **Material At Risk:** Room inventory: 6 TRU waste 5-gal drums (2.4 kg Pu), five Outer/Inner 3013s (22 kg Pu), a Check Standard/Source (500 g Pu), five TRU waste drums (1 kg Pu), samples (150 g Pu), 7 Annual Calibration Standards (3.7 kg Pu) and 0.5 g Pu in LLW bag(s) **Form:** Pu oxide **Event Specific Assumptions:** • All isolated fires start as incipient fires. All	Fire could potentially spread to include other areas within CSSC	MOI – Mod WG1 – High WG2 – High WG3 - High Unlikely	• NFPA compliant installation of electrical devices • Fire Protection Program – Combustible Control Program – Qualified Positions – Flame impingement controls for each Qualified Position – Control of Ignition Sources • Shipping Container Design (contains Celotex™) [SF: Prevents release of 3013 in approved shipping container] • Procedures and Training Program • CSSC Fire Suppression System • Configuration Management Program – TRU Waste Storage Rack Design ▪ Radiant	• Detection by operators • CSSC Fire Detection System • Local fire alarm system • CAMs local alarms	• Fire Protection Program – Combustible Control Program – Fire Department response – Hot wash controls – Fire extinguishers available – Standoff controls • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, prevents propagation of fire to/from other areas, maintains structural integrity] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained – Any TRU waste not in closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • Shipping Container Design – Fire resistant – Containment • Shipping Container Qualification and Storage	• Standoff Calc-Qualified Position flame impingement controls • PFHA • Accident Analysis Calc this is a design basis fire • Failure evaluation for TRU waste drums in fires	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program [SF: Limits size, intensity, duration, and location of fire, prevents Deep Seated fire] – Qualified Positions – Flame impingement controls for each Qualified Position – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program – Fire watch trained – Material handler trained – Any TRU waste not in closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Event (full room fire) is Prevented Strategy for this event is that the Fire Suppression system prevents the full room involvement (fire suppression would have to fail in order to have a full room fire); see isolated and intermediate fire events for consequences.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
intermediate fires start as isolated fires. All room fires start as intermediate fires. The fire suppression system prevents the full room fire. • The MAR for LLW items is conservatively assumed to be 0.5 g Pu oxide to account for the contamination contained on the waste. • Any TRU waste not in closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • An open drum of TRU waste involved in a fire results in Low consequences to WG1 • Packaging of 5-gal waste • The CSSC Fire Suppression System terminates postulated fires before generation of significant soot capable of blinding the HEPA filters			heat barrier – Automatic electrical shunt • Shipping Container Qualification and Storage Surveillance Program		Surveillance Program • CM Program or Fire Protection Program – Automatic electrical shunt • Interlocks [SF: Signal from fire detection system to isolate normal ventilation supply, shutdown normal exhaust ventilation to support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System (includes interlocks to start low flow mode) • Vented TRU Waste Drum Design • Material Control and Accountability Program [SF: Inventory control] • Radiological Protection Program (Constant Air Monitoring) • Waste Management Program [SF: Establishes LLW limits] • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Each 3013 shall be in a Qualified Position unless specifically transferring between Qualified Positions – Criticality limits MAR – Limits amount of MAR in TRU waste drums • Inner 3013 Container Design		OSA-qualified vented 55-gal or 5-gal drum. • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Each 3013 shall be in a Qualified Position unless specifically transferring between Qualified Positions – Limits amount of MAR in TRU waste drums • Waste Management Program [SF: Establishes LLW limits] **Engineered:** **SC:** None Required **SS:** *[Assume WG1 evacuates upon activation of fire alarm]* **WG1**: • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] • 3013 Inner/Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					• 3013 Outer Container Design [SF: Provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • 3013 Container Transport Cart [SF: Prevents direct flame impingement on 3013] • Check Standard/Source Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Annual Calibration Standard Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Gas and oxide ample vial design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure]		the Inner/Outer 3013 container confines the MAR while the worker evacuates] • Vented TRU Waste Drum Design [SF: Vented closed non-combustible drum provides sufficient delay between fire initiation and container breach to allow safe evacuation] • Check Standard/Source Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Annual Calibration Standard Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Gas and oxide sample vial design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] **WG2**: • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire, prevents propagation to room fire, also limits soot production and prevents HEPA pluggage] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure] **WG3**: • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							Suppression System [SF: Extinguish any fire, prevents propagation to room fire, also limits soot production and prevents HEPA pluggage] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							ventilation system as part of the confinement system in maintaining differential pressure]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: RS-1 **Event Type:** E-1 **Event Description:** Isolated fire results in a release from a 3013 container in transit outside the storage rack Note: This is a pressurized release (oxide). **Location:** 3013 Storage room **Causes:** Combustible / flammable material including misc. combustibles, transport cart, radcon cart, bar code reader, shield doors, computer on MC&A cart AND Ignition sources including electrical shorts (tools, outlets, wiring), thermal sources (wiring), computer on MC&A cart **Material At Risk:** One 3013 container (4.4 kg Pu) **Form:** Pu oxide **Event Specific Assumptions:** • This fire does not challenge the integrity of the Rack Shield Doors.	Fire could potentially spread to include other materials within transit routes and spread to become a room fire. Pressurized release of oxide in a 3013 container	MOI – Low WG1 – High WG2 – High WG3 - High Anticipated	• NFPA Compliant installation of electrical devices • Procedures and Training Program • Fire Protection Program – Combustible Control Program – Control of Ignition Sources – Qualified Positions – Flame impingement controls for each Qualified Position – Standoff Controls [SF: Prevents isolated fire from propagating to the shield doors]	• Detection by operators • CSSC Fire Detection System • Local fire alarm system • CAMs local alarms	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available – Standoff controls • CSSC Fire Suppression System • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Automatic electrical shunt • Each 3013 shall be in a Qualified Position unless specifically transferring between Qualified Positions • Non-combustible Storage Rack Design • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Procedures and Training Program – Fire watch trained – Material handler trained • Interlocks [SF: Signal from fire detection system to isolate normal ventilation supply, shutdown normal exhaust ventilation to support the function of the suppression system by maintaining agent concentration] • CSSC Ventilation Low Flow	• PFHA • Standoff Calc • NFPA Compliant installation of electrical devices (TBD analysis to be done to define NEC classification)	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program – Qualified Positions – Flame impingement controls for each Qualified Position – Control of Ignition Sources – Standoff Controls [SF: Prevents isolated fire from propagating to the shield doors] • Procedures and Training Program – Fire watch trained – Material handler trained • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] **Engineered:** **SC:** None Required **SS:** **WG1**: • 3013 Outer Container Design [SF: In conjunction with combustible controls	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Release from 3013 is prevented

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • Radiological Protection Program (Constant Air Monitoring) • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] • Transport Cart [SF: Prevents direct flame impingement on 3013.] • 3013 Outer Container Design [SF: Provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container]		and flame impingement controls the Outer 3013 container confines the MAR while the worker evacuates] • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] • Transport Cart [SF: Prevents direct flame impingement on 3013.] **WG2**: • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							agent concentration over time, maintains structural integrity] • Transport Cart [SF: Prevents direct flame impingement on 3013.] **WG3**: • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Transport Cart [SF: Prevents direct flame impingement on 3013.]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: RS-1A **Event Type:** E-1 **Event Description:** Isolated fire results in a release from Standards outside the storage rack Note: This is a pressurized release (oxide). **Location:** 3013 Storage room **Causes:** Combustible / flammable material including misc. combustibles, transport cart, radcon cart, bar code reader, shield doors, computer on MC&A cart AND Ignition sources including electrical shorts (tools, outlets, wiring), thermal sources (wiring), computer on MC&A cart **Material At Risk:** Seven Annual Standards (3.7 kg Pu) **Form:** Pu oxide **Event Specific Assumptions:** • This fire does not challenge the integrity of the Rack Shield Doors.	Fire could potentially spread to include other materials within transit routes and spread to become a room fire. Pressurized release of oxide from Standards	MOI – Low WG1 – High WG2 – High WG3 - High Anticipated	• NFPA Compliant installation of electrical devices • Procedures and Training Program • Fire Protection Program – Combustible Control Program – Control of Ignition Sources	• Detection by operators • CSSC Fire Detection System • Local fire alarm system • CAMs local alarms	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available – Control of Ignition Sources • CSSC Fire Suppression System • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Automatic electrical shunt • Check Standard/Source Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Annual Calibration Standard Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Procedures and Training Program – Fire watch trained – Material handler trained • Interlocks [SF: Signal from fire detection system to isolate	• PFHA • NFPA Compliant installation of electrical devices (TBD analysis to be done to define NEC classification) • SS Backfit analysis for standard containers	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program – Control of Ignition Sources • Procedures and Training Program – Fire watch trained – Material handler trained • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] **Engineered:** **SC:** None Required **SS:** **WG1**: • Check Standard/Source Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Annual Calibration Standard Container Design [SF: Provides sufficient delay between fire initiation and container breach	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg SS ventilation is credited as facility controls for worker protection and for reducing the MOI consequences from Low to Neg.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
• This isolated fire occurs outside the standoff distance for the shield doors.					normal ventilation supply, shutdown normal exhaust ventilation to support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • Radiological Protection Program – Constant Air Monitoring – Source Control/Surveillance Program • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] • Transport Cart [SF: Prevents direct flame impingement on 3013.]		to allow evacuation] • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] • Transport Cart [SF: Prevents direct flame impingement on 3013.] **WG2**: • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Area Boundaries(walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • CSSC Fire Suppression System • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • Transport Cart [SF: Prevents direct flame impingement on 3013.] **WG3**: • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • Transport Cart [SF: Prevents direct flame impingement on 3013.]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: RS-1B **Event Type:** E-1 **Event Description:** Isolated fire starting inside the storage racks propagates to become a room fire resulting in a release Note: This is a pressurized release (oxide). **Location:** 3013 Storage room **Causes:** NA **Material At Risk:** 1,920 3013 containers (8448 kg Pu) **Form:** Pu oxide/metal **Event Specific Assumptions:** A fire initiating inside the storage rack is not a credible event because of the following assumptions: • No combustible materials in the storage racks. • No ignition sources inside the storage racks.		Event is prevented.	Fire Protection Program • No combustible materials in the storage racks. • No ignition sources inside the storage racks. Storage Rack (SF: noncombustible design)				**PC** – N/A **Programmatic:** • Fire Protection Program – No combustible materials in the storage racks. – No ignition sources inside the storage racks. **Engineered:** **SC:** • Storage Rack (SF: noncombustible design)	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: RS-2 **Event Type:** E-1 **Event Description:** Full storage room fire resulting in a release from multiple 3013 containers (Note: This includes pressurized releases from oxide containers) **Location:** 3013 Storage room **Causes:** Combustible / flammable material including misc. combustibles, transport cart, bar code reader, shield doors , MC&A cart, Radcon cart AND Ignition sources including electrical shorts (tools, outlets, wiring), thermal sources (wiring), prolonged loss of HVAC OR Loss of ventilation causing the rack shield doors to heat-up above the ignition temperature. Note: Seismic plus fire is addressed in E-6 list **Material At Risk:** Room inventory – Approximately 1,920 3013 containers (8448 kg Pu) or	Fire could potentially spread to include other areas within CSSC.	MOI – High WG1 – High WG2 – High WG3 - High Unlikely	• 3013 Outer Container Design • NFPA Compliant installation of electrical devices • Storage Surveillance Program (includes 3013 standard, integrity of container) • Fire Protection Program – Combustible Control Program – Control of Ignition Sources – Qualified Positions • Procedures and Training Program – Fire watch trained – Material handler trained	• Detection by operators • CSSC Fire Detection System • Local fire alarm system • CAMs local alarms	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available – Standoff controls [SF: Prevent the isolated fire from propagating to the shield doors (prevents overheating of shield doors HDPE to the point of ignition and prevents the breach of 3013 containers or the Annual Calibration Standards)] – Fire-rated Storage Room walls and heat resistant shield door material with metal cladding – Control of Ignition Sources – Automatic electrical shunt • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, prevents propagation of fire to/from other areas, maintains structural integrity (before/during/after)] • CSSC Fire Detection and	• PFHA • NFPA Compliant installation of electrical devices (TBD analysis to be done to define NEC classification) • SS Backfit analysis for Annual Calibration Standards • Accident analysis for loss of ventilation in the storage room.	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program – Control of Ignition Sources – Qualified Positions – Fire-rated Storage Room walls and heat resistant shield door material with metal cladding – Standoff controls for shield doors [SF: Prevent the isolated fire from propagating to the shield doors (prevents overheating of shield doors HDPE to the point of ignition and prevents the breach of 3013 containers or the Annual Calibration Standards)] • Procedures and Training Program – Fire watch trained – Material handler trained • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3]	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Event is Prevented Control Strategy: Standoff distances and ignition controls prevent a full storage room fire.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
equivalent (includes annual standards) **Form:** Pu oxide/metal **Event Specific Assumptions:** • Accident analysis for loss of ventilation in the storage room will determine that a loss of ventilation will not result in a fire initiated by shield door material ignition. • Event is initiated by an unmitigated isolated fire outside the storage racks.					Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • Each 3013 shall be in a Qualified Position unless specifically transferring between Qualified Positions • Radiological Protection Program (CAMs) • 3013 Transport Cart [SF: Prevents direct flame impingement on 3013] • Interlocks [SF: Isolates normal supply and shutdown normal exhaust to support fire suppression] • 3013 outer container design [SF: Provides sufficient delay to allow fire suppression to activate and extinguish fire to prevent breach of container] • Noncombustible Storage Racks • Heat resistant shield door material with metal cladding • Check Standard/Source Container Design [SF: Provides sufficient delay between fire initiation and		**Engineered:** **SC:** • 3013 Outer Container Design [SF: Noncombustible design] • Noncombustible Storage Racks • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, prevents propagation of fire to/from other areas, maintains structural integrity (before/during/after)] • Heat resistant shield door material with metal cladding **SS:** *[Assume WG1 is evacuated- see isolated fire events]* **WG1**: • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container confines the MAR while the worker evacuates] • Check Standard/Source Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					container breach to allow evacuation] • Annual Calibration Standard Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation]		• Annual Calibration Standard Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] • 3013 Transport Cart [SF: Prevents direct flame impingement on 3013] **WG2**: • 3013 Outer Container Design [SF: Noncombustible design] • Noncombustible Storage Racks • CSSC Fire Area Boundaries • Heat resistant shield door material with metal cladding • 3013 Transport cart [SF: Prevents direct flame impingement on 3013] **WG3**: • 3013 Outer Container Design [SF: Noncombustible design] • Noncombustible Storage Racks • CSSC Fire Area Boundaries • Heat resistant shield	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							door material with metal cladding • 3013 Transport Cart [SF: Prevents direct flame impingement on 3013]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: RS-2A **Event Type:** E-1 **Event Description:** Fire engulfs the entire 3013 Storage Room resulting in a release from 3013 containers Note: This is a eutectic (metal) release **Location**: 3013 Storage room **Causes:** Combustible / flammable material including misc. combustibles, transport cart, bar code reader, shield doors AND Ignition sources including electrical shorts (tools, outlets, wiring), thermal sources (wiring), prolonged loss of HVAC OR Loss of ventilation causing the rack shield doors to heat-up above the ignition temperature. **Material At Risk:** Room inventory – Approximately 1,920 3013 containers (8448 kg Pu) **Form:** Pu metal **Event Specific Assumptions:**	Fire could potentially spread to include other areas within CSSC.	MOI – High WG1 – High WG2 – High WG3 - High Anticipated	• NFPA Compliant installation of electrical devices • Storage Surveillance Program (includes 3013 standard) • 3013 Storage Room walls and doors • Fire Protection Program – Combustible Control Program – Control of Ignition Sources – Qualified Positions • Procedures and Training Program	• Detection by operators • CSSC Fire Detection System	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available – Fire-rated Storage Room walls, shield door material and metal cladding – Standoff controls for shield doors – Control of Ignition Sources • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, prevents propagation of fire to/from other areas, maintains structural integrity (before/during/after)] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained • Shipping Container Qualification and Storage Surveillance Program	• Accident analysis for loss of ventilation in the storage room.	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program – Control of Ignition Sources – Qualified Positions – Fire-rated Storage Room walls and heat resistant shield door material with metal cladding – Standoff controls for shield doors • Procedures and Training Program – Fire watch trained – Material handler trained • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] **Engineered:** **SC:** • 3013 Outer Container Design [SF: Noncombustible design] • Noncombustible storage racks • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Event is prevented.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
• Accident analysis for loss of ventilation in the storage room will determine that a loss of ventilation will not result in a fire initiated by shield door material ignition.					• Automatic electrical shunt • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • Each 3013 shall be in a Qualified Position unless specifically transferring between Qualified Positions • 3013 Outer Container Design • Radiological Control Program • Heat resistant shield door material with metal cladding • Noncombustible storage racks		concentration over time, prevents propagation of fire to/from other areas, maintains structural integrity (before/during/after)] • Heat resistant shield door material with metal cladding **SS:** *[Assume WG1 is evacuated- see isolated fire events]* **WG1**: • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container confines the MAR while the worker evacuates] • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] **WG2**: • 3013 Outer Container Design [SF: Noncombustible design] • Noncombustible storage racks • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, prevents propagation of	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							fire to/from other areas, maintains structural integrity (before/during/after)] • Heat resistant shield door material with metal cladding **WG3**: • 3013 Outer Container Design [SF: Noncombustible design] • Noncombustible storage racks • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, prevents propagation of fire to/from other areas, maintains structural integrity (before/during/after)] • Heat resistant shield door material with metal cladding	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: RS-11 **Event Type:** E-1/E-5 **Event Description:** Fire in 3013 storage room heats 3013 containers to the point of over-pressurization AND loose material mixes with moderator (molten HDPE) resulting in a criticality. **Location:** 3013 Storage room **Causes:** Combustible / flammable material including misc. combustibles, transport cart, bar code reader, shield doors AND Ignition sources including electrical shorts (tools, outlets, wiring), thermal sources (wiring), pyrophoric material fire, prolonged loss of HVAC **Material At Risk:** One 3013 container (4.4 kg Pu) **Form:** Pu oxide/metal **Event Specific Assumptions:**	Fire could potentially spread to include other areas within CSSC. Possible pluggage of HEPA filters. For a fire involving metal in a 3013 container, formation of a eutectic will result in a breach of the 3013 prior to pressurization. The consequences of metal in a fire (including additional energy from oxidation) are bounded by the pressurized release of oxide from a 3013 container.	MOI – Low WG1 – High WG2 – High WG3 - High Unlikely	• Storage Surveillance Program (includes 3013 standard) • 3013 Outer Container Design • NFPA Compliant installation of electrical devices (explosion proof) • 3013 Storage Room walls and doors • Configuration Management Program • Fire Protection Program – Combustible Control Program – Control of ignition sources – Fire rated Storage Room walls and heat resistant shield door material and metal cladding, combustible controls) – Qualified Positions – Flame impingemen t controls for each	• Detection by operators • CSSC Fire Detection System	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, prevents propagation of fire to/from other areas, maintains structural integrity (before/during/after)] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Training and Procedures – Fire watch trained – Material handler trained • Shipping Container Qualification and Storage Surveillance Program • Electrical shunt • CSSC Ventilation Normal Exhaust System • CSSC Ventilation Low Flow System • Each 3013 shall be in a Qualified Position unless specifically transferring between Qualified Positions • TSR Restricted mode control • Radiological Protection Program	• Standoff Calc for shield door	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program – Control of Ignition Sources – Qualified Positions – Flame impingement controls for each Qualified Position – Fire-rated Storage Room walls and heat resistant shield door material with metal cladding – Standoff controls for shield doors • Procedures and Training Program – Fire watch trained – Material handler trained • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] **Engineered:** **SC:** None Required **SS:** [Assume WG1 is evacuated- see isolated fire	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Event is prevented.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
			Qualified Position – Standoff controls for shield doors • 3013 Outer Container Design • Training and Procedures – No electrical transport device (manual transport only)		• NIMS (NIMs may not be fire rated) • Noncombustible storage racks		events] **WG1**: • 3013 Outer Container Design [SF: Confines the MAR while the worker evacuates] • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] **WG2**: • 3013 Outer Container Design [SF: Noncombustible design] • Noncombustible storage racks • CSSC Fire Area Boundaries • Heat resistant shield door material with metal cladding **WG3**: • 3013 Outer Container Design [SF: Noncombustible design] • Noncombustible storage racks • CSSC Fire Area Boundaries • Heat resistant shield door material with metal cladding	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-1 **Event Type:** E-1 **Event Description:** Fire in the glovebox breaches a 3013 and results in a release of radiological material. This event is the bounding glovebox fire because of the potential of pressurized release. (Once a 3013 is punctured there is no longer a potential for a pressurized release) **Location:** Glovebox **Causes:** Combustible/ flammable materials AND Ignition sources including electrical shorts OR Operator Error **Material At Risk:** One 3013 container (4.4 kg Pu) plus holdup (600 g Pu) **Form:** Pu oxide **Event Specific Assumptions:** • TRU waste generated during glovebox operations is sent out before another 3013 can be brought in. • Glovebox Room is a	This fire could spread to the Glovebox Room (no additional MAR).	MOI – Low WG1 – High WG2 – High WG3 – High Anticipated	• Procedures and Training Program • Fire Protection Program – Combustible Control Program – Control of Ignition Sources	• Operator detection • Glovebox Fire Detection and Alarm System	• Glovebox design (confinement boundary) • CSSC Ventilation Exhaust System (filtration) • Glovebox Fire Detection and Alarm System – Activates Glovebox Fire Suppression System – Shutdown Normal CSSC Supply and CSSC Normal Exhaust – Actuates CSSC Low Flow Ventilation System – Shuts down dry air supply system – Activates local alarm • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained – Samples and combustible TRU waste will be removed from the glovebox before a 3013 container is brought into the glovebox. • Glovebox Exhaust System (filtration, maintaining negative pressure) • Can Puncture Device – low O2 environment in CPD – CPD restricted vent path – Robust structural integrity • 3013 Outer Can Design • CO_2 Glovebox Fire Suppression System		**PC** – N/A **Programmatic:** • Procedures and Training Program – Fire watch trained – Material handler trained – Samples and combustible TRU waste will be removed from the glovebox before a 3013 container is brought into the glovebox. • Emergency Preparedness Program (evacuation for WG1; shelter or remain indoors for WG2, WG3) • Nuclear Criticality Safety Program – Limits MAR in glovebox room/glovebox to 5 kg Pu (Glovebox Room is a Qualified Position). **Engineered:** **SC:** None Required **SS:** **WG1**: • Glovebox Confinement Boundary [SF: Contains the MAR	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg SS ventilation credited as facility controls for worker protection and for reducing the MOI consequences from Low to Neg.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
single Qualified Position. • Glovebox does not breach. • Glovebox confinement boundary extends from the inlet to the outlet HEPA filters in the Glovebox exhaust system.					• Manual Glovebox Fire Suppression (MgO) • CSSC Fire Detection and Alarm System • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas • CSSC Ventilation Low Flow Exhaust System • CSSC Building Structure (perimeter walls, ceiling, floor) • Nuclear Criticality Safety Program – Limits MAR in glovebox room/glovebox to 5 kg Pu (Glovebox Room is a Qualified Position).		sufficient time to allow facility worker to safely evacuate] • Glovebox Fire Detection and Alarm System [SF: Detects fire, activates local alarm for personnel to evacuate] • Can Puncture Device [SF: Robust structural integrity protects 3013 and prevents pressurized release] **WG2**: • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition too low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF:	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure] **WG3**: • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-1B **Event Type:** E-1 **Event Description:** Isolated glovebox fire results in a release of radiological material. Note: This is not a pressurized release **Location:** Glovebox **Causes:** Combustible/ flammable materials AND Ignition sources including electrical shorts OR Operator Error **Material At Risk:** One Inner/Outer 3013 container (4.4 kg Pu) plus holdup (600 g Pu) **Form:** Pu oxide **Event Specific Assumptions:** • TRU waste generated during glovebox operations is sent out before another 3013 can be brought in. • Glovebox Room is a single Qualified Position. • Glovebox/glove does not breach.	This fire could spread to the Glovebox Room (no additional MAR).	MOI – Neg WG1 – High WG2 – Mod WG3 – Mod Anticipated	• Procedures and Training Program • Fire Protection Program – Combustible Control Program – Control of Ignition Sources	• Operator detection • Glovebox Fire Detection and Alarm System	• Glovebox design (confinement boundary) • CSSC Ventilation Exhaust System (filtration) • Glovebox Fire Detection and Alarm System – Activates Glovebox Fire Suppression System – Activates CSSC Low Flow Ventilation System – Shuts down dry air supply system – Activates local alarm • Emergency Preparedness Program (evacuation) • Procedures and Training Program • Fire Protection Program Fire Protection Program – Combustible Control Program – Control of Ignition Sources • Glovebox Exhaust System (filtration, maintaining negative pressure) • CO_2 Glovebox Fire Suppression System • Manual Glovebox Fire Suppression (MgO) • CSSC Fire Detection and Alarm System • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the		**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program • Procedures and Training Program – Fire watch trained – Material handler trained – Samples and combustible TRU waste will be removed from the glovebox before a 3013 container is brought into the glovebox. • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Nuclear Criticality Safety Program – Limits MAR in glovebox room/glovebox to 5 kg Pu (Glovebox Room is a Qualified Position). **Engineered:** **SC:** None Required **SS:** **WG1**: • Glovebox Design [SF: Contains the MAR sufficient time to allow	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
• Glovebox is leak tight (design basis). • Glovebox confinement boundary extends from the inlet to the outlet HEPA filters in the Glovebox exhaust system.					unaffected areas • CSSC Ventilation Low Flow Exhaust System • CSSC Building Structure (perimeter walls, ceiling, floor) • Procedures and Training Program – Fire watch trained – Material handler trained – Samples and combustible TRU waste will be removed from the glovebox before a 3013 container is brought into the glovebox. • Nuclear Criticality Safety Program – Limits MAR in glovebox room/glovebox to 5 kg Pu (Glovebox Room is a Qualified Position).		facility worker to safely evacuate] • Glovebox Fire Detection, and Alarm System [SF: Detects fire, activates local alarm for personnel to evacuate] **WG2**: (Not required but listed to mitigate consequences to negligible) • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure] **WG3**: (Not required but listed to mitigate consequences to negligible) • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-1C **Event Type:** E-1 **Event Description:** Isolated fire in Glovebox Room results in a release of radiological material from an outer 3013 container. Note: This is a pressurized release. **Location:** Glovebox Room (outside glovebox) **Causes:** Combustible/ flammable materials AND Ignition sources including electrical shorts OR Operator Error **Material At Risk:** One Outer 3013 container (4.4 kg Pu) **Form:** Pu oxide **Event Specific Assumptions:** • TRU waste generated during glovebox operations is sent out before another 3013 can be brought in. • No storage of MAR is allowed in the Glovebox	Fire could potentially spread to include other areas within CSSC	MOI – Low WG1 – High WG2 – High WG3 - High Anticipated	• Gaseous Agent Enclosure (walls, floor, dampers, ceiling, etc) [SF: Maintains concentration of agent over time] • NFPA compliant installation of electrical devices • Fire Protection Program – Combustible Control Program – Control of Ignition Sources – Qualified Positions – Flame impingement controls for each Qualified Position • Procedures and Training Program • Configuration Management Program – Electrical shunt (prevent re-ignition due to a short) • 3013 Outer Container Design	• Detection by operators • CSSC Fire Detection System • Local fire alarm system • CAMs local alarms	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available • CSSC Fire Suppression System • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Samples and combustible TRU waste will be removed from the glovebox before a 3013 container is brought into the glovebox. – No storage of MAR is allowed in the Glovebox Room outside the glovebox. – Material handler trained • Automatic electrical shunt • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • Radiological Protection Program (Constant Air Monitoring)	• Standoff Calc-Qualified Position flame impingement controls • PFHA	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program [SF: Limits size, intensity, duration, and location of fire, prevents Deep Seated fire] – Qualified Positions – Flame impingement controls for each Qualified Position – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program – Fire watch trained – Samples and combustible TRU waste will be removed from the glovebox before a 3013 container is brought into the glovebox. • No storage of MAR is allowed in the Glovebox Room outside the glovebox. • Nuclear Criticality	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Release is prevented by 3013 outer container and CSSC fire suppression system.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Room outside the glovebox. • Glovebox Room is a single Qualified Position. • Glovebox and Glovebox Exhaust System do not breach. • Glovebox confinement boundary extends from the inlet to the outlet HEPA filters in the Glovebox exhaust system.					• CSSC Fire Detection and Alarm System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas • CSSC Ventilation Low Flow Exhaust System • CSSC Building Structure (perimeter walls, ceiling, floor) • Nuclear Criticality Safety Program o Limits MAR in glovebox room/glovebox to 5 kg Pu (Glovebox Room is a Qualified Position).		Safety Program – Limits MAR in glovebox room/glovebox to 5 kg Pu (Glovebox Room is a Qualified Position). – **Engineered:** **SC:** None Required **SS:** *[Assume WG1 evacuates upon activation of fire alarm]* **WG1**: • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container confines the MAR while the worker evacuates.] **WG2**: • Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire, also limits soot production to prevent HEPA pluggage] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] **WG3**: • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-1D **Event Type:** E-1 **Event Description:** Isolated fire in Glovebox Room results in a release of radiological material from an inner 3013 container. Note: This is a pressurized release. **Location:** Glovebox Room (outside glovebox) **Causes:** Combustible/ flammable materials AND Ignition sources including electrical shorts OR Operator Error **Material At Risk:** One Outer/Inner 3013 container (4.4 kg Pu) **Form:** Pu oxide **Event Specific Assumptions:** • TRU waste generated during glovebox operations is sent out before another 3013 can be brought in. • No storage of MAR is allowed in the Glovebox Room outside the	Fire could potentially spread to include other areas within CSSC	MOI – Low WG1 – High WG2 – High WG3 - High Anticipated	• Gaseous Agent Enclosure (walls, floor, dampers, ceiling, etc) [SF: Maintains concentration of agent over time] • NFPA compliant installation of electrical devices • Fire Protection Program – Combustible Control Program – Control of Ignition Sources – Qualified Positions – Flame impingement controls for each Qualified Position • Procedures and Training Program • Configuration Management Program – Electrical shunt (prevent re-ignition due to a short) • Inner 3013 Container Design	• Detection by operators • CSSC Fire Detection System • Local fire alarm system • CAMs local alarms	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available • CSSC Fire Suppression System • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Samples and combustible TRU waste will be removed from the glovebox before a 3013 container is brought into the glovebox. – No storage of MAR is allowed in the Glovebox Room outside the glovebox. – Material handler trained • Automatic electrical shunt • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • Radiological Protection Program (Constant Air Monitoring) • CSSC Fire Detection and Alarm System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling,	• Standoff Calc-Qualified Position flame impingement controls • PFHA	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program [SF: Limits size, intensity, duration, and location of fire, prevents Deep Seated fire] – Qualified Positions – Flame impingement controls for each Qualified Position – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program – Fire watch trained – Samples and combustible TRU waste will be removed from the glovebox before a 3013 container is brought into the glovebox.	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg SS ventilation credited as facility controls for worker protection and for reducing the MOI consequences from Low to Neg.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
glovebox. • Glovebox Room is a single Qualified Position. • Glovebox and Glovebox Exhaust System do not breach. • Glovebox confinement boundary extends from the inlet to the outlet HEPA filters in the Glovebox exhaust system.					doors, etc) • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas • CSSC Ventilation Low Flow Exhaust System • CSSC Building Structure (perimeter walls, ceiling, floor) • Nuclear Criticality Safety Program o Limits MAR in glovebox room/glovebox to 5 kg Pu (Glovebox Room is a Qualified Position).		– No storage of MAR is allowed in the Glovebox Room outside the glovebox. • Nuclear Criticality Safety Program – Limits MAR in glovebox room/glovebox to 5 kg Pu (Glovebox Room is a Qualified Position). **Engineered:** **SC:** None Required **SS:** *[Assume WG1 evacuates upon activation of fire alarm]* **WG1**: • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] • 3013 Inner Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] **WG2**: • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							• CSSC Fire Suppression System [SF: Extinguish any fire, also limits soot production to prevent HEPA pluggage] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							confinement system in maintaining differential pressure] **WG3**: • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and to close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining a design basis suppression agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement,	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-1E **Event Type:** E-1 **Event Description:** Isolated Glovebox Room fire results in a release of radiological material from waste in drums or samples. This is a pressurized release. **Location:** Glovebox Room **Causes:** Combustible/ flammable materials AND Ignition sources including electrical shorts OR Operator Error **Material At Risk:** Samples (150g Pu) or unassayed TRU waste (395g Pu) **Form:** Pu oxide **Event Specific Assumptions:** • TRU waste and samples generated during glovebox operations are sent out before another 3013 can be brought in. • No storage of MAR allowed in the Glovebox Room outside the glovebox.	Fire could potentially spread to include other areas within CSSC	MOI – Neg WG1 – High WG2 – High WG3 - High Anticipated	• NFPA compliant installation of electrical devices • Fire Protection Program – Combustible Control Program – Control of Ignition Sources • Procedures and Training Program • Configuration Management Program – Electrical shunt (prevents re-ignition due to a short) Automatic	• Detection by operators • CSSC Fire Detection System • Local fire alarm system • CAMs local alarms	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available • CSSC Fire Suppression System • Building Structure (non-combustible construction) – Gaseous Agent Enclosure (walls, floor, dampers, ceiling, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained – Samples and combustible TRU waste and samples will be removed from the glovebox before a 3013 container is brought into the glovebox. – No storage of MAR is allowed in the Glovebox Room outside the glovebox. – No 3013 or sample processing will be performed in CSSC	• PFHA • Failure evaluation for TRU waste drums in fires	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program [SF: Limits size, intensity, duration, and location of fire, prevents Deep Seated fire] – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program – Fire watch trained – Samples and combustible TRU waste and samples will be removed from the glovebox before a 3013 container is brought into the glovebox. – No storage of MAR is allowed in the Glovebox Room outside the glovebox. – No 3013 or sample processing will be performed in CSSC during waste	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg Strategy for this event is that the Fire Suppression system prevents propagation of the fire (fire suppression would have to fail in order to have a larger fire).

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
• No 3013 or sample processing will be performed in CSSC during waste removal activities. • This does not involve the glovebox. • Glovebox Room is a single Qualified Position. • Glovebox does not breach. • Any TRU waste not in closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • An open drum of TRU waste involved in a fire results in Low consequences to WG1					during waste removal activities. – Any TRU waste not in closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • Gas and Oxide Sample Vial Design • Vented TRU Waste Drum Design • Configuration Management Program – Automatic electrical shunt (prevent re-ignition due to a short) • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • Material Control and Accountability Program (to limit MAR in TRU drums, inventory control) • Radiological Protection Program (Constant Air Monitoring) • Waste Management Program – Criticality limits amount of material in waste drums – TRU waste acceptance criteria • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Limits amount of MAR		removal activities – Any TRU waste not in closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Limits amount of MAR in TRU waste drums **Engineered:** **SC:** None Required **SS:** *[Assume WG1 evacuates upon activation of fire alarm]* **WG1**: • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] • Vented TRU Waste Drum Design [SF: Closed non-combustible drum provides sufficient delay between fire initiation and container breach to allow safe evacuation] • Gas and Oxide Sample Vial Design [SF:	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					in TRU waste drums • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas • CSSC Ventilation Low Flow Exhaust System • CSSC Building Structure (perimeter walls, ceiling, floor)		Provides sufficient delay between fire initiation and container breach to allow evacuation] **WG2**: • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure] **WG3**: • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							maintaining agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-2 **Event Type:** E-1 **Event Description:** Full Glovebox Room fire results in a release of radiological material (this event could start inside or outside the glovebox). Note: This is a pressurized release. This bounds an isolated room fire that breaches the glovebox. **Location:** Glovebox Room **Causes:** Unmitigated isolated fire spreads and involves the entire MAR in the room. **Material At Risk:** Sealed Inner or Outer 3013 (4.4 kg Pu) and holdup (600g Pu). Note: The MAR could be inside or outside the glovebox **Form:** Pu oxide **Event Specific Assumptions:** • Glovebox Room is a single Qualified Position • Glovebox confinement boundary extends from the inlet to the outlet HEPA filters in the Glovebox exhaust system • A small amount of	Fire could potentially spread to include other areas within CSSC	MOI – Low WG1 – High WG2 – High WG3 - High Unlikely	• Gaseous Agent Enclosure (walls, floor, dampers, ceiling, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • NFPA compliant installation of electrical devices • Fire Protection Program – Combustible Control Program – Control of Ignition Sources – Flame impingement controls for each Qualified Position • Procedures and Training Program (SF: Material control and placement) • CSSC Fire Suppression System • Configuration Management Program – Electrical shunt (prevent re-	• Detection by operators • CSSC Fire Detection and Alarm System (Local fire alarm system) • CAMs local alarms	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available • CSSC Fire Suppression System • Building Structure (non-combustible construction) – Gaseous Agent Enclosure (walls, floor, dampers, ceiling, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained – Samples and combustible TRU waste and samples will be removed from the glovebox before a 3013 container is brought into the glovebox. – No storage of MAR is allowed in the Glovebox Room outside the glovebox. – No 3013 or sample processing will be performed in CSSC during waste removal activities. – Any TRU waste not in	• Standoff Calc-Qualified Position flame impingement controls • PFHA • Accident Analysis Calc this is a design basis fire for the glovebox room – 5 Kg Pu non-pressurized • Failure evaluation for TRU waste drums and Inner 3013 Containers in fires	**PC** – N/A **Programmatic:** • Fire Protection Program – Combustible Control Program [SF: Limits size, intensity, duration, and location of fire, prevents Deep Seated fire] – Flame impingement controls for each Qualified Position – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program – Samples and combustible TRU waste and samples will be removed from the glovebox before a 3013 container is brought into the glovebox. – No storage of MAR is allowed in the Glovebox Room outside the glovebox.	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg Pressurized release from 3013 is prevented. Strategy for this event is that the Fire Suppression system prevents the full room involvement (Fire suppression would have to fail in order to have a full room fire). The pressurized release from an outer 3013 is prevented. SS ventilation credited for worker protection and for reducing the MOI consequences from Low to Neg.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
contaminated LLW may be present in the glovebox rooms and is assumed to be an insignificant contributor to the MAR • TRU waste and samples generated during glovebox operations are sent out before another 3013 can be brought in • No storage of MAR is allowed in the Glovebox Room outside the glovebox. • No 3013 or sample processing will be performed in CSSC during waste removal activities • Any TRU waste not in closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • An open drum of TRU waste involved in a fire results in Low consequences to WG1			ignition due to a short)		closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • Automatic Electrical shunt (prevent re-ignition due to a short) • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • Vented TRU Waste Drum Design (SF: Provides sufficient time for the operators to evacuate prior to breach when exposed to a fire event) • Material Control and Accountability Program (to limit MAR in TRU drums, inventory control) • Radiological Protection Program (Constant Air Monitoring, PPE) • Waste Management Program – TRU waste acceptance criteria • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program to limit MAR] – Limit the glovebox room to 5 Kg Pu (the Glovebox Room is a Qualified Position) – Limits amount of MAR in TRU waste drum – Periodic assessment to		– No 3013 or sample processing will be performed in CSSC during waste removal activities – Any TRU waste not in closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Limits the glovebox room to 5 Kg Pu (the Glovebox Room is a Qualified Position) – Limits amount of MAR in TRU waste drum – Periodic assessment to verify that the hold-up in the glovebox is less than what was analyzed) **Engineered:** **SC:** None Required	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					verify that the hold-up in the glovebox is less than what was analyzed) • 3013 Inner Container Design • 3013 Outer Container Design • Glovebox Fire Detection and Alarm System – Activates Glovebox Fire Suppression System – Triggers CSSC Low Flow Ventilation System – Shuts down dry air supply system – Activates local alarm • CO_2 Glovebox Fire Suppression System • Manual Glovebox Fire Suppression (MgO) • Glovebox Design [SF: Contains the MAR sufficient time to allow facility worker to safely evacuate] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas • CSSC Building Structure (perimeter walls, ceiling, floor) • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, prevents propagation of fire to/from other areas, maintains structural integrity]		**SS:** *[Assume WG1 evacuates upon activation of fire alarm]* **WG1**: • CSSC Fire Detection and Alarm System (Fire starts outside glovebox) [SF: Detects fire and activates local evacuation alarm] • Glovebox Design [SF: Contains the MAR sufficient time to allow facility worker to safely evacuate] • 3013 Container Design [SF: In conjunction with combustible controls and flame impingement controls the 3013 outer container confines the MAR while the worker evacuates] • Vented TRU Waste Drum Design [SF: Closed non-combustible drum provides sufficient delay between fire initiation and container breach to allow safe evacuation] **WG2**: • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire, prevents propagation to room fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, prevents propagation of fire to/from other areas, maintains structural integrity] • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining agent concentration] • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							of container] **WG3**: • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire, prevents propagation to room fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, prevents propagation of fire to/from other areas, maintains structural integrity] • Interlocks to close dampers in the	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining agent concentration]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: NDA-1 **Event Type:** E-1 **Event Description:** Isolated fire in the NDA Room results in a radiological release. Note: This is a pressurized release. **Location:** NDA Room **Causes:** Combustible / flammable material including misc. combustibles AND Ignition sources including electrical shorts (tools, outlets, wiring), thermal sources (wiring) **Material At Risk:** One check standard/source (500 g Pu) plus either one 3013 container (4.4 kg Pu) or one unassayed Type 7A (5-gal) TRU waste drum (395 g Pu) or or 7 Annual Calibration Standards (3.7 kg Pu) **Form:** Pu oxide **Event Specific Assumptions:**	Fire could potentially spread to include other materials within the NDA Room Potential for fire to cause polymer NMC components to melt and 3013 to breach causing a criticality.	MOI – Low WG1 – High WG2 – High WG3 – High Anticipated	• Fire Detection and Suppression System • NFPA compliant installation of electrical devices • NMC design [SF: Intrinsically Safe] • Procedures and Training Program • Fire Protection Program – Combustible Control Program – Control of Ignition Sources – Flame impingement controls for each Qualified Position	• Detection by operators • CSSC Fire Detection System	• Radiological Protection Program • Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained • Automatic electrical shunt • CSSC Ventilation Normal Exhaust System • CSSC Ventilation Low Flow Exhaust System • Each 3013 shall be in a Qualified Position unless specifically transferring between Qualified Positions • 3013 Outer Container Design • CSSC Building Structure • Vented TRU Waste Drum Design [SF: Closed non-combustible drum provides sufficient delay between fire initiation and container breach	• PFHA • Backfit analysis for standards (to be able to delay release until WG1 evacuates)	**PC – N/A** **Programmatic:** • Fire Protection Program – Combustible Control Program – Flame impingement controls for each Qualified Position • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program – Fire watch trained **Engineered:** **SC:** None Required **SS:** **WG1:** • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container confines the MAR while the worker evacuates] • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg SS ventilation credited as facility controls for worker protection and for reducing the MOI consequences from Low to Neg.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					to allow safe evacuation] • Check Standard/Source Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Annual Calibration Standard Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining agent concentration]		evacuation alarm] • Vented TRU Waste Drum Design [SF: Closed non-combustible drum provides sufficient delay between fire initiation and container breach to allow safe evacuation] • Check Standard/Source Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Annual Calibration Standard Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • NMC design [SF: Intrinsically Safe] **WG2:** • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							• CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire, also limits soot production to prevent HEPA pluggage] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor)	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							[SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure] • NMC design [SF: Intrinsically Safe] **WG3:** • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire, also limits soot production to prevent HEPA pluggage] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							over time, maintains structural integrity] • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • CSSC Building Structure (perimeter walls, ceiling, floor) [SF: Supports operation of ventilation system as part of the confinement system in maintaining differential pressure] • NMC design [SF: Intrinsically Safe]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: NDA-2 **Event Type:** E-1 **Event Description:** Room fire results in a release from 3013 containers Full room fire involving all MAR in the NDA Room results in a release from SNM containers and TRU waste containers Note: This is a pressurized (oxide) release. **Location:** NDA Room **Causes:** Combustible / flammable material including misc. combustibles AND Ignition sources including electrical shorts (tools, outlets, wiring), thermal sources (wiring) **Material At Risk:** Four 3013 containers (17.6 kg Pu) and 500 g Pu Check Standard./Source **OR** one TRU waste drum (395 g Pu) and 500 g Pu Check Standard/Source **Form:** Pu oxide	Fire could potentially spread to include other areas within CSSC	MOI – Mod WG1 – High WG2 – High WG3 - High Unlikely	• Gaseous Agent Enclosure (walls, floor, dampers, ceiling, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • NFPA compliant installation of electrical devices • Fire Protection Program – Combustible Control Program – Control of Ignition Sources – Qualified Positions – Flame impingement controls for each Qualified Position • Shipping Container Design (contains CelotexTM) [SF: Prevents release of 3013 in approved shipping container] • Procedures and Training Program • CSSC Fire	• Detection by operators • CSSC Fire Detection System • Local fire alarm system • CAMs local alarms	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained • Shipping Container Design – Fire resistant – Containment – 3013 Outer container design • Shipping Container Qualification and Storage Surveillance Program • Electrical shunt (prevent re-ignition due to a short) • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by	• Standoff Calc-Qualified Position flame impingement controls • PFHA • Accident Analysis Calc this is a design basis fire • Failure evaluation for TRU waste pails and drums in fires •	**PC – N/A** **Programmatic:** • Fire Protection Program – Combustible Control Program [SF: Limits size, intensity, duration, and location of fire, prevents Deep Seated fire] – Qualified Positions – Flame impingement controls for each Qualified Position – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program – Fire watch trained • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Each 3013 shall be in a Qualified Position unless specifically	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Event is Prevented Strategy for this event is that the Fire Suppression system prevents the full room involvement (Fire suppression would have to fail in order to have a full room fire); see isolated fire events for consequences.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Specific Assumptions:			Suppression System • Configuration Management Program – TRU Waste Storage Rack Design ▪ Radiant heat barrier – Electrical shunt (prevent re-ignition due to a short) • Shipping Container Qualification and Storage Surveillance Program		maintaining agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • Vented TRU Waste Drum Design • Material Control and Accountability Program (to limit MAR in TRU drums, inventory control) • Radiological Protection Program (Constant Air Monitoring) • Waste Management Program – Criticality limits amount of material in waste drums – TRU waste acceptance criteria • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Each 3013 shall be in a Qualified Position unless specifically transferring between Qualified Positions – Limits amount of MAR in TRU waste drums • Inner 3013 Container Design • 3013 Outer Container Design • Check Standard/Source Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation]		transferring between Qualified Positions – Limits amount of MAR in TRU waste drums **Engineered:** **SC:** None Required **SS**: [Assumes WG1 evacuates upon activation of fire alarm] **WG1:** • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container confines the MAR while the worker evacuates] • Vented TRU Waste Drum Design [SF: Closed non-combustible drum provides sufficient delay between fire initiation and container breach to allow safe evacuation] • Check Standard/Source Container Design [SF: Provides sufficient	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					• Annual Calibration Standard Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation]		delay between fire initiation and container breach to allow evacuation] • Annual Calibration Standard Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] **WG2:** • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire, prevents propagation to room fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							gaseous agent concentration over time, prevents propagation of fire to/from other areas, maintains structural integrity] • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] **WG3:** • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							[SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire, prevents propagation to room fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, prevents propagation of fire to/from other areas, maintains structural integrity] • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: OF-1 **Event Type:** E-1 **Event Description:** Fire in the Fan/Filter Building results in a release from filters **Location**: Fan/Filter Building **Causes:** Electrical Short Unknown ignition sources Human error Equipment Failure AND Combustibles **Material At Risk:** Residual Pu contamination on filters **Form:** Pu oxide **Event Specific Assumptions:** • A fire in the ventilation building subsequent to a CSSC event that resulted in a release from CSSC is not deemed a credible scenario. Seismic induced fire is covered in a separate event.	Complete loss of ventilation system	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg Anticipated	• NFPA Compliant installation of electrical devices • Building Structure (non-combustible) • Fire Protection Program • Procedures and Training Program	• Operator detection • Fan filter building fire detection and alarm system	• Fire detection and suppression system • Emergency Response Program (Evacuation) • Procedures and Training Program • Fire Protection Program (Fire Pre-plan) • Radiological Protection Program • Glovebox HEPA filters • 3013 Outer Containers • HEPA Filter Program • Criticality Safety Program – Periodic surveys of exhaust system to prevent gradual accumulation in ducts and HEPA filters	None required	**PC** – N/A **Programmatic: Protects MAR assumption** • Criticality Safety Program – Periodic surveys of exhaust system to prevent gradual accumulation in ducts and HEPA filters • HEPA Filter Program **SC:** None required **SS:** None Required **WG1:** None required **WG2:** None required **WG3:** None required	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: OF-2 **Event Type:** E-1 **Event Description:** Fire in the external Fan/Filter Building that damages the supply and exhaust system and causes a release **Location:** Building exterior (Fan/Filter Building) **Causes:** Electrical Short Human error Equipment Failure AND Combustibles **Material At Risk:** One Inner/Outer 3013 (4.4 kg Pu) plus glovebox holdup (600 g Pu) **Form:** Pu oxide **Event Specific Assumptions:** • Event results in a loss of the glovebox exhaust system.		MOI – Neg WG1 (located near GB) – High WG1a (located in filter/fan bldg) - Neg WG2 – Neg WG3 - Neg Anticipated	• NFPA Compliant installation of electrical devices • Non Combustible Materials (Site Engineering Standards) • Fire Protection Program Procedures and Training Program	• Operator detection • Fan/Filter Building Fire Detection and Alarm System • Ventilation System differential pressure alarm • CAM Alarm	• Fan/Filter Building Fire detection and Alarm System • Glovebox and GB ventilation system (HEPA) • Emergency Response Program (Evacuation) • Procedures and Training Program • Fire Protection Program (Fire Pre-plan) • Radiological Protection Program • Nuclear Criticality Safety Program (limits MAR in the glovebox to 5 kg Pu) • Glovebox Design [SF: Contains the MAR sufficient time to allow facility worker to safely evacuate] • Interlocks to isolate the dry air supply to the glovebox [SF: Prevents over-pressurization of the glovebox] • Glovebox differential pressure Alarm [SF: Detects low differential pressure and sounds local alarm]		**PC – N/A** **Programmatic:** Nuclear Criticality Safety Program (limits MAR in the glovebox to 5 kg Pu) **Engineered:** **SC:** None required **SS:** **WG1** (located near GB)**:** • Glovebox Design [SF: Contains the MAR sufficient time to allow facility worker to safely evacuate] • Interlocks to isolate the dry air supply to the glovebox [SF: Prevents over-pressurization of the glovebox] • Glovebox differential pressure Alarm [SF: Detects low differential pressure and sounds local alarm] **WG1a (located in filter/fan bldg):** None required **WG2:** None required **WG3:** None required	MOI – Neg WG1 – Neg WG1a – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: MEZ-1 **Event Type:** E-1 **Event Description:** Fire in mezzanine train causes partial loss of fire suppression capability and the glovebox fire suppression system (CO_2). **Location:** Mezzanine **Causes:** Combustible / flammable material including misc. combustibles AND Ignition sources including electrical shorts (tools, outlets, wiring), thermal sources (wiring) **Material At Risk:** None **Form:** NA **Event Specific Assumptions:** • Only one mezzanine train is installed. • No ventilation ducts pass through the mezzanine.	Fire could potentially spread to include other areas within CSSC	MOI – NA WG1 – NA WG2 – NA WG3 - NA Anticipated	• NFPA Compliant installation of electrical devices • Fire Protection Program (combustible controls) • Procedures and Training Program	• Detection by operators • CSSC Fire Detection System • Local fire alarm system	• CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program • Fire rated separation between CSSC Fire Suppression Train A and B	• PFHA	**PC** – N/A **Programmatic:** None Required **Engineered:** **SC:** None Required **SS:** None Required	MOI - N/A WG1 – N/A WG2 – N/A WG3 – N/A Event as postulated is a SIH that affects a system.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-3 **Event Type:** E-6 **Event Description:** Fire external to CSSC that propagates into the CSSC areas **Location:** All Project Areas **Causes:** Fire outside the project area **Material At Risk:** Storage room: 8448 kg Pu. Packaging Area inventory: 6 TRU waste 5-gal drums (2.4 kg Pu), a Check Standard/Source (500 g Pu), one TRU waste drum (1 kg Pu), samples (150 g Pu), 7 Annual Calibration Standards (3.7 kg Pu) and 0.5 g Pu in LLW bag(s) Glovebox holdup: 600 g Pu. **Form:** Pu oxide or metal **Event Specific Assumptions:**	Full facility fire	MOI –High WG1 – High WG2 – High WG3 - High Anticipated	• Building Structure (e.g., Storage Room walls, fire barriers, etc.) – 3 hour external fire barriers (walls, ceiling, floor) • Duct length • Fire Protection Program • Procedures and Training Program	• Operator detection	• Building Structure (e.g., Storage Room walls, fire barriers, etc.) – 3 hour external fire barriers (walls, ceiling, floor) • CSSC Fire Detection and Suppression System Equipment • Emergency Preparedness Program • Procedures and Training Program • Fire Protection Program – Add combustible control language, etc.	• PFHA	**PC** – N/A **Programmatic:** • Fire Protection Program • Procedures and Training Program **Engineered:** **SC:** • Building Structure (e.g., Storage Room walls, fire barriers, etc.) – 3 hour external fire barriers (walls, ceiling, floor) [SF: Prevents external fire from propagation into CSSC] **SS :** **WG1:** • Building Structure (e.g., Storage Room walls, fire barriers, etc.) – 3 hour external fire barriers (walls, ceiling, floor) [SF: Prevents external fire from propagation into CSSC] **WG2:** • Building Structure (e.g., Storage Room walls, fire barriers, etc.) – 3 hour external fire barriers (walls, ceiling, floor) [SF: Prevents external fire from propagation into CSSC]	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Fire propagation into CSSC is prevented.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							WG3: • Building Structure (e.g., Storage Room walls, fire barriers, etc.) – 3 hour external fire barriers (walls, ceiling, floor) [SF: Prevents external fire from propagation into CSSC]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-5 **Event Type:** E-1 **Event Description:** A fire in one fire area within CSSC propagates into another CSSC fire area resulting in a release. **Location:** Any two CSSC fire areas **Causes:** Combustible / flammable material including misc. combustibles AND Pathway for propagation AND Ignition source: electrical short (tools, outlets, wiring, heaters) thermal sources (heaters, wiring **Material At Risk:** Rack Storage Inventory: 8448 kg Pu. Packaging Area inventory: 6 TRU waste 5-gal drums (2.4 kg Pu), a Check Standard/Source (500 g Pu), one TRU waste drum (1 kg Pu), samples (150 g Pu), 7 Annual Calibration Standards (3.7 kg Pu) and 0.5 g Pu in LLW bag(s) Glovebox Area Inventory: Holdup: 600 g Pu. **Form:**	Fire could propagate to involve the entire facility.	MOI –High WG1 – High WG2 – High WG3 - High Unlikely	• NFPA compliant installation of electrical devices • Fire Protection Program – Combustible Control Program – Control of ignition sources – Qualified Positions – Flame impingement controls for each Qualified Position • Shipping Container Design (contains Celotex™) [SF: Prevents release of 3013 in approved shipping container] • Procedures and Training Program • CSSC Fire Suppression System • Configuration Management Program – TRU Waste Storage Rack Design ▪ Radiant heat	• CSSC Fire detection and alarm system • CAMs • Operator detection	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available • CSSC Fire Suppression System • Building Structure (non-combustible construction) – Gaseous Agent Enclosure (walls, floor, dampers, ceiling, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained – Samples and combustible TRU waste will be removed from the glovebox before a 3013 container is brought into the glovebox. – No storage of MAR is allowed in the Glovebox Room outside the glovebox. – No 3013 or sample processing will be performed in CSSC during waste removal activities – Any TRU waste not in	• PFHA • Soot loading analysis (HEPA Filters) • DBA	**PC** – N/A **Programmatic:** • Fire Protection Program- MOI, WG1, WG2, WG3 – Combustible Control Program [SF: Limits size, intensity, duration, and location of fire, prevents Deep Seated fire] – Qualified Positions – Flame impingement controls for each Qualified Position – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program – Fire watch trained – Material handler trained – Samples and combustible TRU waste will be removed from the glovebox before a 3013 container is	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Event is Prevented Strategy for this event is that the Fire Suppression system prevents the full room involvement and propagation Fire suppression would have to fail in order to have a full room fire); see isolated and intermediate fire events for consequences.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Pu oxide and/or metal **Event Specific Assumptions:** • An open drum of TRU waste involved in a fire results in Low consequences to WG1			barrier – Automatic electrical shunt • Fire Area boundaries – 2-hr fire barriers – Gaseous agent enclosure		closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • Shipping Container Design – Fire resistant – Containment • 3013 Outer container design • Shipping Container Qualification and Storage Surveillance Program • Automatic electrical shunt • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • Vented TRU Waste Drum Design • Material Control and Accountability Program [SF: Limit MAR in TRU drums, inventory control] • Radiological Protection Program (Constant Air Monitoring) • Waste Management Program – Criticality limits amount of material in waste drum – waste acceptance criteria		brought into the glovebox. – No storage of MAR is allowed in the Glovebox Room outside the glovebox. – No 3013 or sample processing will be performed in CSSC during waste removal activities – Any TRU waste not in closed drums (5-gal or 55-gal) is immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum. • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Each 3013 shall be in a Qualified Position unless specifically transferring between Qualified Positions – Limits the glovebox room to 5 Kg Pu (the Glovebox Room is a Qualified	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					• Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Each 3013 shall be in a Qualified Position unless specifically transferring between Qualified Positions – Limits amount of MAR in TRU waste drums – Limits the glovebox room to 5 Kg Pu (the Glovebox Room is a Qualified Position) – Periodic assessment to verify that the hold-up in the glovebox is less than what was analyzed) • Glovebox Design [SF: Contains the MAR sufficient time to allow facility worker to safely evacuate] • 3013 Inner/Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Inner/Outer 3013 container confines the MAR while the worker evacuates] • Check Standard/Source Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Annual Calibration Standard Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation]		Position) – Limits amount of MAR in TRU waste drum – Periodic assessment to verify that the hold-up in the glovebox is less than what was analyzed) **Engineered:** **SC: (MOI)** • CSSC Fire Area Boundaries (walls, floor, ceiling, doors, etc) [SF: Prevents propagation of fire to/from other areas, maintains structural integrity] (Only wall between Storage Room and rest of CSSC is SC) • 3013 Outer Container Design [SF: Noncombustible design] **SS:** *[Assume WG1 evacuates upon activation of fire alarm]* **WG1**: • CSSC Fire Detection and Alarm System [SF: Detects fire and activates local evacuation alarm] • Glovebox Design [SF: Contains the MAR sufficient time to	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					• Oxide Sample Vial Design [SF: Provide sufficient delay between fire initiation and container breach to allow safe evacuation] • Gas Sample Vial Design [SF: Provide sufficient delay between fire initiation and container breach to allow safe evacuation]		allow facility worker to safely evacuate] • 3013 Inner/Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Inner/Outer 3013 container confines the MAR while the worker evacuates] • Vented TRU Waste Drum Design [SF: Provide sufficient delay between fire initiation and container breach to allow safe evacuation] • Check Standard/Source Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Annual Calibration Standard Container Design [SF: Provides sufficient delay between fire initiation and container breach to allow evacuation] • Oxide Sample Vial Design [SF: Provide sufficient delay between fire initiation and container breach to allow safe evacuation] • Gas Sample Vial Design [SF: Provide sufficient delay	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							between fire initiation and container breach to allow safe evacuation] **WG2**: • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire, prevents propagation to room fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, prevents propagation of fire to/from other areas, maintains structural	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							integrity] • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] **WG3**: • 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							Suppression System [SF: Extinguish any fire, prevents propagation to room fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, prevents propagation of fire to/from other areas, maintains structural integrity] • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-7 **Event Type:** E-1 **Event Description:** A fire involving LLW resulting in a release. **Location**: Anywhere within CSSC LLW is authorized. **Causes:** Combustible/ flammable material including job control waste, misc. combustibles, decon solutions AND Ignition sources: electrical short (tools, outlets, wiring, heaters) thermal sources (heaters, wiring) **Material At Risk:** MAR: 0.5g Pu **Form:** Pu oxide **Event Specific Assumptions:**	Fire spreads to other areas in CSSC	MOI –Neg WG1 – Mod WG2 – Neg WG3 - Neg Anticipated	• NFPA compliant installation of electrical devices • Fire Protection Program – Combustible Control Program – Control of Ignition Sources • Procedures and Training Program • CSSC Fire Suppression System • Configuration Management Program – Automatic electrical shunt	• CSSC Fire detection and alarm system • CAMs • Operator detection	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained • Automatic electrical shunt • Interlocks [SF: Signal from fire detection system to isolate normal ventilation supply, shutdown normal exhaust ventilation to support the function of the suppression system by maintaining agent concentration] • CSSC Ventilation Low Flow Exhaust System [SF: Provides active confinement, maintains CSSC negative pressure and filters exhaust] • Radiological Protection Program (Constant Air Monitoring) • Waste Management Program – LLW criteria	None	**PC** – N/A **Programmatic:** (Not required but listed as being available to mitigate consequences to negligible.) • Fire Protection Program – Combustible Control Program [SF: Limits size, intensity, duration, and location of fire, prevents Deep Seated fire] – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1] • Procedures and Training Program – Fire watch trained – Material handler trained • Waste Management Program [SF: Establishes LLW limits] **Engineered:** **SC:** None required **SS:** None required	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-29 **Event Type:** E-1 **Event Description:** Isolated fire results in a release from shipping container, inner 3013, or outer 3013 container with Pu metal. Note: This is a eutectic (metal) release. **Location**: Packaging Area, Glovebox area, NDA room (outside NMC), 3013 storage room (outside rack storage) **Causes:** Combustible/flammable material including misc. combustibles, Digital Radiography oil, Celotex™ from open containers, computers, cable insulation, waste, laundry AND Ignition sources including electrical shorts (tools, outlets, wiring, computers, electrical equipment racks), thermal sources (wiring), hot work, mechanical sparking **Material At Risk:** One 3013 container (4.4 kg Pu) **Form:** Pu Metal **Event Specific Assumptions:**	Fire could propagate to include other areas.	MOI –Neg WG1 – High WG2 – High WG3 - High Anticipated	• NFPA compliant installation of electrical devices • Fire Protection Program – Combustible Control Program – Qualified Positions – Flame impingement controls for each Qualified Position – Control of Ignition Sources • Shipping Container Design (contains Celotex™) • Procedures and Training Program • Waste Management Program	• Detection by operators • CSSC Fire Detection System	• Fire Protection Program – Combustible Control Program – Fire Department response – Fire extinguishers available – Control of Ignition Sources • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • CSSC Fire Detection and Alarm System • Emergency Preparedness Program (evacuation) • Procedures and Training Program – Fire watch trained – Material handler trained • Shipping Container Design – Fire resistant – Containment • 3013 Outer Container Design • 3013 Inner Container Design • Shipping Container Qualification and Storage Surveillance Program • Automatic electrical shunt • CSSC Ventilation Normal Exhaust System • CSSC Ventilation Low Flow System • Interlocks to close dampers in the affected area and close	• PFHA documentation • AA	**PC** – N/A **Programmatic:** • Fire Protection Program- WG1, WG2, WG3 – Combustible Control Program – Qualified Positions – Flame impingement controls for each Qualified Position – Control of Ignition Sources • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Procedures and Training Program – Fire watch trained – Material handler trained **Engineered:** **SC:** None required **SS:** **WG1**: • 3013 Inner and Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Inner and Outer 3013 containers confines the MAR while the worker evacuates] **WG2**:	MOI - N/A WG1 – N/A WG2 – N/A WG3 – N/A Release from 3013 is prevented

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining agent concentration]		• 3013 Outer Container Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining agent concentration] **WG3**: • 3013 Outer Container	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							Design [SF: In conjunction with combustible controls and flame impingement controls the Outer 3013 container provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Fire Suppression System [SF: Extinguish any fire] • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, maintains structural integrity] • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining agent concentration]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-4 **Event Type:** E-2 **Event Description:** Deflagration/detonation inside CPD or CPD piping during can puncture/gas sampling within the glovebox results in a pressurized release of radioactive material **Location:** Glovebox **Causes:** Spark during can puncture operations of a 3013 Container and Presence of flammable mixture **Material At Risk:** 4.4 Kg Pu **Form:** Pu oxide **Event Specific Assumptions:** • Can puncturing is done only in CPD • Holdup in CPD piping is insignificant	Explosion destroys GB boundary and initiates a fire that could spread to involve other additional materials.	MOI – Low WG1 – High WG2 – High WG3 - High Anticipated	• Can Puncture Device Design – Drill bit (non-sparking, diameter) – Drill Motor Speed • NFPA 69 compliant operations (vent and purge to maintain H2 concentration outside deflagrable conditions)	• Detection by operators • CAMs • Pressure monitor in CPD	• Glovebox design (confinement) • Glovebox Exhaust System • CSSC Ventilation Normal Exhaust System • 3013 Outer Container Design • Can Puncture Device Design – vacuum indication – inert system w/pressure relief capability or isolation prior to puncture – Pressure Boundary ▪ ASME pressure vessel ▪ Sampling System Piping ▪ Isolation valves – NFPA Standard – pressure containment – Puncture operation allowed under vacuum only (interlock) • Emergency Preparedness Program (evacuation) • Training and Procedures – Establish proper system configuration including pressure boundary – NFPA 69 compliant operations (vent and purge to maintain H2 concentration outside deflagrable conditions) • Radiological Protection Program • Fire Protection Program (Combustible Control, Non Combustible Construction,	• PFHA • AA for CPD	**PC** – N/A **Programmatic:** • Training and Procedures – Establish proper system configuration including pressure boundary • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] **Engineered:** **SC:** None required **SS :** **WG1:** • Glovebox Design [SF: Contains the MAR sufficient time to allow facility worker to safely evacuate] • Glovebox Exhaust System [SF: Maintains negative pressure in glovebox] • Can Puncture Device Design – Detonation/Deflagration Pressure Boundary ▪ ASME pressure vessel ▪ Sampling System Piping	MOI - Neg WG1 – Neg WG2 – Neg WG3 – Neg Extremely Unlikely SS Glovebox Exhaust System credited as facility controls for worker protection and for reducing the MOI consequences from Low to Neg.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					Control of Ignition sources) • Building Structure • Glovebox Design [SF: Contains the MAR sufficient time to allow facility worker to safely evacuate]		▪ Isolation valves – NFPA Standard – pressure containment [SF: Robust structural integrity prevents pressurized release] **WG2:** • Glovebox Exhaust System [SF: Maintains negative pressure in glovebox] • Can Puncture Device Design – Detonation/Deflagration Pressure Boundary ▪ ASME pressure vessel ▪ Sampling System Piping ▪ Isolation valves – NFPA Standard – pressure containment [SF: Robust structural integrity prevents pressurized release] **WG3:** • Glovebox Exhaust System [SF: Maintains negative pressure in glovebox] • Can Puncture Device Design – Detonation/Deflagration Pressure Boundary ▪ ASME pressure vessel	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							▪ Sampling System Piping ▪ Isolation valves – NFPA Standard – pressure containment [SF: Robust structural integrity prevents pressurized release]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-4A **Event Type:** E-2 **Event Description:** A deflagration in the glovebox during venting or opening of the CPD results in a release of radiological material. **Location:** Glovebox **Causes:** Ignition of hydrogen (static electricity and/or electrical spark) and Flammable mixture Operator Error Mechanical failure **Material At Risk:** 5 kg Pu (includes GB holdup of 600 grams Pu) **Form:** Pu oxide **Event Specific Assumptions:** • Deflagration events result in MOI doses of < 0.5 rem • Holdup in CPD piping is insignificant	Deflagration destroys GB boundary and initiates a fire that could spread to involve other additional materials.	MOI – Neg WG1 – High WG2 – High WG3 - High Anticipated	• Glovebox Exhaust System (to prevent deflagration at the discharge from the CPD vent) • Glovebox Design (volume is adequate to prevent non-localized flammable mixture) • NFPA Compliant Installation of Electrical Devices • Eliminate flammable atmosphere from CPD prior to opening • NFPA 69 compliant operations	• Detection by operators	• Glovebox Design (containment and volume for localized deflagration) • Glovebox Exhaust System • CSSC Ventilation Normal Exhaust System • Emergency Preparedness Program (evacuation) • Training and Procedures o Establish proper system configuration o NFPA 69 compliant operations • Radiological Protection Program • Fire Protection Program (Combustible Control Program, Non Combustible Construction, Control of Ignition sources) • Process Enclosure Integrity Program (Glove Inspection Program) • Building Structure • 3013 outer container for limited confinement • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] • Limits the MAR in the glovebox room/glovebox to 5 kg Pu	• PFHA • AA for GB deflagration pressure	**PC** – N/A **Programmatic:** • Training and Procedures – Establish proper system configuration – Ensure NFPA 69 compliant operations (i.e., venting and purging) (SF: to maintain H_2 concentration outside deflagrable conditions) • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Limits the MAR in the glovebox room/glovebox to 5 kg Pu **SC:** None Required **SS :** **WG1:** • Glovebox Exhaust System [SF: Maintains negative pressure in glovebox; prevents	MOI - Neg WG1 – Neg WG2 – Neg WG3 – Neg Extremely unlikely

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							deflagration at the discharge from the CPD vent] • Glovebox Design [SF: Volume is adequate to prevent non-localized flammable mixture and to confine localized deflagration pressures] **WG2:** • Glovebox Exhaust System [SF: Maintains negative pressure in glovebox; prevents deflagration at the discharge from the CPD vent] • Glovebox Design [SF: Volume is adequate to prevent non-localized flammable mixture and to confine localized deflagration pressures] **WG3:** • Glovebox Exhaust System [SF: Maintains negative pressure in glovebox; prevents deflagration at the discharge from the CPD vent] • Glovebox Design [SF: Volume is adequate to prevent non-localized flammable mixture and to confine localized deflagration pressures]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-4B **Event Type:** E-2 **Event Description:** A Deflagration/detonation inside a 3013 container during can cutting within the GB results in a pressurized release of radioactive material **Location:** Glovebox **Causes:** Unpunctured 3013 placed in can cutter Presence of flammable mixture in the 3013 Cutting of 3013 container allowing oxygen to enter and causing spark Operator Error Mechanical failure **Material At Risk:** 5 kg Pu (includes GB holdup of 600 grams Pu) **Form:** Pu oxide **Event Specific Assumptions:** • Deflagration events result in MOI doses of < 0.5 rem	Deflagration/ detonation destroys GB boundary and initiates a fire that could spread to involve other additional materials.	MOI – Low WG1 – High WG2 – High WG3 - High Anticipated	• Can cutter Design o Engineered control to prevent cutting open of an unpunctured can or mitigate the consequences of a detonation/deflagration to prevent damaging glovebox from opening of an unpunctured can • Training and Procedures – Visually verify that "aged" 3013 assemblies have been punctured prior to being cut open. Newly generated 3013s (inner containers, outer containers or 3013	• Detection by operators	• 3013 outer container and inner container for limited confinement • Glovebox Design (confinement) • Glovebox Exhaust System • CSSC Ventilation Normal Exhaust System • Emergency Preparedness Program (evacuation) • Radiological Protection Program • Fire Protection Program (Combustible Control Program, Non Combustible Construction, Control of Ignition sources) • Building Structure	• PFHA	**PC – N/A** **Programmatic:** • Training and Procedures – Visually verify that "aged" 3013 assemblies have been punctured prior to being cut open. Newly generated 3013s (inner containers, outer containers or 3013 assembly) may be cut open without being punctured, • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Limits the MAR in the glovebox room/glovebox to 5 kg Pu **SC:** None Required **SS :** **WG1:** • Glovebox Design (SF: confinement boundary and provides a missile shield from catastrophic failure on an unpunctured inner 3013 container outside	MOI - Neg WG1 – Neg WG2 – Neg WG3 – Neg SS Glovebox Design credited as a facility control for worker protection and for reducing the MOI consequences from Low to Neg.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
• 3013s containing metal are not subject to a deflagration as they do not contain significant oxide which would generate gases from radiolysis of adsorbed moisture.			assembly) may be cut open without being punctured,				the CPD) **WG2:** • Glovebox Design (SF: confinement boundary) **WG3:** • Glovebox Design (SF: confinement boundary)	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-40 **Event Type:** E-2 **Event Description:** A Deflagration inside one TRU waste drum results in a pressurized release of radioactive material **Location:** Glovebox Process Area, Packaging Area, NDA Room, KAMS Corridors, Airlocks Causes: Electrical Short, Drop, Mechanical Impact, Operator error, static electricity AND Flammable gas build-up **Material At Risk:** Unassayed/assayed waste (395 g Pu) **Form:** Pu oxide **Event Specific Assumptions:** • Waste is packaged in plastic bags • All drum vents are filtered	Deflagration initiates a fire that could spread to involve other additional materials.	MOI – Neg WG1 – High WG2 – High WG3 - High Anticipated	• NFPA compliant installation of electrical devices • Nuclear Criticality program (limits amount of SNM in 5gal drum) • Operator training • Vented 5-gal TYPE A drums • Waste Management Program – Vented 55-gal TYPE A drums – limits MAR • Fire Protection Program – Control of Ignition Sources	• Detection by operators • CAMs • CSSC Fire detection and alarm system	• CSSC Ventilation Normal Exhaust System • Emergency Preparedness Program (evacuation) • Training and Procedures • Radiological Protection Program • Fire Protection Program (Combustible Control Program, Non Combustible Construction, Control of Ignition sources) • Building Structure • Nuclear Criticality program (limits amount of SNM in 5-gal drum) • Vented 5-gal TYPE A drums • Waste Management Program o Vented 55-gal TYPE A drums o limits MAR	• PFHA • AA for drum deflagration	**PC – N/A** **Programmatic:** • Nuclear Criticality Program [SF: Limits amount of material in 5-gal and 55-gal TRU waste drum] • Operator training for packaging waste • Waste Management Program – Requires DOT 7A Type A or OSA-qualified vented 55-gal and 5-gal drums **SC:** None required **SS :** **WG1:** • Vented 55-gal and 5-gal drum (DOT 7A Type A or OSA qualification meets requirement for SS) [SF: Prevent flammable gas buildup] **WG2:** • Vented 55-gal and 5-gal drum (DOT 7A Type A or OSA qualification meets requirement for SS) [SF: Prevent flammable gas buildup] **WG3:** • Vented 55-gal and 5-gal drum (DOT 7A Type A or OSA qualification meets requirement for SS) [SF: Prevent	MOI - N/A WG1 – N/A WG2 – N/A WG3 – N/A Event is prevented Vent design prevents explosion.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							flammable gas buildup]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-41 **Event Type:** E-2 **Event Description:** A Deflagration inside one sample gas vial or oxide sample vial results in a pressurized release of radioactive material **Location:** Glovebox Process Area, Packaging Area, airlocks, KAMS corridors, NDA room **Causes:** Electrical Short, Drop, Mechanical Impact, Operator error, static electricity AND Flammable gas build-up **Material At Risk:** 150 g Pu, contaminated gas **Form:** Pu oxide **Event Specific Assumptions:** • CPD and sample collection system design prevents Plutonium oxide from entering gas sample vials • Based on physical configuration of sample vial and gas vials, detonation is not credible	Deflagration initiates a fire that could spread to involve other additional materials.	MOI – Neg WG1 – High WG2 – Mod WG3 - Mod Anticipated	• NFPA compliant installation of electrical devices • Operator training • Oxide sample vial and gas vial design • Fire Protection Program - Control of Ignition Sources	• Detection by operators • CAMs • CSSC Fire detection and alarm system	• CSSC Ventilation Normal Exhaust System • Emergency Preparedness Program (evacuation) • Training and Procedures (limits MAR) • Radiological Protection Program • Fire Protection Program (Combustible Control Program, Non Combustible Construction, Control of Ignition sources) • Building Structure • Oxide sample and gas vial design	• PFHA • Design analysis for gas and oxide sample vials to assure that the vials will withstand a deflagration for newly generated and return samples	**PC – N/A** **Programmatic:** None available **SC:** None required **SS :** **WG1:** • Gas and oxide sample vial design [SF: Physical configuration prevents detonations; sufficiently robust to withstand deflagration] **WG2:** (Not required but listed to mitigate consequences to negligible) • Gas and oxide sample vial design [SF: Physical configuration prevents detonations; sufficiently robust to withstand deflagration] **WG3:** (Not required but listed to mitigate consequences to negligible) • Gas and oxide sample vial design [SF: Physical configuration prevents detonations; sufficiently robust to withstand deflagration]	MOI - N/A WG1 – N/A WG2 – N/A WG3 – N/A Release is prevented

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-42 **Event Type:** E-2 **Event Description:** A Deflagration internal to a 3013/9975, annual calibration and check standards/sources, or Inner 3013 during handling results in a pressurized release of radioactive material **Location:** Glovebox Process Area including airlock (3013), Packaging Area (3013 or 9975), NDA Room (3013), 3013 Storage Room (3013), KAMS corridors/airlock (9975) **Causes:** Electrical Short, Drop, Mechanical Impact, Operator error, static electricity AND Flammable gas build-up **Material At Risk:** 4.4 kg Pu **Form:** Pu oxide **Event Specific Assumptions:** • Deflagration events result in MOI doses of < 0.5 rem • This event addresses ISSC compliant standards and standard 3013 compliant Inner and Outer 3013s	Deflagration initiates a fire that could spread to involve other additional materials.	MOI – Neg WG1 – High WG2 – High WG3 - Mod Unlikely	• 3013 Standard and Surveillance Program [SF: Ensures no accumulation of significant flammable gases] • ISSC Program [Ensures no accumulation of significant flammable gases] ○ Annual calibration standard and check standard/source design • Operator training (handling of 3013s, 9975s, Inner 3013s, Standards) • Fire protection (control of ignition sources) • Inner 3013s are not present in the facility for more than one shift before being leak checked (inner containers that pass the leak check are 3013 compliant inner containers) • 3013 Outer Container Design [SF:	• Detection by operators • CAMs • CSSC fire detection and alarm system	• CSSC Ventilation Normal Exhaust System • Emergency Preparedness Program (evacuation) • Radiological Protection Program • Fire Protection Program (Combustible Control Program, Non Combustible Construction) • Building Structure • 9975 Shipping Container Design • 9975 Shipping Container Qualification Program • Training and Procedures (limits MAR, implements 3013 standard)	• PFHA • Time to LFL for a non leak tested Inner 3013	**PC – N/A** **Programmatic:** • 3013 Standard and Surveillance Program [SF: Ensures no significant accumulation of flammable gases] • ISSC Program [SF: Ensure no significant accumulation of flammable gases in annual calibration standards and check standards/sources] **SC:** None required **SS :** **WG1:** • 3013 Outer Container Design [SF: Able to withstand deflagration without losing confinement] • Check Standard/Source [SF: Will not contain sufficient flammable gases to support a deflagration] • Annual Calibration Standard Container Design [SF: Will not contain sufficient flammable gases to support a deflagration] **WG2:** • 3013 Outer Container Design [SF: Able to withstand deflagration	MOI - N/A WG1 – N/A WG2 – N/A WG3 – N/A The 3013 and ISSC standard compliance prevents a release from a deflagration event.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
(this precludes detonation events). Inner 3013s are newly packaged and will not contain significant hydrogen from radiolysis.			Able to withstand deflagration without losing confinement] • Check Standard/Source and Annual Calibration Standard Containers Design [SF: Will not contain sufficient flammable gases to support a deflagration]				without losing confinement] • Check Standard/Source and Annual Calibration Standard Containers Design [SF: Will not contain sufficient flammable gases to support a deflagration] **WG3:** (Not required but listed to mitigate consequences to negligible) • 3013 Outer Container Design [SF: Able to withstand deflagration without losing confinement] • Check Standard/Source and Annual Calibration Standard Container design [SF: Will not contain sufficient flammable gases to support a deflagration]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-X1 **Event Type:** E-3 **Event Description:** Impact event involving two containers (3013, 9975, Inner Container, gas or oxide sample vial, annual calibration standard containers, or check standard/source containers) resulting in a release (spill) **Location:** CSSC Project Areas excluding glovebox **Causes:** Mishandling of containers (including manual drum handler operations) Container impacts a stationary container or another container during movement Manual drum handler failure **Material At Risk:** Two 3013 containers (8.8 kg Pu combined) or 2 Inner Containers (4.4 kg Pu combined) **Form:** Pu oxide/metal **Event Specific Assumptions:** • Event is bounded by Pu oxide • Based on the process where the contents of one		MOI (Two 3013 containers) – Low MOI (One 3013 container) - Neg WG1 – High WG2 – High WG3 – High Anticipated (Consequences are based on pressurized [approximately 300 PSI] release from 3013) (Consequences from unpressurized inner containers are High, Moderate and Low for WG1, WG2 and WG3, respectively.)	• Procedures and Training Program • Criticality Safety Program	• Detection by operators • CAMs local alarms	• Building Structure • CSSC Ventilation Normal Exhaust System • Emergency Preparedness Program (evacuation) • Radiological Protection Program [SF: CAM alarms method of detection] • 3013 Outer Container Design [SF: Ability to withstand impact without losing confinement] • Inner Container [SF: Ability to withstand impact without losing confinement] • Transport Cart [SF: Limited energy associated with operation] • Oxide Sample Vial Design [SF: Ability to withstand impact without losing confinement] • Gas Sample Vial Design [SF: Ability to withstand impact without losing confinement] • Annual Calibration Standard and Containers [SF: Ability to withstand impact without losing confinement] • Check Standard/Source Containers [SF: Ability to withstand impact without losing confinement]		**PC** – N/A **Programmatic**: None Required **Engineered** **SC:** None Required **SS:** **WG1:** • 3013 Outer Container Design [SF: Ability to withstand impact without losing confinement] • Inner Container Design [SF: Ability to withstand impact without losing confinement] • Transport Cart [SF: Limited energy associated with operation] • Oxide Sample Vial Design [SF: Ability to withstand impact without losing confinement] • Gas Sample Vial Design [SF: Ability to withstand impact without losing confinement] • Annual Calibration Standard and Container Design [SF: Ability to withstand impact without losing confinement]	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg SS 3013 outer container credited as a facility control for worker protection and for reducing the MOI consequences from Low to Neg.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
3013 could be repackaged into multiple Inner Containers. Inner Containers are bounded by one 3013. • Inner Containers are newly generated and are not pressurized.							• Check Standard/Source Container Design [SF: Ability to withstand impact without losing confinement] **WG2:** • 3013 Outer Container Design [SF: Ability to withstand impact without losing confinement] • Transport Cart [SF: Limited energy associated with operation] **WG3:** • 3013 Outer Container Design [SF: Ability to withstand impact without losing confinement] • Transport Cart [SF: Limited energy associated with operation] (Inner Container, gas and oxide sample vials, annual calibration standard container, and check standard/source container, design are also available to protect WG2 and WG3 but not required as SS)	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-X2 **Event Type:** E-3 **Event Description:** Impact to or drop of a Shipping Container, 3013, Inner Container, gas or oxide sample vial, annual calibration standard, check standard/source, or shielded source resulting in its puncture and the release of its contents **Location:** CSSC Project Areas **Causes:** Operator error Mechanical failure of customized tools Container is dropped Transport cart overturns Mechanical failure of transport cart or tools Impact 3013 Container **Material At Risk:** One 3013 Inner/Outer Container (4.4 kg Pu) **Form:** Pu oxide/metal **Event Specific Assumptions:** • Event is bounded by Pu oxide • Inner Containers are newly generated and are	Spread of contamination	MOI – Low WG1 – High WG2 – High WG3 - High Anticipated Consequences are based on pressurized [approximately 300 PSI] release from 3013) (Consequences from unpressurized inner containers are High, Moderate and Low for WG1, WG2 and WG3, respectively.)	• Procedures and Training Program • Transport Cart [SF: Reduces operator error for drops; protects against impacts] • Lifting Tool • Shipping Container Qualification and Storage Surveillance Program • Procedures and Training Program • Hoisting and Rigging Program (Inspections and Preventive Maintenance) • Configuration Management Program	• Detection by operators • CAMs local alarms	• Building Structure • CSSC Ventilation Normal Exhaust System • Emergency Preparedness Program (evacuation) • Procedures and Training Program • Radiological Protection Program [SF: CAM alarms method of detection, PPE] • 3013 Outer Container Design [SF: Ability to withstand impact without losing confinement] • Inner Container [SF: Ability to withstand drop up to 8 ft without losing confinement] • Oxide Sample Vial Design [SF: Ability to withstand impact without losing confinement] • Gas Sample Vial Design [SF: Ability to withstand impact without losing confinement] • Annual Calibration Standard and Containers [SF: Ability to withstand impact without losing confinement] • Check Standard/Source Container Design [SF: Ability to withstand impact without losing confinement] • Shipping Container Qualification and Storage Surveillance Program • Shipping Container Design • Transport Cart [SF: Limited energy associated with operation]		**PC** – N/A **Programmatic**: • Procedures and Training Program [SF: Not lifting Inner Container or 3013 above qualified drop height] **Engineered** **SC:** None Required **SS:** **WG1:** • 3013 Outer Container Design • Inner Container Design • Oxide Sample Vial Design [SF: Ability to withstand impact without losing confinement] • Gas Sample Vial Design [SF: Ability to withstand impact without losing confinement] • Annual Calibration Standard and Container Design [SF: Ability to withstand impact without losing confinement] • Check Standard/Source Container Design [SF: Ability to withstand impact without losing confinement]	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg SS 3013 outer container credited as a facility control for worker protection and for reducing the MOI consequences from Low to Neg.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
not pressurized.					• Lifting Tool • Hoisting and Rigging Program (Inspections and Preventive Maintenance) • Maintenance Program		• Transport Cart [SF: Limited energy associated with operation] **WG2:** • 3013 Outer Container Design • Transport Cart [SF: Limited energy associated with operation] **WG3:** • 3013 Outer Container Design • Transport Cart [SF: Limited energy associated with operation] • (Inner Container, gas and oxide sample vials, annual calibration standard container, and check standard/source container, design are also available to protect WG2 and WG3 but not required as SS)	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: RS-4 **Event Type:** E-3 **Event Description:** Collapse of one of the 3013 storage racks results in fall of containers and release of material **Location:** 3013 Storage Room **Causes:** Failure of storage rack (degradation, corrosion) Improper design or installation Operator error Overloading Impact of cart Structural failure of the building Concrete spalling **Material At Risk:** Approximately 120 3013 containers (528 kg Pu) or annual calibration standards **Form:** Pu oxide/metal **Event Specific Assumptions:** • Only one rack system (120 containers) collapsing at a given time is considered credible. • Event is bounded by Pu oxide		MOI – High WG1 – High WG2 – High WG3 - High Unlikely	• Building Structure • Storage Rack Design [SF: Material properties, capacity, and structural integrity will prevents its collapse] • Procedures and Training Program • Transport Cart [SF: Limited energy associated with operation] • Protective Cage above Rack [SF: Prevent anything from falling on Racks causing failure] • Structural Integrity Program [SF: Periodic verification of structural integrity and preventive/corrective actions as necessary]	• Detection by operators • CAMs local alarms	• CSSC Ventilation Normal Exhaust System • Emergency Preparedness Program (evacuation) • Procedures and Training Program • Radiological Protection Program [SF: CAM alarms method of detection] • 3013 Outer Container Design [SF: Ability to withstand impact or fall without losing confinement] • Building Structure		**PC** – N/A **Programmatic**: • Procedures and Training Program • Structural Integrity Program [SF: Periodic verification of structural integrity and preventive/ corrective actions as necessary] **Engineered:** **SC:** • Storage Rack Design [SF: Material properties, capacity, and structural integrity will prevent its collapse] • Building Structure [SF: Structural integrity to hold up racks and prevent spalling] **SS:** **WG1:** • Storage Rack Design [SF: Material properties, capacity, and structural integrity will prevent its collapse] • Building Structure [SF: Structural integrity to hold up racks and prevent spalling] • Transport Cart [SF: Limited energy associated with operation] **WG2:**	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Event is prevented

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							• Storage Rack Design [SF: Material properties, capacity, and structural integrity will prevent its collapse] • Building Structure [SF: Structural integrity to hold up racks and prevent spalling] • Transport Cart [SF: Limited energy associated with operation] **WG3:** • Storage Rack Design [SF: Material properties, capacity, and structural integrity will prevent its collapse] • Building Structure [SF: Structural integrity to hold up racks and prevent spalling] • Transport Cart [SF: Limited energy associated with operation]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-X3 **Event Type:** E-3 **Event Description:** Concrete spalling or other dropped object impacts 3013, Inner Container, annual calibration standard(s), sample containers, TRU and LL waste containers or shipping container resulting in a release **Location:** All CSSC project areas excluding Storage Racks **Causes:** Concrete spalling due to high stress, high loading, impact, defective concrete FM200/CO2 cylinder drop or failure causes it to become missile Structural failure (e.g., conduits, fixtures, trolley) **Material At Risk:** Two 3013 containers (8.8 kg Pu) **Form:** Pu oxide/metal **Event Specific Assumptions:** • Event is bounded by Pu oxide		MOI – Low WG1 – High WG2 – High WG3 - High Anticipated	• Building Structure (concrete walls and roof) • Structural Integrity Program [SF: Periodic verification of structural integrity and preventive/corrective actions as necessary] • Controls to ensure that the cylinders are capped when unrestrained	• Detection by operators • CAMs local alarms	• Building Structure • Procedures and Training Program • CSSC Ventilation Normal Exhaust System • Emergency Preparedness Program (evacuation) • Radiological Protection Program [SF: CAM alarms method of detection] • 3013 Outer Container Design [SF: Ability to withstand impact without losing confinement] • No 3013s, Inner Containers, 9975, Standards and Samples will be allowed in the Packaging Area during movement of the FM200/CO2 cylinders. • Inner Container design • Shipping Container Design • Annual/Check Standard/Source container design • Vented TRU Waste Drum design • Gas and oxide sample vials design • TRU waste drums will not be permitted under the lift path of the FM200/CO_2 cylinders when cylinders are being lifted.		**PC** – N/A **Programmatic**: • 3013s, Inner Containers, 9975, Standards and samples will not be allowed in the Packaging Area during movement of the FM200/CO_2 cylinders. • Structural Integrity Program [SF: Periodic verification of structural integrity and preventive/ corrective actions as necessary ensure that falling objects from structural failures do not challenge the integrity of the SNM containers] • TRU waste drums will not be permitted under the lift path of the FM200/CO_2 cylinders when cylinders are being lifted. • Cylinders will be capped when unrestrained **Engineered:** **SC:** None Required **SS:** **WG1:** • Building Structure [SF: Structural integrity prevents spalling]	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg SS Building Structure credited as a facility control for worker protection and for reducing the MOI consequences from Low to Neg.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							WG2: • Building Structure [SF: Structural integrity prevents spalling] **WG3:** • Building Structure [SF: Structural integrity prevents spalling]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: RS-10 **Event Type:** E-3/E-5 **Event Description:** Concrete spalling event damages (collapses) a 3013 rack resulting in a loss of geometry resulting in a criticality and pressurized release **Location:** 3013 storage room **Causes:** Concrete spalling due to high stress, high loading, impact, unknown defect **Material At Risk:** One rack section – 120 3013 containers **Form:** Pu oxide/metal **Event Specific Assumptions:**		MOI – High WG1 – High WG2 – High WG3 - High Anticipated	• 3013outer container design • Storage Rack Design (structural integrity prevents collapse) • Building Structure (structural integrity of concrete walls and roof) • Storage Surveillance Program • Configuration Management Program (SSCs and II/I seismic interaction) • Structural Integrity Program [SF: Periodic verification of structural integrity and preventive/corrective actions as necessary] • Protective Cage above Rack [SF: Prevent anything from falling on Racks causing failure]		• CSSC Ventilation Normal Exhaust System • Emergency Preparedness Program (evacuation) • Procedures and Training Program • Radiological Protection Program [SF: CAM alarms method of detection] • 3013 Outer Container Design • Building Structure • NIMS • Storage Rack Design [SF: Material properties, capacity, and structural integrity will prevent its collapse] • Building Structure [SF: Structural integrity to hold up racks and prevent spalling]		**PC** – No **Programmatic**: • Configuration Management Program (SSCs and II/I seismic interaction) • Structural Integrity Program [SF: Periodic verification of structural integrity and preventive/ corrective actions as necessary] **Engineered:** **SC:** • 3013 Outer Container Design • Storage Rack Design [SF: Structural integrity will prevent its collapse] • Building Structure [SF: Structural integrity prevents spalling] **SS:** **WG1:** • Storage Rack Design [SF: Structural integrity will prevent its collapse] • Building Structure [SF: Structural integrity prevents spalling] **WG2:** • Storage Rack Design [SF: Structural integrity will prevent its collapse] • Building Structure [SF: Structural integrity prevents spalling]	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Criticality and release are prevented

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							WG3: • Storage Rack Design [SF: Structural integrity will prevent its collapse] • Building Structure [SF: Structural integrity prevents spalling]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-5 **Event Type:** E-3 **Event Description:** Radiological release during Bag In/Bag Out (Air Lock) Operations resulting in a contamination to the facility worker. **Location:** Ports (Air Locks) GB Maintenance Side Bag In/ Bag Out **Causes:** Airlock Contamination Air Reversal Loss of glovebox vacuum (ventilation) Transfer of contamination from PPE Torn Bag/Failure of Bag (Air Lock) Double door transfer device malfunction Mishandling of sample or waste causes release Operator Error Improper Bag In/Bag Out Technique Bad O-ring (Bad Seal on bag port or glove) Ripped Bag Improper Waste/Sample preparation Sharp edges on waste/ sample		MOI – Neg WG1 – Low WG2 – Neg WG3 - Neg Anticipated	• Radiation Protection Program (Contamination Control e.g., Double Bag, PPE, CAM) • Procedures and Training Program • Air Monitoring • Preventive Maintenance • Airlock Surveys and Periodic Decon		• CSSC Ventilation System • Radiological Protection Program (Contamination Control [e.g., Double Bag, PPE, CAM]) • Procedures and Training Program • Air Monitoring • Preventive Maintenance • Airlock Surveys and Periodic Decon		**PC** – N/A **Programmatic**: (Not required but listed to mitigate consequences to negligible) • Radiation Protection Program (Contamination Control e.g., Double Bag, PPE, CAM) **Engineered:** **SC:** None Required **SS:** None Required	MOI - Neg WG1 – Low WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
material **Material At Risk:** Residual Contamination of plutonium oxide **Form:** Pu oxide/metal **Event Specific Assumptions:** • Minor contamination event - clean up								

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-5A **Event Type:** E-3 **Event Description:** Loss of confinement from Glovebox or ventilation duct resulting in a contamination to the facility worker. **Location:** Glovebox Process Area **Causes:** Leaking glovebox Punctured/torn glove from Glovebox tools Mechanical/structural failure of glovebox, glovebox component, or ducting Carry over from spilled container Maintenance activity Operator error (e.g., misuse of tool, etc.) Breached Glove (Tear/Rip from a sharp tool) Failed Glove Glove breached during can removal operations due to sharp burr on lid Door on furnace is opened prematurely resulting in melting a glove and releasing material to the room Sharp edge of 3013 Inner can cuts operator		MOI – Neg WG1 – High WG2 – Mod WG3 - Low Anticipated	• Glovebox Pressure Boundary (glovebox and ducts)[SF: Structural integrity to maintain confinement] • Maintenance Program (HEPA Filter change out program, Preventive Maintenance) • Process Enclosure Integrity Program • Can Puncture Device (contains moving parts from impacting glovebox structure or damage to gloves) • 3013 Container/Can Cutter and burr remover • Furnace Design [SF: Outer skin temperature meets OSHA requirements and prevents damage to gloves]	• Differential Pressure Measurements/ Alarms • CAM Alarms • Operator detection	• Building Structure • CSSC Ventilation Normal Exhaust System • Glovebox Exhaust System [SF: Maintains negative pressure or inflow through a design basis breach of 125 fpm] • Radiological Protection Program (PPE, CAMs) • Procedures and Training Program • Housekeeping Programs (control of sharp objects, clear vision, etc.) • Interlocks to isolate the dry air supply to glovebox [SF: Prevents pressurization of the glovebox] • Emergency Preparedness Program (evacuation) • Radiological Protection Program (CAMs)		**PC** – N/A **Programmatic**: • Procedures and Training Program • Emergency Preparedness Program [SF: Evacuation of WG1] • Process Enclosure Integrity Program • Radiological Protection Program (CAMs) **Engineered** **SC:** None Required **SS:** **WG1:** • Glovebox Exhaust System [SF: Maintains negative pressure or inflow through a design basis breach of 125 fpm] • Interlocks to isolate the dry air supply to glovebox [SF: Prevents pressurization of the glovebox] • Glovebox Design (glovebox and ducts)[SF: Structural integrity to maintain confinement] **WG2:** (Not required but listed to mitigate consequences to negligible) • CSSC Ventilation Normal Exhaust System	MOI - Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Material At Risk: 5 kg Pu **Form:** Pu oxide/metal **Event Specific Assumptions:**							[SF: Maintain facility negative pressure] **WG3:** (Not required but listed to mitigate consequences to negligible) • CSSC Ventilation Normal Exhaust System [SF: Maintain facility negative pressure]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-8 **Event Type:** E-3 **Event Description:** Material is released from a pressurized 3013 container in the glovebox, resulting in a release into the room. (Note: This is a glovebox over pressurization event) **Location:** Glovebox Process Area **Causes:** Rapid depressurization during can puncturing **Material At Risk:** One 3013 container (4.4 kg Pu) and holdup (600 g Pu) **Form:** Pu oxide/metal **Event Specific Assumptions:**		MOI – Low WG1 – High WG2 – High WG3 - High Anticipated	• Can Puncture Device (vent restriction) • Glovebox Design (integrity) • Glovebox ventilation Design • Storage Surveillance Program; • Material Receipt and Shipping Program (3013 Process) • Procedures and Training Program • Process Enclosure Integrity (Glove Inspection) • Configuration Management Program	• Differential Pressure Measurements/ Alarms • CAM Alarms • Operator detection	• Can Puncture Device design • Glovebox Design • Glovebox Exhaust System maintains vacuum and airflow • Procedures and Training Program • Radiological Protection Program (PPE, Radiological Worker Training, CAM) • Storage Surveillance Program • Process Enclosure Integrity (Glove Inspection) • Emergency Preparedness Program (evacuation) • CSSC Ventilation Normal Exhaust System [SF: Maintain facility negative pressure]		**PC** – N/A **Programmatic:** • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Storage Surveillance Program • Material Receipt and Shipping Program (3013 Process) • Procedures and Training Program **Engineered:** **SC:** None Required **SS:** **WG1:** • Can Puncture Device [SF: Vent restriction] • Glovebox Design (integrity) • Glovebox Exhaust System [SF: Maintains negative pressure in glovebox] **WG2:** • CSSC Ventilation Normal Exhaust System [SF: Maintain facility negative pressure] **WG3:** • CSSC Ventilation	MOI - Neg WG1 – Neg WG2 – Neg WG3 – Neg SS ventilation credited as SS control for WG1 and WG2 and facility control for reducing the MOI consequences from Low to Neg.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							Normal Exhaust System [SF: Maintain facility negative pressure]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-9 **Event Type:** E-3 **Event Description:** Operator receives an uptake (Note: This is a skin puncture due to glovebox operations) **Location:** Glovebox Process Area **Causes:** Operator skin is penetrated by a puncture/ cutting tool Misuse of tool Tool Failure **Material At Risk:** Residual Contamination **Form:** Pu oxide/metal **Event Specific Assumptions:**		MOI – Neg WG1 – Low WG2 – Neg WG3 - Neg Anticipated	• Glovebox • Can Puncture Device • Cutting Tool • Process Enclosure Integrity (Glove Inspection) • Procedures and Training Program	• Operator detection	• Glovebox • Can Puncture Device • Cutting Tool • Process Enclosure Integrity (Glove Inspection) • Procedures and Training Program • Radiological Protection Program		**PC** – N/A **Programmatic**: Not required but listed to mitigate consequences to negligible • Procedures and Training Program • Radiological Protection Program (PPE) **Engineered:** **SC:** (None Required) **SS:** (None Required)	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-10 **Event Type:** E-3 **Event Description:** Glovebox over-pressurization results in material released to the room [Glovebox Air Reversal] **Location:** Glovebox Process Area **Causes:** High Pressure on Ventilation System High flow from Supply Fan Plugged Filters Discharge Line Blocked Exhaust Fan Failure Ventilation system upset/ malfunction Power failure causes a ventilation system outage Operator Error Maintenance Activity CO_2 Fire Suppression System **Material At Risk:** 5.0 kg Pu **Form:** Pu oxide/metal **Event Specific Assumptions:**		MOI – Neg WG1 – High WG2 – Mod WG3 - Low Anticipated	• Interlock to Supply fans [SF: Prevents over-pressurization of glovebox] • Glovebox Ventilation Design [SF: Automatic shutdown supply, opening diverter to atmosphere, and control valve modulation relative to CSSC ventilation] • Glovebox design [SF: Confinement] • Procedures and Training Program	• CAM Alarm • Operator Detection • Differential Pressure Measurements/ Alarms	• Glovebox (e.g., HEPA, gloves, exhaust path) • Radiological Protection Program (PPE, Radiological Worker Training, CAM) • Building Structure • CSSC Ventilation Normal Exhaust System • Glovebox Exhaust System [SF: Maintains negative pressure] • Procedures and Training Program • Interlock to isolate the dry air supply to the glovebox [SF: Prevents over-pressurization of the glovebox] • Emergency Preparedness Program (evacuation) • Low-Flow Ventilation Exhaust System (SF: provide ventilation upon loss of power to the normal ventilation exhaust system) • Interlocks (SF: shutdown normal supply and start low-flow exhaust) • Stand-by diesel generator [SF: Supply power to the low flow exhaust fans, Automatically supply power to low flow ventilation system upon loss of normal power] • HEPA Filter Program • CSSC Ventilation Normal Exhaust System • Nuclear Criticality Safety Program [SF: Limits the MAR in the glovebox room/glovebox to 5 kg]		**PC** – N/A **Programmatic**: • HEPA Filter Program (periodic glovebox HEPA filter replacement) • Procedures and Training Program (Periodic glove replacement/inspection) • Emergency Preparedness Program [SF: Evacuation for WG1] • Nuclear Criticality Safety Program ([SF: Limits the MAR in the glovebox room/glovebox to 5 kg] **Engineered:** **SC:** None Required **SS:** **WG1:** • Glovebox Differential Pressure Alarms [SF: Detects low differential pressure and sounds alarm] • Glovebox Exhaust System [SF: Maintains negative pressure in glovebox] • Interlocks to Supply fans [SF: Prevents over-pressurization of glovebox] • Glovebox Design (glovebox and ducts)[SF: Structural	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					• Glovebox Differential Pressure Alarms [SF: Detects low differential pressure and sounds alarm]		integrity to maintain confinement] • Interlock isolate the dry air supply to the glovebox [SF: Prevents over-pressurization of the glovebox] **WG2:** (Not required but listed to mitigate consequences to negligible) • CSSC Ventilation Normal Exhaust System Maintain CSSC facility differential pressure negative to atmosphere, mitigate releases] • Low-Flow Ventilation Exhaust System [SF: Maintain CSSC facility differential pressure negative to atmosphere, mitigate releases under accident conditions] **WG3:** (Not required but listed to mitigate consequences to negligible) • CSSC Ventilation Normal Exhaust System [SF: Maintain CSSC facility differential pressure negative to atmosphere, mitigate releases] • Low-flow ventilation exhaust system [SF: Maintain CSSC facility differential pressure negative to atmosphere, mitigate releases under accident conditions]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-16 **Event Type:** E-3 **Event Description:** Furnace malfunction results in a release of molten metal that breaches the glovebox confinement and causes a release. Note: This is a eutectic (metal) release. **Location:** Glovebox Area **Causes:** Furnace over temperature interlock fails AND Furnace controller fails AND Glovebox accidentally inerted **Material At Risk:** 4.4 kg metal **Form:** Pu metal **Event Specific Assumptions:** • This is not a credible event based on multiple failures and is not analyzed any further. • Normal glovebox and furnace operations are in		Beyond Extremely Unlikely						

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
air atmosphere								

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-11 **Event Type:** E-3 **Event Description:** Loss of confinement of LLW package **Location:** Anywhere LLW is authorized within CSSC and KAMS transport corridors. **Causes:** Mishandling of waste package Moving object hits waste package Improperly sealed package Operator Error **Material At Risk:** 0.5 g Pu **Form:** Pu oxide/metal **Event Specific Assumptions:** None		MOI – Neg WG1 – Low WG2 – Neg WG3 – Neg Anticipated	• Waste Management Program • Radiological Protection Program • Procedures and Training Program	Detection by operators CAM alarms	• Building design • CSSC Ventilation Normal Exhaust System • Waste Management Program • Radiological Protection Program • Procedures and Training Program • LLW container design (plastic bag) • Emergency Preparedness Program (evacuation)		**PC** – N/A **Programmatic:** (Not required but listed to mitigate consequences to negligible) • Radiological Protection Program (CAMs) • Emergency Preparedness Program [SF: WG1 evacuation] **Engineered:** **SC:** None required **SS:** None required	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-14 **Event Type:** E-3 **Event Description:** Loss of confinement of closed TRU waste drum(s) resulting in release **Location:** Anywhere TRU waste is authorized within CSSC and KAMS Transport corridors **Causes:** Radiolysis of moisture Mishandling of waste drums Impact of the waste drum with a stationary object or another drum during movement Accidental firearm discharge* Improperly sealed package **Material At Risk:** Two drums of TRU Waste (790 g Pu) **Form:** Pu oxide/metal **Event Specific Assumptions:**		MOI – Neg WG1 – High WG2 – Mod WG3 - Low Anticipated	• TRU Waste Drum Design or Drum Vent Design • Procedures and Training Program • Waste Management Program	• Detection by operators • CAM alarms	• Procedures and Training Program • Building Structure • CSSC Ventilation Normal Exhaust System • Emergency Preparedness Program (evacuation) • Radiological Protection Program [SF: CAM alarms method of detection] • Waste Management Program – Requires DOT- or OSA-qualified vented 55-gal and 5-gal drums – Limits material in waste drums		**PC** – N/A **Programmatic:** • Emergency Preparedness Program [SF: Evacuation of WG1] • Radiological Protection Program (CAMs) • Waste Management Program – Requires DOT 7A Type A or OSA-qualified vented 55-gal and 5-gal drums **Engineered:** **SC:** None Required **SS:** **WG1:** • Vented TRU Waste Drum Design [SF: Robustness of drum provides substantial confinement in credible impact events; vent design prevents pressure buildup] **WG2:** (Not required but listed to mitigate consequences to negligible) • Vented TRU Waste Drum Design [SF: Robustness of drum provides substantial confinement in credible impact events, vent design prevents pressure buildup]	MOI - Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							• CSSC Ventilation Normal Exhaust System Maintain CSSC facility differential pressure negative to atmosphere, mitigate releases] **WG3:** (Not required but listed to mitigate consequences to negligible) • Vented TRU Waste Drum Design [SF: Robustness of drum provides substantial confinement in credible impact events, vent design prevents pressure buildup] • CSSC Ventilation Normal Exhaust System Maintain CSSC facility differential pressure negative to atmosphere, mitigate releases]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-18 **Event Type:** E-3 **Event Description:** Puncture of a 3013 container due to firearm discharge **Location:** 3013 Storage Room, Packaging Area, Glovebox, NDA Room **Causes:** Accidental discharge of firearm Mechanical malfunction of firearm Operator error **Material At Risk:** One 3013 container (5.0 kg Pu oxide) **Form:** Pu oxide **Event Specific Assumptions:** None		MOI – Neg WG1 – High WG2 – High WG3 - Mod Anticipated	• Safeguards and Security Program	• Detection by operators • CAM alarms	• Building Structure • CSSC Ventilation Exhaust System • Emergency Preparedness Program (evacuation) • Procedures and Training Program (evacuation) • Shipping Container • 3013 Outer Container		**PC** – N/A **Programmatic:** • Safeguards and Security Program [SF: Prevent accidental discharge of firearm within the CSSC Project Area] **Engineered:** **SC:** None Required **SS:** None Required	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Event is prevented

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-39 **Event Type:** E-3 **Event Description:** Loss of confinement from a non-tested Inner Container results in a spill/contamination to the facility worker (newly welded) Note: This is a non-pressurized event. **Location:** Glovebox process area, packaging area **Causes:** Mechanical (seal) failure Operator error Ventilation failure causing plug ejection Maintenance (e.g., poor seal maintenance) Use wrong plug Helium over pressurizes stub causing stub to drop into room Improperly cut below weld Plug not seated properly Wrong can Can is dropped Leaking Inner Container (e.g., poor weld) Mishandling of Inner Container during initial filling with plutonium oxide Faulty Inner Container Contamination is located between welds, after welds are		MOI – Neg WG1 – High WG2 – Mod WG3 - Low Anticipated	• Procedures and Training Program • Bagless Transfer System design	• CAMs with sampling head in bagless transfer enclosure exhaust stream	• Glovebox Exhaust System • Radiological Protection Program (Contamination Control) - RCO contamination check) • Emergency Preparedness Program (evacuation) • Procedures and Training Program - weld inspections • Bagless Transfer Enclosure Design [SF: Provides protective airflow that sweeps contamination away from WG1] • CSSC Ventilation Normal Exhaust System Maintain CSSC facility differential pressure negative to atmosphere, mitigate releases]		**PC** – N/A **Programmatic:** • Radiological Protection Program (Contamination Control, PPE) • Procedures and Training Program (Proper welding of inner 3013 container) • Emergency Preparedness Program [SF: Evacuation of WG1] **Engineered:** **SC:** None required **SS:** **WG1:** • Glovebox Exhaust System • Bagless Transfer Enclosure Design [SF: Provides protective airflow that sweeps contamination away from WG1] **WG2:** (Not required but listed to mitigate consequences to negligible) • CSSC Ventilation Normal Exhaust System Maintain CSSC facility differential pressure negative to atmosphere, mitigate releases] **WG3:** (Not required but listed to mitigate	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
cut, operator becomes contaminated Operator does not swipe can prior to transport **Material At Risk:** One 3013 container (4.4 kg Pu) **Form:** Pu oxide/metal **Event Specific Assumptions:** None							consequences to negligible) • CSSC Ventilation Normal Exhaust System Maintain CSSC facility differential pressure negative to atmosphere, mitigate releases]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: PA-6 **Event Type:** E-4 **Event Description:** Direct radiation exposure from Digital Radiography equipment (i.e. x-ray). **Location:** Packaging Area **Causes:** Access to primary beam Failure to close door (door not closing) Incorrectly Loading can into Digital Radiography equipment Interlock failures Operator error Damage to shielding (impact, maintenance work) **Material At Risk:** N/A **Form:** N/A **Event Specific Assumptions:** None		MOI – Neg WG1 – Low WG2 – Neg WG3 – Neg Anticipated	• DR Equipment Design (shielding/ interlocks) • ANSI Standards used for design of DRE • Procedures and Training Program • Radiological Protection Program		• DR Equipment Design (shielding/ interlocks) • ANSI Standards used for design of DRE • Procedures and Training Program • Radiological Protection Program • Maintenance		**PC** – N/A **Programmatic:** None required **SC:** None required **SS:** None required **WG1:** • DR Equipment Design (commercially procured and maintained per ANSI Standards)	MOI – NA WG1 – Neg WG2 – Neg WG3 – Neg This is a Standard Industrial Hazard

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-X4 **Event Type:** E-4 **Event Description:** Excessive personnel radiation exposure during operations **Location:** All CSSC Project areas including transport corridors to KAMS **Causes:** Improperly characterized material/ containers (containers have more material or unknown contents) Excessive stay times in front of open shield doors Direct radiation exposure during set up or measurement operations (handling 3013 containers during NDA) Spent filter media or unit dropped or mishandled while being changed or serviced Improper storage or handling of TRU waste and LLW **Material At Risk:** Radiation from stored 1,920 3013s Holdup on HEPA filters TRU waste drums (4) LLW		MOI – Neg WG1 – Low WG2 – Neg WG3 – Neg Anticipated		• TLD, EPD	• Radiological Protection Program • ALARA • Shielding • Storage Room walls • Procedures and Training Program • HEPA Filter Design • Building Structure • Material Receipt and Shipping Program (3013 Process) • NDA Equipment shielding • Waste Management Program	• RDSR	**PC** – N/A **Programmatic:** None required **SC:** None required **SS:** None required	MOI – N/A WG1 – Low WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Form: Plutonium oxide **Event Specific Assumptions:** • Racks are provided with shielded doors • This bounds all credible direct radiation exposure events for the CSSC Project								

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-X5 **Event Type:** E-4 **Event Description:** Inadvertent excessive discharge of FM-200 results in overexposure to agent and serious injury/death. **Location:** CSSC Project Area **Causes:** Equipment failure, operator error, excessive dust, excessive air flow near smoke detector, induced current from lightning strike, smoke from external fire **Material At Risk:** N/A **Form:** N/A **Event Specific Assumptions:** • The FM-200 fire suppression systems are designed as two independent systems for each fire area. • The low-flow ventilation system is assumed to be operating during this event and extended FM-200 discharge ensures the minimum concentration required for extinguishing a fire is maintained. • A discharge from one FM-200 system will not cause injury due to agent	Loss of automatic fire suppression system availability.	MOI – Neg WG1 – High WG2 – Neg WG3 - Neg Unlikely	• Procedures and Training Program – Restrict operations during inclement weather with lightning potential – Restrict operations during external fire events. • Design of FM-200 systems to prevent exceeding a dump concentration in the affected room of 10.5%. • Lightning protection • Design of ventilation system to prevent excessive air flow near smoke detectors • Single set of FM-200 bottles with redundant activation capability.	• Operator detection • FM-200 system actuation alarms	• Time delay on agent discharge upon receipt of actuation signal for each train • Procedures and Training Program • Emergency Preparedness Program (evacuation) • Interlock to prevent of simultaneous discharge of second train (pressure switch or concentration monitor)	• AA. This is a bounding event for chemical exposure. • PFHA	**PC – N/A** **Programmatic:** • Emergency Preparedness Program [SF: Evacuation of WG1] **Engineered:** **SC:** None required. **SS:** **WG1:** • Design of FM-200 system (systems) to prevent exceeding a dump concentration in the affected room of 10.5% (Since SS control does not require a second system, control can be implemented by limiting capacity of FM-200 system.) **WG2:** None required. **WG3:** None required.	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
inhalation. • Overexposure to agent triggers an adrenaline rush (9% – 14%) and heart arrhythmia.								

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-X6 **Event Type:** E-4 **Event Description:** Fire results in excessive discharge of FM-200 resulting in overexposure to agent and serious injury/death. **Location**: CSSC Project Area. **Causes:** Fire within the facility **Material At Risk:** N/A **Form:** N/A **Event Specific Assumptions:** • The FM-200 fire suppression systems are designed as two independent systems for each fire area. • The low-flow ventilation system is assumed to be operating during this event and extended FM-200 discharge ensures the minimum concentration required for extinguishing a fire is maintained. • A discharge from one FM-200 system will not cause injury due to agent inhalation. • Overexposure to agent triggers an adrenaline rush (9% – 14%) and heart arrhythmia. • Agent decomposition due	Loss of automatic fire suppression system availability. Discharge of FM-200 in one fire area may cause agent discharge in other adjacent fire areas.	MOI – Neg WG1 – High WG2 – Neg WG3 - Neg Anticipated	• Design of FM-200 systems to prevent exceeding a dump concentration in the affected room of 10.5%. • Single set of FM-200 bottles with redundant activation capability.	• Operator detection • FM-200 system actuation alarms • Fire Detection and Alarm System	• Time delay on agent discharge upon receipt of actuation signal for each train • Procedures and Training Program • Emergency Preparedness Program (evacuation)	• AA. This is a bounding event for chemical exposure. • PFHA • FM-200 concentration calculations (min and max)	**PC – N/A** **Programmatic:** • Procedures and Training Program • Emergency Preparedness Program [SF: Evacuation of WG1] **Engineered:** **SC:** None required. **SS:** **WG1:** • Design of FM-200 systems to prevent exceeding a dump concentration in the affected room of 10.5%. **WG2:** • None required. **WG3:** • None required.	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
to fire/heat will not result in additional consequences.								

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-20 **Event Type:** E-4 **Event Description:** Process gas (liquid and gaseous nitrogen, P-10, CO_2, argon, argon with 2.5% hydrogen, helium) released into the process area resulting in asphyxiation. **Location:** Assembly process and handling room, CSSC Project Area (excluding storage room). **Causes:** Mechanical failure (corrosion, impacts, etc.), equipment failure (relief valve, etc.), operator error, liquid nitrogen spill **Material At Risk:** N/A **Form:** N/A **Event Specific Assumptions:** • Cryogenic hazard from handling liquid nitrogen is a Standard Industrial Hazard.	Loss of glovebox fire suppression system (CO_2) Loss of portal monitors (P-10) Loss of prompt gamma operability Loss of purge capability to CPD.	MOI – None WG1 – High WG2 – Neg WG3 - None Anticipated	• Design of gas delivery systems (design pressure, location of overpressure relief devices, pipe size) • Procedures and Training Program – Manual 8Q training – No manual actuation of CO_2 fire suppression at manifold (verses in room manual actuation) when glovebox room is occupied • Nitrogen Dewar design • Industrial Hygiene Program	• Operator detection • Fire Alarm System for CO_2 system discharge	• Emergency Preparedness Program (evacuation) • Room volume • Design of gas delivery systems (flow restriction, limit gas supply) • CSSC Normal (or low-flow) Exhaust System • Industrial Hygiene Program • Fire Alarm System for CO_2 system discharge • Glovebox design • Interlock to isolate the dry air supply to the glovebox [SF: Prevents over-pressurization of the glovebox] • Glovebox Exhaust System [SF: Maintains negative pressure in glovebox]	• Gas concentration calculations (max)	**PC – N/A** **Programmatic:** • Emergency Preparedness Program [SF: Evacuation of WG1] • Procedures and Training Program – No manual actuation of CO_2 fire suppression at manifold (verses in room manual actuation) when glovebox room is occupied **Engineered:** **SC:** None required **SS:** **WG1:** • Room volume (except CO_2 glovebox system) • Fire Alarm System for CO_2 system discharge • Glovebox Exhaust System [SF: Maintains negative pressure in glovebox] • Interlock to isolate the dry air supply to the glovebox [SF: Prevents over-pressurization of the glovebox] **WG2:** None required **WG3:** None required	MOI – None WG1 – Neg WG2 – Neg WG3 – None

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-14 **Event Type:** E-5 **Event Description:** Build up of plutonium oxide in the Glovebox Exhaust System (includes pre-filters if present) or Fan/Filter resulting in a criticality. **Location:** Glovebox Process Area **Causes:** Improper installation, missing or damaged GB HEPA filters resulting in gradual plutonium oxide buildup in ductwork or Fan/Filter Main HEPA Filter Hold up monitoring failure Excessive accumulation of fissile material. And moisture on HEPA Filter from leakage from external sources of water into ductwork or HEPA filters with excessive Pu buildup **Material At Risk:** Greater than safe mass of plutonium oxide **Form:** Pu oxide **Event Specific Assumptions:** • A dry criticality event in the ductwork or HEPA filter is precluded by the mass required to accumulate into a critical configuration.		MOI – Neg WG1 – High WG2 – Mod WG3 - Neg Unlikely	• Glovebox differential pressure gauges • Pre-Filters (prevents accumulation in downstream ductwork and HEPA Filter) • Testable GB HEPA Filters (prevents accumulation in downstream ductwork) • Nuclear Criticality Safety Program (Moderator Control Area) • Training and Procedures (Hold Up Monitoring) • HEPA Maintenance Program (HEPA change out) • Radiological Protection Program (surveys) • Nuclear Criticality Safety Program (Periodic surveys of exhaust system to prevent gradual accumulation in ducts and HEPA filters)	• NIMs	• Pre-Filters • Testable HEPA Filters • Glovebox Exhaust System • MC&A • HEPA Maintenance Program (HEPA change out) • Radiological Protection Program (surveys) • NIMs • Emergency Preparedness Program (Evacuation)	• NCSE	**PC** – N/A **Programmatic:** • Nuclear Criticality Safety Program (Moderator Control Area; periodic surveys of exhaust system to prevent gradual accumulation in ducts and HEPA filters) **SC**: None required **SS :** **WG1:** • Testable glovebox HEPA Filters [SF: Prevents accumulation in downstream ductwork] • NIMs [SF: To detect a criticality and activate alarm for evacuation within the 12 rad zone] **WG2:** (Not required but listed to mitigate consequences to negligible) • Testable GB HEPA Filters [SF: prevents accumulation in downstream ductwork] • NIMs [SF: To detect a criticality and activate alarm for evacuation within the 12 rad zone] **WG3:** None required	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-15 **Event Type:** E-5 **Event Description:** Criticality occurs resulting in personnel exposure when water gets into 3013 inner can in inner can welder **Location:** Glovebox Process Area **Causes:** Inner Container Welder cooling water system fails and gets into 3013 inner can Operator Error **Material At Risk:** 5.0 kg Pu (one 3013 plus holdup) **Form:** Pu oxide or metal **Event Specific Assumptions:**		MOI – Neg WG1 – High WG2 – Mod WG3 - Neg Unlikely Not a credible cause of a criticality accident. (a flooded 3013 inner container is subcritical with the maximum allowed Pu mass)	• Glovebox design • 3013 Inner Container Design [SF: Limits volume of water] • Inner Container Welder Cooling Water System with limited volume • Training and Procedures • Nuclear Criticality Safety Program [SF: limits the MAR including hold-up to 5 Kg Pu] • Configuration Management Program	• NIMS	• CSSC Ventilation Exhaust System • Training and Procedures • Nuclear Criticality Safety Program • Configuration Management Program • NIMs • Emergency Preparedness Program (Evacuation)		**PC** – N/A **Programmatic:** • Nuclear Criticality Safety Program [SF: Limits the MAR including hold-up to 5 Kg Pu] **SC**: None Required **SS:** **WG1:** • 3013 Inner Container Design [SF: Limited volume] **WG2:** (Not required but listed to mitigate consequences to negligible) • 3013 Inner Container Design [SF: Limited volume] **WG3:** None Required	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A This event is prevented.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-17 **Event Type:** E-5 **Event Description:** Pu overbatch inside glovebox with open containers results in a dry criticality. **Location:** Glovebox Process Area **Causes:** Operator Error **Material At Risk:** Two 3013 containers plus hold-up (9.4 Kg Pu) **Form:** Pu metal **Event Specific Assumptions:** • The Pu metal bounds oxide (it takes >27 kg Pu as oxide at half theoretical density before dry criticality is credible)		MOI – Neg WG1 – High WG2 – Mod WG3 - Neg Anticipated	• Training and Procedures • Status control • Glovebox design • Nuclear Criticality Safety Program (limits the MAR including hold-up to 5 Kg Pu)	• NIMs	• Emergency Preparedness Program (Evacuation) • Training and Procedures • Radiological Protection Program • NIMs • Nuclear Criticality Safety Program	• NCSE	**PC** – N/A **Programmatic:** • Training and Procedures [SF: procedures limit mass and location of fissile material in project area] • Nuclear Criticality Safety Program [SF: Limits the MAR including hold-up to 5 Kg Pu] **SC**: None required **SS:** **WG1:** None Available **WG2:** None Required **WG3:** None Required	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A This event is prevented.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: GB-17A **Event Type:** E-5 **Event Description:** Introduction of sufficient moderator inside the glovebox results in a criticality. **Location:** Glovebox Process Area **Causes:** Operator Error **Material At Risk:** One 3013 container plus hold-up (5.0 Kg Pu) **Form:** Pu Oxide or metal **Event Specific Assumptions:**		MOI – Neg WG1 – High WG2 – Mod WG3 - Neg Unlikely	• Training and Procedures • Glovebox design (no sumps or places for water to collect, prevents water from entering glovebox) • Nuclear Criticality Safety Program (limits the MAR including hold-up to 5 Kg Pu, limits moderator) • Non-Water-Based Fire Suppression System (glovebox and room) • Fire Response Plan [SF: No water-based suppression agents allowed for firefighting]	• NIMs	• Emergency Preparedness Program (Evacuation) • Training and Procedures • Radiological Protection Program • NIMs • Nuclear Criticality Safety Program	• NCSE	**PC – N/A** **Programmatic:** • Training and Procedures • Nuclear Criticality Safety Program [SF: Limits the MAR including hold-up to 5 Kg Pu, limits moderator] • Fire Response Plan [SF: No water-based suppression agents allowed for firefighting] **SC:** None required **SS :** **WG1:** • Non-Water-Based Fire Suppression System (glovebox and room) **WG2:** (Not required but listed to mitigate consequences to negligible) • Non-Water-Based Fire Suppression System (glovebox and room) **WG3:** None Required	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A This event is prevented.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-25 **Event Type:** E-5 **Event Description:** Operator error results in a criticality from inadvertent assembly of Pu-bearing containers (Note: Potential pressurized release) **Location**: CSSC Project Area **Causes:** Operator error Un-characterized material Improperly characterized material Loss of Spacing Unsafe geometry Accumulation of containers **Material At Risk:** Combination of 3013s, waste drums, sources, standards and samples **Form:** Pu oxide or Metal **Event Specific Assumptions:**		MOI – Low WG1 – High WG2 – High WG3 - High Anticipated (Pressurized release from criticality is extremely unlikely)	• • Waste Drum Storage Rack • Training and Procedures (fissile material handling training, procedures limit mass and location of fissile material in project area) • Nuclear Criticality Safety Program (mass and interaction) - Qualified positions provide spacing for interaction control • Shipping Container Qualification and Storage Surveillance Program • 3013 Outer Container Design • Vented TRU Waste Drum Design • Gas and Oxide Sample Vial Design • Waste Control Program (limits material in waste containers)	• NIMs	• Emergency Preparedness Program (Evacuation) • Training and Procedures • Radiological Protection Program • NIMs • Nuclear Criticality Safety Program	• NCSE	**PC** – N/A **Programmatic:** • Training and Procedures (fissile material handling training, procedures limit mass and location of fissile material in project area) • Nuclear Criticality Safety Program (mass and interaction) - Qualified positions provide spacing for interaction control • Waste Control Program [SF: Limits material in waste containers] • Shipping Container Qualification and Storage Surveillance Program (SF: Identification of compromised containers prior to use.) **Engineered:** **SC**: None required **SS:** **WG1:** • Waste Drum Storage Rack (SF: Prevents tipping of TRU waste drums.) • 3013 Inner/Outer Container Design (SF: Prevents criticality by controlling geometry.) • Vented TRU Waste Drum Design (SF:	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A This event is prevented.

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
			• Check Standard/Source and Annual Calibration Standard Containers Design [SF: Prevents criticality by controlling volume.]				Prevents criticality by controlling spacing between content of multiple drums.) • Gas and Oxide Sample Vial Design (SF: Prevents criticality by controlling volume.) • Check Standard/Source and Annual Calibration Standard Containers Design [SF: Prevents criticality by controlling volume.] **WG2:** • Waste Drum Storage Rack • 3013 Outer Container Design • Vented TRU Waste Drum Design • Gas and Oxide Sample Vial Design • Check Standard/Source and Annual Calibration Standard Container Design **WG3:** • Waste Drum Storage Rack • 3013 Outer Container Design • Vented TRU Waste Drum Design • Gas and OxideSample Vial Design • Check Standard/Source and Annual Calibration Standard Container	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							Design	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-26 **Event Type:** E-5 **Event Description:** Criticality due to moderation and reflection of too many Pu containers (Note: criticalities in sealed containers have the potential to result in a pressurized release.) **Location**: CSSC Project Area **Causes:** Moderation/reflection of Pu **Material At Risk:** Multiple containers of Pu **Form:** Pu metal and/or oxide **Event Specific Assumptions:**		MOI – Low WG1 – High WG2 – High WG3 – High Unlikely (Pressurized release from criticality is extremely unlikely)	• 9975 Shipping Container • 3013 Outer Container Design • 3013 inner container design • Container Qualification Program • Training and Procedures • Waste Management Program • CSSC project area has no significant sources of moderator • Equipment (minimize water cooling / pooling) • Floor Drains external to CSSC to limit depth of water in CSSC to 2” • Flat Floors with no Sumps or Drains • Nuclear Criticality Safety Program – limits the MAR – limits moderator – qualified	• NIMs	• Shipping Containers/ Waste containers • Building structure • Emergency Preparedness Program (evacuation) • Radiological protection program • Training and Procedures • NIMs	• NCSE	**PC** – N/A **Programmatic:** • Nuclear Criticality Safety Program – limits moderator – TSR mode controls – qualified positions) • Fire response plan [SF: no water-based suppression agents allowed for firefighting] • Training and Procedures – Material Handler **Engineered:** **SC**: None required **SS:** **WG1:** • Non-Water-Based Fire Suppression System • 3013 Outer Container design (SF: spacing) **WG2:** • Non-Water-Based Fire Suppression System • 3013 Outer Container Design (SF: spacing) • **WG3:** • Non-Water-Based Fire Suppression System • 3013 Outer Container design (SF: spacing)	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A This event is prevented

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
			positions • Non-water-based fire suppression system (glovebox and room) • Fire response plan (no water-based suppression agents allowed for firefighting)					

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-27 **Event Type:** E-6/E-7 **Event Description:** Loss of normal power results in release from CSSC. **Location:** All Project Areas **Causes:** Loss of power caused by external events (fire, vehicle impact, aircraft crash, etc.) or inclement weather (e.g., lightning, rain, ice, high winds) **Material At Risk:** Glovebox inventory including holdup (5.0 kg Pu) **Form:** Pu oxide/metal **Event Specific Assumptions:** • Materials in closed containers will not be released as a result of loss of power.		MOI – Neg WG1 – High WG2 – Neg WG3 - Neg Anticipated	• Site Power Grid (provides multiple feeds) • Preventative Maintenance	• Operator detection	• Fire Protection Program (Emergency lighting, exit signs, egress path) • Procedures and Training Program • Radiological Protection Program (PPE) • CSSC Low-Flow Ventilation System • Stand-by diesel generator and diesel tank [Automatically supply power to low flow ventilation system upon loss of normal power] • Glovebox Design • Emergency Preparedness Program (evacuation)	None	**PC** – N/A **Programmatic:** • Radiological Protection Program (PPE) **Engineered:** **SC:** None required **SS:** **WG1:** • Glovebox Design [SF: Contains the MAR sufficient time to allow facility worker to safely evacuate] **WG2:** None required **WG3:** None required	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-27A **Event Type:** E-6 **Event Description:** Small aircraft impact into CSSC results in the release of material. **Location:** All CSSC Project Areas **Causes:** Small aircraft or helicopter crash **Material At Risk:** Entire CSSC inventory **Form:** Pu oxide/metal **Event Specific Assumptions:** • The impact would be followed by a fuel fire	• Impact/fire could lead to loss of geometry resulting in a criticality and pressurized release. • Impact/fire could lead to loss of SC or SS systems (e.g., fire suppressio n, ventilation, HEPAs)	MOI – High WG1 – High WG2 – High WG3 - High Extremely Unlikely	• Helicopter flight path restrictions in vicinity of KAC (basis for BEU) • Small Building Footprint (including footprint of ductwork mounted on the building), limited area of externally-exposed walls (Note: This control is limited to the footprint of the building and SSCs mounted to the building exterior. It does not affect the functional classification of individual SSCs.)	• Operator detection • Fire Detection and Alarm System	• CSSC Building Structure (walls and roof are concrete and provide 3-hour fire barriers) • 3013 outer container design • Storage Rack Design • Procedures and Training Program • Glovebox Design • Emergency Preparedness Program (evacuation) • CSSC Normal and Low-flow ventilation exhaust systems • Fire Suppression System • Interlocks to close dampers in the affected area and close normal ventilation supply and exhaust isolation valves in the unaffected areas [SF: To support the function of the suppression system by maintaining agent concentration]	• Frequency Calc (Hearn to provide) • Structural analysis to show the exterior facility walls will withstand impact	**PC – N/A** **Programmatic:** • Helicopter flight path restrictions in vicinity of KAC (basis for BEU) **Engineered:** **SC:** • Small Building Footprint (including footprint of ductwork mounted on the building), limited area of externally-exposed walls (Note: This control is limited to the footprint of the building and SSCs mounted to the building exterior. It does not affect the functional classification of individual SSCs.) • CSSC Building Structure Exterior Walls/Ceiling [SF: Capable of withstanding impact] **SS:** **WG1:** • Small Building Footprint (including footprint of ductwork mounted on the building), limited area of externally-exposed walls (Note: This control is limited to the footprint of the building and SSCs mounted to the building exterior. It does not affect the	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Mitigated frequency of a small aircraft crash into KAC is Beyond Extremely Unlikely

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							functional classification of individual SSCs.) • CSSC Building Structure Exterior Walls/Ceiling [SF: Capable of withstanding impact] **WG2:** • Small Building Footprint (including footprint of ductwork mounted on the building), limited area of externally-exposed walls (Note: This control is limited to the footprint of the building and SSCs mounted to the building exterior. It does not affect the functional classification of individual SSCs.) • CSSC Building Structure Exterior Walls/Ceiling [SF: Capable of withstanding impact] **WG3:** • Small Building Footprint (including footprint of ductwork mounted on the building), limited area of externally-exposed walls (Note: This control is limited to the footprint of the building and SSCs mounted to the building exterior. It does not affect the functional classification	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							of individual SSCs.) • CSSC Building Structure Exterior Walls/Ceiling [SF: Capable of withstanding impact]	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-27B **Event Type:** E-6 **Event Description:** Small aircraft impact into CSSC Fan/Filter Building or Ductwork (outside KAC) results in the release of material. **Location:** CSSC Fan/Filter Building or Ductwork (outside KAC) **Causes:** Small aircraft or helicopter crash **Material At Risk:** HEPA filter and ductwork holdup, glovebox inventory **Form:** Pu oxide/metal **Event Specific Assumptions:** • The impact would be followed by a fuel fire • Small footprint, limited area of externally-exposed walls • The ductwork design outside the KAC footprint prevents aircraft fuel from entering KAC. • Main HEPA filters are not loaded with material from a prior event.	• Impact could allow fire to enter CSSC Project Area (KAC) through the ventilation ductwork. • Impact/fire could lead to loss of SS systems (e.g., ventilation, HEPAs) • Air-flow reversal in CSSC Project Area	MOI – Neg WG1 (located near GB) – High WG1a (located in filter/fan bldg) - High WG2 – Neg WG3 - Neg Extremely Unlikely	• Helicopter flight path restrictions in vicinity of KAC	• Operator detection • Fire Detection and Alarm System • Ventilation System differential pressure alarm	• Building Structure (walls and roof are concrete and provide 3-hour fire barriers) • 3013 outer container design • Procedures and Training Program • Glovebox Design • Emergency Preparedness Program (evacuation) • Fire Suppression System [add interlocks etc.] • Tornado Dampers • Fire Dampers • Ductwork will be periodically surveyed for hold-up. • HEPA Filter Program • Interlocks to shutdown the dry air supply to the glovebox • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Limits the MAR in the glovebox room/glovebox to 5 kg – Periodic assessment to verify that the hold-up in the glovebox is less than what was analyzed – Periodic surveys of exhaust system to prevent gradual accumulation in ducts and CSSC HEPA filters • The ductwork design outside the KAC footprint prevents spilled fuel from entering KAC • Fan/Filter Building Fire	Revise Frequency Calc to include Filter/Fan Bldg.	**PC – N/A** **Programmatic (WG1a):** • HEPA Filter Program • Emergency Preparedness Program [SF: Evacuation of WG1 and WG1a] • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Limits the MAR in the glovebox room/glovebox to 5 kg – Periodic assessment to verify that the hold-up in the glovebox is less than what was analyzed – Periodic surveys of exhaust system to prevent gradual accumulation in ducts and CSSC HEPA filters **Engineered:** **SC:** None required **SS:**	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					Detection and Suppression Systems [SF: Initiates local fire alarm notifying Fan/Filter Building personnel to evacuate].		**WG1** (located near GB)**:** • The ductwork design outside the KAC footprint prevents spilled fuel from entering KAC • Glovebox Design [SF: Contains the MAR sufficient time to allow facility worker to safely evacuate] **WG1a (located in Fan/Filter bldg):** • Fan/Filter Building Fire Detection and Suppression Systems [SF: Initiates local fire alarm notifying Fan/Filter Building personnel to evacuate]. • Testable glovebox HEPA Filters [SF: Prevents accumulation in downstream ductwork] **WG2:** None required **WG3:** None required	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-27C **Event Type:** E-6 **Event Description:** Large aircraft impact into CSSC results in the release of material. **Location: All Project Areas** **Causes:** Large aircraft crash **Material At Risk:** Entire CSSC inventory **Form:** Pu oxide/metal **Event Specific Assumptions:** • Due to the small footprint and limited area of externally-exposed walls, this event is Beyond Extremely Unlikely	• Impact/fire could lead to loss of geometry resulting in a criticality and pressurized release. • Impact/fire could lead to loss of SC or SS systems (e.g., fire suppression, ventilation, HEPAs)	MOI – High WG1 – High WG2 – High WG3 - High Beyond Extremely Unlikely	N/A	N/A	N/A	Frequency Calc (Hearn to provide)	N/A	MOI – N/A WG1 – N/A WG2 – N/A WG3 – N/A Unmitigated frequency of a large aircraft crash into KAC is Beyond Extremely Unlikely

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-27E **Event Type:** E-6 **Event Description:** Vehicle impact into CSSC Fan/Filter Building results in the release of material. **Location:** Fan/Filter Building and Ductwork (outside KAC) **Causes:** Vehicle crash **Material At Risk:** HEPA filter and ductwork holdup, glovebox inventory and holdup (5 kg Pu) **Form:** Pu oxide/metal **Event Specific Assumptions:** • The impact would be followed by a fuel fire • The ductwork design outside the KAC footprint prevents vehicle fuel from entering KAC. • Main HEPA filters are not loaded with material from a prior event.	• Impact/fire could lead to loss of SS systems (e.g., ventilation, HEPAs) • Air-flow reversal in CSSC Project Area	MOI – Neg WG1 (located near GB) – High WG1a (located in filter/fan bldg) - High WG2 – Neg WG3 - Neg Anticipated	• Procedures and Training Program – Speed Limits – Limited vehicular traffic	• Operator Detection	• Ductwork will be periodically surveyed for hold-up. • HEPA Filter Program • 3013 outer container design • Glovebox Design • Vehicle barriers (Jersey Bouncers, bollards, etc.) • KAC Building Structure (CSSC walls are concrete and provide 3-hour fire barriers) • Procedures and Training Program • Glovebox Design • Emergency Preparedness Program (evacuation) • Fire Suppression System [interlocks, etc.] • Tornado Dampers • Fire Damper • Interlocks to shutdown the dry air supply to the glovebox • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Limits the MAR in the glovebox room/glovebox to 5 kg – Periodic assessment to verify that the hold-up in the glovebox is less than what was analyzed – Periodic surveys of exhaust system to prevent gradual accumulation in ducts and CSSC HEPA filters • The ductwork design outside the KAC footprint prevents	None	**PC – N/A** **Programmatic:** • HEPA Filter Program • Emergency Preparedness Program [SF: Evacuation of WG1 And WG1a] • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Limits the MAR in the glovebox room/glovebox to 5 kg – Periodic assessment to verify that the hold-up in the glovebox is less than what was analyzed – Periodic surveys of exhaust system to prevent gradual accumulation in ducts and CSSC HEPA filters **Engineered:** **SC:** None required **SS:** **WG1** (located near GB)**:** • The ductwork design outside the KAC footprint prevents spilled fuel from entering KAC	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					spilled fuel from entering KAC • Fan/Filter Building Fire Detection and Suppression Systems (SF: Initiates local fire alarm notifying Fan/Filter Building personnel to evacuate).		• Glovebox Design [SF: Contains the MAR sufficient time to allow facility worker to safely evacuate] **WG1a (located in Fan/Filter bldg):** • Fan/Filter Building Fire Detection and Suppression Systems (SF: Initiates local fire alarm notifying Fan/Filter Building personnel to evacuate). **WG2:** None required **WG3:** None required	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-28 **Event Type:** E-6/E-7 **Event Description:** External flooding releases contamination **Location:** Anywhere containers may be present **Causes:** External flooding Heavy rains **Material At Risk:** Residual contamination (containers are sealed) **Form:** Pu oxide/metal **Event Specific Assumptions:** • Assembly area basement drains • KAC is not in a regional flood zone • Water cannot flood the glovebox • No significant sources of water within CSSC.		MOI – Neg WG1 – Neg WG2 – Neg WG3 - Neg Beyond Extremely Unlikely	N/A	N/A	N/A	N/A	**PC** – N/A **Programmatic:** None required **Engineered:** **SC:** None required **SS:** None required	MOI - N/A WG1 – N/A WG2 – N/A WG3 – N/A

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-28A **Event Type:** E-7 **Event Description:** High winds/tornado winds impact the CSSC Facility resulting in a release of radioactive material **Location:** Entire CSSC Facility, Fan/Filter Building, Stack **Causes:** High winds, tornadoes, down bursts **Material At Risk:** HEPA filter and ductwork holdup, glovebox inventory and holdup (5 kg Pu) **Form:** Pu oxide/metal **Event Specific Assumptions:** • KAC Building design is assumed to be able to maintain its structural integrity during any credible wind event • Stack far enough away from the KAC such that it will not impact KAC. • The Building Structure (PC-3 qualified for tornado/high-winds) will prevent material in closed containers from being released. • Main HEPA filters are not	• Impact from flying debris could lead to loss of SS systems (e.g., ventilation, HEPAs) • Air-flow reversal in CSSC Project Area • Stack failure results in damage to Fan/Filter Building	MOI – Neg WG1 – High WG2 – High WG3 - Mod Anticipated	None	• Operator detection • Ventilation System differential pressure alarm	• Building Structure (CSSC walls and roof are PC-3 for tornado/high winds) • Tornado Dampers (Supply & Exhaust Ducts at the wall boundary that is PC-3 qualified for tornado/high winds) • Ductwork will be periodically surveyed for hold-up. • HEPA Filter Program • Glovebox Design • 3013 Outer Container Design • Interlocks to shutdown the dry air supply to the glovebox • Emergency Preparedness Program (evacuation) • Procedures and Training Program • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Limits the MAR in the glovebox room/glovebox to 5 kg – Periodic assessment to verify that the hold-up in the glovebox is less than what was analyzed – Periodic surveys of exhaust system to prevent gradual accumulation in ducts and CSSC HEPA filters	N/A	**Programmatic:** • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2]) • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Limits the MAR in the glovebox room/glovebox to 5 kg – Periodic assessment to verify that the hold-up in the glovebox is less than what was analyzed – Periodic surveys of exhaust system to prevent gradual accumulation in ducts and CSSC HEPA filters **Engineered:** **SC:** None required **SS:** **WG1:** • Glovebox Design [SF: Contains the MAR sufficient time to allow facility worker to safely evacuate]	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
loaded with material from a prior event. – Ductwork will be periodically surveyed for hold-up. – HEPA Filter Program							• Interlocks to isolate the dry air supply to the glovebox [SF: Prevents over-pressurization of the glovebox] • Building Structure (CSSC walls and roof are PC-3 for tornado/High Winds) [SF: Protects material in CSSC from tornados/High Winds and missiles] • Tornado Dampers (Supply & Exhaust Ducts at the wall boundary that is PC-3 qualified for tornado/high winds) **WG2:** • Building Structure (CSSC walls and roof are PC-3 for tornado/High Winds) [SF: Protects material in CSSC from tornados/High Winds and missiles] • Tornado Dampers (Supply & Exhaust Ducts at the wall boundary that is PC-3 qualified for tornado/high wind) • Glovebox Design • Interlocks to isolate the dry air supply to the glovebox **WG3:** (Not required but	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							listed to mitigate consequences to negligible) • Building Structure (CSSC walls and roof are PC-3 for tornado/High Winds) [SF: Protects material in CSSC from tornados/High Winds and missiles] • Tornado Dampers (Supply & Exhaust Ducts at the wall boundary that is PC-3 qualified for tornado/high winds) • Glovebox Design • Interlocks to isolate the dry air supply to the glovebox	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-28C **Event Type:** E-7 **Event Description:** Snow, ice, freezing temperatures impact CSSC Ventilation System resulting in a release of radioactive material **Location:** Fan\Filter Building and ductwork outside KAC, Building Structure **Causes:** Snow, ice, freezing temperatures **Material At Risk:** HEPA filter and ductwork holdup, glovebox inventory and holdup (5 kg Pu) **Form:** Pu oxide/metal **Event Specific Assumptions:** • CSSC building structures (including Fan/Filter building and ductwork) are qualified as PC-2 for snow loading per IBC.	• Air-flow reversal in CSSC Project Area • Failure of ductwork could lead to loss of SS systems (e.g., ventilation, HEPAs) • Failure of stand-by diesel generator • Loss of normal power (covered in Event COM-27)	MOI – Neg. WG1 – High WG2 – Neg WG3 - Neg Anticipated		• Operator detection	• Freeze Protection Program • Procedures and Training Program • Radiological Protection Program • CSSC Low-Flow Ventilation System • Stand-by diesel generator and diesel tank [Automatically supply power to low flow ventilation system upon loss of normal power] • Glovebox Design • Emergency Preparedness Program (evacuation) • Nuclear Criticality Safety Program [SF: Establishes the requirements to have an SNM inventory control program] – Limits the MAR in the glovebox room/glovebox to 5 kg – Periodic assessment to verify that the hold-up in the glovebox is less than what was analyzed – Periodic surveys of exhaust system to prevent gradual accumulation in ducts and CSSC HEPA filters • CSSC building structures are qualified as PC-2 for snow loading per IBC. • Fan/Filter Building and ductwork are qualified as PC-2 for snow loading per IBC (Note: If ventilation components exterior to CSSC can be credited as PC-2 for	N/A	PC– yes – PC2 for snow/ice loading **Programmatic:** • Freeze Protection Program **Engineered:** **SC:** None required **SS:** **WG1:** • CSSC building structures are qualified as PC-2 for snow loading per IBC. • Fan/Filter Building and ductwork are qualified as PC-2 for snow loading per IBC (Note: If ventilation components exterior to CSSC can be credited as PC-2 for snow, the Fan/Filter Building would probably not need to be credited.) **WG2:** None required **WG3:** None required	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					snow, the Fan/Filter Building would probably not need to be credited.)			

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-28D **Event Type:** E-7 **Event Description:** Lightning strikes the CSSC project area and results in a release of radioactive material **Location:** **Causes:** Lightning strike Spalling Structural damage Loss of power **Material At Risk:** **Form:** Pu oxide/metal **Event Specific Assumptions:** • Fire caused by lightening is evaluated in previous fire events. • Lightning striking equipment containing material (furnace, can cutter, glovebox, can puncture device, etc.) will not release material.		MOI – Neg. WG1 – Mod WG2 – Low WG3 - Low Unlikely		• Operator detection	• Structural Integrity Program [SF: Periodic verification of structural integrity and preventive/ corrective actions as necessary ensure that falling objects from structural failures do not challenge the integrity of the SNM containers] • Emergency Preparedness Program (evacuation	N/A	PC – N/A **Programmatic:** (Not required but listed to mitigate consequences to negligible) • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] **Engineered:** **SC:** None required **SS:** WG1: None required WG2: None required WG3: None required	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-28E **Event Type:** E-7/E-5 **Event Description:** Seismic event collapses the CSSC Project Area Structure, Fan/Filter Building, ductwork (outside) and stack resulting in a criticality and pressurized release of radioactive material **Location:** CSSC Project Area Structure, Fan/Filter Building, ductwork (outside) and stack **Causes:** Design basis seismic event (10-4) **Material At Risk:** Full facility inventory **Form:** Pu oxide/metal **Event Specific Assumptions:** • Gas bottles are outside the CSSC Project area and will not interact with material within CSSC during seismic events. • FM-200 and CO_2 bottles are located on the mezzanine level (no MAR) and are seismically restrained.	• Full facility fire • Loss of normal power • Loss of support and safety systems • Criticality with energetic release	MOI – High WG1 – High WG2 – High WG3 - High Unlikely	None	• Operator detection	• CSSC Building Structure (confinement, structural integrity, supports SC systems) • Storage room structure (walls and roof are PC-3 seismic) • 3013 Storage Racks including shield doors [SF: structural integrity, maintains 3013 spacing] • Glovebox Design [SF: Contains the MAR sufficient time to allow facility worker to safely evacuate, supports that are qualified as PC-3 seismic prevent tipping etc.] • Glovebox Exhaust System • CSSC Ventilation Normal System (also support GB ventilation system) • CSSC Low-Flow Ventilation System • Fire Detection and Suppression System (PC-3 qualified for seismic events) • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, prevents propagation of fire to/from other areas, maintains PC-3 seismic structural integrity] • Interlock to isolate the dry air supply to the glovebox [SF: Prevents over-pressurization of the glovebox]	Loss of cooling to Storage Room calculation Asphyxiation calculation (all gases simultaneously released) 2/1 Analysis of Equipment in CSSC Project Area (in areas that have material or safety systems) Evaluate other items in glovebox for potential breach during seismic event Seismic analysis/qualification of storage racks, building structure and shield doors to perform intended safety	PC– yes – PC3 for seismic **Programmatic:** • Structural Integrity Program • Emergency Preparedness Program [SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • HEPA Filter Program • Fire Protection Program (Emergency lighting, exit signs, egress path) • Storage Surveillance Program • Nuclear Criticality Safety Program – Limits MAR per container – Moderator controls – Material only in qualified positions – Ductwork will be periodically surveyed for hold-up • Configuration Management Program • Procedures and Training Program • Waste Management Program [SF: Limits MAR] **Engineered:** **SC:** • CSSC Building	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					• Interlocks to isolate ventilation supply (redundant dampers) if exhaust fans are not operating [SF: Prevents pressurization of facility] • 3013 Outer Container Design • Fire Protection Program (Emergency lighting, exit signs, egress path) • Emergency Preparedness Program (evacuation) • Radiological Protection Program • Procedures and Training Program • Standby Diesel [Automatically supply power to low flow ventilation system upon loss of normal power] • All gas bottles are seismically restrained when in use. • FM-200 and CO_2 bottles are seismically restrained. • CO_2 gas delivery system is designed and installed PC-3 seismic. • CPD design [SF: Mounting is PC-2 qualified for seismic events] • Furnace design [SF: Mounting is PC-2 qualified for seismic events] • Can cutter design [SF: Mounting is PC-2 qualified for seismic events] • Interlocks to shutdown supply fans if exhaust fans are not operating [SF: Prevents pressurization of facility] • Boral Plating	function	Structure (CSSC and Storage Room walls and roof are PC-3 for seismic events) [SF: Maintain structural integrity] • 3013 Storage Racks [SF: structural integrity, maintain 3013 spacing] • 3013 Outer Container Design [SF: Maintain integrity] • Boral Plating [SF: Seismically mounted to wall to ensure that it will not damage storage racks and will remain in place to maintain rack below ksafe] **SS:** **WG1:** • Building Structure (CSSC and Storage Room walls and roof are PC-3 for seismic events) [SF: Maintain structural integrity] • 3013 Storage Racks (structural integrity, maintain 3013 spacing) • 3013 Outer Container Design [SF: Maintain integrity] • Boral Plating [SF: Seismically mounted to wall to ensure that it will not damage storage racks and will remain in place to maintain rack below ksafe] • Waste Drum Storage	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					• Storage Surveillance Program • Nuclear Criticality Safety Program – Limits MAR per container – Sub-critical design of storage racks – Moderator controls – Material only in qualified positions – Ductwork will be periodically surveyed for hold-up • Waste Management Program (limit Mar) • Waste Drum Storage Rack Design • NIMs • HEPA Filter Program • Configuration Management Program • Design of FM-200 systems to prevent exceeding a dump concentration in the affected room of 10.5%. • Stack will not fail in a manner to damage the ventilation system or block the exhaust path (PC-3-seismic) • Structural Integrity Program		Rack Design • Glovebox Design [SF: Provides time for evacuation, supports that are PC-3 qualified for seismic events prevent tipping etc.] • Interlock to isolate the dry air supply to the glovebox [SF: Prevents over-pressurization of the glovebox] • FM-200 and CO2 bottles are seismically restrained. • CO2 gas delivery system is designed and installed PC-3 seismic up to the actuation valve. • Design of FM-200 systems to prevent exceeding a dump concentration in the affected room of 10.5%. • CPD design [SF: Mounting is PC-2 qualified for seismic events] • Furnace design [SF: Mounting is PC-2 qualified for seismic events] • Can cutter design [SF: Mounting is PC-2 qualified for seismic events] • NIMs [SF: To detect a criticality and activate alarm for evacuation within the 12 rad zone] **WG2:**	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							• Building Structure (CSSC and Storage Room walls and roof are PC-3 for seismic Events) [SF: Maintain structural integrity] • 3013 Storage Racks (structural integrity, maintain 3013 spacing) • 3013 Outer Container Design [SF: Maintain integrity] • Boral Plating [SF: Seismically mounted to wall to ensure that it will not damage storage racks and will remain in place to maintain rack below ksafe] • Waste Drum Storage Rack Design • CSSC Ventilation Normal System [SF: Provides confinement] • CSSC Low-Flow Ventilation System [SF: Provides active confinement] • Interlocks to isolate ventilation supply (redundant dampers) if exhaust fans are not operating [SF: Prevents pressurization of facility] • NIMs [SF: To detect a criticality and activate alarm for evacuation within the 12 rad zone] • Stack will not fail in a manner to damage the ventilation system or	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							block the exhaust path (PC-3-seismic) **WG3:** • Building Structure (CSSC and Storage Room walls and roof are PC-3 for seismic events) [SF: Maintain structural integrity] • 3013 Storage Racks (structural integrity, maintain 3013 spacing) • 3013 Outer Container Design [SF: Maintain integrity] • Boral Plating [SF: Seismically mounted to wall to ensure that it will not damage storage racks and will remain in place to maintain rack below ksafe] • Waste Drum Storage Rack Design • CSSC Ventilation Normal System [SF: Provides confinement] • CSSC Low-Flow Ventilation System [SF: Provides active confinement] • Interlocks to isolate ventilation supply (redundant dampers) if exhaust fans are not operating [SF: Prevents pressurization of facility] • Stack will not fail in a manner to damage the ventilation system or block the exhaust path	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							(PC-3-seismic)	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
Event Number: COM-28F **Event Type:** E-7 **Event Description:** Seismic event initiates fire in multiple CSSC Project Areas **Location:** CSSC Project Area including Fan/Filter Building **Causes:** Design basis seismic event **Material At Risk:** Total facility inventory – 1,920 3013 containers plus TRU waste, standards, sources, and hold-up **Form:** Pu oxide/metal **Event Specific Assumptions:** • A fire in the storage room will not challenge the shield doors (see event RS-2). This event will add seismic controls. • The mezzanine will not have a fire that releases hazardous material (no MAR). • The fire suppression system will prevent fires from becoming a large room fire capable of propagating through a fire barrier into another area (see event COM-5).	• Loss of normal power • Loss of support and safety systems • Criticality with energetic release	MOI – High WG1 – High WG2 – High WG3 - High Extremely Unlikely	• Fire Protection Program- MOI, WG1, WG2, WG3 – Combustible Control Program [SF: Limits size, intensity, duration, and location of fire, prevents Deep Seated fire] – Hot Work Controls – Fire rated Storage Room walls and heat resistant shield door material with metal cladding – Flame impingement controls for each Qualified Position – Qualified Positions [SF: Qualified positions are required to maintain impingement controls	• Operator detection • Fire Detection and Alarm System	• CSSC Building Structure [SF: Confinement, structural integrity, supports SC systems] • 3013 Storage Racks [SF: Structural integrity, maintain 3013 spacing] • Glovebox Design (provides time for evacuation, supports that are PC-3 qualified for seismic events prevent tipping etc.) • Glovebox Exhaust System • CSSC Ventilation Normal System (also support GB ventilation system) • CSSC Low-Flow Ventilation System • CSSC Fire Detection and Alarm System [SF: To detect fire and initiate fire suppression system] (PC-3 Seismic) • CSSC Non-water-based Fire Suppression System [SF: Extinguish any fire, prevents propagation to room fire] (PC-3 Seismic) • 3013 Outer Container Design – SF: provides sufficient delay to allow fire suppression to activate and put out fire and prevent breach of container] • Fire Protection Program – Emergency lighting, exit signs, egress path – Combustible Control Program [SF: Limits	Loss of cooling to Storage Room calculation Asphyxiation calculation (all gases simultaneously released) 2/1 Analysis of Equipment in CSSC Project Area (in areas that have material or safety systems) Standoff calculation PFHA AA. This is a DBA. Evaluate other items in glovebox for potential breach during seismic	**PC**– yes – PC3 for seismic events **Programmatic:** • Fire Protection Program- MOI, WG1, WG2, WG3 - Emergency lighting, exit signs, egress path (code compliant mounting is PC-2 qualified for seismic events) – Combustible Control Program [SF: Limits size, intensity, duration, and location of fire, prevents Deep Seated fire] – Hot Work Controls – Standoff controls [SF: Prevent the isolated fire from propagating to the shield doors (prevents overheating of shield doors HDPE to the point of ignition and prevents the breach of 3013 containers or the Annual Calibration Standards)] – Flame impingement controls for each Qualified Position – Qualified Positions	MOI – Neg WG1 – Neg WG2 – Neg WG3 – Neg

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
• The Fan/Filter Building is qualified 2/1 to protect the ventilation system. • All equipment in the Fan/Filter Building is PC-3 seismic [SF: Equipment will not initiate a fire due to seismic event] • The CSSC Fire Suppression System terminates postulated fires before generation of significant soot capable of blinding the HEPA filters			during seismic events and subsequent fire] • Procedures and Training Program – Fire watch trained – Material handler trained – Hot work controls • NFPA compliant installation of electrical devices • Shipping Container Design (contains Celotex™) [SF: Prevents release of 3013 in approved shipping container]		size, intensity, duration, and location of fire, prevents Deep Seated fire] – Standoff controls [SF: Prevent the isolated fire from propagating to the shield doors (prevents overheating of shield doors HDPE to the point of ignition and prevents the breach of 3013 containers or the Annual Calibration Standards)] • Emergency Preparedness Program (evacuation) • Radiological Protection Program • Procedures and Training Program • Standby Electrical Power System [SF: Automatically supply power to low flow ventilation system upon loss of normal power] • All gas bottles are seismically restrained when in use. • FM-200 and CO_2 bottles are seismically restrained. • CO_2 gas delivery system is designed and installed PC-3 seismic up to the actuation valve. • CSSC Fire Suppression System • CSSC Fire Area Boundaries (walls, floor, dampers, ceiling, doors, etc) [SF: Maintains gaseous agent concentration over time, prevents propagation of fire to/from other areas, maintains	event Fire detection system actuates in multiple zones to isolate all ventilation. This will defeat credited active ventilation. Spacing between low flow ventilation system components. Evaluate post-seismic fire induced loss of all ventilation.	[SF: Qualified positions are required to maintain impingement controls during seismic events and subsequent fire] • Emergency Preparedness Program ([SF: Evacuation for WG1; shelter or remain indoors for WG2, WG3] • Fire Response Plan (no water-based suppression agents allowed for firefighting) • Procedures and Training Program – Fire watch trained – Material handler trained – Hot work controls • Radiological Protection Program • Structural Integrity Program • HEPA Filter Program • Nuclear Criticality Safety Program (Ductwork will be periodically surveyed for hold-up) **Engineered:** **SC:** • CSSC Fire Area Boundaries (walls, floor, ceiling, doors, all penetration seals including expansion joint, etc) [SF: External	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					structural integrity] • Interlock to isolate the dry air supply to the glovebox [SF: Prevents over-pressurization of the glovebox] • Interlocks to isolate ventilation supply (redundant dampers) if exhaust fans are not operating [SF: Prevents pressurization of facility] • Configuration Management Program – TRU Waste Storage Rack Design ▪ Radiant heat barrier – Automatic electrical shunt • Shipping Container Qualification and Storage Surveillance Program • CPD design [SF: Mounting is PC-2 qualified for seismic events] • Furnace design [SF: Mounting is PC-2 qualified for seismic events] • Can cutter design [SF: Mounting is PC-2 qualified for seismic events] • Fan/Filter Building Fire Suppression System (PC-2 seismic) • Nuclear Criticality Safety Program – Ductwork will be periodically surveyed for hold-up • Fire Response Plan (no water-based suppression agents allowed for firefighting) • Shield Door Design [SF:		3 hr. boundaries (external and storage room) prevent propagation from other areas into CSSC] • CSSC Building Structure (CSSC walls and roof are PC-3 for seismic events) [SF: Maintain structural integrity] • 3013 Storage Racks [SF: structural integrity, maintain 3013 spacing] • 3013 Container Design [SF: Maintains integrity] • Shield Door Design [SF: Structural integrity, maintains stand-off distance before, during and after a seismic event] **SS:** **WG1:** • CSSC Building Structure (CSSC walls and roof are PC-3 for seismic events) [SF: Maintain structural integrity] • 3013 Storage Racks [SF: Structural integrity, maintain 3013 spacing] • 3013 Outer Container Design [Maintains integrity] • Glovebox Design [SF: Construction that is PC-2 qualified for seismic events provides time for	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
					Structural integrity, maintains stand-off distance before, during and after a seismic event] • Design of FM-200 systems to prevent exceeding a dump concentration in the affected room of 10.5% • Fan/Filter Building and Ductwork (PC-2 seismic) [SF: Maintains structural integrity. Will not adversely impact the operability of the ventilation system.] (Note: If ventilation components exterior to CSSC can be credited as PC-2 seismic, the Fan/Filter Building would probably not need to be credited.) • Stack will not fail in a manner to damage the ventilation system or block the exhaust path (PC-3-seismic)		evacuation, PC-3 seismic supports prevents tipping] • Interlocks to isolate the dry air supply to the glovebox [SF: Prevents over-pressurization of the glovebox] • FM-200 and CO2 bottles are seismically restrained. • CO2 gas delivery system is designed and installed PC-3 seismic up to the actuation valve. • Design of FM-200 systems to prevent exceeding a dump concentration in the affected room of 10.5% • CPD design [SF: Mounting is PC-2 qualified for seismic events] • Furnace design [SF: Mounting is PC-2 qualified for seismic events] • Can cutter design [SF: Mounting is PC-2 qualified for seismic events] **WG2:** • CSSC Building Structure (CSSC walls and roof are PC-3 for seismic events) [SF: Maintain structural integrity, confinement with airlocks] • CSSC Ventilation	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							Normal System [SF: Provides confinement] • CSSC Low-Flow Ventilation System [SF: Provides active confinement] • Standby Electrical Power System [SF: Automatically supplies power to low flow ventilation system upon loss of normal power] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Non-water-based Fire Suppression System [SF: Extinguish any fire, prevents propagation to room fire] • Fan/Filter Building Fire Suppression System (PC-2 seismic) [SF: Protects Low Flow Ventilation System from seismically induced building fire] • Fan/Filter Building and Ductwork (PC-2 seismic) [SF: Maintains structural integrity. Will not adversely impact the operability of the ventilation system.] (Note: If the Fan/Filter Building is not constructed the ventilation system is PC-3 seismic.) • 3013 Storage Racks	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							[SF: Structural integrity, maintain 3013 spacing] • Shield Door Design [SF: Structural integrity, maintain stand-off distance during and after a seismic event] • 3013 Outer Container Design [SF: Maintain integrity] • Interlocks to isolate ventilation supply (redundant dampers) if exhaust fans are not operating [SF: Prevents pressurization of facility] • Stack will not fail in a manner to damage the ventilation system or block the exhaust path (PC-3-seismic) **WG3:** • CSSC Building Structure (CSSC walls and roof are PC-3 for seismic Events) [SF: Maintain structural integrity, confinement with airlocks] • CSSC Ventilation Normal System [SF: Provides passive confinement] • CSSC Low-Flow Ventilation System [SF: Provides active confinement] • 3013 Storage Racks [SF: Structural integrity,	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							maintain 3013 spacing] • Shield Door Design [SF: Structural integrity [to maintain stand-off distance during and after a seismic event] • 3013 Outer Container Design [SF: Maintain integrity] • Interlocks to isolate ventilation supply (redundant dampers) if exhaust fans are not operating [SF: Prevents pressurization of facility] • Standby Electrical Power System [SF: Automatically supply power to low flow ventilation system upon loss of normal power] • CSSC Fire Detection and Alarm System [SF: Detects fire, activates fire suppression, and initiates transition to low flow ventilation] • CSSC Non-water-based Fire Suppression System [SF: Extinguish any fire, prevents propagation to room fire] • Fan/Filter Building Fire Suppression System (PC-2 seismic) [SF: Protects Low Flow Ventilation System from seismically induced fire] • Fan/Filter Building and Ductwork (PC-2 seismic) [SF: Maintains	

Unmitigated Event Description, Causes, Event Specific Assumptions	Unmitigated Impact on Systems	Unmitigated Consequences and Initiating Event Frequency	Preventive Features (Design and Administrative)	Method of Detection	Mitigative Features (Design and Administrative)	Planned Analysis	Credited SSCs and Administrative Controls (SC, SS Function including Basis, Safety Function and Requirements, Performance Category)	Mitigated Consequences
							structural integrity. Will not adversely impact the operability of the ventilation system.] (Note: If ventilation components exterior to CSSC can be credited as PC-2 seismic, the Fan/Filter Building would probably not need to be credited.) • Stack will not fail in a manner to damage the ventilation system or block the exhaust path (PC3-seismic)	

Table A-2 Frequency Evaluation Levels

Acronym	Description	Frequency Level ($year^{-1}$)
A	Anticipated, Expected	$f \geq 10^{-2}$/yr.
U	Unlikely	$10^{-4} \leq f < 10^{-2}$/yr.
EU	Extremely Unlikely	$10^{-6} \leq f < 10^{-4}$/yr.
BEU	Beyond Extremely Unlikely	$f < 10^{-6}$/yr.

Table A-3 Consequence Evaluation Levels for Hazard Receptors

Consequence Level (Abbreviation)		Offsite Receptor	Facility Worker	Co-Located Worker
High (H)	Radiological	C > 25 REM	Prompt worker fatality, significant radiological exposure, serious injury that is immediately life threatening or permanently disabling; C ≥ 100 REM Or Radiological material quantity exceeds Hazard Category 3 threshold (per DOE-STD-1027)	Prompt worker fatality, significant radiological exposure, serious injury that is immediately life threatening or permanently disabling Or C≥ 100 REM
	Chemical	C ≥ ERPG-2	Prompt worker fatality, significant chemical exposure, serious injury that is immediately life threatening or permanently disabling Or Uniform distribution of total release C ≥ ERPG-3	Prompt worker fatality, significant radiological exposure, serious injury that is immediately life threatening or permanently disabling Or C ≥ ERPG-3 Or ≥ 29 CFR 1910.119 TQ released
Moderate (M)	Radiological	5.0 ≤ C < 25 REM	Serious injury, no immediate loss of life, no permanent disabilities, hospitalization required Or 25 ≤ C < 100 REM	Serious injury, no immediate loss of life, no permanent disabilities, hospitalization required Or 25 ≤ C < 100 REM
	Chemical	ERPG-1 ≤ C < ERPG-2	Serious injury, no immediate loss of life, no permanent disabilities, hospitalization required Or Uniform distribution of total release ERPG-2 ≤ C < ERPG-3	Serious injury, no immediate loss of life, no permanent disabilities, hospitalization required Or ERPG-2 ≤ C < ERPG-3
Low (L)	Radiological	0.5 ≤ C < 5.0 REM	Minor injuries, no hospitalization Or 5.0 ≤ C < 25 REM	Minor injuries, no hospitalization Or 5.0 ≤ C < 25 REM
	Chemical	PEL-TWA ≤ C < ERPG-1	Minor injuries, no hospitalization Or Uniform distribution of total release ERPG-1 ≤ C < ERPG-2	Minor injuries, no hospitalization Or ERPG-1 ≤ C < ERPG-2
Negligible (N)	All	< Low	< Low	< Low

Table A-4 Controls Selection Criteria Matrix – Public, Co-located and Facility Worker

Frequency / Consequence	Beyond Extremely Unlikely (f < 10-6/yr)	Extremely Unlikely (10-6 ≤ f < 10-4/yr)	Unlikely (10-4 ≤ f < 10-2/yr)	Anticipated (f ≥ 10-2/yr)
**High	*C/A3	A2	A1	A1
Moderate	C	B	B	B
Low	C	B	B	B
Negligible	C	C	C	C

A1

Region A1

Region A1. Unmitigated events falling in Region "A1" due to radiological release require controls (SC for the public and SS for workers), and are highly recommended for additional Levels of Control for all receptors per Ref. 17. Unmitigated events falling in Region "A1," due to chemical release, require SS controls and highly recommended for additional Levels of Control per Ref. 17. The desired result is that the mitigated consequence is moved well into the B region, and possibly the "C" region or the event is prevented.**

A2

Region A2

Region A2. Unmitigated events falling in Region "A2" due to radiological release require controls (SC for the public and SS for workers), and are recommended for additional Levels of Control for all receptors per Ref. 17. Unmitigated events falling in Region "A2," due to chemical release, require SS controls and recommended for additional Levels of Control per Ref. 17. The desired result is that the mitigated consequence is moved well into the B region, and possibly the "C" region or the event is prevented.**.

A3

Region A3

Region A3. Unmitigated events falling in Region "A3" due to radiological release require controls (SC for the public and SS for workers), and are considered for additional Levels of Control for CW or public per Ref. 17. Unmitigated events falling in Region "A3," due to chemical release, require SS controls and consideration for additional Levels of Control per Ref. 17. The desired result is that the mitigated consequence is moved well into the B region, and possibly the "C" region or the event is prevented.**

B

Region B

Events falling in Region "B" require Facility Controls. The desired result is that the mitigated combination of consequence and frequency is moved toward, and possibly into, the "C" region.

C

Region C

Events falling in Region "C" are not considered for controls. However, there may be events in this region that require the addition of Facility Controls because the frequency is higher than desired, the occurrence of the uncontrolled event is unacceptable to management in any event, or the uncontrolled event is unacceptable for programmatic or political reasons.

* Process related internal events that are not covered by NPH or External Events are assumed to be credible events, regardless of frequency, and fall into the Region A's. Credible external man-made events with a frequency of <10-6/yr as conservatively estimated, or <10-7/yr as realistically estimated fall into Region C. NPH events are evaluated at the frequency specified by DOE-STD-1020.

**When a preventive control strategy is selected for unmitigated events falling in Region A1, A2 or A3, there is not an absolute requirement to make the mitigated event BEU. If the control strategy meets all the engineering requirements for its classification [SC for public (radiological) and SS for public (chemical) or workers], it is acceptable even if the event frequency is not BEU. The mitigated event is considered to be in Region B. The desired result is that the mitigated consequence is moved well into the B region, and possibly the "C" region by the addition of Facility Controls.

APPENDIX B

Safety Function Tables

Table B-1. Safety Class Building Structure Controls

Control	Safety Function	Credited Features	Event	
			Number	Type
CSSC Building and Storage Room Structure-Perimeter Walls, and Roof	**SC**: Maintain structural integrity. Capable of withstanding impact	**SC**: • PC-3 NPH structural integrity sufficient to hold 3013 storage racks and prevent spalling • Walls and roof are qualified as PC-3 NPH	**SC**: RS-4, RS-10, COM-27A, COM-28E, COM-28F	**SC**: E3, E5, E7
	SS: Maintain structural integrity. Supports operation of ventilation system as part of the confinement system. Capable of withstanding impact	**SS**: **WG1**: • Qualified as PC-2 for snow loading per IBC **WG2, WG3**: • Supports ventilation system in maintaining differential pressure during facility fire events **WG1, WG2, WG3**: • PC-3 structural integrity sufficient to hold 3013 storage racks and prevent spalling • PC-3 construction provides confinement of material during seismic and high wind/tornado events • PC-3 construction provides protection of SSCs within the facilities during seismic and high wind/tornado events	**SS**: PA-2B, PA-2F, PA-3,PA-3A, GB-1, GB-1D, GB-1E, COM-28C, RS-4, RS-10, COM-27A, COM-28A, COM-28E, COM-28F	**SS**: E1, E3, E5, E7
CSSC Fire Area Boundaries (Walls, Ceiling, Floors, Doors, All Penetration Seals Including	**SC**: Exterior and Storage Room fire area boundaries prevent external fire and fire from other interior areas from propagating into the CSSC Storage Area.	**SC**: • Exterior and Storage Room walls, ceilings, floors, doors and penetration seals are 3-hour fire barriers to propagation of fires into CSSC and into the Storage Room • Maintains structural integrity	**SC**: RS-2, RS-2A, COM-3, COM-28F, COM-5	**SC**: E1, E6, E7

Control	Safety Function	Credited Features	Event	
			Number	Type
Expansion Joints, etc.)	**SS**: Maintains gaseous agent concentration over time, interior fire area boundaries prevent fires from propagating to other areas in the CSSC, and maintains structural integrity.	**SS**: **WG1, WG2, WG3**: • Exterior and Storage Room walls, ceilings, floors, doors and penetration seals are 3-hour fire barriers to propagation of fires into CSSC and into the Storage Room **WG2, WG3**: • The remaining interior fire area boundaries are 2-hour fire barriers • Boundaries support the ventilation system by limiting supply and exhaust ventilation to design basis	**SS**: PA-2, PA-2B, PA-2F, PA-3, PA-3A, RS-1, RS-1A, RS-2, RS-2A, RS-11, GB-1, GB-1C, GB-1D, GB-1E, GB-2, NDA-1, NDA-2, COM-3, COM-5, COM-29, COM-28F	**SS**: E1, E6, E7
Small Building Footprint (Including Footprint of Ductwork Mounted on Building)	**SC**: Minimize event frequency to Beyond Extremely Unlikely	**SC**: • Limited area of externally-exposed walls. (Note: This control is limited to the footprint of the building and SSCs mounted to the building exterior. It does not affect the functional classification of individual SSCs.)	**SC**: COM-27A	**SC**: E6
	SS: Minimize event frequency to Beyond Extremely Unlikely	**SS:** **WG1, WG2, WG3** • Limited area of externally-exposed walls. (Note: This control is limited to the footprint of the building and SSCs mounted to the building exterior. It does not affect the functional classification of individual SSCs.)	**SS**: COM-27A	**SS**: E6

Table B-2. Safety Class Container Controls

Control	Safety Function	Credited Features	Event	
			Number	Type
3013 Outer Container Design	**SC**: In conjunction with combustible controls and flame impingement/standoff controls, maintains confinement during any credible fire event in the Storage Room. Ability to withstand fall from the storage rack and credible impacts without losing confinement.	**SC**: • Robust, noncombustible design provides a confinement function during – fire events in the Storage Room, and – impact events (falling light fixtures, bumping into other containers, fall off the rack, etc.) involving multiple containers.	**SC**: RS-2, RS-2A, COM-5, RS-10, COM-28E, COM-28F	**SC**: E1, E3, E5, E7
	SS: The outer 3013 container confines the MAR while the worker evacuates. In conjunction with combustible controls and flame impingement controls, provides a sufficient delay to allow fire suppression to activate, put out fire, and prevent breach of container. Ability to withstand impact without losing confinement. Prevents criticality by controlling geometry/spacing.	**SS:** **WG1**: • In conjunction with the combustible controls and flame impingement controls, the closed noncombustible container provides a confinement function during fire events giving sufficient time to allow WG1 to evacuate. **WG2, WG3**: • Robust, noncombustible design provides a confinement function during – fire events, and – impact events such as drops, falling light fixtures, bumping into other containers, falling off the transport cart. **WG1, WG2, WG3**: • Prevents criticality by controlling geometry/spacing • Sufficiently robust to maintain confinement during impact events, such as drops, falling light fixtures, bumping into other containers, falling off the transport cart.	**SS**: PA-2, PA-3, PA-3A, RS-1, RS-2, RS-2A, RS-11, GB-1C, GB-2, COM-5, NDA-1, NDA-2, COM-29, COM-42, COM-X1, COM-X2, COM-28E, COM-28F, COM-25, COM-26	**SS**: E1, E2, E3, E5, E7

Table B-3. Safety Class Controls on Storage Equipment

Control	Safety Function	Credited Features	Event	
			Number	Type
3013 Storage Racks	**SC**: Noncombustible storage racks. Capacity, material properties, and design provide structural integrity that prevents collapse of storage rack and maintains 3013 spacing.	**SC**: • PC-3 seismic noncombustible design that protects the geometry (spacing) necessary to prevent a criticality. Maintains 3013 spacing to prevent a criticality in an impact event (RS-10), seismic event (COM-28E) and a seismic event that initiates a fire (COM-28F). • Material properties, capacity, and structural integrity will prevent its collapse	**SC**: RS-1B, RS-2, RS-2A, RS-4, RS-10, COM-28E, COM-28F	**SC**: E1, E3, E5, E7
	SS: Noncombustible storage racks. Capacity, material properties, and design provide structural integrity that prevents collapse of storage rack and maintains 3013 spacing.	**SS for WG1, WG2, WG3**: • PC-3 seismic noncombustible design that protects the geometry (spacing) necessary to prevent a criticality. • Material properties, capacity, and structural integrity will prevent its collapse	**SS**: RS-2, RS-2A, RS-11, RS-4, RS-10, COM-28E, COM-28F	**SS**: E1, E3, E5, E7
Shield Door	**SC**: Heat resistant material capable of maintaining stand-off distance during and after a seismic event	**SC**: • Characteristics of the shield door material are consistent with the storage rack standoff calculation. • Shield door mounting holds shield door in place during a design basis seismic event.	**SC**: RS-2, RS-2A, COM-28F	**SC**: E1, E7
	SS: Heat resistant material capable of maintaining stand-off distance during and after a seismic event	**SS for WG2, WG3**: • Characteristics of the shield door material are consistent with the storage rack standoff calculation. • Shield door mounting holds shield door in place during a design basis seismic event.	**SS**: RS-2, RS-2A, RS11, COM-28F	**SS**: E1, E7

Control	Safety Function	Credited Features	Event	
			Number	Type
Boral Plating	**SC**: In a seismic event, does not damage 3013 storage racks, and remains in place to maintain rack configuration below ksafe.	**SC**: • A borated aluminum (boral) sheet with a minimum thickness of 0.25 inches will be attached to the walls of the Storage Room behind the 3013 container storage racks. The sheet will have a composition such that for the life of the CSSC Facility, the boral sheet will maintain a boron content of at least 2%, at least 95% of which is to be boron-10. This sheet will serve as a slow neutron attenuator to aid in criticality control. • Installed PC-3 seismic such that plates will not damage the 3013 storage racks during a seismic event	**SC**: COM-28E	**SC**: E7
	SS: In a seismic event, does not damage 3013 storage racks, and remains in place to maintain rack configuration below ksafe.	**SS for WG1, WG2, WG3**: • A borated aluminum (boral) sheet with a minimum thickness of 0.25 inches will be attached to the walls of the Storage Room behind the 3013 container storage racks. The sheet will have a composition such that for the life of the CSSC Facility, the boral sheet will maintain a boron content of at least 2%, at least 95% of which is to be boron-10. This sheet will serve as a slow neutron attenuator to aid in criticality control. • Installed PC-3 seismic such that plates will not damage the 3013 storage racks during a seismic event.	**SS**: COM-28E	**SS**: E7

Table B-4. Safety Significant Building Structure and Standby Power Controls

Control	Safety Function	Credited Features	Event	
			Number	Type
Fan/Filter Building Structure-Perimeter Walls, Roof, and Ductwork	Maintains structural integrity. Will not adversely impact the operability of the ventilation system. If the Fan/Filter Building is not constructed, the ventilation system performs this safety function.	**WG1**: • Qualified as PC-2 for snow loading. **WG2, WG3**: • Slab is qualified as PC-3 seismic for mounting equipment.	COM-28C, COM-28F	E7
Room Volume	Removes the possibility of asphyxiation from all process gases other than CO_2 (i.e., nitrogen, P-10, helium, argon, and argon with hydrogen).	**WG1**: • Room volume is sufficient to dilute these potential asphyxiants to concentrations that do not pose a potential for asphyxiation.	COM-20	E4
Standby Electrical Power System	Automatically supplies power to low flow ventilation system upon loss of normal power.	**WG2, WG3**: • Upon loss of normal electrical power, standby diesel supplies power.	COM-28F	E7

Table B-5. Safety Significant Container Controls

Control	Safety Function	Credited Features	Event	
			Number	Type
3013 Inner Container Design	Provides sufficient delay between fire initiation and container breach to allow evacuation. Ability to withstand impact without losing confinement.	**WG1**: • Constructed of noncombustible material and sufficiently robust such that, in conjunction with combustible controls and flame impingement controls, will contain pressurized materials long enough for personnel to evacuate	PA2B, PA-3, PA-3A, GB-1D, GB-2, COM-5, COM-29, GB-15, COM-25, COM-X1, COM-X2	E1, E3, E5, E7

Control	Safety Function	Credited Features	Event	
			Number	Type
		• Sufficiently robust to withstand impact without losing confinement. **WG1, WG2**: • Prevents criticality by controlling geometry.		
Annual Calibration Standard Container Design	Material inside container will not generate sufficient flammable gases to support a deflagration. Provides sufficient delay between fire initiation and container breach to allow evacuation. Prevents criticality by controlling volume. Sufficiently robust to withstand impacts.	**WG1, WG2, WG3**: • Standards cannot create a flammable atmosphere. **WG1**: • Constructed of noncombustible material sufficiently robust to contain pressurized materials long enough for personnel to evacuate • Limited volume prevents critical mass • Provides confinement during impacts.	PA-2F, PA-3, PA-3A, RS-1A, RS-2, COM-5, NDA-1, NDA-2, COM-42, COM-25, COM-X1, COM-X2	E1, E2, E3, E5
Check Standard/Source Container Design (Note: If primary container cannot meet requirement for providing confinement during impact, standards will be stored and transported in a SS secondary container or transport cart.)	Material inside container will not generate sufficient flammable gases to support a deflagration. Provides sufficient delay between fire initiation and container breach to allow evacuation. Sufficiently robust to withstand impacts. Prevents criticality by controlling volume.	**WG1, WG2, WG3**: • Standards cannot create a flammable atmosphere. **WG1**: • Constructed of noncombustible material sufficiently robust to contain pressurized materials long enough for personnel to evacuate • Limited volume prevents critical mass • Provides containment during impacts.	PA-2F, PA-3, PA-3A, RS-1A, RS-2, COM-5, NDA-1, NDA-2, COM-42, COM-25, COM-X1, COM-X2	E1, E2, E3, E5
Gas Sample Vial Design	Provide sufficient delay between fire initiation and container breach to allow evacuation. Physical configuration prevents detonations.	**WG1**: • Constructed of noncombustible material sufficiently robust to contain pressurized materials long enough	PA-3, PA-3A, GB-1E, COM-5, COM-41,	E1, E2, E3,

Control	Safety Function	Credited Features	Event	
			Number	Type
	Sufficiently robust to withstand deflagration. Sufficiently robust to withstand impacts. Prevents criticality by controlling volume.	for personnel to evacuate • Maintain confinement during deflagration • Provides confinement during impacts. **WG1, WG2, WG3**: • Provides containment during deflagration • Prevents detonation • Limited volume of sample vial.	COM-25, COM-X1, COM-X2	E5
Oxide Sample Vial Design	Provide sufficient delay between fire initiation and container breach to allow evacuation. Physical configuration prevents detonations. Sufficiently robust to withstand deflagration. Sufficiently robust to withstand impacts. Prevent criticality.	**WG1**: • Constructed of noncombustible material sufficiently robust to contain pressurized materials long enough for personnel to evacuate • Maintain confinement during deflagration • Provides confinement during impacts. **WG1, WG2, WG3**: • Provides containment during deflagration • Prevents detonation • Limited volume of sample vial.	PA-3, PA-3A, GB-1E, COM-5, COM-41, COM-25, COM-X1, COM-X2	E1, E2, E3, E5
Shipping Container Design	Fire resistant and prevents release.	**WG1, WG2, WG3**: • Provides containment during fire.	HALL-1, PA-1	E1
Vented 55-gal and 5-gal Drum Design (DOT or OSA qualification meets requirement for SS)	Provides sufficient delay between fire initiation and container breach to allow safe evacuation. Robustness of drum provides substantial confinement in credible impact events. Vent design prevents flammable gas buildup. Prevents criticality by controlling spacing between content of multiple assayed drums.	**WG1, WG2**: • DOT 7A Type A closed container constructed of noncombustible material sufficiently robust to contain pressurized materials long enough for personnel to evacuate. **WG1, WG2, WG3**: • Vented drums that meet DOT 7A Type A specifications. Prevents criticality by controlling spacing between content of multiple assayed drums.	HALL-2, PA-2D, PA-2E, PA-3, PA-3A, GB-1E, GB-2, COM-5, NDA-1, NDA-2, COM-40, COM-14, COM-25	E1, E2, E3, E5

Table B-6. Safety Significant Fire Protection System Controls

Control	Safety Function	Credited Features	Event	
			Number	Type
Glovebox CO_2 Fire Suppression Gas Delivery System	During a seismic event, CO_2 gas delivery system does not cause loss of glovebox confinement and does not release CO_2 into inhabited areas. Moderator is not used as fire suppression material. CO_2 bottles are restrained.	**WG1**: • Designed and installed PC-3 seismic up to the actuation valve. • Introduction of fire suppression material does not introduce a water-based material that could act as a moderator.	COM-28E, COM-28F	E7
CSSC Fire Detection and Alarm System	Detects fire, activates fire suppression and evacuation alarm, and initiates transition to low flow ventilation.	**WG1**: • Personnel receive evacuation alarm. **WG2, WG3**: Upon detection of fire, system • Closes supply dampers to limit supply and exhaust ventilation to low flow design basis. • Activates fire suppression. • Initiates transition to low flow ventilation. • Initiates isolation of electrical power.	PA-1, PA-2, PA-2B, PA-2D, PA-2E, PA-2F, PA-3, PA-3A, RS-1, RS-1A, RS-2, RS-2A, RS-11, GB-1, GB-1C, GB-1D, GB-1E, GB-2, NDA-1, NDA-2, COM-5, COM-29, COM-28F	E1, E7
CSSC Fire Suppression System	In conjunction with low flow ventilation and CSSC fire area boundaries, extinguishes any fire, prevents propagation to room fire and prevents HEPA pluggage from soot. Moderator is not used as fire suppression material. FM-200 bottles are restrained.	**WG2, WG3**: • For Pu oxide-bearing containers, the fire suppression is credited as detecting and preventing a fire from growing to a size that causes a pressurized release (supports the credited 3013 container). Additional controls will be required on combustibles in vicinity of 3013s. • This system provides a support function for the ACVS to preclude loss of ventilation as a result of HEPA filter pluggage from soot. • This system is PC-3 seismic.	PA-2, PA-2B, PA-2F, PA-3, PA-3A, RS-1, RS-1A, GB-1, GB-1C, GB-1D, GB-1E, GB-2, NDA-1, NDA-2, COM-5, COM-28E, COM-28F, COM-29	E1, E7

Control	Safety Function	Credited Features	Event	
			Number	Type
		WG1, WG2: • Introduction of fire suppression material does not introduce a water-based material that could act as a moderator. **WG1**: • FM-200 bottles restraints are PC-3 seismic.		
Design of FM-200 Systems	Prevent development of a toxic atmosphere.	**WG1**: • Design of FM-200 systems to prevent exceeding a FM-200 room concentration of 10.5 %.	COM-X5, COM-X6, COM-28E, COM-28F	E4, E7
Glovebox Fire Detection and Alarm System	Detects fire in the glovebox and activates CO_2 local alarm for personnel to evacuate. Activates interlocks that prevent glovebox pressurization from CO_2 activation.	**WG1**: • Interlocks to isolate the dry air supply to glovebox prior to CO_2 discharge (prevents pressurization of the glovebox) • Activates local alarm for evacuation.	GB-1, GB-1B, COM-20	E1, E4

Table B-7. Safety Significant Controls on Stabilization, Measurement and Surveillance Equipment

Control	Safety Function	Credited Features	Event	
			Number	Type
Can Cutter Design	Can cutter mounting will not fail and compromise the glovebox confinement.	**WG1**: • Can cutter mounting qualified as PC-2 seismic.	GB-4B, COM-28E, COM-28F	E2, E7
Can Puncture Device	Prevent pressurized release by puncturing 3013 under controlled conditions. Robust structural integrity protects 3013 and prevents pressurized release. Puncture opening is large enough to prevent pressurization due to a fire. Prevents pressure spike from compromising glovebox integrity. Dimensions prevent detonation within the sampling system piping. Mounting will not fail and result in glovebox breach.	**WG1, WG2, and WG3**: • Isolation valves prevent release that would be sufficient to compromise glovebox confinement. • Detonation Pressure Boundary – ASME pressure vessel – NFPA Standard. – Sampling System Piping • Vent restriction. • Punctured can does not pressurize in a fire. **WG1**: • CPD mounting qualified as PC-2 seismic.	GB-1,GB-4, GB-8, COM-28E, COM-28F	E1, E2, E3, E7
Furnace design	Furnace mounting will not fail and compromise the glovebox confinement.	**WG1**: • Furnace mounting qualified as PC-2 seismic.	COM-28E, COM-28F	E7
NMC Design	Intrinsically safety design.	**WG1, WG2, WG3**: • NMC electronic components do not cause ignition or melting of NMC components that could act as moderator material (e.g. polymers).	NDA-1	E1,E5
Nuclear Incident Monitors	Detect a criticality and activate alarm for evacuation of personnel within the 12 RAD zone.	**WG1, WG2**: • Personnel given notification of criticality event.	GB-14, COM-28E	E5, E7
Transport Cart	Prevents direct flame impingement on 3013. Limited energy associated with operation. Protects containers from direct impact.	**WG1, WG2, WG3**: • Qualified position. Provides distance between 3013 and potential flame. • Manual operation limits inertia and energy associated with the cart. • In impact events, cart is directly impacted rather than container.	RS-1, RS-1A, RS-2, COM-X1, COM-X2, RS-4	E1, E3,

Control	Safety Function	Credited Features	Event	
			Number	Type
Waste Drum Storage Rack Design	Prevents criticality by providing spacing between material in multiple TRU waste drums.	**WG1, WG2, WG3**: • Waste drum storage rack provides a criticality-safe configuration for TRU waste drums under normal operations, and before, during and after a seismic event. Racks are qualified as PC-3 seismic. Prevents toppling of TRU waste drums.	COM-25, COM-28E	E5, E7

Table B-8. Safety Significant Ventilation Controls

Control	Safety Function	Credited Features	Event	
			Number	Type
CSSC Ventilation Normal Exhaust System	Mitigate Pu releases.	**WG2, WG3**: • Maintains negative pressure in project area to protect workers. • Mitigates consequences during releases.	GB-5A, GB-8, GB-10, COM-14, COM-28E, COM-28F	E3, E7
CSSC Ventilation Low Flow Exhaust System	Includes interlocks to start low flow mode. Mitigates release of radionuclides by providing active confinement, maintaining CSSC negative pressure, and filtering exhaust. Protects assumptions made in fire suppression agent concentration calculations. Provides exhaust ventilation upon loss of power to the normal ventilation exhaust system.	**WG2, WG3**: • Ventilation exhaust sufficient to maintain area pressure differential. • Activates upon loss of normal ventilation. • Mitigates consequences during accident conditions. • Activates on loss of normal power.	PA-3A, GB-1E, NDA-2, COM-5, COM-28F, GB-10, COM-28E	E1, E3, E4, E7
Fan/Filter Building Fire Detection and Suppression Systems	Initiates local fire alarm notifying Fan/Filter Building personnel to evacuate. Protects low flow ventilation system from building fire (including seismically induced fire). (Note: If the Fan/Filter Building is not constructed, the Fan/Filter Building fire detection and suppression system will not be needed.)	**WG1a (personnel in the Fan/Filter Building)**: • Personnel receive evacuation alarm. **WG2, WG3**: • Detects fire and suppresses fire before it interferes with operation of the low flow ventilation system. The Fan/Filter Building fire detection and suppression systems are qualified as PC-2 seismic.	COM-27B, COM-27E, COM-28F	E1, E6, E7

Control	Safety Function	Credited Features	Event	
			Number	Type
Glovebox Ventilation Design	Maintains negative pressure in glovebox. Protect the MAR assumption by preventing accumulation in downstream ductwork.	**WG1**: • Maintains glovebox negative pressure under normal conditions. • Maintains adequate face velocity for credible glovebox breach. • Upon indication of low differential pressure, dry air supply is interrupted to prevent glovebox pressurization. • Testable HEPA filters to ensure only residual quantities of material is in the ductwork and main HEPA filters (This control protects the MAR assumption). **WG1, WG2, WG3**: • Contains exhaust material released from a pressurized 3013 in the glovebox.	OF-2, GB-10, COM-39, GB-4, GB-4A, GB-5A, GB-8, COM-20, GB-14, COM-27B, COM-28A, COM-28E, COM-28F	E1, E2, E3, E4, E5, E7
Bagless Transfer Enclosure Design	Provides protective airflow that sweeps contamination away from WG1.	**WG1**: • Airflow direction is sufficient to protect WG1 from contamination.	COM-39	E3
Ductwork design outside the KAC footprint.	Does not provide a pathway for introduction of flammable liquids.	**WG1**: • Prevents fuel from entering KAC.	COM-27B, COM-27E	E6
CSSC stack	Will not fail in a manner that damages the ventilation system or blocks the exhaust path.	**WG1, WG2, WG3**: • CSSC stack is qualified as PC-3 seismic.	COM-28E, COM-28F	E7
Tornado Dampers (Supply & Exhaust Ducts at the wall boundary that is PC-3 qualified for tornado/high wind events)	Prevent release of material from ventilation system.	**WG1, WG2, WG3**: • PC-3 qualified dampers prevent release of material through exhaust system during a tornado or high-winds event.	COM-28A	E7

Table B-9. Safety Significant Glovebox Controls

Control	Safety Function	Credited Features	Event	
			Number	Type
Glovebox Design	Contains the MAR for a sufficient time to allow facility worker to safely evacuate. Prevents non-localized flammable mixture and confines localized deflagration pressures. Along with the glovebox exhaust system, continues to provide confinement during and after a catastrophic failure of an unpunctured inner 3013 container outside the CPD and other events.	**WG1**: • PC-2 seismic qualified construction and noncombustible design provides confinement sufficient to allow evacuation. • PC-3 seismic supports prevent tipping. **WG1, WG2, WG3**: • Sufficient glovebox volume to prevent overpressurization • Robust construction, impact resistant, and fire resistant shell • Withstand pressurization.	GB-1, GB-1B, GB-2, OF-2, COM-5, GB-4, GB-4A, GB-4B, GB-5A, GB-8, GB-10, COM-27, COM-27B, COM-27E, COM-28A, COM-28E, COM-28F	E1, E2, E3, E5, E6, E7
Glovebox Differential Pressure Alarm	Detects low differential pressure and activates local alarm.	**WG1**: • Personnel notified of glovebox pressurization in sufficient time for workers to evacuate.	OF-2, GB-10	E1, E3

B-10. Facility Controls and Standard Industrial Hazard Controls

Control	Safety Function	Credited Features	Event	
			Number	Type
DR Equipment Design	Does not allow direct exposure to x-rays from DR equipment.	• Standard Industrial Hazard requirements met by commercially available equipment maintained per ANSI Standards.	PA-6	E4

Table B-11. Administrative Controls

Safety Program	Credited Administrative Control	Safety Function	Event	
			Number	Type
3013 Standard and Surveillance Program	Ensures no significant flammable gas accumulation. Pressurized containers are identified for repackaging.	Packaging per 3013 Standard prevents flammable gas mixtures from being present inside 3013 containers. Surveillance identifies anomalous 3013 containers including pressurized containers.	COM-42, GB-8	E2, E3
Configuration Management Program	SSCs and II/I seismic interaction.	Facility modifications and procedure revisions do not introduce unevaluated hazards interactions.	RS-10, COM-28E	E3, E7
Emergency Preparedness Program	Evacuation for WG1; shelter or remain indoors for WG2, WG3.	WG1 evacuation prior to loss of confinement. WG2 and WG3 sheltered to protect from hazard.	HALL-1, HALL-2, PA-1, PA-2, PA-2B, PA-2D, PA-2E, PA-2F, PA-3, PA-3A, RS-1, RS-1A, RS-2, RS-2A, RS-11, GB-1, GB-1B, GB-1C, GB-1D, GB-1E, GB-2, NDA-1, NDA-2, COM-5, COM-7, COM-29, GB-4, GB-4A, GB-5A, GB-8, GB-10, COM-11, COM-14, COM-39, COM-5, COM-X6, COM-20, COM-27B, COM-27E, COM-28A, COM-28D, COM-28E, COM-28F	E1, E2, E3, E4, E6, E7
Fire Protection Program	Combustible Controls	Limits size, intensity, duration, and location of fire, prevents Deep Seated fire, prevents breach of outer 3013.	HALL-1, HALL-2, PA-1, PA-2, PA-2B, PA-2D, PA-2E, PA-2F, PA-3, PA-3A, RS-1, RS-1A, RS-2, RS-2A, RS-11, GB-1B, GB-1C, GB-1D, GB-1E, GB-2, NDA-1, NDA-2, COM-3, COM-5, COM-7, COM-29, COM-28F	E1, E7
Fire Protection Program	Combustible Controls	No combustible materials in the storage racks.	RS-1B	E1

Safety Program	Credited Administrative Control	Safety Function	Event	
			Number	Type
Fire Protection Program	Control of Ignition Sources	Ignition sources and combustibles will not be co-located in the vicinity of 3013 containers.	HALL-1, HALL-2, PA-1, PA-2, PA-2B, PA-2D, PA-2E, PA-2F, PA-3, PA-3A, RS-1, RS-1A, RS-2, RS-2A, RS-11, GB-1C, GB-1D, GB-1E, GB-2, NDA-2, COM-5, COM-7, COM-29	E1
Fire Protection Program	Control of Ignition Sources, Storage Rack	No ignition sources inside the storage racks.	RS-1B	E1
Fire Protection Program	Qualified Positions	Qualified positions separate plutonium-bearing material from combustibles and from ignition sources.	PA-2, PA-2B, PA-3, PA-3A, RS-1, RS-2, RS-2A, RS-11, GB-1B, GB-1C, GB-1D, NDA-2, COM-5, COM-29, COM-28F	E1, E7
Fire Protection Program	Fire rated Storage Room walls and heat resistant shield door with metal cladding	Prevents propagation of fire between fire areas.	RS-2A, RS-11, COM-28F	E1, E7
Fire Protection Program	PC-2 emergency lighting, exit signs, egress path signage.	Evacuation.	COM-28E, COM-28F	E7
Fire Protection Program	Hot work controls.	Prevent fire initiators.	COM-28F	E7
Fire Protection Program	Flame impingement controls for each qualified position.	In conjunction with the fire suppression systems and Combustible Control Program prevents 3013 container breach and SNM release.	PA-2, PA-2B, PA-3, PA-3A, RS-1, GB-1B, GB-1C, GB-1D, GB-2, RS-11, NDA-1, NDA-2, COM-5, COM-29, COM-28F	E1, E7
Fire Protection Program	Standoff controls for shield doors.	Prevent isolated fire from propagating to shield doors (prevents overheating of shield doors HDPE to ignition and prevents breach of 3013 containers or the Annual Calibration Standards).	RS-1, RS-2, RS-2A, RS-11, COM-28F	E1, E7
Fire Response Plan	No water-based fire suppression agents.	Criticality not caused by firefighting.	GB-17A, COM-26, COM-28F	E5, E7

Safety Program	Credited Administrative Control	Safety Function	Event	
			Number	Type
Freeze Protection Program	Subfreezing weather does not cause equipment failure.	Facility support systems operate normally during subfreezing weather.	COM-28C	E7
Helicopter Flight Path Restrictions in KAC Vicinity (Basis for BEU)	Reduces frequency of accident scenario.	Flight path controls.	COM-27A	E6
HEPA Filter Program	Periodic HEPA filter replacement	No breakthrough or plugging of HEPA filters. HEPA filters are not loaded with material from a prior event.	OF-1, GB-10, COM-27B, COM-27E, COM-28E, COM-28F	E1, E3, E6, E7
ISSC Program	Ensure no significant accumulation of flammable gases in annual calibration standards and check standards/sources.	Standards do not create flammable atmosphere.	COM-42	E2
Material Receipt and Shipping Program	3013 Process	Receipt inspection identifies pressurized 3013.	GB-8	E3
Nuclear Criticality Safety Program	Establishes the requirements to have an SNM inventory control program.	3013s and TRU waste containers shall be in Qualified Positions unless transferring between Qualified Positions.	PA-3, PA-3A, NDA-2, COM-5, COM-25, COM-26, COM-28E	E1, E5, E7
Nuclear Criticality Safety Program	Establishes the requirements to have an SNM inventory control program.	Mass and interaction control • Qualified positions provide spacing for interaction control	COM-25, COM-28E	E1, E5, E7
Nuclear Criticality Safety Program	Establishes the requirements to have an SNM inventory control program	Control/limit moderators in the CSSC Project Area Moderator control area.	GB-14, COM-26, COM-28E	E5, E7
Nuclear Criticality Safety Program	Establishes the requirements to have an SNM inventory control program	Spacing of radionuclide inventory.	PA-2D	E1

Safety Program	Credited Administrative Control	Safety Function	Event	
			Number	Type
Nuclear Criticality Safety Program	Establishes the requirements to have an SNM inventory control program.	Limits MAR in glovebox room/glovebox to 5 kg Pu (Glovebox Room is a Qualified Position).	GB-1, GB-1B, GB-1C, GB-1D, GB-2, OF-2, GB-4A, GB-4B, GB-10, GB-15, GB-17, GB-17A,COM-5, COM-27B, COM-27E,COM-28A	E1, E2, E3, E5, E6, E7
Nuclear Criticality Safety Program	Establishes the requirements to have an SNM inventory control program.	Periodic assessment and surveys of exhaust system to • prevent gradual accumulation in ducts and CSSC HEPA filters, and • verify that the hold-up in the glovebox is less than what was analyzed.	GB-2,OF-1, COM-5, GB-14, COM-27B, COM-27E, COM-28A, COM-28E, COM-28F	E1, E6, E7
Nuclear Criticality Safety Program	Establishes the requirements to have an SNM inventory control program.	Inventory limits on amount of material in TRU waste drums (5-gal and 55-gal) and 3013 containers.	HALL-2, PA-2D, PA-2E, PA-3, PA-3A, GB-1E, GB-2, NDA-2, COM-5, COM-40, COM-28E	E1, E2, E3, E7
Safeguards and Security Program	Prevents accidental discharge of firearm within the CSSC Project area.	Site security force procedures.	COM-18	E6
Procedures and Training Program	3013s, 9975, standards or samples not allowed in the Packaging Area during movement of FM200/CO_2 cylinders.	3013 containers are restricted to locations that would not compromise the integrity of the container in case of a drop.	COM-X3	E3
Procedures and Training Program	Avoid rapid depressurization of CPD.	After puncturing a 3013, the CPD is vented prior to opening.	GB-8	E3
Procedures and Training Program	Protect cylinder nozzle from dropped object impact.	Cap Unrestrained Cylinders	COM-X3	E3
Procedures and Training Program	Protect integrity of inner 3013 container.	Inner 3013 containers are properly welded.	COM-39	E3
Procedures and Training Program	No lifting 3013 above qualified drop height.	3013 containers are restricted to locations that would not compromise the integrity of the container in case of a drop.	COM-X2, RS-4,	E3

Safety Program	Credited Administrative Control	Safety Function	Event	
			Number	Type
Procedures and Training Program	Glove inspection.	Gloves are inspected, and replacement prevents failure due to routine use.	GB-10, GB-5A,	E3
Procedures and Training Program	Ensure NFPA 69 compliant operations (i.e., venting and purging).	To maintain H_2 concentration outside deflagrable conditions.	GB-4A	E2
Procedures and Training Program	Combustible TRU waste and samples will be removed from the glovebox before a 3013 container is brought into the glovebox.	Combustibles in the glovebox are minimized.	GB-1, GB-1B, GB-1C, GB-1D, GB-1E, GB-2, COM-5	E1
Procedures and Training Program	No storage of MAR is allowed in the Glovebox Room outside the glovebox.	MAR limited.	GB-1C, GB-1D, GB-1E, GB-2, COM-5	E1
Procedures and Training Program	No 3013 or sample processing will be performed in CSSC during waste removal activities.	No ignition sources associated with 3013 or sample processing activities.	GB-1E, GB-2, COM-5	E1
Procedures and Training Program	Fire watch trained.	Fire initiators limited and monitored.	HALL-1, HALL-2, PA-1, PA-2, PA-2B, PA-2D, PA-2E, PA-2F, PA-3, PA-3A, RS-1, RS-1A, RS-2, RS-2A, RS-11, GB-1, GB-1B, GB-1C, GB-1D, GB-1E, NDA-1, NDA-2, COM-5, COM-7, COM-29, COM-28F	E1, E7
Procedures and Training Program	Material handler trained.	MAR limited.	HALL-1, HALL-2, PA-1, PA-2, PA-2B, PA-2D, PA-2E, PA-2F, PA-3, PA-3A, RS-1, RS-1A, RS-2, RS-2A, RS-11, GB-1, GB-1B, COM-3, COM-5, COM-7, COM-29, COM-28F	E1, E7
Procedures and Training Program	Hot work controls	Operations with potential for initiating fire suspended after seismic event.	COM-28F	E7
Procedures and Training Program	Operator training for packaging waste.	Limits MAR.	COM-40	E2

Safety Program	Credited Administrative Control	Safety Function	Event	
			Number	Type
Process Enclosure Integrity Program	Identification of enclosure breach before exposure.	Regular monitoring of enclosure integrity.	GB-5A	E3
Procedures and Training Program	Credited pressure boundary is established during puncturing of 3013 containers.	Establish proper system configuration.	GB-4, GB-4A	E2
Procedures and Training Program	Hold-up monitoring; fissile material handling training; procedures limit mass and location of fissile material in project area.	Processing activities involve insufficient material (including holdup) to cause a criticality event.	GB-17, GB-17A, COM-25, COM-26, COM-28E	E5
Procedures and Training Program	TRU waste not in closed drums (5-gal or 55-gal) will be immediately moved to a DOT 7A Type A or OSA-qualified vented 55-gal or 5-gal drum.	TRU waste confinement is provided by TRU drums or ventilation.	PA-2D, PA-2E,PA-3, PA-3A, GB-1E, GB-2, COM-5	E1
Procedures and Training Program	No CO_2 discharge until operators evacuated.	No manual CO_2 fire suppression actuation at manifold when glovebox room occupied.	COM-20	E4
Procedures and Training Program	Operator training for oxide sample vial and gas sample enclosure.	Limits MAR.	COM-41	E2
Procedures and Training Program	No 3013 transfer from KAMS to CSSC unless inspection verifies • No waste is stored in the transport corridors • No current 3013 or waste transfer is taking place in the hallway • No hazardous chemicals are stored in the transport corridors • No 2 over 1 hazards exist in the transport route.	Pre-transfer transport route inspection.	HALL-1	E1
Procedures and Training Program	Visually verify that “aged” 3013 assemblies have been punctured prior to being cut open. Newly generated 3013s (inner containers, outer	Unpunctured cans that may contain a flammable gas mixture are not cut open.	GB-4B	E2

Safety Program	Credited Administrative Control	Safety Function	Event	
			Number	Type
	containers or 3013 assembly) may be cut open without being punctured, per approved procedure.			
Radiation Protection Program	Contamination Control (e.g., Double Bag, PPE, CAM, enclosures)	Personnel are protected during loss of confinement.	GB-5, GB-5A, GB-9, GB-11, COM-14, COM-39, COM-27, COM-28F	E3, E6, E7
Shipping Container Qualification, Storage Surveillance Program	Identification of compromised containers prior to use.	Regular surveillance of containers.	GB-8, COM-25, COM-28E	E3, E5, E7
Structural Integrity Program	Periodic verification of structural integrity and necessary preventive/corrective actions.	Ensures that falling objects from structural failures do not challenge the integrity of the SNM containers. Ensures storage racks maintain their structural integrity.	RS-4, RS-10, COM-X3, COM-28E, COM-28F	E3, E7
TRU waste drums will not be permitted under the lift path of the FM200/CO_2 cylinders when cylinders are being lifted.	Reduce possibility that a TRU waste drum is impacted by a dropped FM200/CO_2 cylinder.	TRU waste drums are not compromised from impact of dropped FM200 equipment or CO_2 cylinders.	COM-X3	E3
Waste Management Program	Defines allowable waste location and quantity of material in waste containers.	Limits are the basis for MAR.	PA-2D, PA-3, PA-3A, COM-7, COM-40, COM-14, COM-25, COM-28E	E1, E2, E3, E5, E7
Waste Management Program	Requires DOT-qualified vented 55-gal and 5-gal drums.	Deflagration sources prohibited from drum, and MAR limited.	COM-40, COM-14	E2, E3