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Defense Waste Processing Facility Justification for Continued Operation

August 2015

Revision Log

Revision Number	Date	Description of Changes
0	8/2015	Initial Issue
1	8/2015	Adds Reference 10 and Sections 4.1, 4.2, and 5.1

1. Purpose

This Justification for Continued Operation (JCO) addresses the addition of antifoam to the Sludge Receipt and Adjustment Tank (SRAT) and Slurry Mix Evaporator (SME) in the Defense Waste Processing Facility (DWPF) Chemical Process Cell (CPC). This JCO is written in response to the Potential Inadequacy in the Safety Analysis (PISA) PI-2015-0009 (Ref. 1) issued on 5/15/2015, which identified the presence of multiple degradation products of antifoam (e.g., hexamethyldisiloxane [HMDSO]). These degradation products were determined to contribute to the flammability of the SRAT and SME. The purges for the SRAT and SME did not account for the additional antifoam degradation products. Formal notification of this PISA was submitted via an Occurrence Report (EM-SR--SRR-WVIT-2015-0003) Ref. 2.

This JCO amends the current Final Safety Analysis Report (FSAR) (Ref. 3) and subsequent revisions during the life of this JCO. By documenting the compensatory measures and planned corrective actions to allow for continued processing, this JCO satisfies Manual 11Q, Procedure 1.01 (Ref. 4). This JCO replaces the Evaluation of the Safety of the Situation (ESS) (Ref. 6) and will expire upon the implementation of the Fiscal Year (FY)16 DWPF Annual Update which is required to address this Antifoam degradation products concern.

2. Statement of Problem

Antifoam is routinely added to the SRAT and SME, via the Additive Mix/Feed Tank (AMFT), in order to minimize foaming during processing and possible carryover to the Slurry Mix Evaporator Condensate Tank (SMECT). Recent Savannah River National Laboratory (SRNL) testing identified the presence of HMDSO, a degradation product of antifoam. Due to the flammable nature of HMDSO the flammability controls for the SRAT and SME were reevaluated to determine if the existing purges were adequate to address the presence of the antifoam degradation products. This evaluation concluded that the current purge rates were not adequate to account for the presence of HMDSO and that a PISA existed (PI-2015-0009, Ref. 1). The PISA was declared due to the inability of the existing controls, and their assumed parameters, to perform the described Safety Function and effectively provide the credited prevention or mitigation assigned to them in the Safety Basis. An Unreviewed Safety Question Evaluation (USQE) was performed (USQ-WD-2015-00314, Ref. 9) and determined a USQ exists. The USQE was determined to be positive based on multiple factors, including: an increase in the probability of occurrence and consequences of a previously evaluated accident as well as the malfunction of equipment important to safety, and a decrease in the margin of safety. As a result of the PISA, compensatory measures were imposed to place the facility in a safe configuration; these measures include:

- Antifoam addition to any DWPF vessel is prohibited.
- Waste in the SMECT will be sampled and evaluated to characterize sludge content before transferring to the Recycle Collection Tank (RCT).

This JCO provides detailed justification for the removal of the above compensatory measures, primarily on the use of antifoam, as the second restriction was put into place to safeguard against larger sludge carryovers than would otherwise occur using antifoam. By allowing the use of antifoam at DWPF the sludge content in the RCT is once again bounded by the current Safety Basis assumptions. The ESS (Ref. 6) determined that the following scenarios currently documented in the Safety Basis were directly affected by the presence of antifoam degradation products. These scenarios include:

- CPC/Low Point Pump Pit (LPPP) Vessel Explosions
- CPC/LPPP Vessel Spill/Cell Explosion and Pool Fire
- Transfer Line/Jacket Explosion
- Seismic Event
- Tornado/High Winds Event

3. Status of the Facility

Currently the AMFT contains some amount of diluted antifoam (~35 gallons). Antifoam is also present in the line from the AMFT to the SRAT and SME and the seal pot. The AMFT, and the associated transfer system will be drained to the maximum extent practical and then the remaining residual material flushed into the SRAT and SME prior to boiling. The resulting degradation products will evolve into the vapor space during heat up. This is not expected to result in a significant spike in degradation products during heat up. Antifoam was last added to the SRAT and SME in March 2015, at which point the vessels were boiled and the antifoam decomposition products were released into the vapor space of the SRAT and SME. Some of these degradation products are believed to have condensed out into the SMECT. Since this time, no processing has occurred in the SRAT or SME and the vessels remain at heel. No significant quantities of antifoam degradation products are believed to remain in the SRAT and SME. Since the last processing evolutions in the SRAT and SME, the SMECT has been flushed with three tank volumes of water and transferred to the RCT/Recycle Pump Tank (RPT) and out of the DWPF facility. These flushes should have effectively eliminated any degradation products that may have condensed into the SMECT and may be found downstream in the recycle tanks. Since then, transfers to the RCT have only occurred from areas which do not contain antifoam, mainly from decontamination activities performed during the extended outage.

Based on the compensatory measures of References 1 and 6 no antifoam has been added to any DWPF vessel, including the SRAT and SME, and transferred downstream, thus precluding further introduction of antifoam degradation products in the condensate and recycle tanks. Based on the current status of the DWPF facility, it is concluded that degradation products are not currently present and will not be generated while the facility is under the compensatory measures identified in the PISA/ESS. These measures would permit the facility to operate safely without antifoam; however, processing concerns over potential increased carryover to the SMECT and fouling overheads have resulted in a decision not to operate the facility.

4. Risk of Continued Operation

The PISA/ESS compensatory measures resulted in no increased risk to the facility. However, this JCO is required to allow for the addition of antifoam from a production perspective as well as to support a further understanding of the antifoam degradation products.

Limiting the sludge stream Inhalation Dose Potential (IDP) and crediting the Safety Significant (SS) Zone 1 Ventilation system for mitigating the release in the CPC satisfies the requirement to stay below evaluation guidelines for the receptors of concern; however, it does so by using mitigation rather than prevention. In order to strengthen this primarily mitigative strategy, the JCO establishes additional compensatory measures to further reduce the likelihood and consequence of an accident. These factors are outlined below.

4.1 Reduced Sludge Feed IDP

The DWPF Waste Acceptance Criteria (WAC) will be revised to reflect a reduced allowable sludge stream IDP. Limiting the sludge stream IDP to the DWPF process ensures that all of the accident scenarios potentially impacted by antifoam degradation products have their unmitigated consequences to the offsite receptor reduced to approximately 5 rem. The most limiting of these scenarios are the Natural Phenomena Hazard (NPH) events (Seismic or Tornado/High Winds).

Limiting the IDP of the incoming sludge feed to DWPF mitigates the increased risk to the facility posed by the antifoam degradation products.

By limiting the DWPF incoming sludge feed to less than or equal to 1.0E+08 rem/gallon IDP, the unmitigated consequences to the offsite receptor resulting from the NPH scenarios is reduced to approximately 5 rem. The onsite unmitigated consequences to the Occupational Exposed Person (OEP) remain greater than 100 rem.

4.2 Zone 1 Ventilation

In order to provide additional mitigation for releases into the CPC, the Zone 1 Ventilation system will be credited as a first level of control. The system mitigates consequences of radiological events by providing a decontamination factor of 200 through the sand filter. This additional first level of control is applicable to all affected events with the exception of those in the LPPP and the Interarea Transfer Lines. Zone 1 Ventilation in combination with the IDP control reduces the bounding offsite mitigated consequences to approximately 5 rem. The mitigated onsite OEP consequences are reduced to approximately 45 rem. In order to ensure that the Zone 1 Ventilation system is capable of performing its safety function after the explosion, Reference 10 evaluated the most likely method of failure of a CPC process vessel due to an internal explosion. Reference 10 determined that an explosion inside a process vessel would not cause a failure of the Zone 1 Ventilation system such that it is no longer able to perform its safety function.

The consequences reported in the above sections are based on a scaling of the DWPF seismic NPH scenario using the 95% quantile of meteorological data and a 100 cm surface roughness for offsite consequences and the DOE-STD-1189 prescribed dilution factor for the onsite OEP receptor.

4.3 Direct Addition of Antifoam

A factor identified as the major contributor to the degradation of antifoam is the manner in which antifoam is stored and diluted. Currently, antifoam is diluted in the AMFT and then fed to the SRAT and SME as needed. This prolonged dilution (i.e. exposure to water or waste) has been identified as the primary factor in the amount of degradation of antifoam (Ref. 8). A compensatory measure is being implemented as part of this JCO to restrict the use of antifoam to direct, undiluted additions. Eliminating the dilution of antifoam significantly reduces the buildup of antifoam degradation products prior to its addition to the CPC vessels.

A facility modification will be implemented to disable the current antifoam addition system to the AMFT and change the antifoam addition point from the AMFT to a direct addition to the piping leading to the SRAT and SME. The unmixed (fresh) antifoam will be followed by a flush to the receiving vessel.

Antifoam will be added, undiluted, as part of chemical additions to the vessels while the vessels are at or above 90°C. At boiling, any degradation products are expected to rapidly flash to the vapor space (Ref. 8); therefore, no specific boiling time is required. At the lower temperature (90°C) a significant portion of the degradation products should still go into the vapor space and be further released into the vapor space as the liquid reaches boiling.

If steam is lost (due to any reason) after the antifoam addition but prior to boiling, the degradation products would continue to be released at the lower temperatures at a much lower rate. When the vessel later approaches boiling (~100°C), a large portion of the degradation products would be released into the vapor space. This peak would not be as large as the peak from the initial addition (Ref. 8). Additionally the catalytic Hydrogen Generation Rate (HGR) is also dependent on temperature with the peak rate occurring after the material has reached its boiling temperature and the NO_2 destruction has completed (Ref 7). It is not suspected that the catalytic peak and the antifoam degradation product peak would occur simultaneously. Based on these considerations, there is no maximum allowable time before boiling must be achieved after antifoam additions.

Additionally based on the physical configuration (piping, AMFT, and SRAT/SME) limiting the amount of undiluted antifoam that can be added at one time and the current Melter Feed controls in Technical Safety Requirement (TSR) Limiting Condition for Operation (LCO) 3.1.8, no specific control on total antifoam addition volume is necessary.

4.4 CPC Cell Flammability

Currently explosions in the CPC cell are considered to be not credible as the time to Composite Lower Flammability Limit (CLFL) is greater than 4 days. Should a loss of containment occur in the CPC, the material spilled into the cell could contain antifoam degradation products. The potential for these organics to contribute to flammability in the cell such that the time to CLFL decreases below 4 days is not likely, as the compensatory measures of this JCO serve to reduce the amount of degradation products present in the vessels. Specifically, adding antifoam undiluted to the SRAT and SME has been determined to reduce the magnitude of the degradation products' peak in the SRAT and SME vapor space (Ref. 8).

Antifoam is typically added to the CPC processing vessel at a high temperature. This results in a significant portion of the degradation products going into the vapor space and some portion of the products in the vapor space condensing into the SMECT. The likelihood of a spill occurring in the short amount of time between antifoam addition and the spike of degradation products into the vapor space is unlikely. Therefore, only a small amount of degradation products should be available in the CPC processing vessels to contribute to the flammability in the cell.

Additionally, given the conservatisms in the existing catalytic hydrogen generation rate and considering that the amount of degradation products that are driven into the vapor space is temperature dependent, it is reasonable to assume that the currently bounding scenario identified in Reference 3 (small volume of hot liquid bounds a larger volume of cooler liquid) remains the bounding scenario, and the time to CLFL in the cells remains greater than 4 days.

4.5 CPC Vessel Flammability

The flammable antifoam degradation products, when added to the design basis rates for radiolytic and catalytic hydrogen generation, may impact the ability of the purge systems to prevent flammable mixtures from forming; however, the current sludge batch (Sludge Batch (SB)8) catalytic and radiolytic hydrogen generation rates are significantly below design basis values (SB 9 is expected to have similar values). In addition, any antifoam degradation products have been shown to be rapidly released when heated (Ref. 8); this release is expected to occur before the catalytic peak generation rate which requires destruction of the NO_2 prior to occurring (Ref. 7). As a result, the short release of antifoam degradation products are not expected to occur at the same time as the catalytic release. The sludge batch specific generation rates difference and the expected timing of the peak generation/release rates provide margin such that the flammable antifoam degradation products are not expected to create a flammable vapor space in the SRAT or SME. Antifoam is not added to the Melter Feed Tank (MFT); therefore, the concentration of flammable degradation products in the MFT is expected to be low (since the SME is concentrated after any antifoam additions and prior to transferring to the MFT). Additionally, the MFT is operated well below boiling temperature (~55°C), so the margin built into the purge values should be sufficient to prevent flammability. Based on

these margins and Process Vessel Ventilation (PVV) normally providing air flow through the vessels when purge is not operating, the recovery time curves in the TSRs have not been modified.

The SMECT receives the condensate from the SRAT and SME condensers which may contain antifoam degradation products. Since the SMECT operates at low temperatures (max historical temperature of ~36 C), the amount of organics in the vapor space is expected to be low. The SMECT is transferred to the RCT and then to the RPT. These vessels' purge flow rates are based on a bounding sludge carryover which includes both catalytic and radiolytic HGR. SB 8 has significant margin from these design basis HGR (SB9 is expected to also be well below design basis HGR; should SB9 have significantly larger HGR, these results will be communicated with the Department of Energy (DOE) and a path forward will be developed to address this increase). Also, processing of SB8 has not produced a significant amount of sludge carryover (average RCT containing less than 600 gallons of sludge compared to the design basis of 3,500 gallons of sludge). Based on these margins the CPC vessels are not expected to become flammable.

4.6 RPT, LPPP Cell, and Transfer Line Flammability

If the antifoam degradation products are in the Recycle stream to be sent to the Tank Farm in significant quantities, the Tank Farm DSA assumptions may be exceeded. Prior to resuming Recycle transfers back to the Tank Farm (i.e. through the RPT), the stream will be shown to meet the 5% LFL limit for trace organics in the Tank Farm WAC. By ensuring that the 5% trace organics limit is met the actual conditions within the RPT and associated Transfer Lines have margin from design basis flammability assumptions such that these explosion scenarios are not expected to be impacted. Additionally by establishing temperature limits on the RCT, the concentrations of flammables in the RPT vapor space will be further decreased. The RPT is used as a pass through tank when transferring Recycle to the Tank Farm and typically remains at heel. Therefore, when the RPT is full (i.e. a transfer is occurring from the RCT) the temperature of the RPT waste will be similar to the waste transferring in from the RCT. Following a transfer from the RCT, the temperature of the remaining liquid may increase. However, the vessel vapor space is maximized as the liquid volume is decreased thus decreasing the concentration of flammables in the vapor space.

5. Compensatory Measures

5.1 IDP Limit

The current bounding sludge stream IDP that can be received at DWPF is 2.47E+08 rem/gallon. The bounding scenarios in the DWPF FSAR are the NPH scenarios. These scenarios result in a dose to the offsite receptor of less than 11.5 rem. In order to establish a maximum sludge stream IDP that would not challenge the offsite evaluation guidelines, a simple ratio was utilized to establish a limit of 1.0E+08 rem/gallon for the sludge stream received at DWPF. This lower IDP results in a dose to the offsite receptor of approximately 5 rem and to the onsite (100m) receptor of approximately 45 rem. The

salt feed is an insignificant contributor to IDP for waste streams within DWPF. Thus the IDP's for streams within the DWPF facility (e.g., SRAT Stream) will be similarly reduced.

This simplistic model does not directly account for the additional detonation energies from the presence of any antifoam degradation products; however, there is sufficient margin built into the current, highly conservative, explosion consequence model to be considered reasonably conservative to allow consequence reductions with a ratio of 1:2.47.

The IDP limit will be implemented via an update to the WAC Specific Administrative Control (SAC) (TSR 5.8.2.11).

5.1.1 TSR 5.8.2.11, Waste Acceptance Criteria (SAC)

The below sections describe the aspects of the SAC pertaining specifically to this compensatory measure. These are in addition to the existing attributes described in Chapter 11 of Reference 3.

5.1.2 Safety Function

The safety function of the WAC Program specific to this JCO is to protect the bounding initial assumptions for the accident analysis and bounding waste stream characteristics as they pertain to the sludge stream feed to DWPF.

5.1.3 SAC Description

The WAC Program shall ensure that the compositions of sludge stream to be received into DWPF are within analyzed limits prior to transfer. The program involves sampling and analysis or characterization, and the sample or characterization results are compared to specific limits for waste streams to be transferred to DWPF from other facilities. The values established in the compensatory measures are bounding values; therefore, the limits imposed are inherently conservative and no additional safety margins are imposed.

The following parameter limited by the WAC either protects bounding assumptions in the DWPF Accident Analysis or protects assumptions utilized in the design of safety related Structures, Systems, and Components (SSCs).

Inhalation Dose Potential

Sludge 1.0E+08 rem/gallon

5.1.4 Functional Requirements

The WAC program will ensure that the composition of the sludge stream received into DWPF is within the analyzed limits prior to receipt. Sludge stream transfers received at DWPF shall be characterized to ensure that the total effective IDP is less than or equal to

1.0E+08 rem/gallon.

5.1.5 SAC Evaluation

The functional requirements of this SAC perform a Safety Class function by protecting a bounding initial condition used in the accident analysis for DWPF. The safety function of this SAC could not be performed by an existing SSC. Limiting the IDP for the sludge stream received at DWPF requires operator actions that cannot be performed by equipment. Therefore, it was determined that these additional functional requirements of the SAC were appropriate.

The IDP for the sludge stream sent to DWPF will be established prior to receipt of the material via the sludge batch qualification process. The sludge batch qualification program, coupled with the WAC program, ensures the composition of the sludge stream received at DWPF is within the limits provided in the compensatory measures of this JCO. An analytical uncertainty of 2 Sigma shall be accounted for in sample analyses used to determine compliance with this compensatory measure.

5.2 Zone 1 Ventilation

In order to mitigate the additional risk posed by the operation of the DWPF facility using antifoam, the Zone 1 Ventilation system will be credited as an additional first level of control. Since the purge systems have not been shown to prevent explosions, additional redundancy is being built into the TSR specific to the use of Zone 1. LCOs 3.7.1 and 3.9.1 have been revised to require the operability of three Zone 1 Exhaust Fans rather than the single fan currently required and two operable Standby Diesel Generators rather than one. These requirements are further expanded upon in LCOs 3.7.1 and 3.9.1 and their Bases.

5.2.1 LCO 3.7.1 Zone 1 Ventilation

Zone 1 Ventilation maintains the canyon at a negative pressure sufficient to pull any airborne particulate through the sand filter, where the particulate will be deposited. This JCO introduces additional redundancy to LCO 3.7.1 by ensuring that three exhaust fans and both Sand Filter Plenum Pressure transmitters are operable at all times. Additional redundancy, conditions F, G, and H, has been added to require the safe shutdown of the system should the required actions of the LCO conditions not be met within the prescribed completion times, or should three, or more, of the four exhaust fans become inoperable.

5.2.2 LCO 3.9.1 Standby Electrical Power

Standby electrical generation capabilities are provided to maintain power to safety loads and services when normal power is not available. This JCO provides additional redundancy to LCO 3.9.1 by ensuring that both diesel generators are operable at all times. Additionally, the following requirements are added by this JCO to support operability of

the diesel generators.

- Both air receiver pressure indicators for each generator must be operable at all times.
- The lube oil storage (makeup) tank for each diesel generator must have an inventory of greater than or equal to 25%.
- The diesel fuel oil (in either the storage tanks or the day tanks) for both diesel generators must meet specifications. If this condition is not met conditions A, B, C, and G must be entered as appropriate.
- Conditions I and J have been added to require the safe shutdown of the system.

5.3 Condensate Temperature Limit

The SMECT and RCT required purge rates are based on radiolytic and catalytic hydrogen generation rates assuming a bounding sludge content in the vessels. Comparing the bounding sludge content to historical contents and the bounding hydrogen generation to SB 8 rates, these vessels have some margin to address the additional flammable species. The amount of the degradation products in the condensate and recycle vessels (SMECT and RCT) is dependent on the efficiency of the process condensers. These vessels, while containing large amounts of condensate, will be controlled to lower temperature. The lower temperatures will reduce the amount of degradation products that are released to the vapor space. There are times where the temperature in the RCT may be elevated, but these are specific, infrequent processing evolutions (e.g. non-routine off-gas cleaning solutions containing nitric acid or transfers from the Decontamination Waste Treatment Tank (DWTT)) which are not performed until the RCT has been taken to a heel after receiving SMECT transfers. Thus, for these evolutions, the temperature limits imposed on the RCT do not apply.

5.3.1 LCO 3.1.2 CPC Temperature Requirements

This JCO establishes temperature limits on the SMECT and RCT in order to control the organic contribution to CLFL. Temperature indication is provided for the SMECT and RCT to ensure the assumptions made for flammable vapor concentrations are maintained. Should the temperature in the SMECT or RCT exceed 35°C or should the instrumentation become inoperable, this LCO requires actions to remove heat sources to be taken immediately. Additionally, all transfers into the SMECT and into and out of RCT shall be immediately stopped (with the exception of transfers from the Lab). As an additional measure the purge flows to each vessel will be verified to ensure that the vessel vapor space is being purged to TSR requirements. This limit does not account for instrument uncertainty as the limit is the highest, recent (last 10 years), historical temperature for the SMECT. The purge calculations for the SMECT and RCT assume a temperature of 50°C, but do not account for antifoam degradation products. A temperature of 35°C was chosen to decrease the risk of a flammable vapor space.

Controlling to lower temperatures reduces the concentration of flammable vapors. The exact temperature dependence of antifoam degradation products is unknown; therefore, uncertainty will not be applied to the limit or implementation of the limit. Additionally, operational experience has established sufficient confidence in the instrumentation such that no instrument uncertainty is accounted for.

SR 4.1.2.1

An instrument loop test of the SMECT temperature indicating loop, including alarm, will compare the DCS output with Measuring and Test Equipment (M&TE) instrument reading the same Resistance Temperature Detectors (RTD) to verify the operability of the SMECT temperature instrumentation. RTD failure results in either a low temperature (short or loss of power) or high temperature (open circuit). The surveillance frequency is based on engineering judgment of the reliability of the indication and alarm.

SR 4.1.2.2

An instrument loop test of the RCT temperature indicating loop, including alarm, will compare the DCS output with an M&TE instrument reading the same RTD to verify the operability of the SMECT temperature instrumentation. RTD failure results in either a low temperature (short or loss of power) or high temperature (open circuit). The surveillance frequency is based on engineering judgment of the reliability of the indication and alarm.

5.4 Direct Addition of Antifoam

Antifoam degrades once it has been mixed with water or waste (Ref. 8). To minimize the amount of degradation prior to introduction into the hot process vessels a facility modification will be implemented to disable the current antifoam addition system to the AMFT and change the antifoam addition point from the AMFT to a direct addition to the piping leading to the SRAT and SME. The unmixed (fresh) antifoam will be followed by a flush to the receiving vessel.

6. TSR Controls

TSR controls implemented as a part of this JCO are identified in the associated TSR Revision (Ref. 5).

7. Conclusions

Limiting the sludge stream IDP and crediting the SS Zone 1 Ventilation system for mitigating the release in the CPC satisfies the requirement to stay below evaluation guidelines for the receptors of concern; however, it does so by mitigation rather than prevention. In order to strengthen this primarily mitigative strategy, the JCO establishes additional compensatory measures to further reduce the likelihood of an accident.

The suite of compensatory measures established by this JCO, including the reduced

sludge stream IDP implemented via the DWPF WAC program along with crediting the Zone 1 Ventilation system for mitigation of releases inside the CPC, serve to provide a higher level of assurance that the increased risk of flammability posed by antifoam degradation products has been sufficiently mitigated such that the continued operation of DWPF using antifoam can safely be performed. The resulting mitigated consequences are well within the evaluation guidelines.

In addition to the credited compensatory measures (Reduced IDP, Zone 1Ventilation), the risk of a vessel explosion is considered low. This is because: the fresh antifoam will be added directly to the SRAT and SME, minimizing the quantity of degradation products; the temperatures in the SMECT and RCT will be controlled to minimize the amount of organics in the vapor space; the hydrogen generation rates associated with the SB 8 & 9 provide significant margin from the design basis HGRs used to determine the purge design basis rates; and the peak concentrations of degradation products in the vapor space of the SRAT and SME are short in duration (Ref. 8).

8. Exiting the JCO

Upon implementation of the FY16 Annual Update, this JCO shall be exited. The FY16 Annual Update is required to address the antifoam degradation products concern.

9. References

1. PI-2015-0009, The Impact of Antifoam Degradation on CPC Vessel Flammability, May 2015.

2. EM-SR--SRR-WVIT-2015-0003, The Impact of Antifoam Degradation Products on Chemical Process Cell (CPC) Vessel, May 2015.

3. WSRC-SA-6, Final Safety Analysis Report Savannah River Site Defense Waste Processing Facility, Rev. 33.

4. Manual 11Q, Procedure 1.01, Generation, Revision, Review, and Approval of SB Documents, Rev. 19.

5. WSRC-TS-95-0019/S-TSR-S-00001, Technical Safety Requirements Defense Waste Processing Facility, Rev. 56, June 2015.

6. U-ESS-S-00003, Evaluation of the Safety of the Situation (ESS): Impact of Antifoam Degradation on CPC Vessel Flammability (PISA PI-2015-0009), Rev. 0, July 2015.

7. SRNL-STI-2013-00028, Rev. 0, Elimination of Catalytic Hydrogen Generation in Defense Waste Processing Facility Slurries, January 2013.

8. SRNL-L3100-2015-00134, Rev. 2, Observations from Antifoam Degradation Testing, August 2015.

9. USQ-WD-2015-00314, Rev. 0, The Impact of Antifoam Degradation on CPC Vessel Flammability. May 2015.

10. U-ESR-S-00009, Rev. 0, Assessment of Vessel Explosion Impacts on the Defense Waste Processing Facility In Support of the Justification for Continued Operation. August 2015.