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JAN 3 1 2017

Mr. John E. Kieling, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87508-6303

Subject: Nuclear Safety Hazard Evaluation, Nuclear Waste Partnership (NWP) ESS-2016-02, *Evaluation of the Safety of the Situation – Pool Fire Involving Waste Caused by a Large Roof Fall*

Reference: New Mexico Environment Department correspondence from John E. Kieling, Chief, Hazardous Waste Bureau, to Todd Shrader, CBFO and Philip J. Breidenbach, NWP, dated January 13, 2017, subject: Hazardous Waste Facility Permit Noncompliance and Information Repository Guidance, Waste Isolation Pilot Plant, EPA I.D. Number NM4890139088

Dear Mr. Kieling:

The purpose of this letter is to provide the nuclear safety evaluation of a hypothetical accident scenario, NWP ESS-2016-02, *Evaluation of the Safety of the Situation – Pool Fire Involving Waste Caused by a Large Roof Fall,* requested by the NMED in the January 13, 2017, response to the Permittees' December 22, 2016, Notification of Anticipated Noncompliance with Permit Requirements.

We certify under penalty of law that this document and all attachments were prepared under our direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on our inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of our knowledge and belief, true, accurate, and complete. We are aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions, please contact Mr. George T. Basabilvazo at (575) 234-7488.

Sincerely,

Signatures on File

Todd Shrader, Manager
Carlsbad Field Office

Philip J. Breidenbach, Project Manager
Nuclear Waste Partnership LLC

Enclosure

cc: w/enclosure
D. Biswell, NMED *ED
R. Maestas, NMED ED

CBFO:OEP:GTB:AC:17-1006: UFC 5487.00

Evaluation of the Safety of the Situation
Pool Fire Involving Waste Caused by a Large Roof Fall

1.0 Scope of the Evaluation of the Safety of the Situation (ESS)

A potential inadequacy in the WIPP safety basis for the pool fires in the underground was confirmed and documented on December 6, 2016 (PISAD P16-011). The inadequacy resulted from the potential for a large roof fall in a disposal room that impacts vehicles/equipment containing combustible liquids resulting in a pool fire that could affect stored waste. This event is postulated in an area where adequate ground control measures have not been maintained.

Table 1 lists the equipment containing combustible liquids that were originally moved into Panel 7 Room 6 pending disposition. The equipment consists of a 4 ton forklift, 6 ton forklift, scissor lift, CH transporter, and two Load Haul Dumps (LHDs). The equipment was contaminated during the February 2014 radiological release in the underground (UG). The intent was to drain the equipment of combustible fluids and abandon them in the room for permanent disposal. Roof stability concerns have prevented safe re-entry into Panel 7 Room 6 to drain the liquids. A total of 527 gallons of liquid combustible is among the vehicles abandoned in Room 6.

Following CBFO approval to commence waste handling operations, emplacements in the intake and exhaust drifts of Panel 7 will have adequate ground control. However, the equipment abandoned in Panel 7 Room 6 will still contain combustible liquids. When a roof fall occurs above the stored equipment, an ensuing leak of liquid combustible and ignition source from impact have the potential to involve waste in a pool fire. Roof fall induced pool fires have not been identified as an initiator of pool fire events in the DSA. The subsequent USQ determination, USQD D16-169, was positive.

Emplacement or retrieval of waste in the intake drift (S-2520) or exhaust drift (S-2180) of Panel 7 will be within 200 feet of equipment with liquid combustible capacity. Equipment within this stand-off distance is required to have operable automatic fire suppression in accordance with LCO 3.1.2. However, when compared to the safety basis, considerable margin exists in the location and specific liquid combustible capacities of the abandoned equipment to preclude the involvement of waste with a fuel pool.

In addition to addressing the subject PISA, this ESS will also serve as a Justification for Continued Operation (JCO), in accordance with DOE Guide 424.1-1B. This ESS requests CBFO approval to allow the disabled equipment to remain in place without violating LCO 3.1.2. This is similar to the allowance given in Note 1 of LCO 3.1.2 for disabled vehicles in the Vehicle Exclusion Zone.

2.0 Hazard Analysis

WIPP-021, Rev. 6, *Hazards Analysis,* evaluates roof falls in an active panel as Loss of Confinement (LOC) events. Event CH/RH-UG-30-001a bounds postulated roof fall LOC

events. The frequency is anticipated and the consequences are low to all receptors.

The hazards analysis evaluates pool fires from leaks and impacts from vehicle collisions

during transport and at the waste face. For contact-handled (CH) waste, the hazards analysis includes the following bounding events:

CH/RH-UG-01-001a, CH/RH-UG-01-002a1, CH/RH-UG-01-002a2, CH/RH-UG-01-004a, CH/RH-UG-01-007a1, CH/RH-UG-01-007a2, CH/RH-UG-01-007a3, CH/RH-UG-01-007a4, CH-UG-01-001a, CH-UG-01-002a1, CH-UG-01-003a1, and CH-UG-01-003a2.

The above events list leaks of liquid combustibles as pool fire initiators. However, a roof fall in an active room is not specifically stated as an initiator of a pool fire. These events also list vehicle collisions as an initiator of the leak. However, an impact from a roof fall is not specifically listed as causing a leak of liquid combustibles.

Generally, pool fire events have a frequency of anticipated for maintenance leaks while the frequency is unlikely for events involving collisions. The consequences for all pool fires are generally high to the colocated worker and low to the public.

The new initiating event for a pool fire results from an initial and subsequent roof fall that impacts the abandoned equipment, causes a crush and release of the diesel fuel that pools, flows to the waste, and sets off a spark to cause the fire. A pool fire would not be a result of an initial impact of debris since it would take time for the liquid combustible to leak and pool. However, subsequent roof impacts could potentially expose a pool to an ignition source caused by falling debris.

Roof Fall Induced Pool Fire - Event Frequency

While a roof fall is an anticipated event, an ensuing pool fire is considered to be extremely unlikely for the following reasons:

- Fuel tanks are generally protected from direct impacts. Crushing the vehicle/fuel tank would likely not release all 527 gallons of the fuel at the same time. While the fuel tanks are not designed to withstand a roof impact, it is reasonable to assume that not all the liquid would be released given the location of the 6 pieces of equipment and liquid volumes. Given the location of the vehicles, the release of liquid combustible cannot be released at a single point;
- Leaked fuel would seep into the numerous fractures in the floor, fill voids/crevices on the rough loose surface, and would not likely form a large mobile pool;

- The only credible ignition source would be the battery on the vehicles. These batteries would be unlikely to provide a sustained ignition source to ignite diesel fuel/lube oil even with subsequent roof falls.

Roof Fall Induced Pool Fire - Event Consequences

As described above, the DSA bounding pool fires are initiated by either a leak (anticipated) or collision (unlikely) involving the lube truck, which has the largest consolidated volume of combustible liquid of approximately 534 gallons. These events are analyzed in CH/RH-UG-01-007a1, CH/RH-UG-01-007a2, CH/RH-UG-01-007a3, and CH/RH-UG-01-007a4. To bound the material-at-risk (MAR), the analysis assumes the affected equipment is directly at the waste face with no significant separation distance relative to the pool size (WIPP-036).

To prevent the involvement of waste in the postulated pool fires, the DSA/TSRs (LCO 3.1.2) requires operable automatic fire suppression when underground vehicles/equipment are less than or equal to 200 feet from the CH waste face (WIPP-036, WIPP-058). To yield the safest distance from the waste face, the analysis based the pool size on a 16-foot wide drift, since the lube truck is allowed to service these smaller areas (e. g., panel intake drifts). The smaller the width, the larger the required stand-off distance.

In addition, as described in DSA Chapter 4, Section 4.4.2.2, the required stand-off distance in WIPP-058 is 116 feet for the 16 foot-wide drift. Thus, the DSA incorporated 84 feet of margin in specifying the 200 foot stand-off distance.

The abandoned equipment is in a disposal room. For the 33-foot wide disposal room, the distance to the waste face to prevent involvement of the waste would be approximately 68 feet (WIPP-058). Thus, a consolidated volume of 534 gallons of liquid combustible would have to be closer than approximately 68 feet to involve waste.

Table 1 summarizes the liquid combustible capacity for all six vehicles, which sums to approximately 527 gallons. This is conservative since all the stored liquid volumes are assumed to be at their maximum. Figure 1 shows that this volume of liquid is distributed over a distance greater than 100 feet.

The closest vehicle (LHD) to the S-2520 drift is approximately 97 feet away (not considering the location of the fuel tank) and has a liquid capacity of approximately 137 gallons. The closest vehicle (Transporter) to the S-2180 drift is approximately 70 feet away and has a liquid capacity of approximately 89 gallons. The floor in Room 6 is known to slope to the south towards S-2520. The closest vehicle is the LHD more than approximately 97 feet away (with 137 gallons as stated above). The next closest vehicle to the South would be the other LHD located greater than 142 feet away from

S-2520. Given the approximately 97 feet of room length from the LHD to S-2520, it is unrealistic to assume the floor would behave like a hard sloped concrete floor in mobilizing the pool. The spilled liquid would fill voids/crevices on the rough surface. As important, numerous fractures in the salt would also act to prevent pool formation and mobility.

For the LHD, the conservatively calculated stand-off distance, accounting for the pool length and heat flux, would be approximately 66 feet compared to the 97-foot distance of the LHD to S-2520. This value accounts for floor heave by reducing the room width from 33 to 16 feet. Also, due to floor sloping, the liquid pool is assumed to flow towards the S-2520. The new stand-off distance would still provide approximately 31 feet of margin.

For the Transporter, the conservatively calculated stand-off distance, accounting for the pool length and heat flux, would be approximately 47 feet compared to the 70-foot distance of the Transporter to S-2180. This value accounts for floor heave by reducing the room width from 33 to 16 feet. Also, due to floor sloping, the liquid pool is assumed to flow towards the S-2180. This new stand-off distance would still provide approximately 23 feet of margin.

Considering the length (Table 1) and placement (Figure 1) of these vehicles relative to their respective drifts, none of them have sufficient volumes to form pools that could extend to a waste face.

Therefore, waste in neither the intake S-2520 drift nor the exhaust S-2180 drift would be involved in an extremely unlikely pool fire caused by a large roof fall.

3.0 Operational Restrictions and Interim Controls

Emplacement or retrieval of waste in the intake drift (S-2520) or exhaust drift (S-2180) of Panel 7, within 200 feet of the abandoned equipment described above, will not violate LCO 3.1.2, based on a TSR page change included in the attachment.

Emplacement of waste in Panel 7 Room 6 north of the intake drift (S-2520) and south of exhaust drift (S-2180) is prohibited.

4.0 Implementation

The implementation of DSA Revision 5b is sufficient to commence waste emplacement activities with abandoned vehicles/equipment in Panel 7, Room 6, as described in this ESS, with one exception. Operating procedures are required to reflect the suspension of the 200-foot separation distance between the waste face and abandoned equipment.

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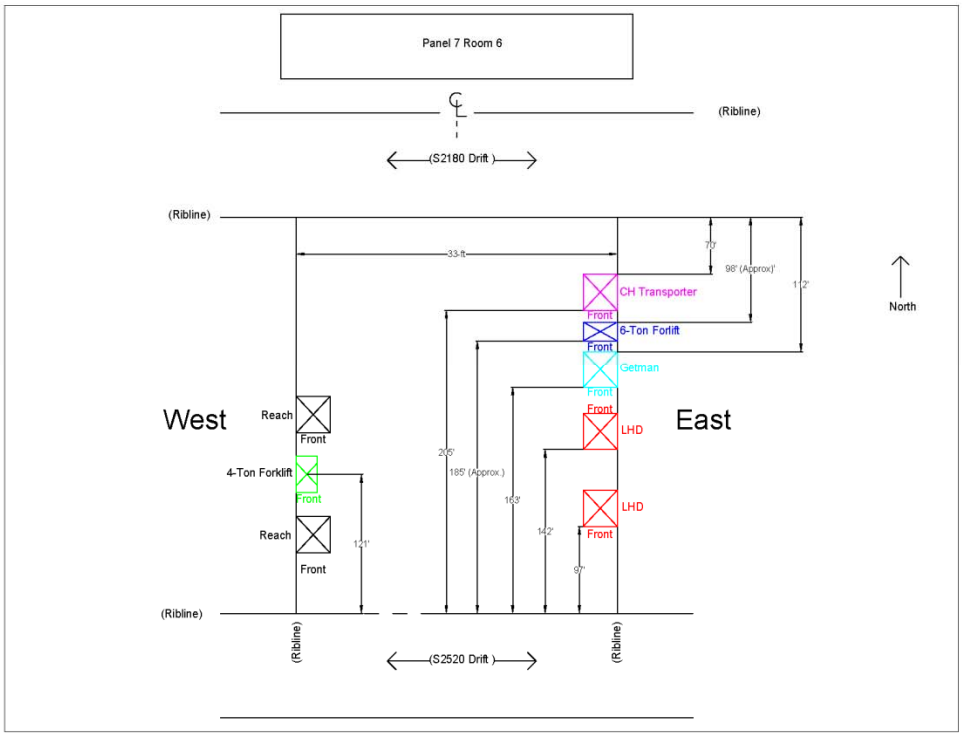
5.0 Planned Corrective Actions and Termination of ESS

The PISA and ESS will be incorporated into the DSA/TSRs during the next annual update.

TABLE 1. Fluid Combustibles for Equipment Abandoned in Panel 7 Room 6					
Equipment Number	**Description [Dimensions]**	**Combustible Loading Type and Quantity**			
		Diesel Fuel (gal)	**Hydraulic Fluid (gal)**	**Engine Oil (gal)**	
74-H-026	4 Ton Toyota Forklift (5FD35) [*5' W x 15.5' L*]	25	19	2.6	47
74-U-008	Scissor Lift (Getman A-64) [*8' W x 25'* L]	33	22	2.5	58
74-U-002A	LHD (EIMCO 913) [*7' W x 31' L*]	62	72	3	137
52-H-007C	6 Ton Toyota Forklift (5FD70) [*5' W x 15.5' L*]	37	19	3	59
52-H-008C	CH Transporter (Getman A-64) [*9' W x 25' L*]	37	48	3.7	89
74-U-039	LHD (EIMCO/Jarvis Clark 9130) [*7' W x 31' L*]	62	72	3.3	137
				Total	**527**

Figure 1. Location Equipment Abandoned in Panel 7 Room 6



The Reach equipment does not contain significant quantities of liquid combustibles

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References Used:

DOE/WIPP 07-3372, Rev. 5b, *Waste Isolation Pilot Plant Documented Safety Analysis*

DOE/WIPP 07-3373, Rev. 5b, *Waste Isolation Pilot Plant Technical Safety Requirements*

WIPP-021, Rev. 6, *Hazards Analysis for the Waste Isolation Pilot Plant Transuranic Waste Handling Safety Basis*

WP 02-AR3001, Revision 12, *Unreviewed Safety Question Determination*

PISA Determination P16-011- Pool Fire Involving Waste Caused by a Large Roof Fall

USQ Determination D16-169 Rev. 0 - *Follow-Up USQD for PISA P16-011, Pool Fire Involving Waste Caused by a Large Roof Fall*

WIPP-058, *DSA Supporting Calculation, Fuel Spill, HEPA filter Plugging, Fire Compartment Over-Pressurization, Facility Pallet Survivability, Lube Truck Standoff Distance , Waste Array Fire Spread, and Internal Drum Event Fire in CH Bay and Along Waste Transport, Revision 2*

WIPP-036, *Evaluation of Fire Involving Waste Handling Equipment*, Revision 1, Nuclear Waste Partnership LLC

ETO-Z-157 Rev. 4, *Fire Protection Engineering Determination of UG Diesel Powered Equipment that Require Automatic Fire Suppression System Installation*

Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements, DOE G 424.1-1B, Chg 1: 4-12-2013

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Technical Safety Requirement Page Change

3.1.2 UNDERGROUND Vehicles and Equipment with a Fire Suppression System

LCO 3.1.2 The FSS on UNDERGROUND vehicles/equipment selected for use SHALL be OPERABLE.

An OPERABLE FSS consists of the following elements:

Control Panel with functional status indicating light(s).

Temperature detection elements.

Adequately charged suppressant system.

Distribution system to disperse the suppressant.

Automatic engine cutoff capability.

MODE Applicability WASTE HANDLING and DISPOSAL

When CH WASTE is present in the WASTE SHAFT STATION or the VEHICLE EXCLUSION ZONE.

When transporting CH WASTE between the VEHICLE EXCLUSION ZONE and the WASTE FACE.

When UNDERGROUND vehicles/equipment are less than or equal to 200 feet from the CH WASTE FACE.

----------**NOTE 1**----------

Disabled (inoperable) vehicles/equipment in the VEHICLE EXCLUSION ZONE or abandoned equipment in Panel 7, Room 6 per ESS-2016-02, Revision 2 are not required to have an OPERABLE Fire Suppression System.

----------**NOTE 2** ----------

Vehicles/equipment outside the VEHICLE EXCLUSION ZONE during the transport of CH WASTE are not required to have an OPERABLE Fire Suppression System.

PROCESS AREA Applicability UNDERGROUND