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Subpart A Inspection Report in Response to the February 14, 2014 WIPP Incident

April 7 - 29, 2014

U. S. ENVIRONMENTAL PROTECTION AGENCY
Office of Radiation and Indoor Air
Center for Waste Management and Federal Regulation
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1.0 Executive Summary

On February 14, 2014, a radiological release took place in the underground of the Department of Energy (DOE)'s Waste Isolation Pilot Plant (WIPP) that led to the release of a small but measurable amount of radioactive material to the environment. In response, the U.S. Environmental Protection Agency (EPA) began an evaluation of the WIPP's continued compliance with the requirements of 40 CFR Part 191, Subpart A, which limits the annual dose to the public from the management and storage of transuranic waste, and Subpart H of the 40 CFR Part 61 National Emissions Standards for Hazardous Air Pollutants (NESHAPs), which also sets public dose limits for facilities operated by the U.S. Department of Energy. As part of this compliance review effort, EPA staff traveled to the WIPP to inspect the WIPP air sampling program and current waste management and storage operations in April 2014. As part of its oversight role, EPA conducts site inspections of the WIPP facility annually.

EPA's April 2014 inspection focused on some of the actions taken by DOE and its prime WIPP contractor, Nuclear Waste Partnership (NWP), in response to the accidental release. EPA inspectors examined the WIPP's air emission monitoring devices and methods used to estimate radiation doses to the public. In addition, EPA inspected radiation sampling locations and equipment, observed sample processing and reviewed the consequence assessment dose estimates.

EPA identified several focus areas in its inspection announcement to DOE. They are listed below, together with a description of the inspection activities and a reference to the relevant section of this report that address each area.

Has DOE accurately characterized the source term and extent of the release?
During the inspection, EPA examined whether DOE's effluent sampling system was able to provide samples that represent the entire release to the environment. EPA found that this was the case. Section 4.1, Ambient Air Sampling, describes actions taken by DOE to rule out releases from points other than the exhaust system. Section 4.2, Mine Ventilation and Effluent Sampling, details EPA's review of the exhaust system. EPA also interviewed the personnel responsible for characterizing the release on a short-term, emergency basis, and found that this activity took place according to procedure. See Section 4.3, Consequence Assessment.

Is the mine exhaust filtration system working as intended, and will it continue to do so?
The HEPA filtration of the mine exhaust prevented most of the contamination from reaching the accessible environment, and is functioning as the first line of defense against further releases. Based on EPA's observations, the HEPA filters continue to work effectively with the additional sealing by DOE to prevent leakage. However, DOE's Accident Investigation Report identifies several deficiencies in the ventilation system that, had they been corrected prior to the accident, would have further minimized the release.[1] The HEPA filtration system has now been operating continuously for a longer period than was ever anticipated. Based on discussions with site personnel, EPA found that DOE is being proactive about managing the system so that it continues to function. This is discussed in Section 4.2, Mine Ventilation.

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[1] Department of Energy. *Accident Investigation Report: Phase 1: Radiological Release Event at the Waste Isolation Pilot Plant on February 14, 2014.* Washington, DC: 2014.

Does DOE have appropriate monitoring and sampling devices on site during underground reentry operations?
Prior to the inspection, DOE provided EPA with information on the sampling and monitoring devices placed throughout the WIPP site that could detect a further release of contamination. EPA inspectors observed this equipment to be in place and operating as described. The equipment is described in Section 4.1, Ambient Air Sampling.

Is DOE's array of on- and off-site air monitors in working order?
EPA inspected all of the locations and instruments in DOE's network of ambient environmental air samplers, in addition to the effluent air samplers that are inspected each year. EPA found several areas for the improvement of the network. These are detailed in Section 4.1, Ambient Air Sampling.

Does DOE continue to store and handle transuranic waste at the site safely and according to procedure?
During its annual inspections, EPA inspects the Waste Handling Building (WHB) and the WIPP underground waste rooms to verify that waste is being handled as described. EPA inspected the WHB during this inspection, and found that the site was following typical waste handling procedures. See Section 4.5, Waste Handling.

1.1 Observations

EPA found that DOE was able to collect representative effluent and ambient air samples during and following the incident to adequately characterize the release. Specifically, the post-filtration effluent air samples used for compliance, taken at monitoring Station B, are representative of all air leaving the facility, including some leakage that bypassed the HEPA filters. The automated shift to the HEPA filtration system significantly mitigated the release. Based on EPA's observations, HEPA filters continue to work effectively, with additional sealing by DOE to prevent any ongoing leakage. Furthermore, failure of the system would not occur without several preceding warning signs and smaller failures that would alert the site operator and provide an opportunity to shut down the ventilation system to prevent the release of unfiltered air. EPA found DOE's ambient air sampling system to be generally adequate for characterizing this event, but DOE needs to make improvements in the future.

EPA identified several opportunities for to DOE to improve its environmental ambient air sampling network. Specifically, some samplers should be positioned differently to ensure that representative samples are collected. Additionally, DOE should revisit the maintenance and reliability of its existing samplers, and consider whether to upgrade the samplers. This incident illustrated the importance of confirmatory ambient sampling during such an event, and, by the time of this inspection, DOE had begun to enhance the existing sampling system. Enhancements to sampling equipment and maintenance would provide greater confidence in DOE's environmental sampling results.

In reviewing DOE's response to the February 2014 release, EPA noted multiple deviations from typical operations specific to sample collection and sample handling. Some deviations are called for by procedure during any radiological incident, and others resulted from decisions by DOE and NWP management in response to this particular release. The changes in protocol led to an inconsistency in the effluent and ambient air sample information collected and sample tracking. Consistency of sample treatment, specifically for effluent sampling, is important to demonstrating compliance.

2.0 Inspection Scope

The scope of this inspection was to verify that the WIPP continues to effectively measure and analyze radiological releases and calculate radiation doses to members of the public. Inspection activities included an examination of effluent and ambient air sampling equipment, and review of sample handling and the procedures used for analyzing samples and documenting results at WIPP Laboratories. This inspection was conducted under the authority of 40 CFR Part 191, Subpart A (hereafter referred to only as Subpart A) and 40 CFR 194.22.

3.0 Inspection Team, Observers and Participants

The inspection team consisted of five EPA staff.

Inspection Team Member	Position	Affiliation
Jonathan Walsh	Inspection Lead	EPA ORIA – RPD
Sam Poppell	Inspector	EPA ORIA – NAREL
Christopher Royce	Inspector	EPA ORIA – NAREL
Scott Faller	Inspector	EPA ORIA – NCRFO
George Brozowski	Inspector	EPA Region 6

Numerous DOE staff and contractors participated in the inspection; below is a partial list.

Participant	Participant
Larry Madl	Art Chavez
Russ Patterson	Tom Lichty
Jacqueline Davis	Jennifer Hendrickson
Mansour Akbarzadeh	Ginny Jones
Rob Hayes	Brian Stubbs
David Squires	Randy Britain
Jerome Hernandez	Jimmy Neatherly
Ed Picazo	Jim Stafford
Walter MacMiller	

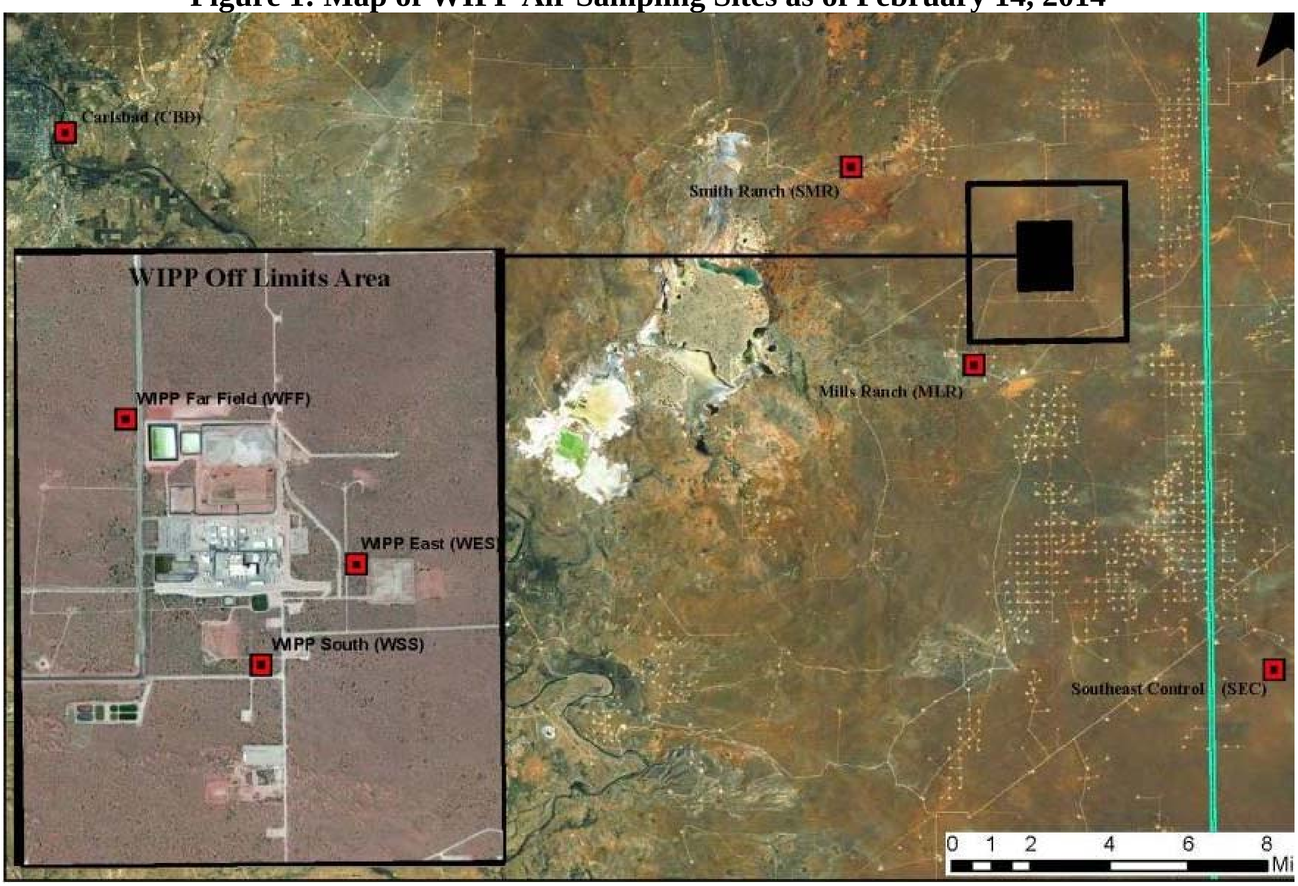
4.0 Performance of the Inspection

The inspection began on Monday, April 7, 2014, at the Skeen-Whitlock building in Carlsbad. Tom Lichty (NWP) provided the EPA inspection team with the safety and security training required to access the WIPP site. In addition to the General Employee Radiological Training (GERT), an additional training session, RAD 111, specific to the February 2014 incident was required for site entry.

During the afternoon of April 7, the inspection team traveled to the site and set up four low-volume ambient air samplers. EPA's samplers were placed in close proximity to DOE's ambient environmental air samplers located at the WIPP Far Field, South, and East locations, as shown in Figure 1. EPA's sampling was designed so that the results could be directly compared to DOE's results from the same locations.[2] These are the environmental sampling locations that were in operation at the time of the release and detected measurable radioactivity. Sample filters from EPA's samplers were collected on April 15, 22, and 29, and sent to EPA's National Analytical Radiation Environmental Laboratory (NAREL) for radiochemical analysis. The results generated by these sampling activities and the comparison of those results with DOE's are located in EPA's *Analysis of EPA and DOE WIPP Air Sampling Data*.[3]

For the remainder of the inspection, the EPA inspection team reviewed procedures, interviewed site staff, and observed activities and equipment to verify the effective implementation of procedures relevant to Subpart A. These activities are described in detail below. The inspection was guided by a checklist. The final, completed checklist is included in Attachment II of this report.

Figure 1: Map of WIPP Air Sampling Sites as of February 14, 2014



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[2] Environmental Protection Agency. *WIPP/QAPP-1. NAREL Quality Assurance Project Plan: Deployment of Air Monitors to the WIPP Site.* National Analytical Environmental Laboratory, Montgomery, AL: Effective Date April 5, 2014.

[3] Environmental Protection Agency. *Analysis of EPA and DOE WIPP Air Sampling Data.* Washington, D.C., 2014. [EPA Air Docket A-98-49, Item II-B1-30; July 2014]

4.1 Ambient Air Sampling

4.1.1 Environmental Monitoring

DOE demonstrates compliance with Subpart A by continuously collecting and analyzing representative samples of the effluent air that is exhausted from the underground facility and Waste Handling Building. For this reason, EPA focused most of its previous inspections on the effluent monitoring system – the probes and sampling devices used to sample air that leaves the underground facility and Waste Handling Building. In addition to effluent sampling, the facility also operates a network of ambient environmental air samplers. These low-volume air samplers are located both on and off the WIPP site and operate continuously. Air is drawn into the sampler and passes through a sample filter. These filters are collected weekly and analyzed to determine the concentration of airborne radioactive particulates in ambient air at that location. During this inspection, EPA made a point of inspecting the full network of ambient environmental air sampling stations. It is important to note that DOE expanded the ambient sampler network in response to the incident, both by reinstating sampling at locations where sampling had been previously conducted but discontinued, and by adding new locations in population centers. DOE added four new ambient sampling locations during the period when EPA conducted its inspection.

On the morning of Tuesday, April 8, the inspection team met the NWP Environmental Monitoring field sampling team, Jerome Hernandez and Jimmy Neatherly, at the WIPP site and drove to all of the low-volume environmental air sampling locations shown in Table 1. EPA inspectors observed the weekly filter changes performed by the environmental sampling team, using procedure WP 02-EM1012 (Rev. 16, effective date 4/4/14).

As shown in Table 1, the ambient environmental sampling network has been expanded significantly following the February event. Prior to the event, seven stations were operated. As seen in Table 1, two air samplers were operating at the Carlsbad station. After the release event this network was expanded to 11 by April 8. On April 9, four additional samplers went into operation in the towns of Artesia, Loving, Eunice, and Hobbs. These last four samplers are not shown in Table 1. On April 14, members of the EPA inspection team traveled to the four new sampling sites and observed sampler positioning and filter changes at those locations.

All of the ambient environmental air samplers are Hi-Q Model CMP-0523CU, housed in metal “birdhouses.” Figure 2 shows these samplers as they are typically set up. The sampling heads protrude vertically from the housing and face downward, at heights that vary between 4 and 8 feet (see Figure 3). A pump inside the birdhouse draws air through the sample head, which contains a filter that captures particulate material. The ambient air samplers have an integrated analog flow meter and pressure gauges. This instrumentation is not used, and therefore does not have a formal maintenance or calibration program. Instead, when a new filter is installed, a calibrated digital flow meter is used to adjust the pump so that 2.0 cubic feet per minute (cfm) of air is drawn across the filter. When the filter is removed, the same calibrated flow meter is used to measure flow across the filter, which typically decreases slightly as material builds up on the filter. Total flow across the filter is calculated by averaging these two flow rates, and multiplying the result by the amount of time that the filter was in operation. This time is measured by a digital timer on the sampler. These digital timers are hand-verified on an annual basis, and paper tags on the unit are used to indicate the date of the last timer verification.

Table 1: Ambient Sampling Stations Observed on April 8

Sampling Location	Abbreviation	Instrument number	Timer Verification date	Filter height (ft., estimated)	In Operation on 2/14/2014
Salt Handling Shaft	(SLT)	10071	3/25/14	6.5	No
Training Building	(STB)	Not recorded	3/25/14	4	No
Guard and Security Building	(GSB)	Not recorded	3/25/14	5	No
WIPP Far Field	(WFF)	13232	6/5/13	8	Yes
WIPP Far Field	(WFF)	15555	3/25/14	8	No
Meteorological Tower	(MET)	14778	3/25/14	4.5	No
WIPP East	(WEE)	10031	6/5/13	7	Yes
WIPP South	(WSS)	13231	6/5/13	7	Yes
Mills Ranch	(MLR)	14888	6/5/13	7.5	Yes
Southeast Control	(SEC)	9918	7/30/13	4.5	Yes
Smith Ranch	(SMR)	10032	7/30/13	8	Yes
Carlsbad	(CBD)	9916	6/20/11	6.5	Yes
Carlsbad	(CBD)	14889	6/5/13	4.5	Yes

Figure 2: Typical DOE Ambient Air Sampler Configuration (location Carlsbad)

Figure 3: Low-Volume Sampling Head

Many of the ambient air samplers were observed to be placed in appropriate, unobstructed areas, and the filter changes took place according to procedures. At the Carlsbad sampling location, however, inspectors observed that the samplers were placed in close proximity to an outbuilding, which could potentially restrict airflow to the sampler. Additionally, while Sampler 14889 showed 170.3 hours elapsed, its duplicate (9916) showed only 129 hours elapsed. According to DOE procedure, a sample can be accepted, with a notation, as long as at least 100 hours are shown for the weekly sample. Sampling staff expected that the discrepancy was caused either by a timer failure, or by overheating, which can cause the pump motor to shut off intermittently. A hand timer was used to verify the timer on sampler 9916. More than 8 minutes elapsed before the timer gave a reading of 0.1 hours, indicating timer failure. Sampling staff allowed the sampler to continue running, and stated that they would return to replace the timer later that day. It was not clear to EPA whether the resulting sample would be considered a duplicate. EPA staff inquired about how instrument failures and maintenance are recorded, and sampling staff stated that the both of these occurrences are noted on the sample sheets.

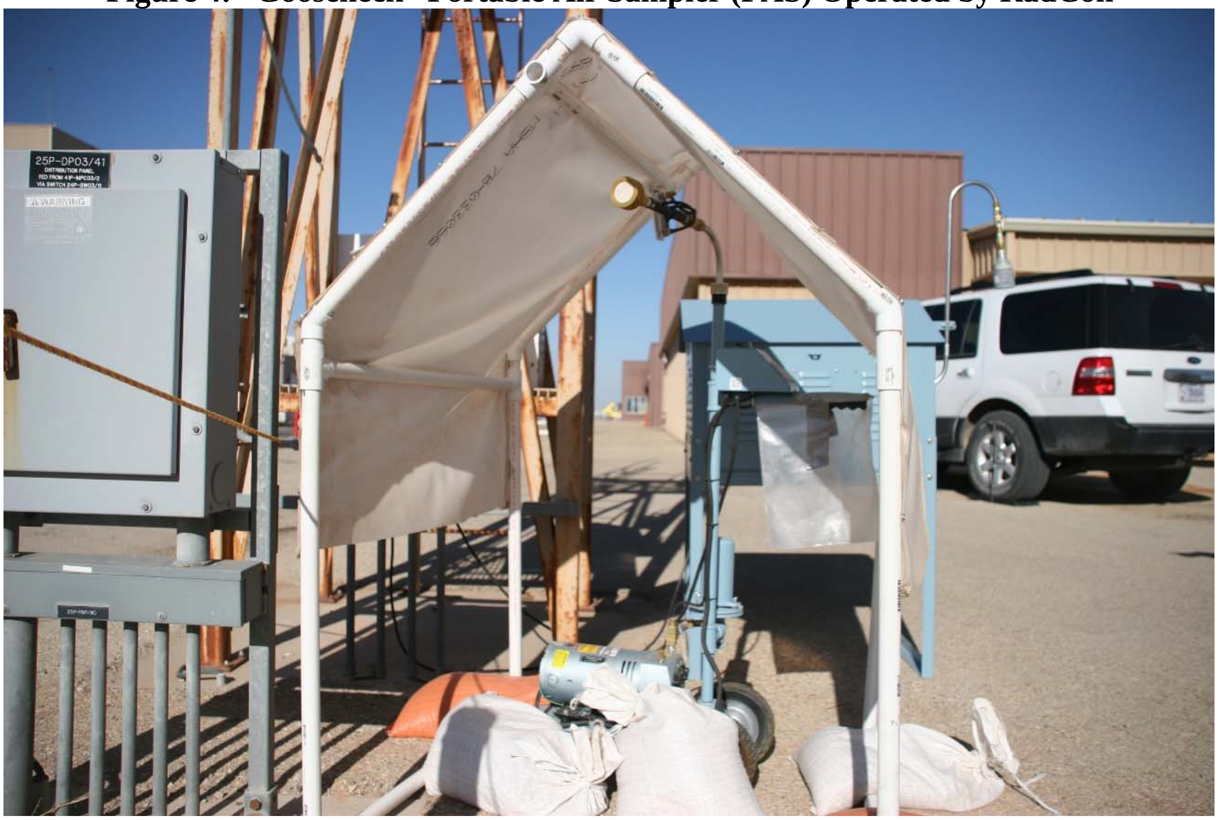
The EPA team discussed ambient environmental air sampling with Jaci Davis (NWP), cognizant engineer for environmental sampling systems. Inspectors inquired whether the air sampling equipment is maintained on a routine basis, and whether it is possible to review the maintenance record for a given instrument. Although the function of the samplers is checked during an annual systems walkdown, there is no set maintenance cycle, and no record dedicated to the maintenance or reliability of the instruments. Instead, instrument maintenance is performed on an “as-needed” basis during weekly sample collection, and the only maintenance records for the samplers are the repairs logged on sample forms, which are retained by the Environmental Monitoring group. Ms. Davis acknowledged that the program has been limited due to staffing constraints.

4.1.2 Radiation Control (RadCon) Air Sampling

In addition to the network of air samplers that is operated by NWP’s Environmental Monitoring program, a separate organization under NWP, Radiation Control (RadCon), has deployed ambient air samplers throughout the site during recovery operations. Sampling activities such as these can be performed at the discretion of the RadCon program, and are typically not subject to EPA oversight because they do not relate directly to regulatory compliance. During the recovery from this incident, however, EPA wanted to be sure that DOE had taken adequate steps to rule out releases from points other than the exhaust shaft. DOE provided information on sampling and monitoring equipment that had been placed around the site to accomplish this task, and the EPA inspection team verified that this equipment was present and operating as DOE had stated.

On Wednesday, April 9, the EPA team inspected the sampling equipment at the Salt Handling and Air Intake Shafts. Because of the underground contamination, the aboveground physical structure (shaft collar) and area surrounding each shaft has been restricted as a Radiological Buffer Area (RBA). The EPA team walked the exterior of the salt shaft, up to the RBA boundary. Brattice cloth, used in mine operations to restrict air flow, had been placed over and around the structure of the shaft collar, making it impossible to view the continuous air monitor at that location without entering the RBA. Four Hi-Q “gooseneck” portable air samplers (PASs) were observed: 240-R1-000-0861, 240-R1-000-1101, 240-R1-000-0062, and 240-R1-000-1610. These instruments are free-standing, low-volume air samplers that do not have any external housing. The sample heads are at waist height and parallel to the ground surface (see Figure 4). Units 0861 and 1101 were outside the boundary of the RBA. Analog flow rate meters in line with the filter head indicated that each was operating at 2 cfm. Although some of the calibration labels were weathered due to the harsh environment at the WIPP, the instrument calibrations are maintained by RadCon, and those that were legible had been recently calibrated. Samples are collected from the PASs and counted for radioactive contamination using procedure WP 12-HP3500. The frequency of filter changes on PASs is daily, although it was 4-8 hours during the initial response. During the initial response, RadCon air samples were all sent for isotopic analysis.

Figure 4: "Gooseneck" Portable Air Sampler (PAS) Operated by RadCon



At the air intake shaft, Hi-Q PAS 240-R1-000-1612 was observed to be operating within the RBA. A Staplex kinetic impactor, which can be used to sample selectively for alpha- and beta-emitting transuranics without collecting lighter radon decay products, was present but not operating. As at the salt shaft, brattice cloth was placed around the shaft collar. At each location, brattice cloth would be pulled over the shaft opening if ventilation was secured (i.e., the ventilation fans turned off). This action would be taken to prevent contamination from escaping the shaft, which could occur if the ambient temperature dropped and warmer air began to rise from the underground.

4.1.3 Observations

EPA observed the DOE WIPP Environmental Monitoring team correctly following procedures and the operators readily answered questions regarding both the ambient sampling equipment and procedures. Following an event, the importance of obtaining accurate, defensible environmental samples is highly evident. The EPA inspection team made several observations which could help DOE strengthen its environmental air sampling program, particularly as it assesses and expands its sampling network.

The physical positioning of several ambient air samplers needs to be improved for the samplers to function properly. The ambient air samplers located at the Carlsbad location were partially obstructed by a large outdoor shed and closely parked maintenance trucks, potentially preventing air flow from the desired 270 degree sampling area or even the 180 degree minimum sampling area. The presence of vehicles could also provide bias from vehicle emissions, which may interfere with collection efficiency. The newly established ambient air samplers located at Artesia, Loving, Hobbs and Eunice were all closely located to structures more than three times the height of the samplers (Figure 5). Each of these samplers should be moved to attempt to get a 270 degree sampling area away from buildings. In addition, samplers in Artesia and Eunice station were located next to regularly plowed farm land, which could reduce the collection efficiency of gathering the targeted radionuclides due to early loading of the sample filters with soil particulates. Lastly, the sampler in Artesia was placed under an exhaust vent for the adjacent fire station. Particulate exhaust from this vent may reduce collection efficiency. This sampler should be moved away from this exhaust. These observations are made in consideration of 40 CFR Part 58, Appendix E, Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring. The samplers sited at WIPP Far Field, WIPP East, WIPP South, Mills Ranch, Smith Ranch, Southeast Control, Met Tower, Salt Hoist, Training Building and the WIPP Guard & Security Building were placed in excellent locations for sample collection.

Figure 5: Ambient Air Sampler, Loving Fire Station

In addition to collecting representative particulate samples, it is important to know the cumulative air volume through the filters to accurately calculate environmental concentrations. DOE's method of averaging the flow rates at the beginning and end of a sampling period is coarse, and a timer failure was observed during the inspection. The EPA inspection team identified several ways in which DOE could limit the amount of error in calculating air volume. These are included in the following section.

EPA's observations verified that DOE has placed additional sampling equipment at the site as it had previously described. It appears that RadCon has taken reasonable steps to detect and mitigate any potential releases from the Air Intake and Salt Handling shafts.

4.1.4 Areas for Improvement

DOE needs to improve the design, positioning, maintenance and overall capability of its ambient environmental air monitoring network. DOE needs to implement a formal maintenance record system for its ambient air sampling equipment, in which each sampler has an instrument logbook to document repairs and assist in trend analysis of failures. In addition to checking air flow with a calibrated meter at each filter change, DOE could send the samplers out for third party calibration annually, or formally calibrate the samplers in-house. Another option that DOE should consider is replacing the current analog units with updated digitally controlled systems. Many manufacturers of air sampling equipment manufacture digital systems that record power failures, air flow rates and total volume sampled.[4] Specifically, air particulate sampling devices should automatically record power outages. In addition to minimizing the impact of timer errors on collecting representative samples, an upgraded system would consistently provide a much more precise record of the volume of air sampled, and therefore more accurate and defensible environmental measurements.

The EPA inspection team felt that ambient air samplers should be checked for proper operation more frequently than the weekly filter collection cycle, especially because failures (such as loss of power or overheating) are not recorded by the sampling equipment and the duration of these problems cannot be definitively known. DOE needs to ensure that problems with the ambient air sampling equipment are addressed proactively, rather than after sampler failure.

4.2 Mine Ventilation and Effluent Air Sampling

The WIPP underground is ventilated by large fans on the surface of the facility, which pull air out of the exhaust shaft. By using different combinations of fans, between 60,000 and 440,000 cubic feet per minute (cfm) can be exhausted from the mine. Under normal operations, effluent air from the facility is exhausted directly to the atmosphere. In an emergency, mine ventilation is reduced and routed through banks of HEPA filters. During this incident, an underground radiation alarm automatically triggered this shift to filtration.

Based on EPA's observations, the HEPA filters continue to work effectively with the additional sealing by DOE to prevent leakage. However, DOE's Accident Investigation Report identifies several deficiencies in the ventilation system that, had they been corrected prior to the accident, would have further minimized the release. Specifically, the investigation concluded that "the unfiltered above ground release identified in Phase 1 of the investigation was preventable. The ventilation system has [HEPA] filter bypass dampers that represent a pathway of unfiltered exhaust into the environment. These isolation dampers are not suitable as a containment boundary and reduce the overall efficiency of the HEPA filter system." (AIB Phase 1 Report, p. ES-8) The investigation found that this situation originated in DOE's assumption that "only relatively smaller releases in the [underground]...were judged to be credible." As a result, "the damper design was not required to meet requirements in the nuclear industry ventilation code." This view of the potential for releases also contributed to a maintenance environment in which "there was significant degradation in the material condition of several ventilation system components identified that were not being aggressively pursued." (p. ES-2)

A major concern of EPA, prior to the inspection, was DOE's post-incident realization that the isolation dampers used to divert exhaust air into the HEPA filter banks were designed with a certain amount of leakage, allowing some effluent air to bypass the filters and be exhausted directly to the atmosphere via Station B. EPA placed a high priority on understanding the implications of this leakage. Because the HEPA filtration system is functioning as the primary defense against additional contamination escaping the underground, EPA also discussed maintenance of the system with the responsible personnel. EPA also inspected the equipment used to sample the exhaust air from both the underground facility and Waste Handling Building (WHB).

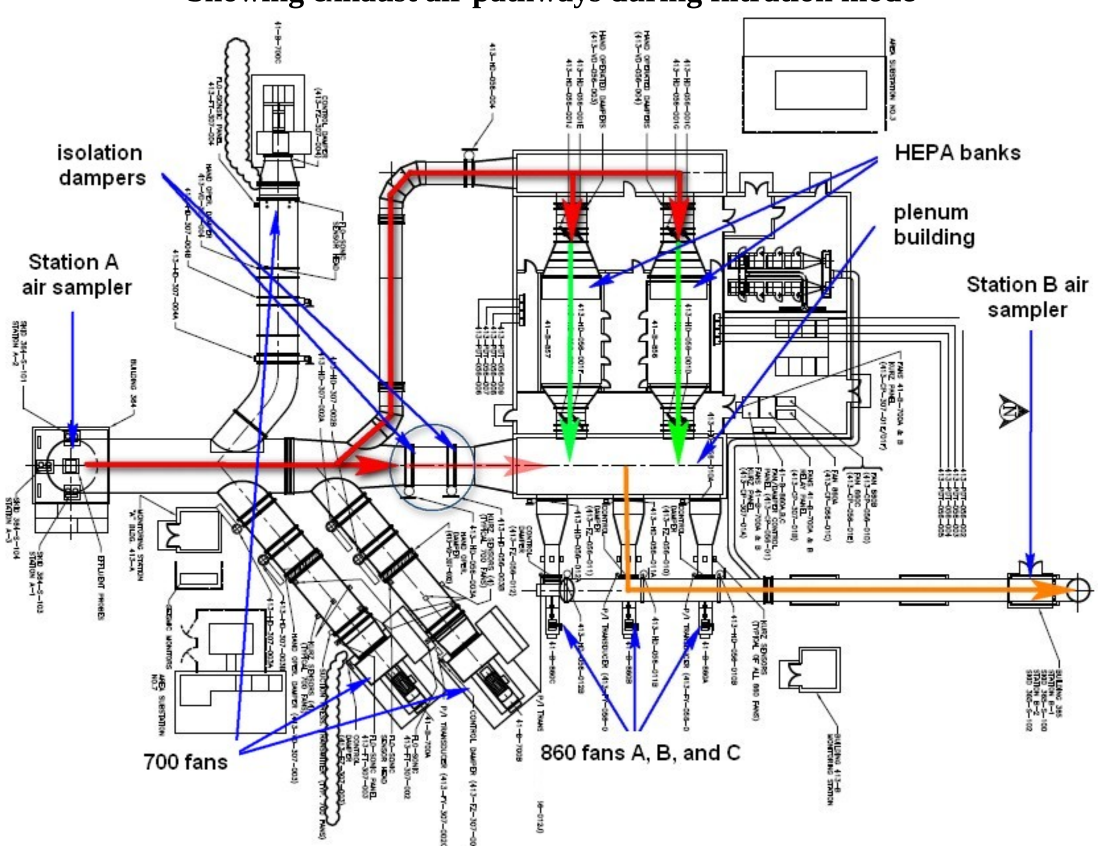
[4] Environmental Protection Agency (EPA). *Environmental Radioactivity Surveillance Guide*. ORP/SID 72-2. Washington, D.C.: 1972

4.2.1 HEPA Filtration of Effluent Air

On the morning of April 9, the EPA inspection team and site engineering staff held a discussion of mine ventilation, HEPA filtration and duct maintenance. EPA inspectors also walked down the outside of the exhaust system, and examined schematics of the system with engineering personnel. From these discussions, EPA was able to confirm that the air that bypassed the HEPA filters (prior to the sealing of the dampers on March 6) passed through the facility exhaust at Station B, and representative samples were taken of the total facility exhaust by effluent samplers at that location.

The exhaust system can be operated in several configurations. If the facility is not in filtration mode and one or more of the three “860” fans is being operated, exhaust air passes through the open dampers into the plenum building, and is then exhausted at Station B. In filtration mode, a single 860 fan is operated and the dampers are closed, forcing air through the HEPA filtration banks. Because the plenum building remains under negative pressure, some unfiltered air passed through the dampers and was exhausted without being filtered, prior to the sealing of this leak pathway. However, because all of this air is exhausted through the same pathway, air samples taken at Station B capture all radioactive material that enters the environment. In Figure 6, the red arrows denote the path of unfiltered mine exhaust, the green arrows show the path of filtered air, and the orange arrow shows the mixture that is exhausted from the plenum building. There are similar sets of dampers on each of the three “700” fans (the typical exhaust points for high ventilation configurations) that are likewise closed when the facility enters filtration mode. However, these dampers are under constant negative pressure, so any leakage at those locations would pull exterior air into the effluent stream.

Figure 6: WIPP Exhaust and HEPA Filtration System, Showing exhaust air pathways during filtration mode



Discussions with engineering staff confirmed that the HEPA system had been tested regularly against its original design standard. At the time of the inspection, considerable effort was being devoted to planning the change-out of the filter media. The site was planning to replace all components (mod or roughing filter which is designed to capture large particles, high-efficiency filter, and two HEPA filters) on one side, and the mod filter on the other side. Pressure gauges are located between each of the filter stages, and the pressure differential (measured in pounds per square inch, or psi) across each component of the filter is used to monitor its performance. As more material builds up on a filter component, air encounters greater resistance when passing through, and the differential pressure increases.

At the time of the inspection, staff were closely watching the roughing filters, and based on conversations with the manufacturers, raised the differential pressure alarm point from 2.0 psi to 2.5 psi, shortly before the previous alarm point was reached on April 7. The previous alarm point was more conservative than necessary, and the filter is designed to withstand a differential pressure greater than 2.5 psi.

In the event that filter loading creates too high a pressure differential across the roughing filter, the filter would tear, creating a pathway for unfiltered air. Because each HEPA bank includes four filter stages in series, however, failure of the roughing filter would not compromise overall filter efficiency. Instead, the next filtration stage, the high efficiency filter, would begin loading at an accelerated rate. Engineering personnel did not anticipate any obstacles to the continued operation of the HEPA filters. A 5 psi pressure differential across the entire HEPA bank is currently the alarm point that would force the site to secure ventilation by shutting down the exhaust fan. (Securing ventilation would increase the risk of contamination escaping through the air intake and salt handling shafts. It is for this reason that brattice cloth has been placed at each of those locations.) Loss of effectiveness of the HEPA filtration system is unlikely to occur through a sudden, catastrophic failure. Rather, many warning signs, alarms and smaller failures would take place before any event could compromise overall HEPA efficiency, allowing DOE to shut down the system if necessary.

4.2.2 Effluent Sampling System

There are four sampling stations set up at the WIPP to sample effluent air from the facility. Station D is underground, at the entrance to the air exhaust shaft, and was not accessible during this inspection. Air exiting the underground through the exhaust shaft passes through Station A, prior to being exhausted or filtered. If the facility is in filtration mode, air passes by Station B after filtration and prior to exhaust. Lastly, all air in the Waste Handling Building passes through HEPA filters and is exhausted through Station C. This includes any air that rises up the Waste Handling Shaft. Prior to the incident, Station A was the sampling point of compliance. Now, Station B represents the facility effluent.

On the afternoon of April 9, the EPA Team inspected effluent air sampling Stations A, B and C. Station A consists of three samplers, or skids, each of which has three filter splits. During the inspection, Skid A-2 was operating as primary skid, and Skid A-1 as backup. This configuration had been in place since the incident. At that time, Skid A-3 was the primary skid. When the shift to filtration mode is complete, the primary skid is shut down, and the filters from that sampler provide evidence of any material that escaped unfiltered from the facility. On April 11, Skid A-3 was brought back online. Procedure WP 12-HP1305, Rev. 12 (effective date 1/16/14) was observed in use at Station A. All skids were within their dates of calibration, and all splits were running at 2.0 scfm (standard cubic feet per minute), with differential pressures between 0 and 2.01 psi. A continuous air monitor (CAM), Canberra iCAM (i.d.

240-R1-0001277), was operating within the Station A building for the protection of the personnel who change the sample filters.

At Station B, Skid B-1 was operating typically. It was calibrated 11/19/13, was drawing 2.0 cfm across each split, and a total differential of 6.06 psi across all three splits (corresponding to roughly 2 psi across each of the filter splits). A Canberra iCAM (serial no. 4828, i.d. 365-CAM-018-001) had been installed on split 3 of Skid B-2. Staff were in the process of connecting this CAM to provide real-time data to the Central Monitoring Room. Procedures for responding to information from the iCAM installed at Station B will be added to WP 12-ER3906, Categorization and Classification of Operational Emergencies.

The EPA team also entered the WHB and inspected Station C. The flow meter (411-NT-008-001) had been calibrated 11/26/2013, and showed that approximately 13,500 scfm were being exhausted from the HEPA filter banks in the WHB, which is within the range of normal operation. The pump for the Station C sampler was pulling approximately 0.280 scfm across the sample filter, with a differential pressure of 0.12 psi, at the time of the inspection.

Station B has played a critical role during the incident response, because it is the only effluent sampling location that represents the facility effluent after it passes through the filtration system and it also served as the basis for determining compliance with EPA standards for this incident. EPA found that Station B continues to operate within its design specifications and is capable of capturing representative samples. Station A continues to operate correctly, and provides an indication of the contamination that is leaving the underground and entering the filtration system. Station C also continues to operate as expected.

4.3 Consequence Assessment

In the event of a radiological release, DOE has procedures in place to immediately assess the severity of the incident and guide its response. In the immediate aftermath of a radioactive release to the air, predictive modeling is an important tool for estimating the airborne plume's direction and concentration in order to assess potential doses to the public. DOE refers to this activity as consequence assessment. Shortly after the February 2014 release at the WIPP, DOE initiated consequence assessment to estimate the extent of the release.

Consequence assessment can be performed using multiple methods, depending on the amount of information that is available. The results of consequence assessment do not support regulatory compliance, but do guide DOE's decision making process during an event. EPA has regularly inspected the consequence assessment program and procedure WP 12-ER4916, Consequence Assessment Dose Projection. In the immediate aftermath of the February 2014 incident, EPA requested DOE's consequence assessment calculations. DOE first provided a consequence assessment on February 21, and later provided multiple revisions prior to the inspection.

During the inspection, EPA examined whether DOE followed its own procedures throughout the incident. Because consequence assessment methodology changes based on the amount of information that is known, EPA sought to understand what DOE knew at various points during the response. Prior to the inspection, DOE had not yet provided EPA a written timeline of the event that showed what actions DOE took during the early response, and what information motivated these actions. Much of the information that EPA sought was provided in DOE's Phase I Accident Investigation Board (AIB) report, which was published by DOE on April 24, shortly after the inspection took place. In particular, Table 1 of the AIB report provides a detailed chronology of the radiological release. This report is not intended to replicate that chronology. This section relates the discussions held with site personnel during the inspection of the events which guided the development of the consequence assessment.

On Wednesday, April 9, Robert Hayes of NWP gave an overview of the incident from the perspective of the consequence assessment personnel, within the Radiological Engineering group. On April 11, the team met with several site personnel to resolve questions about the interaction between Environmental Monitoring, Radiation Control, and Radiological Engineering. Initial participants in the meeting were Ed Picazo (NWP) and Robert Hayes. Other participants, many not recorded, joined throughout that meeting, notably Jim Stafford, the RadCon Environmental Health and Safety Recovery Manager, and Walter MacMiller, the incoming recovery manager.

At the time of the February 5 fire, the continuous air monitors (CAMs) at the exhaust of Panel 6 were not operational, in anticipation of panel closure. The fire clogged the RADOS CAM at Panel 7 with soot. During the underground reentries following the fire, the Panel 7 CAM was cleaned and the optical lens was replaced, and the CAM passed its functional test and was brought back online. On the night of February 14, 2014 at 2314 Mountain Standard Time (MST) the CAM registered a "high" radiation alarm and "high-high" radiation alarm in rapid succession and automatically placed the facility ventilation system into filtration mode, preventing contaminated exhaust from escaping before filtration was activated.

At the time of the incident, it was not the WIPP policy for Radiation Control or Radiological Engineering personnel to be present at the site during the night shift, when waste was not being handled. During the initial incident, the on-call RadCon Manager responded to the site at approximately 0400 MST. At 0630 MST the Station A Skid 2 filter was pulled by RadCon, and counting instruments indicated a high level of contamination. At 0800 MST, filters from Stations A and B were pulled again. Robert Hayes, consequence assessment engineer, was called at approximately 0830 MST and told to report to the site, but provided with no further information. He was detained at security until 1000-1030 MST. When released, he met with Radiation Control, and was presented with initial gross alpha and beta counts from Stations A and B filters. Using those counts, he conducted initial consequence assessments according to procedure, using the activities observed at both Station A and Station B and the dose modeling program HotSpot. EPA inspectors reviewed the initial worst-case calculation, which assumed that all material observed at Station A escaped to the environment. Based on this estimate, the site initiated Radiological Engineering procedure WP 12-RE2002, Off-site Sample Recovery. When there is a possibility of contamination at an environmental sampling location, this procedure transfers sample collection duties from Environmental Monitoring to RadCon, under the guidance of Radiological Engineering. Based on meteorology, the WIPP Far Field sampling location was predicted to be the most affected sampling station. Together with a RadCon technician, Radiological Engineering personnel surveyed their way to the sampler, took external swipes, and counted the filter. No elevated counts were detected using field instruments. (Low levels of contamination on the filter were later detected by radiochemical laboratory analysis.)

On February 15, a second set of filters taken from Stations A and B at approximately 1500 MST showed gross alpha and beta counts that had continued to rise. Prior to this time, the assumption was that this had been an instantaneous "puff" release. Because the release was in fact continuous over time, and because the wind had shifted nearly 180 degrees, consequence assessment needed to be revised, and the entire site needed to be surveyed for contamination. At this time, DOE began using the National Atmospheric Release Advisory Center (NARAC) for consequence assessments, initially using National Weather Service meteorological data. Data from the WIPP meteorological station was incorporated into the NARAC models later. Radiological Engineering conducted site surveys for several days. Every fence post in the main plume was surveyed directly, and had a 12" smear taken on the inside. Outside the calculated plume, every third fence post was surveyed in a similar manner. No survey results were above normal background levels. The only surface contamination found in the facility was inside Station A, and likely escaped during sample filter collection.

EPA was particularly interested in the single sample collected from Skid A-3 on February 15. When the facility shifts into filtration mode, the primary skid is turned off as soon as the shift to filtration is complete. The resulting sample filter reflects all material that might have escaped the facility exhaust unfiltered, and is therefore a key data point in documenting the total release. DOE staff had stated that no elevated counts were observed on a Station A, Skid A-3 filter, and during the inspection, EPA requested documentation to this effect. Site staff were unable to locate a record of the sample. The Recovery manager had logged the initial counts of the sample in a personal log book during the initial incident. Internal electronic records could be found on the Tennelec alpha/beta counter used to screen the filter, which matched these recorded counts, but formal sample tracking or chain-of-custody forms could not be located during the inspection. Site staff agreed that the sample was most likely sent to the Savannah River Site (SRS) for radiochemical analysis, but that this would need to be confirmed by the RadCon manager at the time of the incident, who was not available during the inspection. DOE later provided the chemical mass spectrometry results for this sample (SRNL-F1200-2014-00001). No radiochemical analyses were performed.

4.3.1 Observations

Generally, the EPA inspection team found that consequence assessment was performed according to procedure. However, as noted throughout DOE's Phase I Accident Investigation Report, there were many delays in the early response to the incident. RadCon and Radiological Engineering play critical roles in initiating an incident response, but were only on duty during waste handling activities, and not present during night shift when the incident occurred. DOE now staffs the site 24 hours a day with personnel who are able to respond to a radiological emergency.

EPA inspectors were concerned by the degree to which effluent and ambient sample handling changed during the radiological incident, both according to written procedure and due to operational decisions. Environmental Monitoring personnel collect environmental filters during routine operations. It is part of WIPP procedure that RadCon personnel collect environmental filters without participation by Environmental Monitoring in the event of an emergency. Despite the critical nature of environmental sample collection in an emergency, RadCon's only regular practice fulfilling this role is during an annual exercise.

Also, sample analysis did not follow usual procedures. Samples that would ordinarily be sent to WIPP Laboratories were sent to SRS and Sandia National Labs, and at least one effluent air filter that would ordinarily be subjected to radiological analysis for annual NESHAPs compliance was sent for chemical analysis instead.

4.4 WIPP Laboratories

EPA inspected WIPP Laboratories, which supports annual NESHAP reporting and emergency response activities at the WIPP. On April 10, the team met with Mansour Akbarzedeh, Director, and Ginny Jones, QA Manager, and was given an overview of WIPP Laboratories' process. Inspectors toured the laboratory itself and were given a presentation of the laboratory's analytical services. The focus of EPA's discussions with laboratory staff was to understand the lab's procedures.

Routine environmental air sample filters are collected by environmental monitoring staff using WP 02-EM1012, Att.1. Likewise, effluent air samples are collected by RadCon using WP 12-HP1305, Att. 3. Prior to receipt, all samples are screened outside the lab using a Ludlum 3030. 100 cm^2 swipes are taken on all sides of the package, and 40 dpm α, 80 dpm β criteria must be met for the sample to be accepted. WIPP Laboratories is housed in a building that is operated by the Carlsbad Environmental Monitoring and Research Center (CEMRC), a DOE-funded extension of New Mexico State University. As building operator, CEMRC sets radiological acceptance criteria, and conducts background radiological screening of the entire facility.

Upon receipt, samples are logged into the hardcopy sample tracking log and an internal chain of custody form is generated (WP 12RL-3002). Prior to the incident, samples were held at the site for a 72-hour period to allow radon progeny to decay, then counted for gross α/β activity. This practice was discontinued during this response because radon products do not interfere with isotopic analyses of transuranics, and results can be produced more quickly without compromising the integrity of the results. This change was implemented under procedure WP 12RL-1020, Rev. 0, Emergency Sample Processing.

The initial samples collected were screened for all radioisotopes of concern at the WIPP, using gamma spectroscopy. After the isotopes of concern were identified, most samples were only counted for plutonium and americium. Two weeks prior to the inspection, an additional sample was processed for all radionuclides of concern, to confirm that other isotopes were ruled out correctly. This practice will be continued periodically. EPA inspectors were told that effluent air samples from Station B will eventually be analyzed for all isotopes for reporting NESHAPs compliance.

WIPP Laboratories produces detailed documentation of each sample that it processes. The EPA inspection team examined a complete data package for an environmental air sample filter (AL-WFF2014-0212-1.1). Inspectors noted that one of the sample collection forms (WP 02-EM1012, Att.1) was not properly signed when this filter was collected by RadCon. Although the sample form is not used by WIPP Laboratories, the discrepancy was noted in the data package. WIPP Laboratories' procedure for Sample and Data Reporting allows raw instrument counts to be released as preliminary, prior to QA. This had been the case with this sample, and both the preliminary and final counts were included in the data package. Samples and reports are retained until at least the publication of the Annual Site Environmental Report.

4.4.1 Observations

WIPP Laboratories procedures appear to be clear and well organized. Tracking samples from the field through the laboratory is straightforward. Data packages produced by WIPP Laboratories are comprehensive. EPA's comprehensive analysis of the WIPP Laboratories data can be found in the *Verification and Validation of WIPP Data Packages.*[5]

[5] Environmental Protection Agency. *Verification and Validation of WIPP Data Packages.* Washington, D.C., 2014. [EPA Air Docket A-98-49, Item II-B1-30; July 2014]

As mentioned previously, RadCon may collect environmental filters in the event of an emergency, per procedure WP 12-RE3002, which is enacted at the discretion of the Facility Shift Manager. The deficiency noted in the sample control form confirms that this procedural change during an emergency can lead to errors.

4.4.2 Areas for Improvement

DOE should better integrate routine and incident procedures to enhance preparedness of field and laboratory staff to respond to releases. By better integrating routine and incident procedures, DOE will reduce the potential for error and enhance preparedness of field and laboratory staff to appropriately manage release scenarios. To increase overall response effectiveness, the Environmental Monitoring group could assist with sample collection during an incident response and/or the Radiological Engineering and RadCon groups could collect samples with Environmental Monitoring more frequently during normal operations.

4.5 Waste Handling

On Friday, April 11, the EPA inspection team performed a walk down of the WHB, led by Randy Britain (NWP). In the contact-handled (CH) waste handling bay, inspectors viewed stored waste. Most of this waste had been placed on the pallets that would be used for downloading the waste to the underground. Because of space constraints, four sets of waste containers were stored on the unloading stations, in the open shipping containers that they had arrived in. Waste tracking forms indicated that the waste on pallets had been unloaded on February 2 and 3. The state deadline for emplacing the waste in the underground had been extended to May 17, 2014 by an Administrative Order from the state of New Mexico. The CH Bay contained the maximum number of waste pallets allowed by the Hazardous Waste Permit. If the site demonstrates permit compliance based on actual volumes of stored waste, however, the facility will gain an additional waste capacity equivalent to five pallets, which could be used for site-generated TRU (e.g. reentry personal protective equipment and decon materials).

Inspectors noted that a counting station has been set up in the CH handling bay, with dedicated counting instruments established for effluent air sample filters collected from Stations A and B. These stations were set up in response to the incident. There was a discussion of sample handling during the initial response with RadCon personnel. Effluent sampling filters are collected per WP 12-HP1305. 8-hour, 24-hour, and 72-hour counts are conducted. The team observed that the airlock entrances to the Waste Shaft collar are now posted as a Radiological Buffer Area. RadCon continues to conduct surveys of the waste shaft, and no contamination has been detected in the area so far.

With the exception of the longer storage times allowed by Administrative Order, no procedural changes have been made in waste handling.

5.0 Conclusions

In the past, EPA's Subpart A inspections have been heavily focused on effluent sampling at air stations A, B, C and D and monitoring via the CAMs at the active waste panels. This focus proved to be appropriate, because the CAM functioned as intended during the incident, and automatically initiated the diversion of facility exhaust into the HEPA filtration banks. The HEPA filtration system prevented most of the contamination from reaching the environment. Now that the dampers between the unfiltered exhaust and the plenum building have been sealed with foam, the HEPA filtration system should capture any significant amounts of contamination that are exhausted from the underground.

The HEPA filtration of the mine exhaust is functioning as the first line of defense against further releases, and has now been operating continuously for a longer period than was ever anticipated. Based on discussions with site personnel, EPA found that the site is being proactive about managing the system so that it continues to function. The site is working with the filters manufacturer to make sure that the filters are operated within their design range, and was proactively monitoring filter behavior and planning for filter changes.

Representative samples of the entire release were collected by the effluent sampling system at Station B, allowing an accurate characterization of the source term. Stations A, B and C were all observed to be operating correctly during the time of the inspection. Inspectors observed sampling and monitoring devices placed throughout the WIPP site that could detect a further release of contamination.

Consequence assessment was performed according to procedure and used to guide DOE's response. Although there was some delay in the initial response, DOE has already taken steps to improve this response time. Personnel who are able to respond to a radiological emergency are now on site at all times.

The inspection team found that DOE's ambient environmental air sampling network was generally operating as it was designed and in accordance with procedures. This incident demonstrated the importance of responding to the increased public demand for information following a release. DOE should improve the design, positioning, maintenance and overall capability of its ambient environmental air monitoring network. At a minimum, DOE needs to modify the physical positioning of several samplers to eliminate the obstruction of airflow or particulate loading of filters. DOE could also increase the reliability of its sampling results by implementing a more formal maintenance and calibration system for its sampling equipment, and by upgrading to digital systems that provide more data on air flow rates and system failures.

DOE needs to implement stricter sample collection and sample tracking procedures to provide the highest quality, most defensible data possible at all times. EPA found that tracking samples from their receipt at WIPP Laboratories to final results is clearly and thoroughly documented. However, EPA observed several instances during the incident in which sample handling departed from typical operating procedures. EPA inspectors were concerned by the handoff of sample collection responsibility from Environmental Monitoring to RadCon during an emergency. Although this change in responsibility is clearly documented in site procedures, the sudden staffing change can lead to errors. Specifically, during the lab visit EPA noted a deficiency in a sample control form for an ambient environmental sample filter collected by RadCon. EPA was likewise concerned that samples that would ordinarily be sent to WIPP Laboratories were evidently sent to SRS and Sandia National Labs. While some of these decisions were made for valid reasons, such as high sample radioactivity or backlogs of work at WIPP Laboratories, EPA is concerned that the decisions were made on an ad-hoc basis and not well documented.

EPA is particularly concerned by the handling of the filter from Skid A-3, which would have provided objective evidence that no release took place at Station A prior to the shift to filtration. After initial counting that was judged to be at background, the filter was sent for chemical analysis instead of isotopic analysis. The site has now collected a series of filters at Station B, only some of which have been subjected to a full suite of radiochemical analyses. DOE has valid reasons for preserving these samples as it investigates the incident. However, DOE will need to work with EPA to make sure that the analysis of effluent samples is conducted in a manner that is as consistent as possible with analyses previously performed to support the WIPP's NESHAPs compliance.

Attachment I: Inspection Plan

Inspection Plan: WIPP Underground Reentry

(Transmitted to DOE by letter on April 4, 2014)

Purpose:

EPA regularly conducts inspections to verify that the Department of Energy (DOE) has accurately monitored, calculated, and reported possible radiation doses to members of the public due either to normal operations or to any accidental releases that may have occurred during the last reporting period. EPA has closely tracked DOE's response to the incident on February 14, 2014, which resulted in the release of a small amount of radioactive material from the facility. Given the unusual nature of the situation, and the potential for reentry activities to disturb additional radioactive material, EPA will be present and conduct inspection activities while DOE enters the underground facility.

This inspection is conducted under the authority of 40 CFR 191, Subpart A. This inspection is part of EPA's continued oversight to ensure that, during the operational phase of management and storage of radioactive waste, the WIPP continues to comply with the public dose limits expressed in 40 CFR 191.03. The authority to enter the site and conduct confirmatory sampling, if deemed necessary by the Agency, is provided by § 194.21, Inspections.

Scope:

The scope of this inspection includes activities performed by DOE at the WIPP relevant to radiation releases from the site, with a focus on DOE's ability to prevent further releases and to measure any future releases if they occur. EPA will conduct sampling to determine DOE's capability to adequately quantify any actual or potential radiation dose to members of the public. Inspection activities will include an examination of DOE plans, site procedures and sampling equipment both on- and off-site. In addition to site activities, EPA will also review a sub-set of DOE's laboratory analytical data collected since the incident.

Focal Areas for this Inspection:

- Has DOE accurately characterized the source term and extent of the release?
- Is the mine exhaust filtration system working as intended, and will it continue to do so?
- Does DOE have appropriate monitoring and sampling devices on site during underground reentry operations?
- Is DOE's array of on- and off-site air monitors in working order?
- Does DOE continue to store and handle transuranic waste at the site safely and according to procedure?

Location: This inspection will be held at the WIPP facility located twenty-six miles south east of Carlsbad, New Mexico and the surrounding vicinity as needed.

Inspection Dates: Beginning April 7, 2014.

Attachment II: Inspection Checklist

Mine exhaust filtration system (HEPA filters):

1) Following the foaming of the exhaust dampers, is 100% of the facility exhaust passing through the HEPA banks?
Yes. Now that the dampers between the unfiltered exhaust and the plenum building have been sealed with foam, the HEPA filtration system should capture any significant amounts of contamination that are exhausted from the underground.
2) Based on swipes, CAM results, and air samples taken near the isolation dampers, what is known about the quantity of material that escaped from the dampers?
Because all exhaust (effluent) air, including leakage that bypassed the HEPA filters, is exhausted at Station B, air samples taken at Station B have captured all radioactive material released to the environment.
3) Are the HEPA filters currently operating within design specifications?
Yes. At the time of the inspection, site staff were working with the filters' manufacturer to make sure that the filters are operated within their design range.
4) Will HEPA performance degrade with time? How long can the filters operate before a media change is necessary?
Overall HEPA efficiency will not degrade with time, but differential pressures will increase across individual components. The site operators will make the determination to change media based on actual filter performance (differential pressure).
5) What is the status of DOE's procedures to change the roughing and HEPA filters?
The procedure for changing contaminated media was under development at the time of the site inspection, and was scheduled to be rehearsed during the following week. (The filters were changed in response to the February 14 release.)

Reentry:

1) Has DOE provided a sufficiently specific reentry plan that EPA is able to understand?
Yes. DOE presented details of its Phase 3 reentry to the potentially contaminated areas of the mine during a Town Hall meeting in Carlsbad on April 10.
2) Has DOE used geotechnical and other data (i.e. remote reading of cable extensometers) to understand the underground event to the greatest possible degree?
Yes. Remote geotechnical data did not reveal any abnormal occurrences.
3) Has DOE identified all possible release points from the underground facility (i.e. is the salt handling shaft a possible release point)?
Yes. DOE has established Radiological Buffer Areas at the Waste Shaft, Salt Shaft, and Air Intake Shaft.
4) Has DOE taken proper steps to monitor and sample for any contamination that is disturbed and released during reentry?
Yes. The Waste Handling Shaft is located within the Waste Handling Building, which is surveyed regularly. RadCon has placed additional sampling equipment at the Salt and Air Intake shafts to reasonably detect and mitigate any further potential releases.

Air Sampling Program Review:

1) Perform an independent sampling at a set (3 candidate locations-- WIPP Far Field, WIPP East and WIPP South locations) of DOE air sampling locations by setting up EPA low volume air samplers for the duration of the initial mine reentry activities. Coordinate with DOE to ensure that we can approximate the same methods used at the existing sites, including sampler flow rates, filter media, height above ground, sampling periods, counting periods. Filters will be analyzed by NAREL.
   Sampling was conducted as planned. See Section 4.0.
2) Inspect the DOE air monitoring/sampling locations, verifying the following:
   a. Samplers are well maintained, and flow rate audits are conducted.
   b. Sampler intakes are free of debris and in good working order.
   c. Reliable power is available to service equipment needs.
   d. Airflow in the immediate vicinity of the site is open, and free of obstructions (e.g., brush, walls, buildings, etc).
   e. Site operators are following their quality assurance plans, and documenting actions appropriately.

   Yes. DOE's ambient environmental air sampling network was generally operating as it was designed and according to procedures. Suggestions for improvements are offered in Section 4.1.1, Environmental Monitoring.

Consequence Assessment/Subpart A:

1) Did WIPP staff follow the appropriate procedures for conducting consequence assessments?
   Yes. Consequence Assessment was conducted using the methodologies in procedure WP 12-ER4916, Consequence Assessment Dose Projection. Specifically, initial estimates used the program HotSpot and worst-case assumptions, and later calculations used NARAC models and more refined estimates of the release.
2) What was the Material-at-Risk in Panel 7, Rm 1?
   Material-at-Risk was never used to guide dose projection. Filter counts from Station A were available for use at the time of the first calculation – see Item 4.
3) What was the exact timeline of the incident (i.e. alarms and shift to filtration)?
   Table 1 of the DOE Accident Investigation Board (AIB) Phase I report provides a detailed chronology of the radiological release.
4) What were the assumptions and results of DOE's initial (worst-case) consequence assessment?
   The initial worst-case calculation assumed that all material observed at Station A escaped to the environment. The calculation guided field surveys during the initial response.
5) Can DOE provide data showing that no releases took place from Station A prior to shifting to filtration?
   DOE was unable to provide objective evidence to this effect. DOE has provided calculations which show that unfiltered air did not reach the exhaust before the shift to filtration was complete, and facility logs indicate that the relevant air filter did not show elevated gross alpha/beta counts. However, records of this sample were unavailable during the inspection, and the sample was sent for chemical, rather than radiological analysis.

Stored waste:

1) How is the site currently handling and storing waste? What are the major changes as a result of the incident?
   All stored waste at the site is in the Waste Handling Building, which is full to permitted capacity. Longer storage times have been permitted by Administrative order from the State, but no procedural changes have been made in waste handling.
2) Are all current waste handling activities covered by existing procedures that have already been inspected by EPA? If not, what new procedures have been developed?
   No new procedures have been developed for waste handling.

WIPP Laboratories:

1) How has WIPP Laboratories determined the radionuclides of concern?
   The initial samples collected were screened for all radioisotopes of concern at the WIPP using gamma spectroscopy, which identified plutonium and americium. Additional samples are periodically processed for all WIPP radionuclides.
2) Has WIPP labs altered counting times or any other procedure in response to this incident?
   Procedure WP 12RL-1020, Rev. 0, Emergency Sample Processing, allows the lab to skip a 72-hour holding period to allow radon progeny to decay and final gross alpha/beta count, and proceed directly to the isotopic analyses of transuranics.
3) What quality control steps have been taken by WIPP labs (e.g. spikes, blanks, duplicates)? How are these reflected in WIPP labs' data packages?
   All of the above quality control steps were observed in the data package reviewed by the EPA WIPP inspection team. Verification and validation of WIPP Laboratories' data from the incident was undertaken separately by EPA's National Analytical Radiation Environmental Laboratory.[6]
4) What steps have WIPP labs taken to keep laboratory background to a minimum?
   All samples are screened outside and must be below dose criteria to be accepted. CEMRC, the building operator, sets the radiological acceptance criteria and conducts background radiological screening of the entire facility. For high activity samples, WIPP Laboratories' counting procedures are altered to prevent contamination of the instrument probe.

[6] Environmental Protection Agency. *Verification and Validation of WIPP Data Packages.* Washington, D.C., 2014. [EPA Air Docket A-98-49, Item II-B1-30; July 2014]

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