Waste Isolation Pilot Plant (WIPP)
Haul Truck Fire and Radiological Release Events

Integrated Recovery Plan

Executive Summary

This document describes the actions that the US Department of Energy (DOE) Carlsbad Field Office (CBFO) and the Nuclear Waste Partnership (NWP) have taken and will take at the DOE's Waste Isolation Pilot Plant (WIPP) to integrate recovery efforts from the underground salt haul truck fire and radiological release events and restore WIPP back to transuranic (TRU) waste disposal operations.

The document is divided into seven sections:

1. **Purpose and scope of the plan**
2. **Background**
3. **Event investigation and root cause determination**
4. **Integrated recovery plan objectives**
5. **Key recovery strategies**
6. **Re-entry and recovery**
7. **Planning for resumption of operations**

The objectives of the recovery plan are:

- Protect worker and public health and the environment at all times during the recovery—it is the top priority of the DOE and the NWP and is the essential component of all recovery actions
- Using approved ISMS processes, identify and mitigate the hazards, including mine and radiological safety
- Terminate the low-level release of radioactive material from the underground ventilation exhaust
- Identify the source of the radiological event in the underground and isolate/mitigate the release
- Replace the moderate and high efficiency filters in the underground ventilation exhaust system and remediate any other contamination on the surface
- Identify the root cause of the two events and perform actions to prevent event recurrence
- Utilize WIPP's highly skilled and knowledgeable workforce to the maximum extent practical, recognizing that retaining their unique skills and knowledge are critical for re-entry, recovery, and resumption of waste disposal operations
- Organize and fully utilize the expertise/resources available from the Department, the NWP parent companies, national laboratories, and others to assist NWP to ensure a safe and timely recovery
- Throughout the recovery, ensure effective and transparent communication, involvement, and collaboration with stakeholders, municipalities, and regulators
- Resume waste disposal operations in a safe, systematic manner following completion of corrective actions

Key strategies covered in the document include:

- **Re-entry**
  - Use of Salt Hoist for re-entry with the Air Intake Hoist as the secondary means of egress
  - Unmanned instrumented entry to establish safe habitability before manned entry
  - Manned entry to characterize air quality conditions and mine stability, attempt to identify the cause of the release, and stabilize the incident scene to the extent possible

- **Recovery**
  - Take actions to terminate the low-level release of radioactive material from the underground exhaust
  - Isolation/ mitigation of the activity source in the underground
  - Replace underground exhaust filter bank elements as necessary to support restored operations

- **Workforce protection and usage**
  - Limiting site access to essential personnel during re-entry and mitigation activities that could open fugitive underground exhaust pathways
  - Temporarily assigning some personnel to other key activities

- **Expertise/resource usage**
  - Deploy best-in-class resources from both federal and contractor sectors to recovery efforts

- **Communication**
  - Be proactive and timely in communication to stakeholders and regulators

- **Resumption of operations**
  - Proactive examination of scenarios and options for resuming operations as emergent information unfolds

1.0 Purpose and scope of plan

This document describes the actions that the US Department of Energy (DOE) Carlsbad Field Office (CBFO) and the Nuclear Waste Partnership (NWP) have taken and will take at the DOE's Waste Isolation Pilot Plant (WIPP) to integrate recovery efforts from the underground salt haul truck fire and radiological release events and restore WIPP back to transuranic (TRU) waste disposal operations.

These actions include those initially taken in response to each event, those that will be taken to assure safe re-entry, what is planned during re-entry, and what actions must be completed as part of recovery in preparation to return to operation. This plan is expected to change as a result of knowledge gained from preceding actions. As major strategies change, this plan will be updated.

This is a planning document only. All field activities will be performed using approved WIPP program documents, procedures, and work control processes.

2.0 Background

2.1 WIPP overview

The Waste Isolation Pilot Plant is a U.S. Department of Energy facility designed to safely isolate defense-related transuranic waste from people and the environment. Waste temporarily stored at sites around the country is shipped to WIPP and permanently disposed in rooms mined out of an ancient salt formation 2,150 feet below the surface. WIPP, which began waste disposal operations in 1999, is located 26 miles outside of Carlsbad, N.M. The facility is managed and operated for the DOE by Nuclear Waste Partnership, LLC.

2.2 The events

2.2.1 Haul truck fire in the WIPP underground

On February 5, 2014, an underground diesel-powered vehicle used to transport mined salt caught on fire. All underground personnel were evacuated to the surface. Ventilation to the underground was aligned through filtered exhaust and all waste handling operations were suspended. Initial critiques were performed by NWP and DOE deployed an Accident Investigation Board to investigate the event in accordance with DOE Order 225.1B.

2.2.2 Radiological release event

On February 14, 2014, a continuous air monitor detected airborne radioactive contamination in the underground. There were no employees working underground at the time. Per site procedures, site and offsite sampling and monitoring were initiated to characterize the release. Site access was limited to essential personnel only. The source of the airborne radioactive contamination is under investigation.

2.3 Key initial actions to the event

2.3.1 Response to the underground salt haul truck fire

- Evacuated and provided accountability for all personnel
- Treated employees as necessary for smoke inhalation
- Activated EOC/JIC and made notifications
- Held NWP critique to identify issues and initial corrective actions
- Provided onsite Corporate management support for recovery efforts
- Established event War Room for command and control center
- Supported the AIB investigation
- Developed Recovery Plans for both Surface and Underground
- Executed three entries with Mine Rescue under approval of MSHA to assess fire and assure it was extinguished
- Once fire confirmed extinguished, terminated EOC
- Executed reentry plans to confirm operability of two hoists for primary and secondary egress/access
- Confirmed air quality and reestablished CAM operability after impacts on CAMs from soot
- Preserved incident scene
- Made various mine entries accompanied by AIB members and advisors
- Began ventilation modeling to understand smoke propagation

2.3.2 Response to the radiological release

- Per site procedure, sheltered in place and performed initial radiological monitoring of site and offsite areas (there were no personnel underground)
- Activated EOC/JIC
- Evacuated non-essential personnel and limited site access to essential personnel
- Assigned all nonessential personnel to offsite duties or placed on standby until radiological conditions stabilized
- Ongoing daily sampling and monitoring to assess offsite consequences, analyze hazards, define onsite radiological controls, and identify the source
- Established whole-body exit monitoring for all site personnel and visitors
- Terminated EOC/JIC once release levels sufficiently lowered and stabilized
- Continued support to AIB now reviewing both events
- Began assembling corporate resources to support recovery

3.0 Event investigation and root cause determination **(this section will be completed when the root cause analysis findings are issued)**

Root cause identification and analysis
Following the events, formal critiques were performed and immediate corrective actions were initiated (see previous section). A formal Accident Investigation Board (AIB) was appointed by DOE to investigate and determine causal factors for both events. Critical corrective actions will be mandatory prerequisites to future operations or activities.

4.0 Integrated recovery plan objectives

4.1 Protect worker and public health and the environment at all times during the recovery—it is the top priority of the DOE and the NWP and is the essential component of all recovery actions

4.2 Using approved ISMS processes, identify and mitigate the hazards, including mine and radiological safety

4.3 Terminate the low-level release of radioactive material from the underground ventilation exhaust

4.4 Identify the source of the radiological event in the underground and isolate/mitigate the release

4.5 Replace the moderate and high efficiency filters in the underground ventilation exhaust system and remediate any other contamination on the surface

4.6 Identify the root cause of the two events and perform actions to prevent event recurrence

4.7 Utilize WIPP's highly skilled and knowledgeable workforce to the maximum extent practical, recognizing that retaining their unique skills and knowledge are critical for re-entry, recovery, and resumption of waste disposal operations

4.8 Organize and fully utilize the expertise/resources available from the Department, the NWP parent companies, national laboratories, and others to assist NWP to ensure a safe and timely recovery

4.9 Throughout the recovery, ensure effective and transparent communication, involvement, and collaboration with stakeholders, municipalities, and regulators

4.10 Resume waste disposal operations in a safe, systematic manner following completion of corrective actions

5.0 Key Recovery Strategies

5.1 Re-entry

- **Salt Hoist:** the salt hoist will be used as the primary pathway for underground re-entry activities.

- **Air Intake Shaft (AIS) Hoist:** the AIS hoist will be used as the secondary egress path to meet MSHA requirements

- **Unmanned entry:** before sending any personnel into the shaft or the underground, atmospheric monitoring instrumentation will be transported on the conveyance to characterize air quality throughout the shaft and surrounding areas.

- **Manned entry:** data from air monitoring equipment will be used to determine the type of personal protective equipment (PPE) necessary for the manned team. If results are acceptable, the manned team will wear Powered Air Purifying Respirators (PAPRs) with backup batteries and self-contained breathing apparatus (SCBA) in reserve. If the probe finds significant activity, the team will wear SCBAs. PPE will be determined consistent with DOE requirements.

  Once lowered into the underground on the salt hoist, the team will establish a base from which to operate and rest, and establish appropriate communication with the entry team and the CMR. Armed with equipment for radiation detection, industrial hygiene sampling, communication, and ground control, the team will progress through the mine to the AIS to ensure two modes of egress from the mine; then to the ventilation regulator to configure the controls to Auto for improved ventilation control from the CMR. After ensuring ventilation stability, a separate entry into the mine will progress to the suspect incident areas and attempt to identify the location of the source of the activity, marking off clean and contaminated areas. This effort will focus on Room 7, Panel 7 and Room 1, Panel 6, near where the alarming continuous air monitor (CAM) is located.

  Before manned entry, the ventilation system and filtration system will be verified to be stable and with sufficient margin to support any unplanned releases.

- **Robotics:** the deployment of robotics has been investigated and robots are available if conditions warrant.

5.2 Recovery

- **Isolation/ mitigation of the activity source in the underground** will depend on the instrument readings and visual observations made by the manned team and any subsequent remote or manned surveillance actions. Regardless of the findings, careful and comprehensive work/safety planning and preparation will be performed prior to any source isolation activities.

- **If the source of the activity is in a visible, accessible location**: it may be possible to simply cleanup or containerize/over pack the waste. For example, if a drum has dropped from the stack and the lid has come off or the drum is punctured.

- **If the source of the activity is in an inaccessible location:** such as deep within the rows of drums, it may be necessary to install bulkheads (seal the room off). Note that this strategy would result in the loss of disposal space in the repository.

- **Filter banks** for the repository ventilation/exhaust system are located on the surface. During the radiological event, the filters ventilation system significantly reduced the radiological release as designed. The filters are now

contaminated, but the system is stable and functioning. However, planning is underway, parallel with re-entry efforts, for filter replacement due to loading, and to seal leakage pathways.

5.3 Workforce protection and usage

- **Limiting site access to essential personnel during re-entry and mitigation activities**: during salt and AIS hoist movements, filter replacement, and other re-entry and mitigation activities with potential to disturb waste or residual contamination, all non-essential personnel will be restricted from site access and will be assigned to offsite, in-town activities such as training. This will minimize radiological risk to the workforce.

- **Temporarily assigning some personnel to other key activities**: some of the work performed and supported by WIPP personnel stopped when waste disposal operations was suspended. The strategy is to temporarily assign as many personnel as possible to corrective, repair, and improvement work that can be performed at the site and in-town during the shutdown. The unions have agreed to this approach. The advantage of this approach is that key, unique talent will be retained rather than lost to the local booming oil and gas market and a local economy that has only 2% unemployment.

5.4 Expertise/resource usage

- **Organize and deploy best-in-class resources.** CBFO and NWP will use all available federal and corporate resources in recovering from the radiological event. To this end, WIPP will employ/is employing the following in recovering from the radiological event:
  - National Labs
  - DOE headquarters and other sites
  - NWP parent companies

5.5 Communication

- Proactively communicate with stakeholders and regulators through the full set of communication channels
- Utilize lessons learned to continuously improve communications

5.6 Resumption of operations

- **Systematic resumption**: Resumption of waste disposal activates will be performed in a systematic, controlled manner.

6.0 Re-entry and recovery

6.1 Management support activities

- Team of specialists from NWP parent companies (URS, B&W, AREVA) were immediately assigned to WIPP (corporate reachback) with assignments in the following areas:
  - Interface with DOE Office of Environmental Management
  - Re-entry and Recovery Planning/Management

  - Resumption Management
  - Plutonium Management
  - Environmental Monitoring and Radiological Controls
  - Recovery Planning
  - Strategic Planning/Communication/HR
- National Labs—LANL, SRNL, and INL are already assisting in recovery planning efforts. Their expertise and technology will continue to be used throughout the recovery
- DOE headquarters—experts from EM and NNSA are being engaged in a variety of areas including communication and event investigation
- Radiological control technicians and SMEs from SRR, INL, AMWTP, and LANL are providing support
- DNFSB staff are onsite observing recovery efforts
- Expertise from other DOE sites are supporting AIB and recovery activities

6.2 Workforce protection and usage plan

- Actions to return WIPP Non-essential employees to site
  - Regular, ongoing communication with personnel on standby
  - Maximize presentation of required training at off-site locations
  - Define site radiological conditions and post as appropriate
  - Provide necessary personnel monitoring equipment and stations
  - Provide additional monitoring training as necessary to site personnel and visitors
  - Make facility modifications as necessary to ensure airborne pathways are directed through filtered release
  - Complete changes to emergency response procedures identified from event investigations
  - Return employees in stages as needs are determined by Operations management to support required site work activities
  - Remove monitoring requirements when determined appropriate by Radiolgical Controls management
- Limiting site access to essential personnel during initial re-entry and mitigation activities, which present contamination pathways to the underground
- Temporarily assigning some personnel to other key activities

6.3 Communication plan

- Develop a communication plan to ensure all stakeholders and regulators are getting timely, accurate, and consistent progress updates. Stakeholders include site workers, CBFO, DOE-HQ, community leaders, state leaders, media
  - Daily Status Report on website
  - Regular Status updates to key Regulator and state leaders
  - Regular All Hands meetings
  - Town Hall Meetings as required
  - News release updates for new information

6.4 Environmental monitoring and survey plan

- Off site
  - Initial characterization surveys
    - Following the underground radioactivity release that occurred on 2/14/14, Environmental Monitoring and Radiological Controls personnel performed extensive on-site and off-site surveys to characterize the WIPP site and immediate off-site impact. NWP personnel also performed plume models using NARAC atmospheric modeling codes. The results of on- and off-site initial surveys performed were consistent with model predictions with low levels of radioactivity detected on environmental air samples.
    - Following release detection on 2/14/14, seven perimeter and two blank air samples were pulled on a special basis to characterize the release. In addition, samples of soil (27 samples with 5 control samples), and 7 perimeter water samples with one control sample were obtained. Results will be communicated as received.
  - Ongoing surveys
    - Samples of site perimeter vegetation are being performed to assess off-site vegetation impact. Results will be communicated as received.
    - NWP Environmental Controls has an established environmental monitoring program, as described in the WIPP Environmental Monitoring System Description (DOC/WIPP-05-3318), to include routine monitoring of site emissions, and environmental media analysis to characterize WIPP environmental emissions.
    - The Environmental Controls group will continue to obtain these samples (air, soil, water) on a weekly basis, in accordance with the established site program, and will revert to accident monitoring upon indication of change in conditions.
- On site
  - Initial characterization surveys
    - NWP Radiological Controls has an established radiological habitability program, and has enhanced that program following the release event to ensure the habitability of the site. Radiological Controls personnel have performed extensive surveys following the indication of a release to ensure the site conditions were characterized and understood.
    - Routine and release follow-up air sampling on the WIPP site and hundreds of samples from portable and fixed air samples since the release show no detectable contamination.
    - Following the event, Radiological Controls personnel have performed over a thousand contamination smears within the WIPP site. Three smears taken under the A-2 skid in the “Station A” exhaust sampling building showed contamination,

possibly the result of contamination migration during the sample pull evolution to obtain the initial air sample. All other samples showed no contamination above detectable levels.

- The smears to characterize the site include general site areas, predicted maximum deposition regions from plume models (to include building roofs), and areas of high occupancy.
- Several times the Salt shaft has been reporting as 'upcasting'; each time this condition has been reported, follow-up surveys have been performed of the shaft collar region with no contamination detected. The salt shaft collar region has been covered to minimize potential contamination. In addition, real-time air monitors were provided to detect and alarm any high activity releases.
- Since 2/14/14, Radiological Controls personnel have performed almost 1000 personnel whole body surveys at the WIPP Controlled Area exit, with no process related contamination detected.

o Ongoing surveys

- Following the event, compensatory monitoring was established to ensure the continued habitability of the WIPP Property Protection Area. These surveys include:
  - Air sampling of all mine access shafts
  - Contamination surveys of all mine access shafts (weekly, or as indicated based on air sample results or indications of "upcasting")
  - More frequent changes of station A and B samples
- In addition, the NWP procedure for radiological surveys, WP 12-HP1100, is being revised to reflect the change in radiological conditions, to include:
  - Contamination surveys of high traffic areas and building entrances in the Property Protection Areas (weekly)
  - Contamination surveys of the WIPP main cafeteria (daily)

- Although releases to the environment have not resulted in contamination above 10CFR835 limits on the WIPP site, some potential exists for fugitive release at underground access points. As a result, radiological postings have been established to ensure that access points to the underground are controlled to prevent inadvertent entry. Required exit monitoring requirements are stipulated for these areas, since these areas are established for contamination potential, ensuring underground contamination is contained at the source and does not migrate out of radiological posted areas.
- New Radiological Buffer Area boundaries (along with corresponding controlled areas) have been established for contamination control at all the mine access locations, to include:
  - Air Intake Shaft
  - Salt Shaft
  - Waste Shaft Collar
  - Auxiliary Air Intake Building

    - Building 413 Exhaust Filter Building and surrounding underground exhaust ductwork
- These posting changes implement contamination control measures following the release event. Additional changes are anticipated to accommodate initiation of mine reentry and subsequent recovery activities.

6.5 Regulatory compliance plan

- WIPP is working to obtain an emergency permit from NMED due to the fact that some activities required by the existing permit cannot be performed
- NWP will obtain appropriate formal approvals from DOE for key TSRs that currently cannot be performed because of access restrictions
- WIPP will coordinate with other regulators to address the changed conditions ensuring compliance with applicable regulations, including EPA, MSHA, and NRC

6.6 Re-entry plan

- All reentry activities will be performed using WIPP approved procedures and work control processes. These steps outline some of the key planning activities that will be incorporated
- Prerequisites for entry
    - Ensure compensatory measures for entry identified by the Haul Truck Fire event are met prior to reentry (immediate LL from fire event / information from mine rescue entries)
    - Obtain Pu experienced radiological controls personnel to participate in planning and on each reentry team.
    - Establish re-entry team makeup
    - Train non-site personnel on mine safety.
    - Train reentry personnel on specific hazards associated with Pu
    - Complete dry runs
    - Obtain necessary radiological monitoring equipment (CAMs, retrospective samplers, lapel monitors, isotopics, etc. – battery capability)
    - Obtain Anti-contamination clothing
    - Obtain respiratory protection equipment – PAPR/SCBA
    - Obtain communication equipment for workers, base station, and CMR communication
    - Obtain video equipment
    - Fall Protection
    - Obtain egress monitoring stations/equipment
    - Establish personnel decontamination capability
    - Establish standby mine rescue team
    - Establish written re-entry procedure
    - Establish RWP
    - Establish JHA
- Summary of reentry steps
    - Establish Shaft / Conveyance Habitability
    - Establish Egress Capability & Operating Base
    - Establish CMR control for ventilation system in filtration mode
    - Identify Source Term

- Source Containment / Confinement if possible
- Conduct reentry
  - Establish Shaft / Conveyance Habitability
    - Survey the above ground AIS conveyance
    - Conduct unmanned AIS shaft air monitoring survey down to 2150 feet as part of pre-op checks of hoist
    - Establish AIS conveyance as safe to transport people and validate proper PPE for conditions
    - Repeat steps above for Salt shaft / conveyance
    - Initiate manned entry to conduct radiological surveys on way down to 2150 feet
  - Establish Egress Capability & Operating Base
    - Survey (air quality, contamination, ground control, etc.) mine between AIS and Salt shafts – establish safe zone and mine operating base at Salt station
  - Establish CMR control for ventilation system in filtration mode
    - Survey from Salt shaft (W30) to S700 to E140 to S400
    - Configure 308 regulator from manual to auto
  - Wait at least 12 hours to adjust monitor and stabilize the ventilation system
  - Identify Source Term
    - Survey and perform ground control checks from SALT shaft (W30) to S1950 to E140 to S2520 (under the exhaust duct/overcast) into Panel 7 (air intake)
    - If needed, survey from E140 to S2750 up to Panel 6 closure barrier.
    - With visual observation and video equipment, to the extent possible, locate and identify the source of the release
  - Source Containment / Confinement if practical
    - Based on results from above, and with additional planning, subsequent entries will be made to implement controls to contain/confine
  - Robotics may be deployed as necessary to further examine source term or aid in containment

6.7 Recovery plan

- Summary of Recovery Plan
  - Purpose of recovery
    - Establish conditions that will allow return to Surface and Underground operations

- Strategy
  - The strategy is largely dependent on levels of underground contamination found during re-entry and the physical nature of the source term
  - The recovery plan ends when the mine is ready to support operations

- Recovery Actions
  - Take actions to terminate the low-level release of radioactive material from the underground ventilation exhaust
  - Develop and implement a comprehensive corrective action plan to address the AIB results
  - Evaluate infrastructure modifications, training, and procedure and process changes required from event lessons
  - Establish a training and drill program of abnormal and emergency events
  - Ensure that personnel have radiological equipment necessary to allow for safe evacuation if another failure were to occur
  - Review AOP's and EP's to identify needed changes
  - Enhance training to work in a rad environment
  - Evaluate the Ventilation system to determine need for decontamination, or operational/ design changes

7.0 Planning for resumption of operations

7.1 Establish a joint DOE/contractor working group to consider key systems and processes likely affected by the event; potential long-term impacts to the WIPP facility and the TRU complex; and the range of potential recovery actions.

7.2 Based on results of investigations and impacts of contamination, establish necessary changes to WAC, mine configuration, or operations to support resumption of waste shipments

7.3 Conduct readiness reviews consistent with DOE Order 425.1d prior to resuming operations