Waste Isolation Pilot Plant Recovery Plan

Revision 0

September 30, 2014

[This page left blank.]

EXECUTIVE SUMMARY

Overview

This Recovery Plan provides a safe and compliant approach to resuming operations at the Waste Isolation Pilot Plant (WIPP), the repository for disposal of the nation's defense transuranic (TRU) waste. The U.S. Department of Energy (DOE) is committed to resuming operations by the first quarter of calendar year 2016, and this Recovery Plan outlines the Department's approach to meet that schedule while prioritizing safety, health, and environmental protection. The recovery and resumption of TRU waste disposal operations at WIPP are central to the Department's mission. This Recovery Plan summarizes the strategy, key activities, and management approach to safely return WIPP to its statutorily mandated mission of TRU waste disposal operations in support of the DOE's mission requirements and its commitments to the public and the community, as well as TRU waste generator sites and their host states. This Recovery Plan is being issued before the investigations into the cause of the radiological release in the WIPP repository and other oversight actions are completed in order to inform all stakeholders of the status of the Department's current plans and the effects of the suspension of WIPP operations.

Background

The DOE Carlsbad Field Office is responsible for management and operations of WIPP. WIPP is designed to safely isolate TRU waste generated by atomic energy defense activities from the public and the environment. TRU waste temporarily stored at sites around the country is shipped to WIPP and disposed in rooms mined out of an ancient salt formation 2,150 feet below the surface. WIPP began waste disposal operations in 1999 and is located 26 miles outside of Carlsbad, New Mexico.

TRU waste generated by atomic energy defense activities is a by-product of nuclear weapons research and production, facility dismantlement, and site cleanup. This waste consists primarily of tools, gloves, clothing, and other such items contaminated with trace amounts of radioactive elements, mostly plutonium. Legacy TRU waste inventory is located at four remaining large-quantity sites—Hanford Site (Washington State), Idaho National Laboratory (Idaho), Los Alamos National Laboratory (New Mexico), and Savannah River Site (South Carolina)—and at over 20 small-quantity sites throughout the nation. In 2005, the Department completed cleanup and closure of its fifth large-quantity site, the Rocky Flats Environmental Technology Site (Colorado), with TRU waste shipped to and disposed of at WIPP.

Multiple federal and state regulatory entities oversee WIPP. WIPP must meet applicable federal and state requirements for worker safety, nuclear safety, radiological safety, mine safety, chemicals controlled under the Resource Conservation and Recovery Act, security, and transportation, packaging, and shipping. The primary regulators are the U.S. Environmental Protection Agency for long-term repository certification and the New Mexico Environment Department with regard to the disposal of hazardous waste constituents and other items. New Mexico State University's Carlsbad Environmental Monitoring and Research Center conducts site and environmental monitoring and has an internal dosimetry program that can be utilized by area residents. Pursuant to the Waste Isolation Pilot Plant Land Withdrawal Act, periodic audits are conducted by the U.S. Mine Safety and Health Administration. The U.S. Nuclear Regulatory Commission and the U.S. Department of Transportation regulate various aspects of the shipment of waste to the facility. The Defense Nuclear Facilities Safety Board issues periodic reviews of activities at the WIPP site in accordance with its statutory mandate.

The WIPP facility has made much progress in TRU characterization, transportation, and disposal over the past 15 years. As of February 2014, the Department has safely removed approximately 90,800 cubic meters of TRU waste from 22 generator sites throughout the country, disposing of the waste at WIPP, and greatly reducing the environmental risk resulting from continued long-term storage to site workers and the public in the vicinity of generator sites.

The Two Incidents at WIPP in February 2014

WIPP suspended operations on February 5, 2014, following a fire involving an underground vehicle. Nine days later, on February 14, 2014, a radiological event occurred underground, contaminating a portion of the mine primarily along the ventilation path from the location of the incident, releasing a small amount of contamination into the environment.

The Department appointed an Accident Investigation Board, which conducted and completed an investigation of the underground fire. The Accident Investigation Board published their report[1] on March 13, 2014. Similarly, the Department appointed a second Accident Investigation Board to determine the cause of the February 14 radiological release and to develop recommendations for corrective actions. This second Accident Investigation Board is using a two-phased approach. Phase 1 focused on the response to the radioactive material release, including related exposure to aboveground workers and the response actions. The Phase 1 report[2] was issued on April 24, 2014.

The Department and the WIPP management and operations contractor, Nuclear Waste Partnership, LLC, are finalizing corrective action plans for both the underground fire and Phase 1 of the radiological release. The key elements of the corrective action plans are also outlined in this Recovery Plan, and implementation of the corrective actions is well underway.

Phase 2 of the investigation is ongoing and focuses on the cause of the radiological release. The Board will provide its findings when the investigation is complete, currently expected by the end of calendar year 2014.

To complement the Accident Investigation Board investigation into the radiological release, the Department also established a Technical Assessment Team to perform a comprehensive, independent technical review of the mechanisms and chemical reactions that may have occurred and contributed to the release of radioactivity. Primary review areas of the Technical Assessment Team include site assessment and sampling, analysis, and characterization; TRU drum processes and practices; and evaluation of potential reaction mechanisms and chemistry. The Technical Assessment Team is comprised of experts from the Savannah River National Laboratory, the Pacific Northwest National Laboratory, the Sandia National Laboratories, the Oak Ridge National Laboratory, and the Lawrence Livermore National Laboratory. Los Alamos National Laboratory is separately performing an extensive review of its TRU program and is sharing the results with the Technical Assessment Team. The Technical Assessment Team chairperson has coordinated the team's activities with the Accident Investigation Board.

The investigations to date indicate that the February 14 radiological release originated from a TRU waste drum that did not meet the WIPP Waste Acceptance Criteria. This drum was processed at Los Alamos National Laboratory and is known to have nitrate salts, low pH, and organic material, which are likely to have been contributing factors to the release. The Permitees of WIPP, the Carlsbad Field Office and

[1] AIB fire report available at: http://www.wipp.energy.gov/Special/AIB%20Report.pdf
[2] AIB Phase 1 report available at: http://www.wipp.energy.gov/Special/AIB_Final_WIPP_Rad_Release_Phase1_04_22_2014.pdf.

Nuclear Waste Partnership, have provided a detailed proposal for the expedited initial closure of Panel 6 and Panel 7, Room 7, so that a potential release from any nitrate-salt-bearing waste container in Panel 6 or Panel 7, Room 7, does not pose a threat to human health and environment, in accordance with the New Mexico Environment Department's May 20, 2014, Administrative Order.

Strategy for Recovery

The objective of this Recovery Plan is to safely resume emplacing waste in WIPP in the first quarter of calendar year 2016. Safety, health, and protection of the public, the workers, and the environment are the Department's highest priorities. Every stage of recovery will be supported by rigorous regulatory compliance and robust upgrades to nuclear safety, fire protection, radiological controls, and emergency management, and associated documentation, procedures, and training. These will be validated in accordance with Departmental directives through the conduct of Operational Readiness Reviews at the contractor and federal levels. At all stages of recovery, the Department will communicate openly, early, and frequently with the public and stakeholders.

When disposal operations resume, the first wastes to be disposed of will be the site-derived waste from the recovery actions and the containers currently stored in the Waste Handling Building at WIPP. Once these waste containers have been safely disposed of, WIPP will begin receiving wastes from waste generator sites. The number of shipments that can be processed will increase as supported by ventilation improvements and equipment.

After resumption of emplacement of waste in 2016, operation of a new ventilation system is required to restore the WIPP emplacement rate to full operations. WIPP will resume full-scale mining of salt for waste emplacement when the new permanent ventilation system is operational.

The recovery strategy includes seven key elements:

1. **Safety**—Safety is paramount to the overall strategy. Resumption of waste emplacement operations requires a nuclear facility to be in a safe condition at all times. The Accident Investigation Board reports for the underground fire and the radiological release identified a number of weaknesses with the WIPP safety programs. In light of these deficiencies, it is imperative that safety documentation be revised, upgraded to required standards, and implemented prior to recommencing waste emplacement operations, in order to ensure the safety of the public, the workers, and the environment. Recovery will proceed at a safe pace, commensurate with workforce capabilities, mine conditions, and status of WIPP infrastructure and systems.

2. **Regulatory Compliance**—The regulatory and permitting aspects of recovery focus on ensuring that modifications to the facility are protective of human health and the environment. Changes are made using the procedures and processes established by the agencies that regulate WIPP. The Department will work closely with the New Mexico Environment Department and the Environmental Protection Agency to expedite resumption of operations.

3. **Decontamination**—WIPP's concept of operations will be revised from a fully uncontaminated ("clean") facility to one that has contaminated as well as uncontaminated areas. This will affect all aspects of WIPP operations, including policies, procedures, training, cost, and schedule, and will offer operational challenges to WIPP workers and management. Increased vigilance and attention to detail are required to ensure worker safety.

4. **Ventilation**—Increasing ventilation capacity is a principal requirement for safe underground operations, as it supports worker safety, mining, and waste emplacement. Ventilation will be increased in phases. The ongoing first phase is the installation of two skid-mounted fan/HEPA filter units, which will allow increased activities involving diesel engines, such as roof bolting, and will provide redundancy with the current high-efficiency particulate air filter system operations. The second phase will be supplemental ventilation. This will reconfigure the underground with bulkheads, ventilation regulators in the bulkheads, and supplemental fans. Supplemental ventilation will allow for increased activities that create fumes and dust, including very limited mining and initial waste operations. The third phase consists of a new ventilation system and the construction of a supporting exhaust shaft. This last phase will restore WIPP to its pre-incident airflow capacity for simultaneous mining and waste emplacement operations.

5. **Mine Stability and Underground Habitability**—Recovery activities will address mine stability and all those activities that are required to make the mine habitable, such as radiological characterization, posting of radiological zones, operational checks of mine safety equipment, replacing damaged equipment, fire loading reduction, cleaning, trash removal, and electrical system safe restart. These are required as part of recovery to ensure worker safety and health.

6. **Workforce Retraining**—To maximize cost-effective execution of the recovery activities and prepare the WIPP organizational team for long-term mission accomplishment, the strategy to staff the recovery project is to maximize use of the existing workforce, retraining staff for new activities specific to recovery and for future, more complex contaminated operations in personal protective equipment and under nuclear management controls. The existing workforce will be trained to enhanced safety programs, with mentoring provided by subject matter experts. The Accident Investigation Board noted significant deficiencies in the training/skills/job knowledge in critical areas such as the radiation control program, and therefore additional workforce training is called for in any case. Design of the training plans would be comprehensive enough to ensure that the existing workforce can be efficiently deployed throughout the recovery process. Maintaining the ability of workers to perform recovery functions, in addition to their normal WIPP operations responsibilities, is a Department priority.

7. **Managing Waste Streams**—Currently, there are 144 waste containers safely stored aboveground at WIPP in the Waste Handling Building, awaiting disposal. None of this waste is part of a nitrate salt waste stream. There is also waste temporarily staged at Waste Control Specialists, located in Andrews County, Texas, on the New Mexico–Texas border.

   Within the inventory shipped from Los Alamos National Laboratory to Waste Control Specialists, there are 73 standard waste boxes containing waste from the same waste stream as the breached container. Waste Control Specialists, with DOE support, placed these 73 standard waste boxes into 34 modular concrete canisters to provide an additional layer of confinement and placed the canisters in a trench covered with soil. The temperature of the standard waste boxes is monitored continuously. The balance of the inventory at Waste Control Specialists (i.e., waste containers that do not contain unremediated nitrate salts) is safely stored within an enclosed storage facility.

   The Department is continuing to characterize and certify TRU waste at the Idaho National Laboratory, Oak Ridge National Laboratory, the Savannah River Site, and Argonne National Laboratory for eventual shipment to WIPP. Waste continues to be generated at the Hanford site and Lawrence Livermore National Laboratory. The Department is carefully evaluating and analyzing the impacts on storage requirements and commitments with state regulators at the generator sites. These efforts will inform decisions related to the availability of storage for certified TRU waste until waste shipments to WIPP can resume. The Department has surveyed

these TRU waste generator sites and evaluated their waste stream documentation and determined that there are no other waste containers having the specific characteristics of the Los Alamos National Laboratory nitrate salt waste stream.

Schedule and Cost

Detailed activities and objectives associated with commencement of waste emplacement operations have been identified and documented by the contractor. These activities, along with the estimated cost and schedule required for completion, make up the contractor "baseline," which is currently under review by the Department. Work plans and packages are being developed to support the contractor's baseline. Key activities that must be completed in a timely fashion to meet the planned startup date include: resumption of ground control (bolting); initial closure of Panel 6 and Panel 7 Room 7; increasing ventilation capacity; completing surveys, cleanup and maintenance of the mine; decontamination of the underground; completion of contractor and Departmental Operational Readiness Reviews; and regulatory review and approvals. The schedule will continue to be refined as recovery activities are performed and additional information is learned. The current schedule is aggressive, and the Department will continue to look for opportunities to accelerate activities and execute work in parallel, reducing the time needed for critical activities.

WIPP recovery costs for resumption of operations are estimated to be approximately $242 million, a portion of which will be drawn from the base budget for WIPP operations. Major cost drivers include: facility program and safety documentation enhancements and revisions, mine habitability and operations, facility upgrades, waste emplacement operations, operational readiness assessments, and program management support. Additionally, to restore WIPP to full operations, two capital asset project line items are required: (1) a new permanent ventilation system, with an estimated cost range of $65 million–$261 million, and (2) supporting exhaust shaft, with an estimated cost range of $12 million–$48 million. These line item cost estimates are preliminary, and will be refined as detailed planning is developed and as uncertainties are reduced. These costs are based on the planning to date and may change as new information is received or requirements change.

Conclusions

Any and all safety concerns in response to the February 2014 salt truck fire and radiological release events will be addressed to create an environment of robust safety awareness at WIPP that complies with applicable requirements and protects workers, the public, and the environment. The WIPP underground will be systematically made habitable for safe operations and protective of workers with resumption of critical mine safety and maintenance operations. Operations will include simultaneous activities in contaminated and uncontaminated sections of the mine. Ventilation will be increased in phases back to its pre-incident airflow capacity, the mine will be surveyed and made habitable for workers, and the workforce will be retrained for contaminated operations and cross-trained for recovery activities.

The schedule to commence waste emplacement operations is the first quarter of calendar year 2016, with the intent to incrementally increase waste emplacement operations over time. Options are being explored to determine if some actions can be accelerated.

The Department is committed to ensuring the safety and continued progress of the TRU waste programs at the generator sites in order to fulfill our commitments to the host states. The Department is continuing to characterize and certify TRU waste for eventual shipment to WIPP, and the generator sites are continuing to store TRU waste safely on-site until WIPP operations are resumed. We will communicate detailed shipping plans with states as waste emplacement resumes.

The Accident Investigation Board and the Technical Assessment Team are continuing their work related to the causes of the radiological release. Findings and recommendations from that work will be incorporated into WIPP activities going forward. The Recovery Plan is intended to provide reasonable confidence for resumption of WIPP disposal operations by: (1) safely isolating the waste of concern; (2) initial closure of the affected waste disposal panels; (3) responding to weaknesses identified by the Accident Investigation Board reports through comprehensive upgrades to programs, procedures, and training; (4) upgrading equipment, infrastructure, and facilities; and (5) ensuring that waste generators have rigorous characterization, treatment, and packaging processes and procedures and that all waste meets WIPP Waste Acceptance Criteria. If substantive new information is identified that impacts the activities currently identified and included in the Recovery Plan, it will be revised.

The Department is committed to resuming WIPP operations as a critical part of the environmental cleanup program, and we will continue to work with our regulators, our community partners in New Mexico, TRU waste generators, and other stakeholders around the country to ensure that this is done safely and efficiently.

CONTENTS

Figures

Tables

ACRONYMS

AIB	Accident Investigation Board
cfm	cubic feet per minute
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
HEPA	high-efficiency particulate air
HWDU	Hazardous Waste Disposal Unit
NMED	New Mexico Environment Department
NWP	Nuclear Waste Partnership LLC
TRU	transuranic
WIPP	Waste Isolation Pilot Plant

[This page left blank.]

1 INTRODUCTION

Transuranic, or "TRU," waste[1] began accumulating in the 1940s with the beginning of the nation's nuclear defense program. Generally, this waste consists of clothing, tools, rags, residues, debris, soil and other items contaminated with radioactive elements, mostly plutonium. As early as the 1950s, the National Academy of Sciences recommended deep disposal of long-lived TRU radioactive wastes in geologically stable formations, such as deep salt beds. Sound environmental practices and strict regulations require such wastes to be isolated to protect human health and the environment.

Bedded salt is free of fresh flowing water, easily mined, impermeable, and geologically stable—an ideal medium for permanently isolating long-lived radioactive wastes from the environment. However, its most important quality in this application is the way salt rock seals all fractures and naturally closes all openings.

Throughout the 1960s, government scientists searched for an appropriate site for radioactive waste disposal, eventually testing a remote desert area of southeastern New Mexico where, 250 million years earlier, evaporation cycles of the ancient Permian Sea had created a 2,000-foot-thick salt bed.

In 1979, Congress authorized the U.S. Department of Energy's (DOE, or Department) Waste Isolation Pilot Plant (WIPP). The WIPP facility, located 26 miles southeast of Carlsbad, New Mexico, was constructed during the 1980s. Congress limited WIPP to the disposal of TRU wastes generated by atomic energy defense activities. In 1998, the U.S. Environmental Protection Agency (EPA) certified WIPP for safe, long-term disposal of TRU wastes. WIPP began TRU disposal operations in March 1999.

> *"This is really an absolutely core facility for the country … we've just got to stay focused on getting this critical facility back in operation for the country, [and] for the community that has been so supportive and so much a partner in what we have done."*
>
> —Energy Secretary Ernest Moniz

For purposes of disposal at WIPP, there are two categories of TRU waste. Contact-handled TRU waste can be safely handled by workers under controlled conditions without any shielding other than the containers. Contact-handled TRU waste will be approximately 96 percent of the total anticipated volume of waste to be disposed of at WIPP. The remaining four percent will be remote-handled TRU waste, which emits more penetrating radiation than contact-handled TRU waste and must be handled and transported in lead-shielded casks or containers.

The DOE Carlsbad Field Office, which leads the nation's TRU waste disposal effort at WIPP, has coordinated TRU waste cleanup at a number of generator sites around the country. WIPP provides for

[1] Transuranic waste, as defined by the Waste Isolation Pilot Plant Land Withdrawal Act (Public Law 102-579), is "waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste with half-lives greater than 20 years, except for (A) high-level radioactive waste, (B) waste that the Secretary of Energy has determined, with concurrence of the Administrator of the Environmental Protection Agency, does not need the degree of isolation required by the disposal regulations, or (C) waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with part 61 of title 10, Code of Federal Regulations."
These man-made elements have atomic numbers greater than uranium, thus "trans-uranic," or beyond uranium on the periodic table of elements.

safe, permanent disposal of long-lived radioactive defense wastes, receiving TRU waste from 35 waste generator sites nationwide.

The operation of WIPP is a key part of the DOE Office of Environmental Management mission, which is to complete the safe cleanup of the environmental legacy brought about from five decades of nuclear weapons development and government-sponsored nuclear energy research. WIPP is the nation's only repository for the disposal of TRU waste generated by atomic energy defense activities to support this strategic mission, and is therefore a critical component in meeting the nation's national security objectives.

1.1 Site Description

Located in Eddy County in the Chihuahuan Desert of southeastern New Mexico, the WIPP site encompasses 41.4 square kilometers or 16 square miles. This part of New Mexico is relatively flat and is sparsely inhabited, with little surface water. The site is 42 kilometers (26 miles) east of Carlsbad in a region known as Los Medaños ("the dunes"). WIPP includes about 12 kilometers (7.5 miles) of active underground excavations in the geologically stable Salado Formation, 655 meters (2,150 feet) below the surface.

The Waste Isolation Pilot Plant Land Withdrawal Act (Public Law 102-579) was signed into law on October 30, 1992, transferring the administration of federal land from the U.S. Department of the Interior to the DOE. The surface land uses remain largely unchanged from pre-1992 uses and are managed in accordance with accepted practices for multiple land use. However, mining and drilling for purposes other than those which support WIPP are prohibited within the WIPP site, with the exception of two existing leases for oil and gas development below 6,000 feet.

The majority of the lands in the immediate vicinity of the 16-square-mile WIPP site are managed by the U.S. Department of the Interior Bureau of Land Management. Land uses in the surrounding area include livestock grazing; potash mining; oil and gas exploration and production; and recreational activities such as hunting, camping, hiking, and bird watching. The region is home to diverse populations of animals and plants.

1.2 Facility Description

There are three groups of structures associated with the WIPP facility: surface facilities, shafts and underground facilities, as depicted in Figure 1.

1.2.1 Surface Facilities

The surface structures accommodate the personnel, equipment, and support services required for the receipt, preparation, and transfer of TRU waste from the surface to the underground. There are two surface locations where TRU waste is managed and stored. The first area is the Waste Handling Building Container Storage Unit for TRU waste management and storage, which has separate facilities for contact-handled and remote-handled TRU waste. The second area designated for managing and storing TRU waste is the Parking Area Container Storage Unit, an outside container storage area, which provides storage space for additional contact-handled and remote-handled packages on an asphalt and concrete surface.

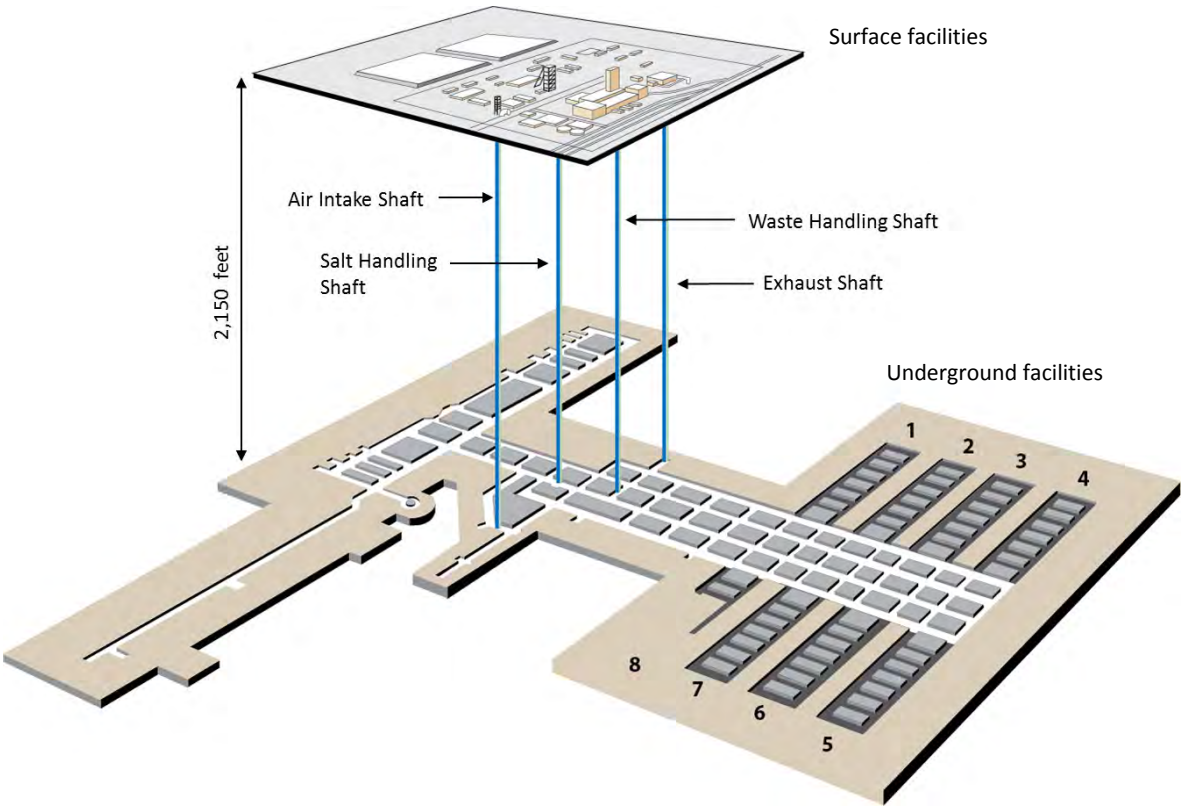


Figure 1. WIPP Surface, Shafts, and Underground Facilities

1.2.2 Shafts

There are four shafts that connect the surface with the underground. The air intake and exhaust shafts provide the necessary air circulation for the underground. The air intake shaft provides the greatest percentage of air to the underground. The salt handling shaft is used to remove mined salt from the underground and also serves as an air intake shaft. The waste handling shaft is used to transport TRU waste containers to the underground for emplacement. The waste and the salt shafts are also the primary means for transport of personnel and equipment to and from the underground.

1.2.3 Underground Facilities

The underground facilities include the Hazardous Waste Disposal Units (HWDUs), research and development area, mine safety shelters, maintenance shops, and elements of the ventilation system (e.g., bulkheads, overcasts, airlocks, and ventilation system regulators).

1.2.3.1 Hazardous Waste Disposal Units

The underground structures include the underground HWDUs; an area for future underground HWDUs; the shaft pillar area; interconnecting tunnels (called “drifts”); and other areas. An underground HWDU is a single excavated panel, consisting of seven rooms and two access drifts, designated for disposal of TRU waste containers. To increase the capacity and efficiency of the underground, it is envisioned that waste could be disposed of in the drifts between Panels 1 through 8. Contact-handled waste has been disposed of in Panels 1 through 6. Panels 4 through 6 also contain remote-handled waste. Contact-handled TRU and remote-handled TRU disposal was underway in Panel 7, Room 7 when WIPP operations were suspended in February 2014. Panel 8 excavation started in August 2013 (see Figure 2).

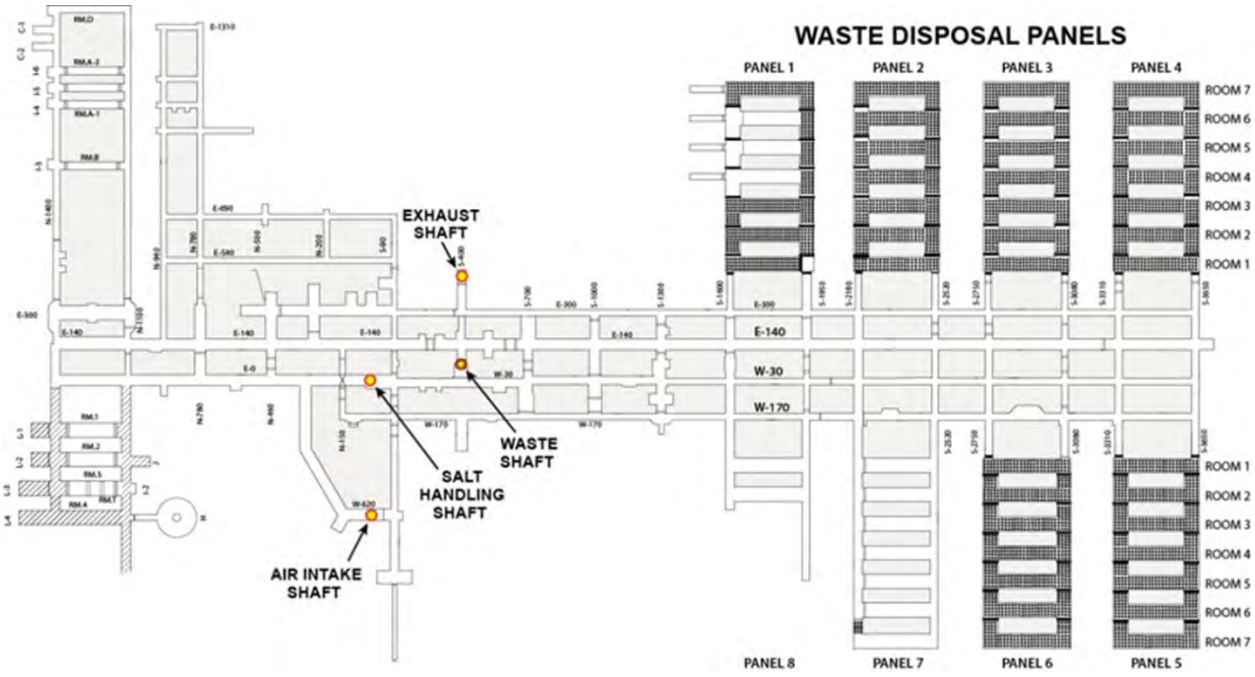


Figure 2. Waste Disposal Panels

1.2.3.2 Underground Ventilation System

The ventilation system that serves the underground is designed, maintained, and operated to meet or exceed the criteria specified by 30 CFR Part 57, Safety and Health Standards Underground Metal and Nonmetal Mines, and the New Mexico Mine Safety Code for mines. The ventilation system also must meet the requirement of the WIPP Hazardous Waste Facility Permit (NM 4890139088-TSDF).

The underground ventilation system has served all underground facilities and has provided a suitable environment for underground personnel and equipment during normal activities; confinement and channeling of potential airborne radioactive material in the event of an accidental release or smoke and fumes in the event of an underground fire; and high-efficiency particulate air (HEPA) filtration of exhaust air to minimize any doses to the onsite personnel and to minimize offsite releases. Under normal operating conditions at WIPP, the exhaust is not filtered, but since the radiological incident on February 14, 2014, HEPA filters have been used to ensure protection of the public and WIPP workers should there be residual airborne contamination from the radiological incident.

Air is supplied to the underground horizon, at 2,150 feet below the surface, through the waste shaft, the salt handling shaft, and the air intake shaft, and exhausted through a single shaft by exhaust fans located on the surface. Standby HEPA filtration, also located on the surface on top of the air exhaust shaft, is engaged upon detection of radioactive particulates in the exhaust air stream by continuous air monitors placed in the underground and in the ventilation system.

The underground ventilation system currently consists of six exhaust fans (three main fans in the normal flow path and three smaller fans in the filtration flow path), two identical HEPA filter assemblies arranged in parallel, and associated ductwork. Underground ventilation is divided into four separate flow paths supporting the waste disposal area, the construction area, the north area, and the waste shaft station. Figure 3 graphically displays the flow of air in the existing underground ventilation system.

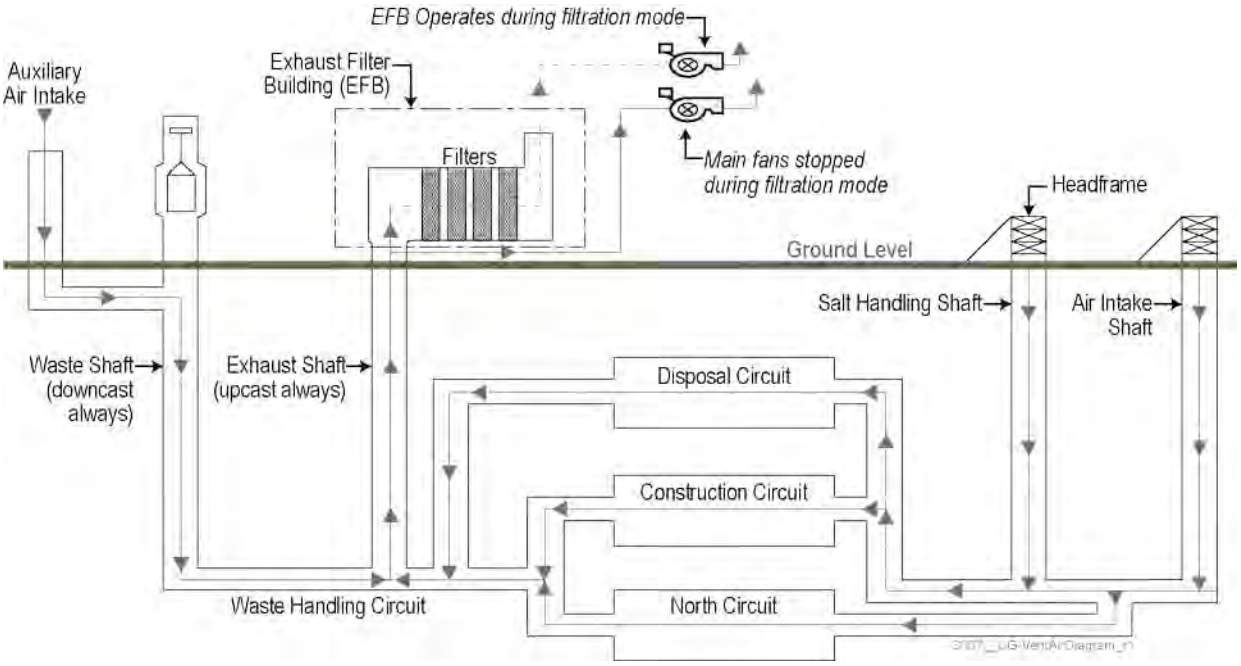


Figure 3. WIPP Ventilation System Serving the Underground—Current Configuration

1.3 Oversight of WIPP

Multiple federal and state regulatory entities oversee WIPP. WIPP must meet applicable federal and state requirements for worker safety, nuclear safety, radiological safety, mine safety, chemicals controlled under the Resource Conservation and Recovery Act, security, and transportation, packaging, and shipping. The primary regulators at WIPP include the EPA for long-term repository certification and the New Mexico Environment Department (NMED) with regard to the disposal of hazardous waste constituents. These agencies conduct inspections with regard to air, surface water discharge, and groundwater at the WIPP site and participate in Carlsbad Field Office audits of waste characterization at generator sites. Pursuant to the Waste Isolation Pilot Plant Land Withdrawal Act, periodic audits are conducted by the U.S. Mine Safety and Health Administration. The U.S. Nuclear Regulatory Commission and the U.S. Department of Transportation regulate various aspects of the shipment of waste to the facility. The Defense Nuclear Facilities Safety Board issues periodic reviews of activities at the WIPP site. Although it does not have regulatory authority, New Mexico State University's Carlsbad Environmental Monitoring & Research Center conducts site and environmental monitoring and has an internal dosimetry program that can be utilized by area residents.

The Department is committed to conducting its WIPP operations in a manner that protects the public, the environment, and its workers. DOE ensures safe operations by: (1) designing WIPP in accordance with rigorous safety standards that require detailed, documented safety analyses and multiple layers of protection; (2) operating WIPP with highly qualified and trained personnel using well-defined procedures; and (3) maintaining WIPP facilities' safety systems in accordance with well-defined programs.

2 THE TWO INCIDENTS AT WIPP IN FEBRUARY 2014

WIPP waste disposal operations were suspended on February 5, 2014, following a fire involving an underground vehicle. Nine days later, on February 14, 2014, a radiological event occurred underground at WIPP, contaminating a portion of the mine primarily along the ventilation path from the location of the incident and releasing a small amount of contamination into the environment. This section summarizes (1) what is known about what happened during the two events based on the investigations conducted to date, (2) the Department's ongoing response to the incidents, and (3) the effects on the WIPP facility. Figure 4 shows where the two incidents occurred.

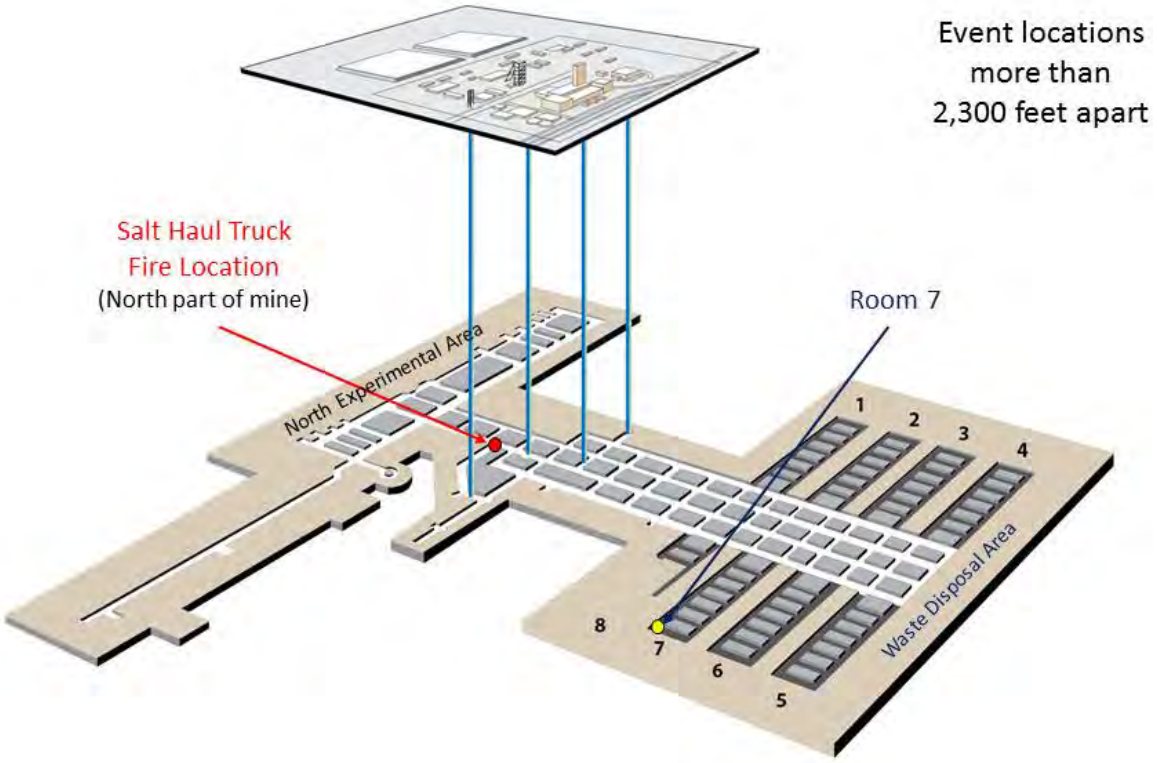


Figure 4. Location of the Two Incidents at WIPP in February 2014

2.1 February 5 Fire Incident

2.1.1 Fire Incident Description

On February 5, 2014, at approximately 10:45 am, an underground fire occurred involving a salt haul truck, a diesel-powered vehicle used to move mined salt from the underground. There were 86 people in the underground at the onset of the fire; all exited the mine safely. Six personnel were evaluated for smoke inhalation and released from a local hospital the day of the underground fire. One employee continues to be treated for smoke inhalation as a result of the fire.

2.1.2 Fire Accident Investigation

On February 7, 2014, the Department appointed an Accident Investigation Board (AIB) to determine the cause of the accident and to develop recommendations for corrective actions to prevent recurrence. The AIB is an independent entity that performs a rigorous accident investigation and prepares associated investigation reports in accordance with established Department requirements, i.e., DOE Order 225.1B, *Accident Investigations*.

The results of the fire accident investigation were released in an extensive report issued March 13, 2014 (DOE 2014a).[2] The AIB report identified 10 contributing causes and 35 areas where the Department and WIPP's management and operating contractor, Nuclear Waste Partnership, LLC (NWP) would be required to evaluate processes or procedures and develop and implement corrective actions. The report cited weaknesses in the fire protection, emergency management, maintenance, and oversight by DOE. DOE and NWP are finalizing corrective action plans responding to the AIB report, the key elements of which are outlined in this Recovery Plan. Implementation of the corrective actions is well underway.

2.1.3 Effects of the Fire

The fire burned the engine compartment of the salt haul vehicle and consumed the front tires, which contributed significantly to the amount of smoke and soot in the area of the fire. Flames from the vehicle and the tires impinged on the mine walls and caused flaking of salt. More significant with regard to the longer term recovery, the fire resulted in heavy smoke damage in the immediate area and to the mechanical and electrical equipment and systems throughout the underground. Soot was deposited on the mine's walls, shafts, and underground equipment, including the waste hoist tower, which is used to transport TRU waste containers to the underground for disposal. Additionally, soot collected in the HEPA filtration system, resulting in necessary replacement of ventilation filters in June 2014. In summary, the soot and smoke from the fire adversely affected key equipment and facilities of the WIPP repository, which has resulted in a widespread cleanup effort throughout the underground and identification of deficiencies in WIPP's emergency response, maintenance, and other operational procedures.

2.2 February 14 Radiological Release Incident and Initial Response

2.2.1 Radiological Release Description

On February 14, 2014, at 11:14 pm, a continuous air monitor detected a radiological release in the underground. The underground ventilation system automatically switched to HEPA filtration and the damper was manually opened and adjusted to achieve designated airflow. The airflow was reduced from 425,000 cubic feet per minute (cfm) to 60,000 cfm. No employees were in the underground at the time. The continuous air monitor was located immediately outside Panel 7.

Redirecting the ventilation through the HEPA filters is designed to protect aboveground workers at the site and the public in the surrounding areas by minimizing radiation releases to the environment. The automatic switch to HEPA ventilation operated as designed, thereby minimizing the external radiological release. Slightly elevated levels of airborne radioactive concentrations were detected outside the WIPP facility after the release occurred due to leakage through closed ventilation filter bypass dampers.

[2] AIB fire report available at: http://www.wipp.energy.gov/Special/AIB%20Report.pdf.

2.2.2 The Department's Initial Response

Actions were taken immediately following the incident to stabilize the facility and to determine the extent of impact to WIPP personnel, the public, and the environment. Activities included radiological surveys across the WIPP site and adjacent areas, as well as collection and analysis of environmental and personnel bioassay samples. Bioassay tests showed that 22 workers received internal contamination as a result of the release, each with a total lifetime exposure of less than 10 millirem over 50 years, which is equivalent to the exposure resulting from a chest x-ray. All follow-up tests were below minimum detectable concentrations. No long-term adverse health effects are expected for these employees.

Other WIPP recovery actions followed as part of the initial incident response. On March 6, two ventilation system dampers that were known to have allowed a small amount of the radioactive material to bypass the HEPA filters were sealed with a high-density foaming material. Periodic air sampling downstream of the HEPA filters was conducted and publicized on the WIPP recovery website. Soil, surface water, sediment, animal, and vegetation sampling were performed. Maintenance was performed on the ventilation system fans to ensure reliable operation.

In response to stakeholder requests, the Department initiated a comprehensive public outreach and communications strategy that included weekly town hall meetings, upgrading the WIPP recovery website, starting WIPP Update email notifications, and conducting regular, formal and informal discussions with WIPP's regulators.

2.2.3 Radiological Release Accident Investigation and Technical Assessment

On February 27, 2014, the Department appointed a second AIB to determine the cause of the radiological release and to develop recommendations for corrective actions. This second AIB is using a two-phased approach. The first phase focused on the response to the radioactive material release, including related exposure to aboveground workers and the response actions, while the second phase, which is ongoing, is evaluating the cause of the underground radiological release event.

The first phase is complete, and the results are documented in the comprehensive report issued April 24, 2014 (DOE 2014b).[3] According to the Phase 1 report, the cumulative effect of inadequacies in ventilation system design and operability compounded by degradation of key safety management programs and safety culture resulted in the release of a minimal amount of radioactive material from the underground to the environment. The Phase 1 report identified eight contributing causes and 47 areas of improvement for the Department and NWP. The report cited deficiencies in the response to the event and in the areas of nuclear safety, maintenance, radiological protection and controls, emergency management, safety culture and oversight. The corrective action plans being developed by DOE and NWP to address the findings of the Phase 1 report are currently in the final stages of approval. The key elements of the corrective action plans are outlined in this Recovery Plan, and implementation of the corrective actions is ongoing.

Phase 2 of the AIB investigation of the radiological release is in process and focuses on the cause of the radiological release. The AIB will provide its findings when the investigation is complete, currently expected by the end of calendar year 2014.

To complement the AIB investigation, DOE established a Technical Assessment Team to perform a comprehensive, independent technical review of the mechanisms and chemical reactions that may have

[3] AIB Phase 1 report available at: http://www.wipp.energy.gov/Special/AIB_Final_WIPP_Rad_Release_Phase1_04_22_2014.pdf.

resulted in the release of radioactivity. Primary review areas of the Technical Assessment Team include site assessment and sampling, analysis and characterization, TRU drum processes and practices and evaluation of potential reaction mechanisms and chemistry. The Technical Assessment Team is comprised of experts from Savannah River National Laboratory, Pacific Northwest National Laboratory, Sandia National Laboratories, Oak Ridge National Laboratory; and the Lawrence Livermore National Laboratory. Los Alamos National Laboratory is separately performing an extensive review of its TRU program and is sharing the results with the Technical Assessment Team. The Technical Assessment Team chairperson has coordinated the team's activities with the AIB.

To achieve the most technically definitive analysis of samples and materials collected at WIPP and Los Alamos National Laboratory, as well as characterization and assessment of the WIPP release event, the Technical Assessment Team plans and executes its work using industry-accepted forensic science and analytical chemistry, within a quality assurance framework to provide traceability and quality control. The Technical Assessment Team thoroughly documents the collection, analysis, and maintenance of the sampled materials in recognition that its actions, findings, and conclusions will be considered by the AIB as part of its investigation.

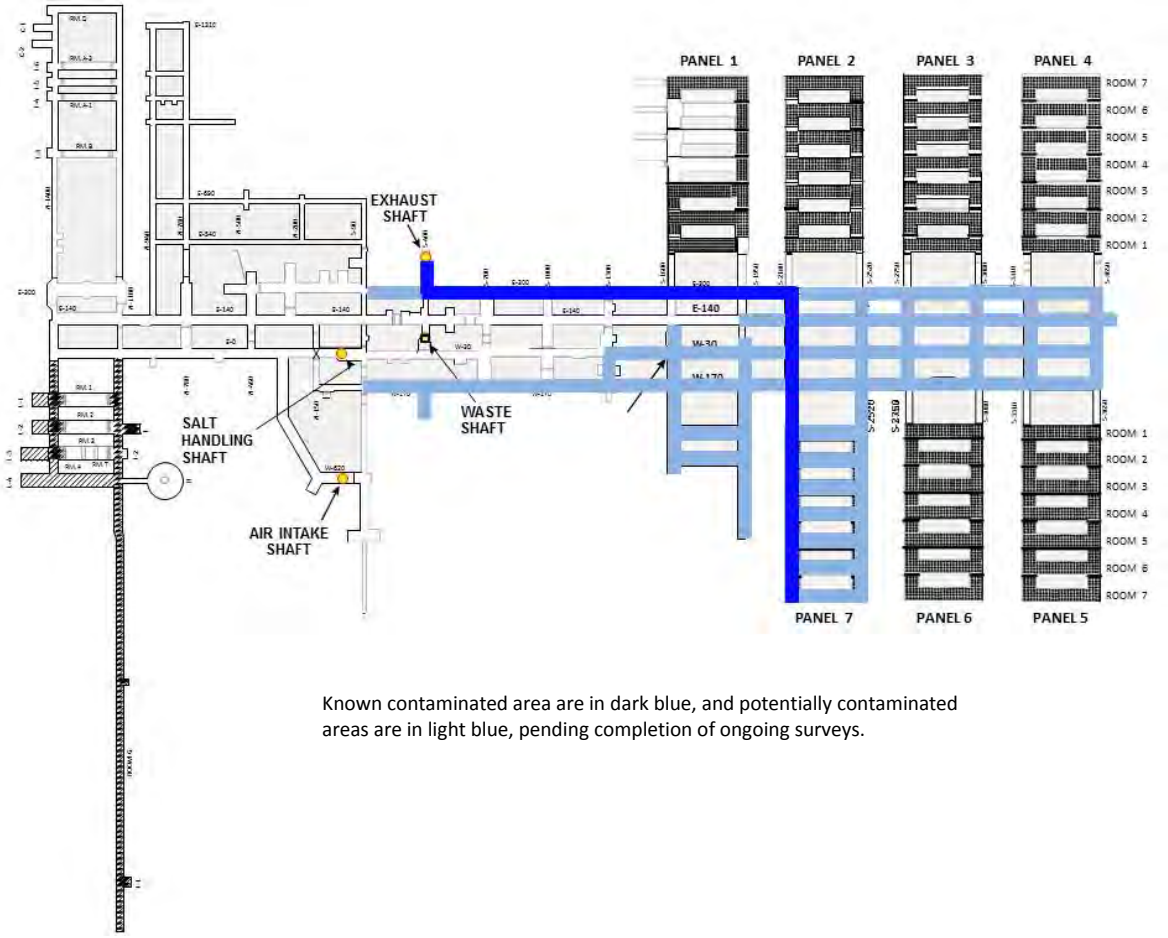
A May 2014 video camera examination of the waste in Panel 7, Room 7 identified that a waste container originating from Los Alamos National Laboratory had been breached. Following identification of the waste container, samples were obtained underground, and analyses of those samples and other analytical and investigative work continues by both the AIB and the Technical Assessment Team. To date, only one breached drum has been identified, however, a more complete video camera inspection of Panel 7, Room 7 will be initiated in October 2014.

To date, the Department has determined the following: heat damage is evident; magnesium oxide sacks were disturbed by the incident; at least one drum was breached; and nitrate salts, low pH, and organic material may be contributing factors to the breach. Analysis to date indicates that the radioactive constituents of the radiological release are consistent with the contents of the one drum that has been visually identified as having been breached. Further analyses are being conducted by the AIB and Technical Assessment Team, and the results will be documented in their respective reports, to be released in calendar year 2014.

2.2.4 Effects of the Radiological Release Incident

As a result of the radiological event, portions of the WIPP underground and the existing surface mounted ventilation system are radiologically contaminated. Comprehensive surveys are ongoing to determine the extent of the contamination. Although it is expected that most of the underground will be free of contamination, Figure 5 indicates areas that may exhibit varying degrees of contamination. Based on the ventilation flow and radiological surveys to date, it is anticipated that the exhaust drift and shaft, Panel 7, and the common drift area adjacent to Panels 1 through 8 may be potentially contaminated. As discussed in greater detail in Section 3.2, this will require WIPP to operate with uncontaminated and contaminated sections of the underground, which is a key part of the recovery strategy.

Since the radiological release, the underground ventilation system has operated in filtration mode through two parallel HEPA filter banks with an air flowrate of 60,000 cfm of filtered air, which is significantly lower than the normal, unfiltered rate of 425,000 cfm. Air is exhausted through the filter banks by one of three available exhaust fans. This HEPA filtration system provides a means for removing the airborne particulates that may contain radioactive and hazardous waste contaminants in the reduced exhaust flow before they are discharged through the exhaust stack to the atmosphere. The HEPA filtration system is designed for one exhaust fan to operate at a time. The other two fans serve as back-up and are rotated into service, and they can only support limited underground operations.



Known contaminated area are in dark blue, and potentially contaminated areas are in light blue, pending completion of ongoing surveys.

Figure 5. Potential Contaminated Areas in the Underground

The current limited ventilation constrains the number of personnel and activities that can be conducted in the underground at any time. Operations impacted include activities that produce exhaust or fumes (e.g., diesel engines for roof bolters, fork lifts, salt haul trucks, underground construction vehicles) and create underground dust (e.g., mining, roof bolting, vehicle movements, movement of salt).

The radiological event released a very small amount of contamination to the environment. On February 19, 2014, scientists at the Carlsbad Environmental Monitoring & Research Center detected trace amounts of the radioactive isotopes americium and plutonium on an air filter from an ambient air sampling station located approximately 0.6 of a mile northwest of the WIPP site on the WIPP access road. The Carlsbad Environmental Monitoring & Research Center noted that all of the radiation levels detected were very low and were well below any level of public and environmental hazard. Later results showed that the released low levels of radioactivity decreased significantly after the event, and the analyses continue to reflect that the air around the WIPP site is safe, posing no harm to the environment or the public.[4]

[4] The sampling results are available at http://www.cemrc.org/2014-wipp-release/.

3 RECOVERY PLAN

3.1 Objective

The recovery and resumption of TRU waste disposal operations at WIPP are central to the Department's mission. The Recovery Plan details the steps to achieve restart and support DOE's mission requirements, as well as commitments to the public, the community, generator sites, and their host states. The objective is to resume emplacing waste in WIPP in the first quarter of the calendar year 2016. Safety, health, and protection of the public, the workers, and the environment are DOE's highest priorities. Every stage of recovery will be supported by rigorous regulatory compliance and robust upgrades to nuclear safety, fire protection, and emergency management documentation, procedures, and training. These will be validated in accordance with Departmental directives through the conduct of Operational Readiness Reviews at the contractor and federal levels. At all stages of recovery, the Department will communicate openly, early, and frequently with the public, stakeholders, and regulators.

When disposal operations resume, the first wastes to be disposed of will be the site-derived waste from the recovery actions and the containers currently stored in the Waste Handling Building at WIPP. Once these containers have been safely disposed of, WIPP will begin receiving wastes from waste generator sites. The number of shipments that can be processed will increase as supported by ventilation improvements and equipment.

Accomplishments to Date, September 2014:

- Defined and implemented initial compensatory actions
- Initiated facility program and safety management enhancements
- Developed Evaluation of Safety of the Situation documents
- Initial entry underground
- Room 7, Panel 7 observed
- Los Alamos National Laboratory breached drum identified
- Exhaust System pre-filters replaced
- Radiological Buffer Areas established
- Interim ventilation procurement initiated
- Decontamination studies initiated
- Workforce retrained for radiological activities
- Prepared activity cost and schedule estimates.

3.2 Strategy

The overarching recovery strategy includes seven key elements: (1) safety; (2) regulatory compliance; (3) decontamination; (4) ventilation; (5) mine stability and underground habitability; (6) workforce retraining; and (7) managing waste streams. These key elements of the strategy are discussed in this section.

A key element of the strategy for recovery is not to decontaminate areas of WIPP where decontamination is technically challenging (such as the 2,100 foot vertical air exhaust shaft), or would be overly costly or delay the return to operations. Rather, the strategy is to separate the contaminated areas from the balance of the underground and operate WIPP with both contaminated and clean areas. WIPP operations will change from a being a fully uncontaminated ("clean") facility to one that has both contaminated and uncontaminated areas. This will affect all aspects of WIPP operations, including policies, procedures, training, cost, and schedule, and will offer operational challenges to WIPP workers and management. Increased vigilance and attention to detail are required to ensure worker safety.

It is envisioned that the initial waste will be emplaced into the contaminated area, e.g., Panel 7 first, followed by emplacement in the drifts between Panels 2 through 4 and 5 through 7 (see Figure 2). Over time, as areas are decontaminated and other contaminated areas are closed off, the majority of operations will take place in the clean parts of the facility.

Increasing ventilation capacity is a principal requirement for safe underground operations, as it supports worker safety, mining, and waste emplacement. Since the radiological event, it is necessary to operate the existing underground ventilation system in filtration mode, which is inadequate to support operations in both the "clean" and contaminated underground areas. The ventilation levels must be increased to support the recovery of WIPP and resume waste emplacement and, eventually, full disposal operations and concurrent mining operations. The recovery strategy calls for ventilation to be increased in phases. The ongoing first phase is the installation of two skid-mounted fans on the associated HEPA filter units, which will increase the ventilation flow from 60,000 cfm to 114,000 cfm and allow redundancy for fan maintenance. Currently, to change out HEPA filters the entire ventilation system must be shut down, and, therefore, no workers are permitted underground. The boost in ventilation flow will also permit increased activities requiring diesel engines, such as roof bolting. The second phase is the supplemental ventilation system, which will reconfigure the underground with bulkheads, ventilation regulators in the bulkheads, and supplemental fans without much expense and will allow for a further increase of activities that create fumes and dust, especially very limited mining and initial waste operations. The third phase, consists of a new permanent ventilation system and the construction of a supporting shaft and two drifts. This last phase will restore WIPP to its pre-incident airflow capacity for simultaneous mining and waste emplacement operations.

Also key to the recovery strategy is addressing the deficiencies identified in the AIB reports and other assessments prior to commencing operations. No emplacement will occur without closing out corrective actions and validating preparedness and competencies with Operational Readiness Reviews. [5]

The existing workforce plays a key role in the recovery strategy. Rather than hire new workers trained to work in radiologically contaminated environments, the current workforce is being trained to perform work in uncontaminated and contaminated environments and to minimize skills mix imbalances. Maintaining the ability of workers to perform recovery functions, in addition to their normal WIPP operations responsibilities, is a Department priority. For example, waste handlers and miners will be performing recovery scope, including soot cleaning and decontamination until waste emplacement and mining resume.

Finally, DOE sites that generate waste from atomic energy defense activities for disposal at WIPP will continue characterization and certification activities to meet regulatory milestones. WIPP is reexamining its processes to ensure that all will have rigorous characterization, treatment, and packaging processes and procedures in place to ensure compliance with WIPP Waste Acceptance Criteria.

3.2.1 Safety

Following the WIPP fire and radiological release incidents, immediate response actions were implemented to stabilize the plant and identify the cause of the events. Significant compensatory measures were quickly implemented to establish a safe operating envelope for response and recovery.

---

[5] An Operational Readiness Review is a disciplined, systematic, documented examination of facilities, equipment, personnel, procedures, and management control systems to verify that a facility can be operated safely within its approved safety envelope as defined by the facility safety basis. See DOE Order 425.1D, *Verification of Readiness to Start Up or Restart Nuclear Facilities*.

New management and corporate subject matter experts conducted initial assessments and started initiatives to immediately correct or mitigate significant deficiencies. These actions have ensured that immediate health and safety issues were addressed during response and ongoing recovery efforts.

The strategy for nuclear safety management leading up to commencement of waste emplacement operations is based on development of Evaluation of Safety of the Situation documents used to evaluate and perform recovery activities. Work will continue to be conducted under these documents until a revision to the existing safety documentation—the Documented Safety Analysis—is implemented.

The Phase 1 report for the radiological release identified a number of weaknesses with the WIPP nuclear safety program. For example, the hazard analysis did not result in appropriate safety classifications, and in general there was a reduction in the level of conservatism in the safety documentation over time. In light of these deficiencies, it is imperative that all safety documentation be revised, upgraded to required standards, and implemented, prior to recommencing waste emplacement operations, in order to ensure the safety of the public, the workers, and the environment.

In accordance with 10 CFR Part 830 Subpart B, Safety Basis Requirements, WIPP is defined as a Hazard Category 2 nuclear facility, because "there are significant on-site consequences beyond localized consequences" if a nuclear accident were to occur. As such, the WIPP contractor must establish and maintain a safety basis for a Hazard Category 2 facility. A Documented Safety Analysis is a documented analysis of the extent to which a nuclear facility can be operated safely with respect to workers, the public, and the environment, including a description of the conditions, safe boundaries, and hazard controls that provide the basis for ensuring safety.

Current Status—Safety Management Programs, which are described in the Documented Safety Analysis, are documented functional programs that provide the broad foundation for safe disciplined facility operations. In accordance with nuclear safety, Safety Management Programs that control and discipline operations are a key component of defense-in-depth and are an integral part of safe operations. Key Safety Management Programs (e.g., Nuclear Criticality Safety Program, Radiation Protection Program, Procedures and Training Program, and Emergency Preparedness Program) are described in separate chapters in the Documented Safety Analysis, with key attributes for nuclear safety defense-in-depth being identified in these chapters.

The AIB identified elements of Safety Management Programs involved in the events or in the response to the events that were noncompliant. NWP has developed a set of corrective and compensatory actions in response to both events using its Contractor Assurance System process and methodology. These corrective actions address needed improvements in processes and procedures, organizational capability, and physical systems. The suite of corrective actions may need refinement as additional information becomes available through mine condition assessments, further waste characterization, conclusion of the AIB deliberations, and completion of Safety Management Program functional assessments. As corrective actions are completed, personnel are trained, and processes and procedures are developed, compliant Safety Management Programs will be re-established and replace compensatory measures.

In addition to the Safety Management Programs identified in the Documented Safety Analysis, there are other Safety Management Programs that are integrated into the overall set of programs to provide for safe disciplined facility operations. Examples include the Contractor Assurance Program, Engineering Program, Work Control Program, Nuclear Safety Program, and Integrated Safety Management System Program.

Recovery Actions—A revised Documented Safety Analysis is being developed to address the inadequacies identified in the existing Documented Safety Analysis and implement new controls required to resume operations.

To ensure quality, a senior review committee process is being used for the development of the revision to the WIPP Documented Safety Analysis. The committee consists of senior DOE Carlsbad Field Office and NWP management who review key elements of the safety documentation while in the development phase to provide alignment and direction. This process ensures that the right hazards are identified and the proper controls are developed.

As an initial step in the recovery process, WIPP is implementing compensatory measures and activities identified in the Corrective Action Plans. This includes conduct of assessments to identify gaps and deficiencies, management self-assessments and validation of effectiveness and confirmation. As Safety Management Programs and revisions to the safety basis documents are developed and implemented, the reliance on compensatory measures will be reduced accordingly.

Three Safety Management Programs—emergency management, fire protection, and radiological readiness and safety—are key to existing recovery activities as well as resumption of waste emplacement activities:

- **Emergency Management**—The Emergency Management Program is being enhanced to improve response to site incidents and emergencies. Following the emergency events that occurred in February 2014, compensatory measures were immediately instituted to enhance the ability to respond to any future events. The program is being restructured to align with current and changing needs in accordance with the National Incident Management System and the Incident Command System. The restructuring includes updates to the emergency management policies, plans, and procedures, as well as changes to equipment and facilities. Training, drills and validation exercises are being conducted. The program will be verified to align with DOE requirements and the revised Documented Safety Analysis. After successful implementation, the compensatory measures will be removed. This enhanced program will be in place prior to the start of operations.

- **Fire Protection**—The Fire Protection Program is being enhanced to include upgrading underground fire protection equipment, better controls on combustible loading, improved scheduling of maintenance to manage fire protection controls, new fire protection equipment, changes to the engineering review of fire loading and maintenance regime, and inclusion of greater probability of fires in the safety analysis. These actions are designed to protect the safety of workers and equipment and prevent another fire from occurring in the underground. This enhanced program will be in place prior to the start of operations.

- **Radiological Readiness and Safety**—A comprehensive program has been initiated to examine aspects of the Radiological Control Program and to address the need to operate in both an uncontaminated and a contaminated environment. The program complies with 10 CFR Part 835, Occupational Radiation Protection, and DOE-STD-1128-2008, *Good Practices for Occupational Radiation Protection in Plutonium Facilities*. Immediate interim actions were instituted to address gaps. Trained radiation control personnel from other sites have been brought to WIPP to augment the staff, mentor personnel, and provide support to new radiological activities. These personnel have since returned to their home sites. As procedures are updated, training and drills are conducted on the new procedures and processes. This enhanced program will be in place prior to the start of operations.

The implementation of a revised Documented Safety Analysis and implementation of new and enhanced Safety Management Programs will be independently verified by an Independent Verification Review and confirmed through Operational Readiness Reviews by both the contractor and the Department, a key element to resumption of operations. These reviews will be completed prior to resumption of waste emplacement operations and again prior to the commissioning of the permanent ventilation system and the associated operations it will support.

Timeframe for Action—The Documented Safety Analysis revision and implementation actions that reflect current mine conditions and eliminates compensatory measures is targeted to be completed in the fourth quarter of fiscal year 2015, prior to resumption of disposal operations. AIB corrective actions and Safety Management Program implementation necessary for restart are targeted to be completed in the same timeframe. The Documented Safety Analysis revision to support testing of the new permanent ventilation system and full operations is scheduled to be completed by the third quarter of fiscal year 2016.

3.2.2 Regulatory Compliance

The regulatory and permitting aspects of recovery focus on ensuring that modifications to the facility are protective of human health and the environment. Changes are made using the procedures and processes established by the agencies that regulate WIPP. The Department will work closely with the NMED and the EPA to expedite resumption of operations. The regulatory requirements for restart are outlined in the following paragraphs. The Department will fully comply with all regulatory requirements and commitments.

Current Status—The Department has received three Administrative Orders from the NMED as follows:

- February 28, 2014[6]: Established a schedule of compliance for all aboveground facility permit inspections, monitoring, recordkeeping, and reporting requirements.

- May 12, 2014[7]: Addressed permit-required actions in the underground (monitoring Permit requirements) that could not be performed and modifications to requirements under the February 28, 2014 Administrative Order. This order required two plans: *Underground Compliance Plan* (DOE 2014c) and an *Underground Derived Waste Storage Plan* (DOE 2014d). It also required the Permitees to begin monitoring for the volatile organic compound trichloroethylene. This second Administrative Order also established the terms of conditions for WIPP to commence normal operating status.

- May 20, 2014[8]: Addressed the initial closure of Panel 6 and Panel 7, Room 7 containing nitrate-salt-bearing waste containers in the WIPP underground. This order required the development and submittal of the *Waste Isolation Pilot Plant Nitrate Salt Bearing Waste Container Isolation Plan* (DOE 2014e) describing the Department's plans for implementing closure of Panel 6 and Panel 7, Room 7.

There are frequent communications with the NMED and the EPA regarding the recovery activities of interest. The DOE and the EPA have entered into a Memorandum of Understanding regarding compliance with 40 CFR Part 61, National Emission Standards for Hazardous Air Pollutants (DOE and

[6] http://www.wipp.energy.gov/library/Information_Repository_A/Directives_from_the_Secretary/NMED_AO_2_27_14.pdf
[7] http://www.wipp.energy.gov/library/Information_Repository_A/Directives_from_the_Secretary/Administrative_Order.pdf
[8] http://www.wipp.energy.gov/information_repository/information_repository_a/Directives_from_the_Secretary/WIPP_Order_05-20001.pdf

EPA 1995). Any recovery activities that affect long-term performance of the WIPP repository will be coordinated with the EPA and be factored into their ongoing review of the WIPP Recertification Application, a five year review that must be completed by March 2015 in order for WIPP to operate.

The Mine Safety and Health Administration has been conducting inspections of the WIPP facility, which were initially focused on surface facilities because underground access had not been available. Both underground and surface inspections are now being performed quarterly. The Mine Safety and Health Administration inspected the WIPP surface facilities in mid-June, and issued 52 citations for various conditions including general workplace tidiness, exposed electrical wiring, and missing safety guards on equipment. All 52 of the citations have been addressed with corrective action measures implemented and accepted by the inspectors.

The Carlsbad Field Office will continue to work closely with the Mine Safety and Health Administration to find ways to improve the safety and working environment at the facility. It is anticipated that DOE's Office of Environmental Management will enter into a Memorandum of Understanding with the Mine Safety and Health Administration soon.

Recovery Actions—It is currently anticipated that one or more permit modification[9] requests will be required prior to reopening WIPP. Proactive communications will continue with the NMED and EPA through the recovery efforts on these permit modifications. The NMED has the final authority to determine the classification of permit modification requests.

Lifting the Administrative Orders will require resumption of Carlsbad Field Office inspections and monitoring for the aboveground and underground Permit requirements; closing Panel 6 and Panel 7, Room 7; the NMED inspection of the surface and underground; and approval of any required permit modifications requests necessary to resume operations. Specific conditions for resumption of normal WIPP operations include: (1) inspection and approval by the NMED and (2) continued monitoring for the volatile organic compound trichloroethylene.

The NMED's focus with regard to recovery is on compliance with the requirements specified in the Hazardous Waste Permit, which include:

- Restart of permit-required inspections and monitoring for underground Permit related activities that are addressed by the Administrative Orders described above.

- Perform actions mandated by the Resource Conservation and Recovery Act (e.g., Hazardous Waste Permit, Appendix D, continued notifications to the NMED, post-emergency reporting, decontamination updates, etc.).

- Submit proper notices and modification requests for activities that deviate from the current permit, such as the permit modification request to address the change of the minimum running annual average ventilation exhaust rate of 260,000 standard cfm; the planned change notice to the permitted facility regarding ventilation; and the planned change notice to mine a new access drift and to drill a new shaft.

---

[9] Permit modifications are defined and the specific list of classifications are listed in 40 CFR 270.42. Class 1 permit modifications are simple changes that may be put into effect by the permittees without prior approval from the regulatory agency; Class 2 permit modifications require a public comment period and agency decision within 90 to 120 days of submittal; and Class 3 permit modifications may be complex and require public participation, an option for public hearing, and have no time period for agency decision making.

Once the underground can be safely accessed and adequate ventilation is in place to perform this work, initial closure of Panel 6 and then Panel 7, Room 7 will be completed in compliance with the State's May 20, 2014, Administrative Order. Prior to the WIPP incidents, DOE had proposed a revised panel closure design to the NMED and the EPA on March 18, 2013. The proposal would change the panel closure design from installation of a 12-foot-thick isolation wall, followed by a 26-foot solid concrete wall, to the installation of a steel bulkhead in the access drifts on the waste disposal side, followed by filling the access drifts with a minimum of 100 feet of mined salt, and then another steel bulkhead. This proposal will be evaluated by the NMED to determine if it adequately addresses the potential hazards from the nitrate-salt-bearing waste for the permanent closure of Panel 6. The EPA also must approve this change to the facility design and has initiated a rulemaking to do so (78 FR 72612). The substantial barriers (chain-link, brattice cloth, mined salt, and bulkhead) alone will not be the final closure for Panel 6. An evaluation of a component that can be relied on to mitigate the effects of an event similar to the one that occurred in Panel 7 will be performed. This component may include a substantial structure, but must take into consideration constructability and available ventilation. Final panel closure design for Panel 6 will be approved by the NMED and the EPA and aligned with required certification activities.

Nitrate-bearing waste containers in Panel 6 and Panel 7, Room 7 will be isolated consistent with the Department's *Waste Isolation Pilot Plant Nitrate Salt Bearing Waste Container Isolation Plan* (DOE 2014e), issued in accordance with the NMED's May 20, 2014, Administrative Order. The *Waste Isolation Pilot Plant Nitrate Salt Bearing Waste Container Isolation Plan* provides the proposed steps for expedited initial closure of Panel 6 and Panel 7, Room 7, such that a potential release from any nitrate-salt-bearing waste containers does not pose a threat to human health or the environment. The AIB for the radiological release and the Technical Assessment Team are conducting analyses based on sampling and visual inspection to determine the contributing elements of the exothermic reaction.

Timeframe for Action—In addition to the regulatory activities required to support the permanent ventilation system changes, there will be ongoing interaction required to address operating procedure changes, underground equipment modifications and upgrades to the Safety Management Programs. Ongoing dialogue with the NMED and the EPA as recovery activities progress is critical to the implementation of these improvements.

Panel 6 initial closure is scheduled to be completed in first quarter of fiscal year 2015, and Panel 7, Room 7 closure by mid fiscal year 2015.

3.2.3 Decontamination

Decontamination is a key element of the WIPP Recovery Plan. The radiological release incident changed WIPP from a "clean" nuclear facility to one that will require simultaneous operations in contaminated and uncontaminated areas for a period of time. Panel 7, the exhaust drift, and the exhaust shaft are contaminated, but the degree is not yet known. Also, there may be additional areas that are contaminated due to the flowpath of the exhaust during the incident and afterwards. This affects WIPP's concept of operations and the required knowledge and training of the WIPP workforce.

As noted earlier, a key element of the strategy for recovery is to not decontaminate areas of WIPP where decontamination is technically challenging or would be overly costly or delay the return to operations. The strategy is to separate the contaminated areas from the balance of the underground and operate WIPP with both contaminated and clean areas.

Current Status—The underground currently has both uncontaminated and contaminated areas. Only certain areas are contaminated because, except during the ventilation shift to filtration mode, the

ventilation system was drawing air from the active waste emplacement location (Panel 7) where the radiological event occurred, along the shortest path to the exhaust shaft.

A vast majority of the underground is expected to not have been affected by the radiological event. Comprehensive surveys are being conducted to confirm mine conditions. For areas with elevated levels that are expected to be used long-term (e.g., Panel 7), decontamination options are being evaluated. Alternatively, appropriate protective equipment and procedures will be utilized.

Evaluation of decontamination techniques is ongoing. NWP has contracted with the Idaho National Laboratory to determine the relative effectiveness of various methods of decontamination for the WIPP underground. The decontamination of salt surfaces has not been well documented in the current available literature. New processes have been designed and tested using actual WIPP salt material, as well as other materials, including both surrogate contaminants and americium contamination. Idaho National Laboratory has extensive experience in simulating different kinds of radiological contamination.

Of the methods tested at Idaho National Laboratory (dry brushing, vacuum cleaning, water washing (spray misting), strippable coatings, and mechanical grinding), the most practical seems to be fresh-water spray. This is expected since the repository is mined in a salt formation, and salt is readily soluble. The method essentially dissolves the top layer upon which surface contaminants are deposited (whether the contamination itself is soluble or not). Effectiveness is very high, and it is easy and rapid to deploy. This decontamination method is clearly preferable over conventional techniques employed on engineered surfaces from a usability perspective. Another option that could be used is a fixative barrier, which may be necessary for equipment where water washing is not advisable, or areas with high potential for rock disturbance.

Recovery Actions—All contaminated areas are in the process of being properly marked and barricaded to prevent access. The first step for decontamination is to test the effectiveness of fresh-water spray as a method of removing contamination. Research shows that water spray will release contamination from the surface and either carry it as runoff into the floor porosity, or wick it into the rock via capillary flow, where it is trapped within the interstitial grain boundaries. The water tends to drive the contamination deeper in the salt. At this point, it is thought that this will be an effective method for fixing contamination in Panel 7, Rooms 1 through 6, and other areas of the mine where contamination may be present. It may be necessary to spray a fixative over some areas with high potential for contact with heavy equipment. The fixative can be colored to help monitor any potential damage to the coating. The purpose of these decontamination activities is to affix radioactive contamination and prevent airborne entrainment; it is not to remove all contamination in the affected areas.

Timeframe for Action—Decontamination activities will be initiated upon completion of preliminary and in-mine tests. Decontamination, where appropriate, is expected to begin in mid-fiscal year 2015. These are preliminary schedules due to the considerable uncertainty with the level of contamination, and the technology has not been fully defined.

3.2.4 Ventilation

The ventilation system that serves the underground is designed, maintained, and operated to meet or exceed the criteria specified by 30 CFR Part 57, Safety and Health Standards Underground Metal and Nonmetal Mines, and the New Mexico Mine Safety Code for mines. The ventilation system also meets the requirement of the WIPP Hazardous Waste Facility Permit. Adequate ventilation is required for life sustainability, to remove of dust during mining, to provide fresh air, and to remove exhaust fumes during diesel engine operations.

Since the radiological event, it has been necessary to operate the existing underground ventilation system in filtration mode, which is inadequate to support operations of both "clean" and contaminated underground areas. The ventilation levels must be increased to support the recovery of WIPP and resume waste emplacement and, eventually, full disposal operations and concurrent mining operations. It also serves as a first line of defense in the event of a waste handling accident by providing a single pass, direct flow of air through the underground facility to a series of HEPA filtration units. In the event of breached waste containers, the underground ventilation system assists in the confinement of released material.

The underground portion of the ventilation system consists of bulkheads, overcasts, airlocks, and ventilation system regulators in the bulkheads that are used to segregate the underground ventilation circuits to accommodate salt movement. In order to bring the repository back into operation as safely as possible, a three-phased strategy is being employed to provide increased airflow to the repository (see Table 1). The first and second phases are required for commencement of waste emplacement operations, and the third phase is required for full operations.

Table 1. Ventilation Airflows

	Total Airflow (cfm)
Standard operations	425,000
WIPP Permit requirement	260,000
HEPA filtration	60,000
First phase: Interim skid-mounted ventilation	114,000
Second phase: Supplemental ventilation	180,000
Third phase: Permanent ventilation	420,000

Current Status—As a result of the radiological event, the underground ventilation system was switched from 425,000 cfm of free-flow air to the filtration mode of 60,000 cfm of filtered air and remains in that condition at this time. Filtration mode mitigates the consequences of an underground waste handling accident by reducing the air flow rate and directing the underground exhaust through two HEPA filter units located on the surface in the exhaust filter building.

The DOE Carlsbad Field Office is currently executing the first phase, or interim ventilation system, which will provide an additional capacity of 54,000 cfm above the existing capacity of 60,000 cfm, for a total of 114,000 cfm. The HEPA skid and fan unit final designs have been completed and were released to the subcontractors for manufacture in August 2014. The HEPA skids are scheduled to be manufactured, emplaced, tested, and fully operational by April 2015. The instrumentation and control design package is in final design review. The skid-mounted units will provide additional ventilation sufficient to allow the resumption of necessary safety and stability activities. For example, the current airflow limits mine stability operations to one roof bolter at a time, whereas the added capacity provided by interim ventilation will allow simultaneous operation of multiple roof bolting machines.

Recovery Actions—Airflow is the major limitation to recovery operations for a significant portion of the recovery schedule. This means that many underground recovery activities, especially those involving diesel equipment, will need to be conducted in series, rather than concurrently, until additional ventilation capacity is obtained. Work will be conducted in a manner that efficiently sequences activities on multiple shifts to optimize the use of available airflow. Based on the current reduced ventilation flow, at most only two pieces of underground diesel equipment can be operated simultaneously while maintaining adequate airflow conditions for personnel and the active waste emplacement panel. Parallel activities will be limited to activities that do not exceed air quality or underground ventilation limits.

The second phase, or supplemental ventilation system, reconfigures the mine using bulkheads, overcasts, airlocks, and bulkhead ventilation regulators augmented with supplementary fans to provide 135,000 cfm. The combined interim and supplemental ventilation systems will provide 180,000 cfm. Supplemental ventilation for clean areas of the mine, including mining operations, will be obtained by using one of the existing shafts as an exhaust shaft for radiologically uncontaminated air. Once in place, this second phase will provide sufficient ventilation flow to support limited waste emplacement operations.

The third phase will be to design and construct a new permanent underground ventilation system capable of providing 420,000 cfm airflow, restoring the facility back to full, unrestricted operation. This will provide the ventilation required to simultaneously conduct mine stability activities, mining, maintenance, waste emplacement, and research and development activities.

Replacement of the HEPA filtration system pre-filters was completed in June 2014. The need for future replacement of the pre-filters to support ongoing recovery activities will continue to be evaluated.

Timeframe for Action—Interim ventilation is on schedule to be installed in the second quarter of fiscal year 2015, with startup in mid-year fiscal year 2015. Supplemental ventilation will be operational in the first quarter of fiscal year 2016.

3.2.5 Mine Stability and Underground Habitability

In addition to decontamination and ventilation, there are other aspects of underground habitability that must be addressed as part of recovery. This includes addressing mine stability and activities that are required to make the mine habitable, such as radiological characterization, posting of radiological zones, operational checks of mine safety equipment, replacing damaged equipment, fire loading reduction, cleaning, trash removal, and electrical system safe restart. These are required as part of recovery to ensure worker safety and health.

Current Status—The underground has been segmented into zones for the purposes of scheduling and tracking progress as areas in the underground are recovered to support the restart of operations. Once a zone has been characterized and determined to be free of contamination and underground safety is established (e.g., federal requirements of the Mine Safety and Health Administration), entry teams establish a "radiological buffer area" area where no personal protective equipment is required. This provides a more efficient work environment. Currently, over 16,500 out of about 30,000 linear feet of the underground has been established as a radiological buffer area or clean area, and this encompasses the salt shaft, air intake shaft, and waste shaft areas. The current projection is that 90 percent of the underground will be found to have not been contaminated.

The underground requires constant maintenance to continue operations. The salt roof, floor and walls creep inward at a slow rate, and certain areas of the underground need attention. The WIPP salt moves to fill in mined areas at an average rate of three to six inches per year. Stability inspections are ongoing as underground restoration activities are being performed.

Extra fire protection compensatory measures have been implemented (e.g., requiring fire watches) to support recovery activities in the underground while improvements to the fire protection program are being developed.

Recovery Actions—The first stage of restoring mine conditions is to achieve routine mine entry in order to address Mine Safety and Health Administration requirements, mine stability and worker safety and health issues, as well as support for continued the incident investigation. The current safety documentation (Evaluation of Safety of the Situation documents) allows for activities that provide for

worker safety, such as mine inspection, source term identification and characterization, system inspections associated with entry requirements, and routine habitability activities, such as trash removal and general housekeeping. Once an area is determined to be a radiological buffer area or a clean area, crews will be able to enter with reduced personal protective equipment to conduct the following activities:

- Restore safety systems;
- Perform stabilization activities (e.g., bolting);
- Vacuum soot and clean surfaces as required;
- Remove/replace damaged equipment;
- Begin maintenance on equipment;
- Restore equipment fire suppression systems;
- Check electrical system and equipment and remove carbon.

Some underground areas will remain contamination areas, and the above activities will be performed in these areas using separate equipment so as to avoid contamination to the clean areas of the underground.

Currently NWP is averaging about four entries a week with the goal to increase to daily entries, and then multiple daily entries, as allowed by ventilation capacity. The safety process ensures there is adequate ventilation to support the activities performed for each entry. With the limited air flow, NWP will control operations and work on multiple shifts to support the large backlog of safety-related activities.

The Zone Recovery Teams, comprised of radiation control technicians, geotechnical surveyors, mechanics and other crafts as needed will take necessary radiation readings and smears for contamination and will measure how much the salt walls are moving inward. Based on these readings, the crew will identify the areas that require attention to address floor heave, buckling, or roof deformation. The radiation survey currently underway will determine if these mine stability issues are within contaminated areas or in radiological buffer areas or clean areas. Following the completion of the survey, teams can be dispatched to conduct stability actions as required.

Stability of the underground remains a very high safety priority and therefore emphasis has been placed on the resumption of roof bolting activities. The principal objective is to help the rock mass support itself by installing bolts. Holes are drilled into the ceiling and walls and a long steel rod is installed to hold the rock mass together.

Bolting operations will resume in areas of the mine that have been rolled back to a radiological buffer area. Bolting operations will then move towards Panel 6 to ensure safe access in support of beginning initial panel closure activities, and will be done in contaminated areas as necessary.

Bolting will be prioritized based on the geotechnical inspections and surveys. There is bolting equipment that is currently in the potentially contaminated areas. When it is necessary to bolt in a contaminated area, this potentially contaminated equipment will be used. The Recovery Plan includes establishing a specific contaminated maintenance area and tool crib to support operations in the contaminated areas.

Timeframe for Action—Expansion of the radiological buffer area is ongoing and will continue through fiscal year 2015. "Catch-up" roof bolting to make up for eight months of suspended mine stability activities is scheduled to begin in fiscal year 2015 and continue through that fiscal year.

3.2.6 Workforce Retraining

To maximize cost-effective execution of recovery activities and prepare the WIPP organizational team for long-term mission accomplishment, the Department will maximize use of the existing workforce,

retraining staff for new activities specific to recovery (e.g., decontamination) and for future, more complex contaminated operations in personal protective equipment and under nuclear management controls. The existing workforce will be trained through the Safety Management Program enhancement initiatives, with mentoring provided by the subject matter experts. In some cases, WIPP "base" operations personnel have been assigned to activities that were suspended due to the incident. For example, waste handlers and miners are being retrained to perform recovery scope including soot cleaning and decontamination.

Maintaining flexibility of the workforce in support of recovery activities is a Department priority, and positive discussions are ongoing among management, the workforce, and the bargaining unit leadership. These discussions cover such topics as cross-training personnel for multiple skills, training personnel for new activities, and work schedule changes to support time-critical recovery activities.

Current Status—Training of the workforce for work in contaminated environments is continuing with classroom, practice, and on-the-job training, including becoming proficient working in radiological personal protective equipment. Since the event, employees have been retrained as radiation workers and trained and fit-tested on the appropriate radiological area respirators. A total of 253 workers are now qualified as advanced radiation workers, and an additional 184 workers are trained as basic radiation workers. These personnel were used to conduct response activities and entries in support of the AIB investigation, and they are currently being used to conduct recovery activities. In addition, 97 of the advanced group have been trained on enhanced radiological practices for work in contamination, high contamination, and airborne areas. Additional training on decontamination techniques is being developed and will be provided to the workers to support the recovery, decontamination, and operations in contaminated work areas.

Recovery Actions—Cross-training will continue. For example, some workers will learn decontamination techniques and become proficient in applying these techniques in the contaminated areas.

Prior to commencing waste emplacement operations, all personnel will complete re-qualification training including requisite proficiency verification. This training will be enhanced to include programmatic and procedural changes as a result of corrective actions and readiness activities. In particular, this training will include working under the new Documented Safety Analysis controls, working in a radiologically controlled environment, and working in the reduced ventilation environment in the repository. Readiness activities will validate the workforce is adequately trained and proficient to resume waste handling operations.

Timeframe for Action—Workforce cross-training will continue to optimize skills-mix changes, until resumption of operations.

3.2.7 Managing Waste Streams

3.2.7.1 Waste of Concern

Preliminary investigations to date indicates that the February 14, 2014, radiological release originated from a TRU waste drum processed at Los Alamos National Laboratory that did not meet the WIPP Waste Acceptance Criteria. This drum was part of a Los Alamos National Laboratory waste stream known to have nitrate salts, low pH, and organic material, which are likely to have been contributing factors to the release. The Permitees of WIPP, the Carlsbad Field Office and NWP, have provided a detailed proposal for the expedited initial closure of Panel 6 and Panel 7, Room 7, so that a potential release from any

nitrate-salt-bearing waste container in Panel 6 or Panel 7, Room 7 does not pose a threat to human health and environment, in accordance with the NMED's May 20, 2014, Administrative Order.

This Recovery Plan does not address in detail issues related to the processing of waste that is sent to WIPP or the current management of containers within this waste stream. Investigation of this aspect of the February 14 incident is still being conducted by the AIB and the Technical Assessment Team, both of which are anticipated to complete their work in calendar year 2014. Additional information gained as part of the ongoing investigations will be addressed in the detailed recovery planning, as this will be critical to WIPP's resumption of waste emplacement.

To date, the Department has determined the following: heat damage is evident; magnesium oxide sacks were disturbed by the incident; at least one drum was breached; and nitrate salts, low pH, and organic material are likely to have been contributing factors to the breach.

As outlined below, the Department is actively managing the TRU waste streams generated at LANL and other locations during the period in which WIPP is not accepting waste.

3.2.7.2 Waste On-Site at WIPP

Currently, there are 144 waste containers (with a volume of 129 cubic meters) safely stored aboveground at WIPP in the Waste Handling Building, awaiting disposal. None of this aboveground waste is part of the nitrate salt waste stream. These 144 waste containers had been received from DOE sites, but had not yet been emplaced when the February 5 fire event occurred, leading to the suspension of WIPP operations. The inventory also includes non-nitrate salt wastes from Los Alamos National Laboratory, as well as wastes from Idaho National Laboratory and the Savannah River Site in South Carolina.

As discussed in Section 3.2.2, underground waste containers having nitrate-bearing waste will be isolated in accordance with the *Waste Isolation Pilot Plant Nitrate Salt Bearing Waste Container Isolation Plan* (DOE 2014e), which provides the proposed steps for expedited closure of Panel 6 and Panel 7, Room 7, such that a potential release from any nitrate-salt-bearing waste containers does not pose a threat to human health or the environment.

The WIPP Hazardous Waste Facility Permit allows waste to be stored aboveground for no more than 60 days. WIPP has been granted a permit extension to accommodate the waste currently being stored aboveground in 60 day intervals. The Department will continue to work closely with the NMED regarding permit extensions as needed.

DOE has evaluated the feasibility of returning some of this inventory to the generator sites but does not believe that it is currently necessary. The Recovery Plan includes emplacement of this aboveground waste as part of the commencement of waste emplacement operations.

3.2.7.3 Waste Staged at Waste Control Specialists

Waste Control Specialists, located in Andrews County, Texas on the New Mexico–Texas border adjacent to Eunice, New Mexico, was selected as a temporary staging facility for Los Alamos National Laboratory wastes soon after the operations of WIPP were suspended. Some waste was moved from Los Alamos National Laboratory to Waste Control Specialists in an effort to meet the goals of the "3706 TRU Waste Campaign" by June 30, 2014, as agreed to between DOE and the State of New Mexico in the Framework Agreement. Within the inventory shipped from Los Alamos National Laboratory to Waste Control Specialists, there are 73 standard waste boxes containing waste from the same waste stream as the breached container. Waste Control Specialists, with DOE support, placed these 73 standard waste boxes

into 34 modular concrete canisters to provide an additional layer of confinement and placed the canisters in a trench covered with soil. The 73 standard waste boxes were arranged to be fully retrievable. The temperature of the standard waste boxes is monitored continuously. The balance of the inventory at Waste Control Specialists (i.e., waste containers that do not contain unremediated nitrate salts) is safely stored within an enclosed storage facility.

3.2.7.4 Effects on Waste Generators

The Department is continuing to characterize and certify TRU waste at the Idaho National Laboratory, Oak Ridge National Laboratory, the Savannah River Site, and Argonne National Laboratory for eventual shipment to WIPP. Waste continues to be generated at the Hanford site and Lawrence Livermore National Laboratory. The Department is carefully evaluating and analyzing the impacts on storage requirements and commitments with state regulators at the generator sites. These efforts will inform decisions related to the availability of storage for certified TRU waste until waste shipments to WIPP can resume.

In parallel with the ongoing AIB Phase 2 investigation into the direct cause and contributing causes of the release, generator site certification programs are being assessed to ensure the programs certify waste meeting the WIPP Waste Acceptance Criteria. After issuance of the AIB Phase 2 report, the need for any additional corrective actions will be assessed and implemented at generator sites. All waste generators will have rigorous characterization, treatment, and packaging processes and procedures in place to ensure compliance with WIPP Waste Acceptance Criteria.

The Department has surveyed the TRU waste generator sites and evaluated their waste stream documentation and determined that there are no other waste containers having the specific characteristics of the Los Alamos National Laboratory nitrate salt waste stream.

3.3 Cost, Timing, and Other Considerations

Detailed activities and objectives associated with commencement of waste emplacement operations have been identified and documented by the contractor. These activities, along with the estimated cost and schedule required for completion, make up the contractor baseline, which is currently under review by the Department. Work plans and packages are being developed to support the contractor's baseline. The schedule will continue to be refined as recovery activities are performed and additional information is learned. The current schedule is aggressive, and the Department will continue to look for opportunities to accelerate activities and execute work in parallel, reducing the time needed for critical activities.

3.3.1 Summary Schedule

NWP has developed detailed schedule estimates covering the duration of the recovery through the resumption of waste emplacement. The schedule depicts the primary activities required to be accomplished for each major work breakdown structure elements. A "roll-up" summary schedule with major activities is provided in Figure 6. Major activities on the schedule include:

- Initial incident response (complete): initial radiological surveys throughout the WIPP site, sealing of bypass dampers, safety documentation to support immediate actions, installation of a continuous air monitor at the exit of the HEPA filters, collection and analysis of environmental samples, completion of bioassay program.

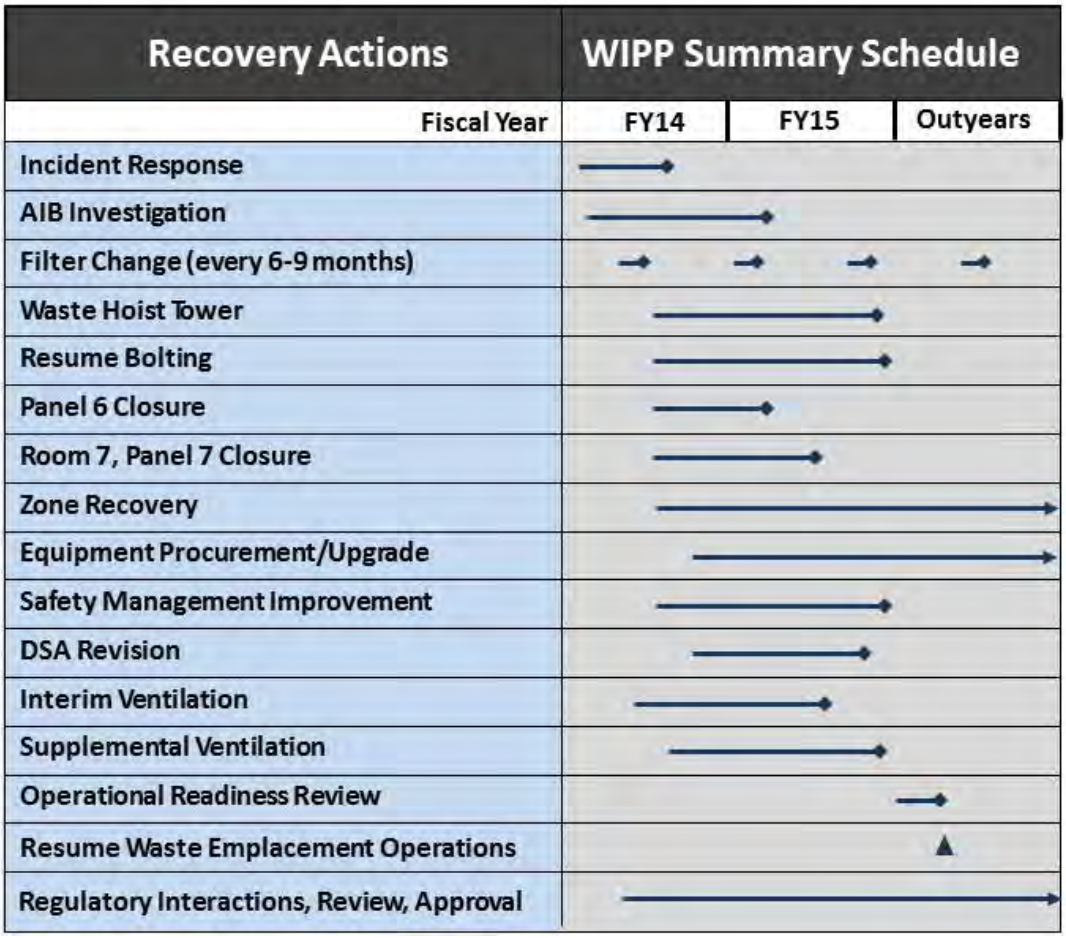


Figure 6. WIPP Summary Schedule

- AIB investigation: completion of the Phase 2 radiological release investigation as discussed in Section 2.2.
- HEPA filter change (first one completed): replacement of the pre-filters of the HEPA banks due to soot buildup.
- Waste hoist tower cleaning and maintenance: restore waste hoist, which has been down due to soot buildup on physical and electrical system; includes normal preventive maintenance.
- Catch-up roof bolting: bolting for mine stability, which has not been performed since the fire event, will be performed in accordance with geotechnical surveys and monitoring data and ground control engineering analysis.
- Panel 6 and Panel 7, Room 7 initial closure: planning and closure activities will be performed in accordance with the NMED's May 20, 2014, Administrative Order.
- Zone recovery and cleanup: radiological characterization, posting of radiological zones, operational checks of mine safety equipment, replacing damaged equipment, fire loading reduction, cleaning, trash removal, and electrical system safe restart.

- Equipment procurement and upgrades: replace aged and/or contaminated equipment with newer, cleaner, and compliant models. Where applicable, automatic suppression systems and diesel particulate filters will be added to current pieces of equipment within the current fleet.

- Safety management improvements: strengthen WIPP's programs in nuclear safety, emergency management, fire protection, radiation protection, procedures and training, quality assurance, industrial safety, engineering program, Contractor Assurance Program, etc.

- Documented Safety Analysis revisions: complete development of safety bases for operations.

- Interim ventilation: increase ventilation to 114,000 cfm using two skid mounted HEPA filter banks/fans; includes installation of duct work, controls, utilities, and infrastructure.

- Supplemental ventilation: increase ventilation to 180,000 cfm by utilizing existing shaft infrastructures with reconfigured bulkhead regulators and supplemental fans.

- Operational Readiness Reviews: activities associated with performance of the contractor and DOE reviews for initial emplacement and operation of the permanent ventilation system. These reviews will be executed after completion of required operational (processes, procedures, and personnel qualifications) and facility (equipment and control systems) improvements and contractor-led assessments.

- Resume waste emplacement operations: initiation of disposal of site-derived waste, followed by waste in the Waste Handling Building.

- Regulatory review/approvals: interactions and reviews to support any permit modifications and other regulatory commitments.

Detailed work plans and packages are being developed to support these activities in accordance with the estimated schedule.

The schedule will continue to be refined as recovery activities are performed and additional information is learned. The current schedule is aggressive. The schedule does not currently include contingency that may be necessary if there are unanticipated difficulties or delay in remediation of Panel 7 or in execution of other aspects of this plan. Every effort will be made to mitigate impact to the schedule should any of these risks occur; however, the planned commencement of waste emplacement operations could be impacted. The Department will continue to look for opportunities to execute work in parallel and reduce the schedule.

3.3.2 Cost

The Continuing Appropriations Resolution, 2015 (H.J. Res 124), enables the government to be funded through December 11, 2014. This Continuing Resolution allows funds for WIPP to be obligated at a rate necessary to ensure timely execution of activities necessary to restore and upgrade the repository, with a requirement to notify the appropriations committees on each use of this authority that exceeds customary apportionment allocations.

The WIPP recovery costs by major work breakdown structure element and fiscal year are provided in Table 2. These costs are based on the detailed planning to date and may change as new information is received or requirements change (e.g., if the Department discovers new information regarding the cause of the radiological release, activities could change, affecting the cost).

Table 2. Cost Summary Profile

WBS		FY2014	FY2015	Outyears	Total
1.7	**Event Recovery Project**				
1.7.1	Facility Program Enhancements	$8,174	$38,733	$10,718	$57,625
1.7.3	Documented Safety Analysis	$2,374	$3,015	$0	$5,389
1.7.4	Mine Habitability/Operations	$12,230	$57,852	$25,985	$96,066
1.7.5	Facility Upgrades	$825	$6,454	$3,960	$11,239
1.7.6	Waste Placement	$0	$86	$7,092	$7,178
1.7.7	Readiness for Operations	$0	$0	$9,983	$9,983
1.7.8	Program Management Support	$4,603	$30,216	$19,684	$54,504
1.7	**Recovery Project Total**	$28,206	$136,356	$77,421	$241,983

Note: Costs in $thousands.

WIPP recovery costs are estimated to be approximately $242 million. Major cost drivers include:

- Facility program enhancements (enhancements that address the findings in the AIB reports to enable safe and compliant operation, e.g., nuclear safety, emergency management, fire protection, radiation protection, procedures and training, quality assurance, industrial safety, engineering program, Contractor Assurance Program, etc.).
- Documented Safety Analysis upgrades and revisions.
- Mine habitability and operations (decontamination, remediation, mine stabilization, interim ventilation, supplemental ventilation, mining equipment, Panel 6 and Panel 7, Room 7 initial closure, maintenance corrective actions).
- Facility upgrades (upgrades to salt and waste hoist controls, temporary change facility, establishment of formal Emergency Operations Center).
- Waste emplacement (activities directly related to waste disposal operations, replacement of aged waste handling equipment to support disposal operations, and activities to support regulatory compliance objectives).
- Readiness for operations (independent assessments of readiness of operations).
- Program management support (administrative services required to support recovery objectives and activities, e.g., executive management, project/program management, regulatory compliance, public affairs).

Additionally, to restore WIPP to full operations, two capital asset project line items are required: (1) a new permanent ventilation system, with an estimated cost range of $65 million–$261 million, and (2) a supporting exhaust shaft, with an estimated cost range of $12 million–$48 million. These line item cost estimates are preliminary and will be refined as detailed planning is developed and as uncertainties are reduced.

3.3.3 Workforce Staffing Needs

NWP full-time equivalent workforce staffing needs for WIPP recovery are approximately 240 full time equivalents in 2014, 270 full time equivalents in 2015, and 180 full time equivalents in the outyears. To maximize cost-effective execution of recovery and prepare the WIPP organizational team for long-term mission accomplishment, the strategy is to augment the existing contractor team with subject matter experts, utilizing NWP corporate reachback and supply chain capabilities as appropriate. This approach provides needed leadership and functional capability for critical areas, such as radiological controls, conduct of operations, engineering, project management, work control, and emergency preparedness. Subject matter experts brought on for training and consultation are temporary and will not continue after resumption of WIPP operations.

The existing workforce will be trained through the Safety Management Program enhancement initiatives, with mentoring provided by the subject matter experts. In addition, a number of permanent positions are being requisitioned and filled in areas such as engineering, contractor assurance, radiological controls, work control and emergency management to ensure there is staffing to support critical needs and strengthen programmatic functions.

In some cases, WIPP base operations personnel assigned to activities that have been suspended due to the incident, such as waste handlers and miners are being retrained to perform recovery project scope (e.g., soot cleaning and decontamination). The staffing approach reflects utilization of the WIPP workforce as it relates to the recovery activities and normal "base" operations and the dual responsibilities for many of the existing contractor organizational functions to execute ongoing base contract scope in parallel. The recovery scope has been resource-loaded, reflective of the activities required to restore the underground mine, implement programmatic improvements, ventilation system modifications and resume operations.

3.3.4 Assumptions and Risks

The WIPP Recovery Plan is based on several key assumptions and risks to support the resumption of waste emplacement operations in first quarter of calendar year 2016. The plan is affected by the impact of any incident investigation results on existing programs, regulatory approvals, mine stability, regulatory requirements to resume operations, failure of aged equipment, environmental impacts (lightning, moisture, cold air, etc.), and changes to foundational requirements.

More specifically, the key assumptions include:

1. Existing drifts and panels will remain stable and not suffer roof falls or cave-ins.

2. Waste emplacement can begin under a permit modification, administrative order, or Resource Conservation and Recovery Act contingency plan without meeting the annual air flow requirements currently in the waste permit. Repository monitoring requirements are being evaluated to determine permit impacts associated with reduced ventilation (less than 260,000 standard cfm running annual average ventilation exhaust rate in accordance with the Permit).

3. The exhaust shaft will continue to operate in current condition without decontamination. This additional decontamination activity, if required, would be substantial and is not in the current plan. The Recovery Plan assumes simultaneous operation of uncontaminated and contaminated sections of the underground.

Key risks that exist for the WIPP Recovery Plan include:

1. Activities in the underground require more air flow than can be provided by the existing and interim ventilation systems. Interim ventilation is planned to increase the flow in the contaminated portion of the underground to allow limited operations (roof bolting, characterization and decontamination). A risk exists that the interim ventilation does not provide sufficient ventilation to support these operations as planned.

2. There is no identifiable root cause to the radiological release, event investigation requires lengthy access to Panel 7, Room 7, or there is unforeseen information that extends the accident investigation (e.g., additional breached drum(s), sampling, etc.). Performing substantial tasks, such as removal of the breached drum, is not included in the Recovery Plan schedule or estimate. The accident investigation is not complete; however, there is no indication at this time that retrieval of waste from Panel 7, Room 7 will be necessary. This activity would have a direct impact on many other recovery activities.

3. Bolting operations cannot be done in current personal protective equipment and requires different protection to meet requirements. If this risk is realized, work would have to be suspended while the need for additional personal protective equipment is evaluated, appropriate personal protective equipment procured, procedures updated, and personnel trained. NWP is currently evaluating new personal protective equipment options in the marketplace to find a better fit for bolting/mining; extensive experience in high hazard nuclear facility operation provides confidence in ability to resolve and avoid schedule impact.

4. Further degradation or failure of critical equipment, infrastructure and facilities (such as the underground electrical distribution system fails due to age and soot from the fire).

5. The addition of the permanent ventilation system and/or new exhaust shaft will require a Permit Modification Request submittal to the NMED and it is included in the schedule (e.g., a Class 3 permit modification request may be required). If the EPA determines that changes required for the permanent ventilation system differ significantly from the most recent compliance certification baseline, a Planned Change Request would be needed, which requires additional scope, cost, and schedule as compared to a Planned Change Notice. The NMED will also need to inspect changes to the permitted part of the facility for the new ventilation system.

6. Agreement on the substantial panel closure approach for Panel 6 and Panel 7, Room 7. This could be realized if the NMED requires a higher classification of permit modification for Panel 6 and/or Panel 7, Room 7 initial closure plans or does not agree to the closure design. Public interest may provide regulators a basis for escalation from Class 2 to Class 3. Class 2 requires public notice, whereas Class 3 requires public participation including a public hearing. The timeframe for a Class 3 Permit modification for WIPP has been a minimum of 18 months after submittal to the NMED. An EPA rulemaking regarding revised closure design (78 FR 72612) is ongoing.

7. Decontamination methodology does not work on salt and more extensive decontamination methods are required. Planned decontamination will be validated before field deployment and the appropriate method developed early, prior to the scheduled activity. In the worst case, a redesign of the decontamination process would be required.

8. Procurement of equipment does not support the required need date. This covers delays due to equipment or material availability, supplier contract problems, design construction issues (e.g.,

as-built conditions), prerequisites for construction not performed on schedule, regulatory issues. The mitigation approach is to identify difficult and long lead procurements, maintain a valid and updated qualified supplier list, consider independent validation of constructability in field, ensure progress of prerequisite activities are monitored and develop contingency plans where needed.

4 CONCLUSIONS

Any and all safety concerns in response to the February 2014 salt truck fire and radiological release events will be addressed to create an environment of robust safety awareness at WIPP that complies with applicable requirements and protects workers, the public, and the environment. The WIPP underground will be systematically made habitable for safe operations and protective of workers with resumption of critical mine safety and maintenance operations. Operations will include simultaneous activities in contaminated and uncontaminated sections of the mine. Ventilation will be increased in phases back to its pre-incident airflow capacity, the mine will be surveyed and made habitable for workers, and the workforce will be retrained for contaminated operations and cross-trained for recovery activities.

The schedule to commence waste emplacement operations is the first quarter of calendar year 2016, with the intent to incrementally increase waste emplacement operations over time. Options are being explored to determine if some actions can be accelerated.

The Department is committed to ensuring the safety and continued progress of the TRU waste programs at the generator sites in order to fulfill our commitments to the host states. The Department is continuing to characterize and certify TRU waste for eventual shipment to WIPP, and the generator sites are continuing to store TRU waste safely on-site until WIPP operations are resumed. We will communicate detailed shipping plans with states as waste emplacement resumes.

The Accident Investigation Board and the Technical Assessment Team are continuing their work related to the causes of the radiological release. Findings and recommendations from that work will be incorporated into WIPP activities going forward. The Recovery Plan is intended to provide reasonable confidence for resumption of WIPP disposal operations by: (1) safely isolating the waste of concern; (2) initial closure of the affected waste disposal panels; (3) responding to weaknesses identified by the Accident Investigation Board reports through comprehensive upgrades to programs, procedures, and training; (4) upgrading equipment, infrastructure, and facilities; and (5) ensuring that waste generators have rigorous characterization, treatment, and packaging processes and procedures and that all waste meets WIPP Waste Acceptance Criteria. If substantive new information is identified that impacts the activities currently identified and included in the Recovery Plan, it will be revised.

The Department is committed to resuming WIPP operations as a critical part of the environmental cleanup program, and we will continue to work with our regulators, our community partners in New Mexico, TRU waste generators, and other stakeholders around the country to ensure that this is done safely and efficiently.

5 REFERENCES

10 CFR Part 830, Nuclear Safety Management, Subpart B, Safety Basis Requirements.

10 CFR Part 835, Occupational Radiation Protection.

30 CFR Part 57, Safety and Health Standards Underground Metal and Nonmetal Mines.

40 CFR Part 61, National Emission Standards for Hazardous Air Pollutants.

40 CFR Part 270, EPA Administered Permit Programs; the Hazardous Waste Permit Program.

78 FR 72612. Criteria for the Certification and Recertification of the Waste Isolation Pilot Plant's Compliance with the Disposal Regulations; Panel Closure Redesign. Proposed rule for 40 CFR Part 194.

DOE 2014a. *U.S. Department of Energy Accident Investigation Report, Underground Salt Haul Truck Fire at the Waste Isolation Pilot Plant February 5, 2014*. Washington, DC: U.S. Department of Energy.

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

DOE 2014c. *Underground Compliance Plan*. Carlsbad, New Mexico: U.S. Department of Energy Carlsbad Field Office.

DOE 2014d. *Underground Derived Waste Storage Plan.* Carlsbad, New Mexico: U.S. Department of Energy Carlsbad Field Office.

DOE 2014e. *Waste Isolation Pilot Plant Nitrate Salt Bearing Waste Container Isolation Plan.* Carlsbad, New Mexico: U.S. Department of Energy Carlsbad Field Office.

DOE and EPA 1995. "Memorandum of Understanding between the U.S. Environmental Protection Agency and the U.S. Department of Energy Concerning the Clean Air Act Emission Standards for Radionuclides; 40 CFR Part 61 Including Subparts H, I, Q & T." Signed by Mary D. Nichols, EPA Assistant Administrator for Air and Radiation, September 29, 1994; signed by Tara O'Toole, DOE Assistant Secretary for Environment, Safety, and Health, April 5, 1995. http://www.epa.gov/radiation/docs/neshaps/epa_doe_caa_mou.pdf.

DOE Order 225.1B, 2011. *Accident Investigations*. Washington, DC: U.S. Department of Energy.

DOE Order 425.1D, 2010. *Verification of Readiness to Start Up or Restart Nuclear Facilities*. Washington, DC: U.S. Department of Energy.

DOE-STD-1128-2008. *Good Practices for Occupational Radiation Protection in Plutonium Facilities*. Washington, DC: U.S. Department of Energy.