

**Office of Enterprise Assessments
Assessment of the Waste Isolation Pilot Plant
Conduct of Operations Program
Implementation for Underground Operations**



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Acronyms

CBFO	Carlsbad Field Office
CFR	Code of Federal Regulations
ConOps	Conduct of Operations
CRAD	Criteria and Review Approach Document
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
LO/TO	Lockout/Tagout
MSHA	Mine Safety and Health Administration
NWP	Nuclear Waste Partnership, LLC
OFI	Opportunity for Improvement
ORPS	Occurrence Reporting and Processing System
SME	Subject Matter Expert
U/G	Underground
UFE	Underground Facility Engineer
WIPP	Waste Isolation Pilot Plant

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EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) Office of Nuclear Safety and Environmental Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of the effectiveness of the conduct of operations program for Underground operations at the Waste Isolation Pilot Plant (WIPP). This assessment was conducted to evaluate the performance of WIPP conduct of operations, as implemented by the facility contractor, Nuclear Waste Partnership, LLC (NWP). This assessment was conducted on April 23-27 and June 11-22, 2018.

NWP has developed a conduct of operations program, including implementing procedures and practices, which adequately meets the expectations set forth in DOE Order 422.1, *Conduct of Operations*, for the following specific elements that were assessed:

- Shift Routines and Operating Practices
- Communications
- Investigation of Abnormal Events, Conditions, and Trends
- Control of Equipment and System Status
- Lockout and Tagouts
- Turnover and Assumption of Responsibilities
- Technical Procedures.

With some exceptions, the assessed elements have been adequately implemented for conducting operations underground at WIPP. Improvements since EA's 2016 assessment of conduct of operations were observed in the areas of lockout and tagouts and the investigation of abnormal events, conditions, and trends. Available data showed that NWP has improved their lockout and tagout performance by leveraging a new coordinator position, which helps identify issues early in the process. In addition, abnormal events are being conservatively reported, tracked, and resolved.

However, one finding was identified concerning the lack of adequate procedures and practices to ensure effective operation of the underground ventilation system. EA also observed weaknesses in some aspects of shift routines and operating practices, communications, control of equipment and system status, and technical procedures. EA found examples of deficient processes used to operate the bulkhead door system and underground ventilation system. For the bulkhead door system, no fault tree analysis had been developed, as required, and an observed line up of the system was inadequately performed. For the underground ventilation system, again, the required fault tree analysis had not been developed.

Additional weaknesses were identified with respect to communication processes between the Underground Facility Operations and Mining Operations organizations, conflicting guidance for procedure use, and the lack of guidance for identifying and preventing "skin" layer failures on the back (ceiling) and ribs (wall) of the mine.

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1.0 PURPOSE

The U.S. Department of Energy (DOE) Office of Nuclear Safety and Environmental Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of the effectiveness of the conduct of operations (ConOps) program for Underground¹ (U/G) operations at the Waste Isolation Pilot Plant (WIPP). This assessment was conducted to evaluate the performance of WIPP ConOps, as implemented by the facility contractor, Nuclear Waste Partnership, LLC (NWP). The assessment was conducted on April 23-27 and June 11-22, 2018.

2.0 SCOPE

This assessment was conducted in accordance with the *Plan for the Office of Enterprise Assessments Assessment of Selected Conduct of Operations Processes at the Waste Isolation Pilot Plant, April – June 2018*. The assessment evaluated the effectiveness of the implementation of the WIPP ConOps program, processes, and procedures, primarily for U/G operations, in accordance with the requirements of DOE Order 422.1, *Conduct of Operations*. In particular, EA evaluated the effectiveness of processes used in the U/G to facilitate the current shift routines and operating practices; vertical and horizontal communication between management, workers, and work groups; investigation of abnormal event conditions and trends; control of equipment and system status; lockout and tagouts; turnover and assumption of responsibilities; and technical procedure development and implementation.

3.0 BACKGROUND

WIPP is the DOE repository established for the disposal of defense-related transuranic long-lived radioactive waste, including contaminated clothing, tools, rags, residues, debris, and soil as well as other items contaminated with plutonium and other man-made radioactive elements. The DOE Carlsbad Field Office (CBFO) provides direction and Federal oversight for the design and operation of WIPP facilities for the DOE Office of Environmental Management (EM). The EM Chief of Nuclear Safety is the safety basis approval authority for WIPP; however, the CBFO Office of the Waste Isolation Pilot Plant Assistant Manager is responsible for the day-to-day oversight of the project. NWP, an AECOM-led consortium with partner BWXT and major subcontractor AREVA Federal Services, is the primary contractor responsible for WIPP management and operations.

WIPP is located approximately 30 miles southeast of Carlsbad, New Mexico, within a remote 16-square-mile tract. WIPP facilities include surface structures for receiving and handling waste shipments and a system of excavated rooms 2,150 feet underground in a geologically-stable salt formation (i.e., a salt mine). The various surface structures are designed for unloading transporters and transferring transuranic (TRU) waste containers to the underground rooms. WIPP activities include transport container unloading, container movement, mining, and various facility maintenance operations. These activities involve many potential hazards that must be effectively controlled. These hazards include exposure to

¹ At WIPP, the term “Underground operations” specifically refers to activities performed within the mine facility, and not those performed in the support facilities, buildings, and structures on the surface.

radiation, radiological contamination, and various physical hazards associated with mining activities and facility operations, such as subsurface hazards, toxic gases, confined spaces, machine operations, high-voltage electrical equipment, pressurized systems, and noise.

Past assessments and EA operational awareness activities at WIPP have identified challenges with the execution of the ConOps program, including the development and execution of procedures, management decision making, coordination between related processes (e.g., geotechnical analysis, underground facility operations, work planning, ground control, and mining), and communications with the mine workers regarding underground operations. During assessments and oversight activities performed in 2017, CBFO also identified issues with the implementation of the lockout/tagout (LO/TO) procedure for WIPP operations. In addition, the new supplemental ventilation system (SVS) has a number of operational complexities that are being addressed by the contractor; EA has not yet assessed and evaluated the effectiveness of SVS operation. Finally, as of the second quarter of Fiscal Year 2018, mining operations have resumed at WIPP, and NWP has implemented a new strategy to guide its shift-work, i.e., mining operations are performed on the front shift, and waste emplacement operations are performed on the back shift. EA has not assessed the WIPP ConOps program since the time when these changes were made.

4.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*. EA implements the independent oversight program through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. Organizations and programs within DOE use varying terms to document specific assessment results. In this report, EA uses the terms “deficiencies, findings, and opportunities for improvement (OFIs)” as defined in DOE Order 227.1A. In accordance with DOE Order 227.1A, DOE line management and/or contractor organizations must develop and implement corrective action plans for the deficiencies identified as findings. Other important deficiencies not meeting the criteria for a finding are also highlighted in the report and summarized in Appendix C. These deficiencies should be addressed consistent with site-specific issues management procedures.

As identified in the assessment plan, this assessment considered requirements related to DOE Order 422.1, and the criteria and lines of inquiry presented in the following objectives from EA Criteria and Review Approach Document (CRAD) 30-02, *Review of Conduct of Operations Criteria Review and Approach Document*, Rev. 0, dated October 6, 2015:

- Objective 2.b. – Shift Routines and Operating Practices
- Objective 2.d. – Communications
- Objective 2.f. – Investigation of Abnormal Events, Conditions, and Trends
- Objective 2.h. – Control of Equipment and System Status
- Objective 2.i.1 – Lockout and Tagouts
- Objective 2.l. – Turnover and Assumption of Responsibilities
- Objective 2.p. – Technical Procedures.

EA examined key documents, including system descriptions, work packages, procedures, manuals, analyses, policies, and training and qualification records. EA also conducted interviews and focus groups with key personnel responsible for developing and executing the associated programs; observed various operations and support activities; and walked down relevant portions of the WIPP facility, focusing on the U/G operations. The members of the EA assessment team, the Quality Review Board, and EA management responsible for this assessment are listed in Appendix A. A detailed list of the documents

reviewed, personnel interviewed, and observations made during this assessment, relevant to the findings and conclusions of this report, is provided in Appendix B.

EA conducted a previous assessment of the WIPP ConOps program in January 2016, and this assessment examined the completion and effectiveness of corrective actions from the findings described in the previous assessment. Results of the corrective action assessments are included in Section 5.0, Results, of this report.

5.0 RESULTS

5.1 Shift Routines and Operating Practices

This section addresses EA's assessment of shift routines and operating practices. DOE Order 422.1, Attachment 2, Section 2.b, *Shift Routines and Operating Practices*, and implementing procedures for this section of the order provided the basis for this portion of the assessment.

Criterion:

The operator has established and implemented operations practices to ensure that shift operators are alert and informed of conditions and operate equipment properly. (DOE Order 422.1)

At WIPP, multiple operations, including ventilation checks, mining, ground control, hoisting, and waste handling, work in the U/G. Each of these operations is performed under a different shift routine. General guidance for shift routines for each organization is described in WIPP procedure (WP) 04-CO.01-2, *Conduct of Operations Program – Shift Routines and Operating Practices*, which appropriately covers the elements of DOE Order 422.1, Attachment 2, Section 2.b. EA interviewed staff members and observed each group performing shift activities in order to ensure that the procedural requirements are being implemented appropriately.

Status of Equipment Checks

Procedure WP 04-CO.01-2 states that, prior to using equipment for waste handling and other underground operations, the operator must perform preoperational checks in accordance with the procedure specific to the equipment. EA observed multiple such preoperational checks of equipment to evaluate this operation.

For the beginning-of-shift preoperational check of the waste hoist and the preoperational check of the continuous miner², EA observed that, in both cases, the operator did not have the checklist in hand but did perform checks adequately and did mark the checklist after completion. EA also observed preoperational checks of the waste transporter and the salt haul truck; although both were performed adequately with the checklist in-hand, the checklist for the waste transporter was left blank. During the preoperational check of the salt haul truck, EA observed that the checklist was not consistent with the procedures used by underground facility engineers (UFEs) for making determinations of ventilation requirements. The checklist used for the salt haul truck included a section for the UFE to record ventilation flow rates. However, the procedure that was used by the UFE to measure ventilation flow rate did not direct the UFE to complete the checklist that was used by the salt haul truck operator, and the format of the checklist did not match the way the UFE normally recorded flow rate measurements, resulting in confusion. See additional discussion of this issue in Sections 5.2 and 5.7 of this report.

² A self-propelled mining machine, sometimes called a continuous mining machine, that rips nonmetal ores from the mine face and loads it onto conveyors or into shuttle cars in a continuous operation.

Overall, EA observed that WIPP operators properly performed equipment preoperational status checks. NWP has established checklists for preoperational checks of equipment, but operators are not required to have these checklists in hand to verify and document thorough completion of all steps.

Protection from Personnel Hazards

EA observed that, in general, personnel adhered to the established safety requirements while performing ground control activities, mining, taking air flow readings, and downloading and emplacing waste. Operators wore the required personal protective equipment during all EA observations. While touring the mine, EA noted an unrestrained, broken ground control bolt in the back (ceiling) of the drift, which presented a falling object hazard to personnel if the bolt became dislodged and fell. EA informed the mining and ground control crew of this hazard, and the crew confirmed that they would take the appropriate actions to address it by either attaching a lanyard to the bolt or setting up a barrier to prevent personnel from walking under the bolt.

Authorization to Operate Equipment

WP 04-CO.01-2 designates who is responsible for the operation of equipment under their area of operations. The UFE is responsible for the operation of underground systems. Mining managers are responsible for mining equipment operation, hoisting managers are responsible for hoist operation, and waste handling managers and crew leads are responsible for operation of the waste handling equipment. These managers designate routine operations that may be performed without requesting permission, as long as they are performed by personnel who are trained and qualified on that specific equipment. The work planning process is relied on to manage the effective execution of operations so that they do not conflict with one another, and each operator verifies pre-requisites prior to starting to ensure that the operation can be completed safely. For the operations that EA observed, the personnel who were operating equipment had appropriate qualification and certification, and designated supervisors generally directed the operation.

However, NWP has not established a rigorous process, including clear authority, to modify or reconfigure mine ventilation control curtains (temporary, moveable barriers used to redirect and modify ventilation flow). Verbal authorization from the UFE is passed to the miners through their supervisor for ventilation control curtain adjustments, without written authorization. EA observed miners repositioning a mine ventilation control curtain, which they stated they had been instructed to close; however, the responsible UFE later stated that no authorization was given for the configuration change. Adjusting the position of the ventilation control curtain locally modified the ventilation configuration of the mine and subsequently reduced ventilation flow below that which is necessary to safely operate diesel equipment located in this area. The ventilation control curtain was re-opened a few hours later, re-establishing appropriate ventilation in the area, and the equipment was not operated until ventilation was re-established and verified to be sufficient for safe diesel operation. NWP held a fact-finding meeting the following day. (See **Finding F-NWP-1**.)

As a result of the ventilation control curtain adjustment event, NWP clarified that only the UFE can direct a change of facility ventilation controls, which includes temporary ventilation control curtains. In contrast to the event that took place during a mining operation, EA noted that the waste handling crew communicated with the central monitoring room to ensure that ventilation was established properly prior to performing activities during an observation of waste emplacement operation.

Shift Operating Base

WIPP has established a shift operating base in the U/G near the junction of the South 550 (S-550) and West 30 (W-30) drifts, which is located close to the shaft hoists where personnel enter and exit the mine. The shift operating base includes an office area that houses the equipment and reference materials needed for underground facility operations. The UFEs conduct turnovers there and also return to this office when not performing operations. The hoist bottom tenders have small offices in the vicinity of their hoists, which they utilize during their shifts when not tending the hoist. The tenders have multiple means of communication with their counterparts at the surface, including the hoisting bell sequence, which is posted prominently. The other operations groups working in the U/G conduct their turnovers at the surface and typically return to the lunch room (“dinner hole”), located near the shift operating base, when not performing operations. The lunch room is also equipped with communications equipment, such as phones and computers, as well as some reference materials. WP 04-CO.01-2 prohibits the use of written materials that do not relate to operation and also prohibits the use of entertainment devices in order to prevent distraction. EA observed that operators were following this procedure. Overall, the shift operating bases that EA observed were adequately located, equipped, and utilized.

Shift Routines and Operating Practices Conclusion

Overall, NWP has adequately established operations practices to ensure that shift operators are alert, informed of conditions, and operate equipment properly. Equipment was operated properly, with the appropriate authorizations and under conditions adequate for use. However, NWP has not established a rigorous process, including clear authority, to modify or reconfigure mine ventilation control curtains.

5.2 Communications

This section addresses EA’s assessment of communications. DOE Order 422.1, Attachment 2, Section 2.d, *Communications*, including staff perceptions of communications effectiveness, provided the basis for this portion of the assessment.

Criterion:

The operator has established and implemented operations practices that ensure accurate, unambiguous communications among operations personnel. (DOE Order 422.1)

Communication between management and workers, and between work groups, is required to the effectively implement the ConOps program at WIPP. The primary focus during this assessment was program implementation for underground operations, which require coordination of functions and communications. There are multiple Operations organizations at WIPP (e.g., Mining Operations, Underground Facility Operations, Waste Operations) responsible for implementing the ConOps program in the U/G. To assess communications among various operational personnel, EA conducted a focus group study³ with employees who work in various areas of the mine, and observed operations in the U/G. A total of 37 NWP employees (non-management) participated in the focus group sessions. Each focus group session lasted approximately one hour, and workers from Mining Operations, Geotechnical Engineering, Underground Facility Operations, and Waste Operations participated, as did union safety representatives.

³ A focus group study is a carefully planned series of discussions designed to obtain opinions and perceptions on a defined area of interest in a permissive, nonthreatening environment. Each group is conducted with optimally 5 to 10 people led by a skilled interviewer.

Focus group participants were asked a standard set of questions by EA facilitators trained in conducting focus groups. Questions focused primarily on various aspects of communications and the coordination of work activities.

Coordination of Work Activities

Focus group participants often mentioned that changes, delays, and disruptions to work plans occur quite frequently. The workers often mentioned that plans must be changed because radiological control technicians and/or UFEs are not available to support the operation. Many participants indicated that more radiological control technicians are needed, and that their own work group is currently short-handed and has been for some time. Inadequate communications were also cited as an important contributor to delays. For example, UFEs are not always given accurate information about the current location of trucks and mining machines. After an error is discovered, UFEs often have to make adjustments to underground ventilation control configurations. It was also reported that machines are sometimes not adequately maintained (e.g., run out of fuel).

In the focus groups, many workers expressed frustration over resources being frequently unavailable to support their planned work, leading to poor morale and frustration with management. They stated that they had a lack of understanding as to why the related work of various groups cannot be better coordinated. Also, some workers believe that new technologies could be implemented that would alleviate significant problems by making information continuously available about the air flow at various underground locations and the exact location of equipment throughout the mine.

EA's observations of underground activities corroborated many of the comments provided by workers in the focus groups. For example, during mining operations in Panel 8, changes made by miners to ventilation control curtains resulted in a lack of ventilation sufficient to operate the salt haul trucks parked in Panel 8, Room 1, as previously discussed in Section 5.1 of this report. The Mining Operations supervisor and the miners assigned to mine in this area were not aware that the changes they made had a detrimental effect on ventilation in the panel where the mining operation was to be performed. The miners reported that ventilation in their work area was sufficient because earlier measurements by UFEs provided data that indicated there was adequate air flow for their operation. However, the miners made local changes to the ventilation configuration in Room 1 of Panel 8 by repositioning a ventilation control curtain, which prevented air flow through this area. The work crew did not understand the effect the change would have on local area ventilation. The UFE generates documentation to report the results and locations of the air flow measurements; and although this documentation was available, the miners assigned to mine in the area were not aware of the locations, nor the actual results of these measurements, when questioned by EA. This lack of uniform understanding between the Underground Facility Operations and Mining Operations staff indicated that the operational practices in place are not adequate to ensure accurate, unambiguous communications between personnel performing related operations.

(Deficiency)

Also, when observing the salt haul truck operators conducting preoperational checks on equipment, EA identified that communication between work groups was inhibited. The information collected on the preoperational checklist used by Mining Operations was not consistent with the information provided by Underground Facility Operations for the operation of the equipment. (See Section 5.7 of this report for further discussion about this issue.)

EA's observations of underground operations and interviews with NWP management also demonstrated issues with communication between related ground control functions. EA compared the ground control Priority List with the ground control issues identified by the Mine Safety and Health Administration (MSHA) and other independent evaluators. MSHA has issued citations for hazardous ground conditions

that have not been abated. For each of these conditions, NWP has taken compensatory measures, but the condition still exists despite some of these citations having been in place for more than a year. While some areas identified by MSHA inspectors have been corrected in a timely manner, only the Priority List was provided to EA for review. Mining operators and management stated that, in addition to self-identified and/or reported ground conditions, they significantly rely on the Priority List developed for ground control by the geotechnical engineers. The Priority List was the only documentation provided to EA to explain the prioritization of ground control activities. However, discussions with geotechnical engineers revealed that the Priority List only includes major areas that need ground control remediation, and the list is not intended to cover every area; some other areas may require attention, including installation of a few roof bolts or scaling of the back (top/ceiling) or ribs (sides/walls). This represents a discontinuity between the use of the Priority List as intended by its authors and how it is actually being used to inform operations, and in part, this may potentially explain why some areas in the U/G have been cited by MSHA but have not received attention for prolonged periods of time.

Communications and Transfer of Information

Focus group participants cited several types of concerns and problems related to perceived inadequacies in the flow of information both horizontally and vertically at WIPP.

Management Communication with Union Workers

Union representatives expressed a lack of confidence and trust in top NWP management officials. They believe some managers have avoided communicating and attending meetings with them. Union representatives stated that management does not keep them well informed regarding safety-related issues. Statements such as, “We are often the last to find out,” and “Safety takes a back seat here; our concerns fall on deaf ears,” were prominent. Many workers believe that the frequent turnover among upper-level managers, and a lack of mining experience among these managers at WIPP, makes it difficult for management to establish trust with the union and the workforce. EA confirmed that many management changes have occurred since the restart in January 2017. For example, senior-level managers in Mining Operations and Engineering have changed multiple times.

Several hourly workers who participated in the focus groups (in addition to the union representatives) expressed distrust or lack of confidence in management above first-line supervisors. In contrast, many participants report having a good relationship with their first-line supervisor, and they do not appear to be reluctant to ask questions and voice concerns about potential hazards.

Several participants indicated that opportunities for two-way communication with management are insufficient. Some participants stated that they do not believe management is interested in hearing their ideas for improvements. Some said they would welcome the opportunity to have small group (roundtable) discussions with management on a regular basis.

Subsequent to these focus groups, additional meetings between union representatives, NWP management, and CBFO management have taken place. Many of these issues were discussed, and some progress has been made towards resolution. In addition, in response to the perceived and observed lack of mining expertise among top management, NWP has developed a new upper-level management position, titled the Chief of Mining, to take a leadership role in managing and coordinating operations in the U/G. This position has been staffed by a manager with extensive mining and mine management experience.

Communications between Different Work Groups/Shifts

Some participants who work on the back shift stated that they are not kept as well informed as the day shift. As previously mentioned, UFEs stated that they are not always adequately informed about current plans and conditions in the mine (e.g., the location of diesel powered equipment). Some workers expressed frustration with the formal system for reporting problems that require the assistance of other work groups, stating “Completing WIPP request forms is not effective. It takes too long to get a response,” “We are expected to complete too much paperwork; too much red tape,” and “We should just be able to tell our boss, and he should make sure it gets taken care of.”

EA’s observations of the supervisors’ beginning-of-shift meetings corroborated some of the perceptions expressed by the workers. For example, significant confusion was evident regarding the location and operating condition of equipment in the U/G. In one instance, the uncertainty of the fuel level and operational condition of the roof bolter and scaler equipment in the contaminated area of the East 300 (E-300) drift prohibited Underground Facility Operations from determining where ventilation would be needed. This confusion significantly delayed the UFEs in modifying the ventilation configuration. EA also observed the initial mine entry functions of the UFEs to conduct the required air quality examinations, and then make the necessary ventilation changes for work to be performed. When the UFEs encounter any delay in knowing where ventilation is needed, the effect is compounded for the entire shift (and possibly beyond), because the initial work of the UFEs must be completed before other operations can be initiated in the U/G.

Emergency Notifications and Worker Preparedness to Evacuate

Regarding the adequacy of the underground emergency notifications system, several participants stated that those who are working in powered air-purifying respirators, within a panel, or in noisy conditions, may not hear phones, radios, or audible alarms. A few participants also mentioned that they may not see the warning strobe lights if no one has moved them close to their current work site. Some participants believe that evacuation drills could be improved by holding them unannounced and providing feedback to workers after the drill so they know what went wrong and what they could do better next time.

Effective Transfer of Information: Training and Succession Planning

Overall, most participants indicated that their work groups are short-handed and have been for some time. Many participants stated, “It takes a long time to get new workers qualified.” These statements suggest that there still are significant challenges to ensuring that new employees are well established and fully competent. Some participants also expressed concerns about the lack of opportunities for experienced workers to help provide on-the-job training and coach newer underground workers.

Several of the focus group participants expressed concerns about the impending loss of several knowledgeable senior staff members, subject matter experts (SMEs), and managers. This concern was particularly evident among the geotechnical engineers and ground control SMEs. Several geotechnical engineers stated that they plan to retire soon, and consistently, concern was clearly expressed about the need to be better prepared for their potential loss, and the loss of other experienced SMEs. Several participants also stated that some workers, particularly the new/less experienced underground workers, may not have an adequate grasp of the principles of ground control and ventilation being used in the mine. Some offered the opinion that, “It takes experience for miners to learn how to recognize ground control hazards. Many underground workers currently do not have enough experience. Some think they know more than they actually do.” Also that, “Many people do not understand the ramifications that small changes can have on the entire ventilation system. If we have to reconfigure the air it may take 1-2 hours.”

It was suggested by some participants that new underground employees should actually watch some of the ground control activities in order to help them better understand the back and rib support system and have greater confidence in it. Other suggestions included holding a ground control seminar and having ground control and ventilation SMEs participate in conducting new miner and annual refresher training. Such training has been performed in the past and was well received.

Positive Perceptions and Observations

Despite the perceived and verified weaknesses that inhibit communications and negatively affect underground operations, EA observed some indications that recent program and process improvements have been made. Specifically, effort has been made to improve the effectiveness of communication between the geotechnical engineering group and the workers underground, employee engagement to address safety concerns, and shift turnover.

Many participants expressed trust and confidence in the NWP geotechnical engineers. The miners who conduct ground control operations stated that the geotechnical engineers often seek their input in making decisions about how to address certain potentially hazardous ground conditions. At this peer level, this appears to be a relevant example of engaging workers in formulating and implementing effective solutions to workplace problems.

In addition, recently initiated Zone Safety Committees may help to promote greater worker involvement and a more robust safety culture. EA observed a Safety Committee meeting for Zone 7 (Engineering group). The meeting was well organized and well run, as demonstrated by the active participation and engagement of the 14 attendees, as well as the clearly established agenda for the 1-hour meeting. The committee chairman effectively led discussions on the status of several ongoing efforts to maintain and improve the safety of workers in the engineering building, as well as some sitewide safety initiatives and events, such as an upcoming evacuation drill. Workers were also encouraged to suggest ideas for new topics. This committee has been meeting almost every other week since January 2018. Most committees have been meeting regularly and, according to management and staff, are making improvements to safety.

Several participants expressed that the quarterly all-employee briefings were well done and provided valuable information to the workforce about current activities, accomplishments, and future plans for the site. These participants said that management has announced plans to make several improvements to the facility and some significant infrastructure upgrades. These upgrades may help improve employee morale and worker perceptions of confidence that management is concerned for their well-being and quality of life. A few participants stated that, in addition to the all-employee briefings, management should meet with smaller groups of workers. Some stated that in such a setting “there would be more questions and dialogue.” (See **OFI-NWP-1**.)

Management has recently initiated a few strategies to improve coordination of related work activities, including the daily shift turnover meeting at 3:45 pm and T-4 (i.e., four weeks from the time the activity is scheduled to take place) planning. These new strategies are intended to address inadequacies in communication and coordination of work. EA will follow up to assess the effectiveness of these initiatives.

Communications Conclusion

Overall, the WIPP ConOps program has established adequate practices to establish communications in support of operations. However, focus group discussions suggest that workers at WIPP perceive that related work activities are often inadequately coordinated and that the flow of information between various workers and work groups must be improved. Consistent with these perceptions, EA observed

fundamental weaknesses in how information is communicated both horizontally and vertically regarding operations in the Underground. In addition, the staff responsible for executing underground operations at WIPP are concerned that the communications processes and practices are ineffective.

5.3 Investigation of Abnormal Events, Conditions, and Trends

This section addresses EA's assessment of the implementation of processes for investigating events to determine their impact and prevent recurrence, with a specific focus on underground operations. DOE Order 422.1, Attachment 2, Section 2.f, *Investigation of Abnormal Events, Conditions, and Trends*, and NWP's implementing procedures for this section of the order, provided the basis for this portion of the assessment.

Criterion:

The operator has established and implemented operations practices for investigating events to determine their impact and prevent recurrence. (DOE Order 422.1)

EA evaluated the approach taken by NWP to investigate recent events that have been reported to the Occurrence Reporting and Processing System (ORPS) in order to assess the effective implementation of this process into the WIPP ConOps program. Forty-six ORPS reports involving WIPP underground activities have been filed since January 2016. EA reviewed 22 of these reports.

NWP has exhibited a proactive approach to identifying and reporting abnormal events by entering a significant number of events into its issues management system that are below the ORPS reporting threshold. Since January 2016, 130 underground events categorized as "sub-ORPS" were reported into the WIPP issues management system. EA also reviewed a sample of 14 of the abnormal underground-related events that were below the threshold of reporting into ORPS. Of the reports reviewed, none met the criteria for ORPS reporting, and all were appropriately investigated.

For the events that EA reviewed, the investigation process was comprehensive and implemented on a graded approach based on the significance of the event. With one exception, the process has been effective in identifying causal factors and associated corrective actions to prevent recurrence. EA found one example of a repeat event in the sample of the ORPS and sub-ORPS events, which was related to the control of hazardous energy. The number of hazardous energy control events involving underground activities that have recurred since 2016 (12 ORPS and 42 sub-ORPS incidents) indicate that the investigation process was not fully effective in preventing recurrence of these events. Nevertheless, the number of hazardous energy control events has significantly decreased since January 2018, likely because some additional efforts have been made to evaluate and address (e.g., retraining and instituting a LO/TO coordinator; see Section 5.5 of this report) the root and contributing causes.

One weakness in the WIPP investigation process is that it does not require personnel/witness statements to be obtained after an abnormal event. NWP management initiated WIPP Form WF 18-336 to address this weakness through its issues management system. EA will follow up to assess the effectiveness of this action.

Trending of abnormal events and conditions is performed informally. When an issue or event is screened for the issues management system, a "trend code" is assigned based on initial facts associated with the event, in accordance with NWP procedure WP 04-CO.01-6, *Conduct of Operations Program – Investigation of Abnormal Events, Conditions and Trends*. However, WP 04-CO.01-6, Section 3.5, *Event Investigation Reporting, Training and Trending*, does not discuss trending or how to use the assigned trend codes. Therefore, contrary to DOE Order 422.1, Attachment 2, Section 2.f, NWP has not

established and implemented operations practices that include the trending of events. After discussions with EA, NWP management initiated an item in its issues management system (WF 18-337) to resolve this issue.

Investigation of Abnormal Events, Conditions, and Trends Conclusion

NWP has established and implemented an investigation process for events that acceptably implements the requirements of DOE Order 422.1, Section 2.f. NWP identifies, investigates, and corrects abnormal events and conditions by reporting events into the WIPP corrective action/issues management program, including many that are below the threshold of DOE reporting. Additionally, excluding multiple hazardous energy control related events, corrective actions have been effective in reducing the likelihood of recurrence. However, EA identified two weaknesses during this assessment – the first was identified in the investigation process, where personnel statements are not required to be obtained after an event has occurred, and the second was related to establishing a process for event trending. In both cases, NWP management is taking actions to address these weaknesses.

5.4 Control of Equipment and System Status

This section addresses EA's assessment of the processes and procedures in place within NWP to control the status of equipment and systems that influence facility operation. DOE Order 422.1, Attachment 2, Section 2.h, *Control of Equipment and System Status*, and NWP's implementing procedures for this section of the order, provided the basis for this portion of the assessment.

Criterion:

The operator has established and implemented operations practices for initial equipment lineups and subsequent changes to ensure facilities operate with known, proper configuration as designed. (DOE Order 422.1)

The primary focus during this assessment was program implementation in the U/G, although some surface operations were also assessed in order to understand the overall health of the program. As previously discussed, WP 04-CO.01, *Conduct of Operations*, is the guiding document for the overall ConOps program. This document contains the DOE-approved matrix required by DOE Order 422.1, which identifies that the principal procedure addressing control of equipment and system status is WP 04-CO.01-8, *Conduct of Operations Program – Control of Equipment and System Status*. Implementing procedures appropriately cover the required elements of the Order.

Each Operations organization maintains logs, including narrative logs, logs of equipment locked out, and logs of out-of-service equipment. Narrative logs are maintained in accordance with WP 04-CO.01-11, *Conduct of Operations Program – Logkeeping*. NWP has instituted electronic logs for both Facility Operations and Underground Facility Operations. The system, known as WebEOC, records who makes entries in the log, and records the time and date of the entry. The WebEOC logs over several days reviewed by EA were adequate. The log appropriately contained a daily summary of the status of key equipment, as well as specific entries when the Supplemental Ventilation System (SVS) fan was both started up and later secured.

Control of Lineups

WP 04-AD3005, *Administrative Control of System Lineups*, defines a thorough process for determining which systems require lineups, which systems require independent verification of the lineup, the development and documentation of desired lineup, and the special techniques for component verification.

In particular, WP 04-AD3005 requires the responsible manager to perform and document a fault tree analysis to determine if the system requires independent verification and/or frequency-based verification of the system lineup. WP 04-AD3005 also directs performance of system lineups to be conducted in accordance with WP 04-GC3005, *Performance of System Lineups*. WP 04-GC3005 appropriately requires the FSM to identify any components known to not conform to the normal lineup due to active lockouts or other situations, and then to document them on the component deviation sheet. Contrary to the requirements of WP 04-AD3005, neither the underground bulkhead door system nor the underground ventilation system have a documented fault tree analysis. **(Deficiency)**

EA reviewed the completed lineup for both the underground bulkhead doors system and the underground plant air system. Both completed lineups identified that components were found in positions contrary to the required position and were left in the same position as they were found by the operator. Additionally, both completed lineups identified a number of components that were no longer accessible due to ground control conditions in the South end of the mine. However, WP 04-AD3034, *Technical and Maintenance Procedure Use and Adherence*, requires procedures to be followed as written, and if the performer cannot follow the procedure as written, the performer is to place the system in a safe status and contact responsible management. Management is then required by WP 04-AD3034 to either determine that the procedure can indeed be performed as written, or else initiate a change to the procedure to allow its correct performance. The completed lineups for both the underground bulkhead door system and the underground plant air system were not in accordance with the requirements of WP 04-AD3034. **(Deficiency)**

Equipment Deficiencies

DOE/WIPP 07-3372, *Waste Isolation Pilot Plant Documented Safety Analysis*, requires preoperational inspections prior to use of mobile equipment in the U/G. The waste handling equipment has a collection of specific procedures, while the mining equipment is addressed by WP 04-AU1042, *Non-Waste Handling Equipment Preoperational Requirements*. When equipment has a deficient condition that must be corrected before the equipment can be considered operable, the equipment must be tagged as out-of-service in accordance with WP 04-AD3016, *Equipment Out of Service Process*. WP 04-AD3016 appropriately requires that tags be logged, issued, cleared, and reviewed monthly to maintain cognizance of the equipment's deficient status. Equipment that could cause personal injury due to inadvertent activation is also appropriately required to be locked out in accordance with WP 04-AD3011, *Equipment Lockout/Tagout*.

EA attended approximately 10 turnover meetings and pre-job briefings, and assessed the use of these meetings to inform equipment operators in the U/G of equipment deficiencies and/or to establish or update paths forward to resolve the known deficiencies. EA observed that routine operational issues, such as the need for additional fuel, were adequately addressed at these meetings.

Mobile waste handling equipment is required to carry a logbook in addition to receiving a series of proceduralized, equipment-specific, preoperational checks. The logbook is designed to document the results of the preoperational inspection, as well as the number of any associated work orders, known as Action Requests, that have been initiated to address any identified deficiencies. The waste handling engineers are required to review the equipment logbooks to maintain cognizance of the equipment status. EA observed that preoperational checks were adequately performed on the underground waste transporter, and also observed that the required logbook reviews were being performed appropriately.

EA observed one instance when operators did not ensure proper equipment configuration before authorizing its return to service after testing. In this instance, the quarterly calibration of the Bulkhead 308 local indicator was stopped midway through for unrelated reasons at the end of a shift, and the

partially completed calibration results were not reviewed before authorizing the equipment's return to service. The error was recognized and corrected prior to downloading waste, and NWP created WIPP Form WF 18-293 to document the issue.

Temporary Modifications

Temporary modifications are controlled in accordance with WP 09-CN3046, *Temporary Plant Modification Control*. This process appropriately requires involvement of the cognizant system engineer prior to implementing the temporary modification. The process also appropriately requires an unreviewed safety question determination (USQD) to be performed in accordance with WP 02-AR3001, *Unreviewed Safety Question Determination*, to ensure that the facility safety basis is not adversely impacted by the temporary modification. TM-17-003, *Remove Bolted On Extension Guard on WH Forklift*, was reviewed by EA, as it applied to waste handling equipment used in the U/G. The USQD was appropriately detailed and met the aforementioned process requirements.

Engineering Documents

Distribution and configuration control of engineering documents is addressed by WP 09-CN3034, *Configuration Management Determination*; WP 09-CN3007, *Engineering Change Notice*; and WP 09-CN3022, *Engineering File Room Operations*. EA conducted an assessment of Conduct of Engineering at WIPP and published the report in November 2017. During the 2017 assessment, EA verified that controlled copies of relevant system drawings were accessible to the operating staff. During the current assessment, EA carried out a spot check of the controlled copies and determined that they are current and available to the operating staff.

Control of Equipment and System Status Conclusion

Overall, the NWP ConOps processes adequately control the status of equipment and systems. Multiple operating organizations are responsible for various pieces of equipment, and although some differences were noted in the processes used for preoperational checks, EA did not observe that any of these differences would result in degraded operations. Nevertheless, EA noted two deficiencies, regarding the lack of a documented fault tree analysis for the underground bulkhead doors and underground plant air system, as well as inadequate procedure use and adherence in the performance of system lineups for the same two systems.

5.5 Lockout and Tagouts

This section addresses EA's assessment of the processes and procedures in place at WIPP to implement the LO/TO program and ensure the safety of personnel working on equipment. The focus was proper isolation of energized equipment and verification of zero-energy checks prior to maintenance work. DOE Order 422.1, Attachment 2, Section 2.i.1, *Lockout and Tagouts*, and NWP's implementing procedures for this section of the order, provided the basis for this portion of the assessment.

Criterion:

The operator has established and implemented operations practices for the installation and removal of lockout/tagouts for the protection of personnel. (DOE Order 422.1)

All WIPP organizations use the common procedure WP 04-AD3011 to control equipment LO/TO. The operating organizations are called "Controlling Organizations" in the procedure and are responsible for identifying lockout points and installing Controlling Organization locks prior to the release of the

equipment for maintenance. As part of the process, the lockout is independently verified, and the appropriate Controlling Organization maintains a record of the lockout. NWP has also implemented a LO/TO coordinator to implement all LO/TO in surface facilities, as discussed below. The process described in WP 04-AD3011 is adequate.

As noted in Section 5.3, NWP had previously experienced a number of incidents related to control of hazardous energy. Remedial actions included workforce retraining and the addition of the aforementioned LO/TO coordinator. The LO/TO coordinator identified a number of situations that potentially could have become LO/TO violations but were prevented by implementing the final review role of the LO/TO coordinator. For example, the following are some of the potential issues that the LO/TO coordinator helped to avoid:

- identified where an incorrect component had been tagged;
- corrected an incorrectly transcribed lock number in a log;
- identified that a continuation sheet, which was missing signatures on tags, was being used; and
- recognized that a pressure relief/drain point, which was originally missed, should be added to the lockout of the fire water system.

NWP also examined the historical periodicity of LO/TO violations. Based upon analysis of historical data, NWP was concerned that LO/TO violations may again start to increase. To address this concern, pre-job briefings for LO/TO-related work have incorporated “just-in-time” LO/TO refresher training. The use of historical WIPP data to predict future problems is an acceptable method for establishing trends in occurrences that lead to preventable events.

EA also reviewed lockout logs for several of the Controlling Organizations. NWP is adequately conducting the required periodic reviews of the lockout logs. The lockout logs reviewed by EA were correct.

Lockout and Tagouts Conclusion

NWP has adequately established processes to control LO/TO for the protection of personnel. NWP has taken steps to proactively ensure adequate implementation of the LO/TO process.

5.6 Turnover and Assumption of Responsibilities

This section addresses EA’s assessment of the practices for turnover and assumption of responsibilities implemented at WIPP. DOE Order 422.1, Attachment 2, Section 2.1, *Turnover and Assumption of Responsibilities*, and the NWP implementing procedures for this section of the order, provided the basis for this portion of the assessment.

Criterion:

The operator has established and implemented operations practices for thorough, accurate transfer of information and responsibilities at shift or operator relief to ensure continued safe operation. (DOE Order 422.1)

Procedure WP 04-CO.01-12, *Conduct of Operations Program – Turnover and Assumption of Responsibilities*, adequately defines the key positions in the U/G that require turnover. The UFE requires a formal turnover in all cases, and the waste handling engineer must conduct a formal turnover during waste handling operations that extend beyond a single shift. Both of these positions are only staffed part-

time. At the end of their shift, the day shift UFE is able to perform a face-to-face turnover with the oncoming back shift, but the end of the back shift is several hours before the beginning of the day shift, which inhibits the back shift operators' ability to also routinely conduct a face-to-face turnover. Procedure WP 04-CO.01-12 also adequately establishes and implements processes for reliefs during a shift.

Procedure WP 04-CO.01-12 requires the oncoming UFE to review log entries going back 48 hours or since his or her last shift, whichever is less. While observing a shift change, EA noticed that the UFE reviewed the appropriate log entries before taking the watch. During the afternoon turnover, which is conducted face-to-face, the off-going and oncoming staff discussed the turnover sheets and obtained answers to any questions. Upon completion of turnover, the UFE led an adequate briefing with the oncoming crew to review the status of the U/G, the work planned for the shift, and other pertinent topics. Other Operations groups working in the U/G also conduct turnovers or beginning-of-shift briefings as appropriate. Procedure WP 04-AD3008, *Preparation and Use of Round Sheets, Surveillance Data Sheets, Shift Briefing Packages, and Critical Component/Equipment Status Sheets*, requires beginning-of-shift briefing packages to be developed for each crew each day, and NWP was able to produce these packages upon request. However, the turnover sheets that are actually used by the operators are informal, one-page documents. There has been an effort to upload these documents to a single SharePoint site so that other groups in Operations can see them, but currently, the page is only used sporadically. (See **OFI-NWP-2**.)

EA observed several beginning-of-shift and turnover meetings of varied Operations groups, identifying varying levels of quality and efficacy. One afternoon turnover between the off-going Underground Facility Operations day shift and the oncoming back shift was brief but effective. Regarding Underground Facility Operations, items of interest were consistently communicated from one shift to the next. The turnover between the day shift and the back shift in the Hoisting Operations group is done one-on-one, without a turnover sheet, so the plan for the upcoming shift is relayed by the Hoisting supervisor speaking individually with each oncoming operator. This practice could cause miscommunication or important information to be missed. (See **OFI-NWP-2**.)

- EA observed one beginning-of-shift meeting for the back shift Waste Handling crew and noted that it was effective and conducted in accordance with procedure. The crew was attentive, duties for the shift were discussed and understood, and necessary personnel were present. EA also observed one beginning-of-shift meeting for a day shift mining and ground control crew and noted that it was not an effective transfer of information between the crew manager and the miners. There was confusion about who would be performing which tasks, including confusion over who would be in training that day and therefore not working in the U/G. Additionally, some tasks assigned by the crew manager had been completed the day before, which the miners who received the assignment pointed out. The task priorities the manager provided to the crew were too broad because all the work activities for the shift were assigned the same (high) priority.
- NWP conducts a 5:45 am beginning-of-shift meeting for all supervisors of the day shift in order for them to gain information from other groups about the plans for the day and the work that occurred on the back shift. Overall, the meeting was disorganized, with extensive discussion of items outside the scope of the meeting.
- In spring 2018, NWP resumed holding in the underground lunchroom a beginning-of-shift meeting for the back shift between UFEs, personnel responsible for maintenance, ground control, and safety, and sometimes one representative with waste handling responsibilities. The rest of the waste handling crew cannot attend this meeting because it occurs at the same time as their beginning-of-shift meeting on the surface, and other Underground Facility Operations members also cannot attend

the back shift meeting because they are performing air checks during this time. Although this meeting has improved communications between the work groups, the limited availability of operators to attend the meeting reduces its effectiveness.

Turnover and Assumption of Responsibilities Conclusion

NWP has established and implemented operations practices for accurate transfer of information and responsibilities at shift relief to ensure continued safe operation. However, some operating organizations with different shift schedules and needs for turnover present a challenge to consistent quality of turnovers.

5.7 Technical Procedures

This section addresses EA's assessment of the development, maintenance, and use of technical procedures, including maintenance work instructions, at WIPP, with a focus on their application in the U/G. DOE Order 422.1, Attachment 2, Section 2.p, *Technical Procedures*, provided the basis for this portion of the assessment.

Criterion:

The operator has established and implemented operations practices for developing and maintaining accurate, understandable written technical procedures that ensure safe and effective facility and equipment operation. (DOE Order 422.1)

WP 15-PS.01, *Procedures Program*, acceptably flows down the requirements of the order for procedure initiation, approval, review, and determination of training requirements, and it also addresses the types of procedures used at WIPP (e.g., alarm response, emergency operating). WP 04-AD3034 properly conveys requirements and expectations for using procedures, performing them as written, and stopping work and notifying management when procedures cannot be performed as written. WP 15-PS.2, *Procedure Writer's Manual*, describes an adequate process for controlling procedure content, consistent use of terms, and format. WP 15-PS3002, *Controlled Document Processing*, includes requirements for periodic review of procedures, as well as the number of field revisions that can be accumulated prior to a full revision of the procedure.

EA observed an example of these procedures being implemented during an operation to process a TRUPACT waste container. Waste handling operators adhered to established procedures. When they encountered high levels of volatile organic compounds (VOCs), the operators appropriately stopped work in a safe status, and management determined a path-forward in order to conduct a field revision of the relevant procedures. After the changes were made to the procedure, the work appropriately proceeded under the field revision.

Nevertheless, NWP has no specific time limit for a field revision to exist, other than the two-year frequency for procedure review. DOE Order 422.1 requires provisions for initiating a revision when changes remain in effect for extended periods. By reviewing the document database, EA confirmed that WP 15-PS3002 is currently undergoing a revision to reduce the time a field revision can exist before a full revision is required.

The NWP technical procedures that EA reviewed were current, and the required biennial reviews were performed as scheduled. EA observed numerous instances where WIPP supervisors and/or workers properly verified that the procedures that were about to be used were the latest approved/controlled version.

NWP has established proper use categories for procedures, including “continuous use” (i.e., procedure in-hand and followed step-by-step) and “reference use” (i.e., procedure is available for reference during procedure performance if needed). EA noted that WP 10-WC3012, *Work Control Document Writer’s Guide*, established a different expectation for utilizing reference use and continuous use procedures, which conflicts with the expectations of WP 04-AD3034. Specifically, WP 10-WC3012 requires continuous use procedures to be present at the job site (with no specific requirement for step-by-step completion), and reference use procedures are not required to be readily available during performance of the task. This conflict was brought to the attention of the NWP Operations manager. **(Deficiency)**

With respect to ground control operations, the ground control strategy and procedures were technically defensible and adequately described the strategy and procedures for identifying and preventing roof falls due to a failure of the overlaying roof beam. However, the procedures lack the criteria and technical basis for identifying ground fall hazards due to failures of “skin” layers on the roof and ribs (walls). The responsible geotechnical engineering SME informed EA that guidance and procedures to address this gap are in development and expected to be complete later this year. EA reviewed some of the technical documentation that is proposed to serve as the technical basis for this document and determined it to be appropriate. Currently, SMEs perform periodic walkdowns to assess the skin failure hazards. Nevertheless, until this guide or procedure is formally approved and implemented, no procedure, process, or practice has been formally established to ensure that this hazard is appropriately identified and prevented. **(Deficiency)**

Regarding the use of established procedures for evaluating underground ventilation and for making changes to the underground ventilation control configuration, EA observed UFEs performing ventilation-related evaluations and ventilation control adjustments, UFEs coordinating with mine and ground control operations, and the implementation of WIPP Ground Control strategy and procedures. Evaluation of these operations revealed the following:

- Although the UFEs demonstrated the knowledge to make changes to underground ventilation controls, NWP has not established and implemented procedures to govern this critical process. Without a proceduralized process, the management of changes to the ventilation configuration of the mine will most likely be inconsistent. In addition, the potentially resultant variation and uncertainty in air flows can have significant negative impacts on all operations in the U/G. The Underground Facility Operations manager stated that such procedures are in the planning stage of development. **(Finding F-NWP-1)**
- Although procedures are in place for making airflow measurements in the U/G, the application of and adherence to these procedures and the recognition of inconsistent results were not uniform across all operations. UFEs demonstrated knowledge and adherence to established procedures when conducting an initial evaluation of mine ventilation, but a subsequent evaluation of air flow in Panel 8, which was conducted by U/G Facility Operations rovers prior to beginning a mining operation, identified that the UFE did not recognize inconsistent and erroneous results. For example, the air flow into Panel 8 was measured to be less than the air flow into Room 1, which is not physically possible because Room 1 is a sub-volume of Panel 8. Other UFEs corrected these air measurements prior to mining or diesel equipment operation. CBFO reported that an analogous situation was observed the following week while auditing air measurement operations underground.
- A preoperational checklist is used by mining operations for the salt haul trucks. EA observed a lack of consistency between the information collected on the preoperational checklist used by Mining Operations and the information provided by Underground Facility Operations associated with the operation of the equipment. The preoperational checklist, which was developed by Mining Operations, and the processes and procedures used by UFEs to determine and notify workers that

sufficient ventilation is present to operate the diesel equipment, do not fully correlate. This misalignment can potentially lead to inconsistent data being provided to validate readiness to use equipment for operations. In response, NWP conducted a fact-finding meeting and initiated modifications to processes and procedures for the coordination between Mining Operations and Underground Facility Operations.

- EA made an additional observation related to the procedures used for operator round sheets. Operator round sheets in the U/G include equipment and locations that, at the time of this assessment, were inaccessible due to deteriorated ground conditions in the South end of the mine. However, the round sheets were correctly marked to show that readings were not taken in inaccessible areas. Nevertheless, a UFE on duty stated that the round sheets are undergoing revision. EA confirmed this by checking the document database (QMIS).

Another example of less than adequate procedure use and adherence occurred when system lineups were performed without fully complying with expectations. (See Section 5.4 of this report.)

Technical Procedures Conclusion

With a few significant exceptions, NWP has established and implemented adequate operations practices for developing and maintaining accurate, understandable written technical procedures that ensure safe and effective facility and equipment operation. The procedures reviewed by EA are in the correct format, sufficiently detailed, and technically accurate. The exceptions to this conclusion include that NWP has not established and implemented procedures with sufficient detail for accomplishing ventilation control operations in the U/G (e.g., configuration changes or adjustments), or for identifying and preventing failures of roof and rib “skin” layers or the installed ground control support system (e.g., bolts, straps, and meshing).

5.8 Follow-up on Previous Findings

A previous finding related to the subject of this report was documented in the *Office of Enterprise Assessments Assessment of Selected Conduct of Operations Processes at the Waste Isolation Pilot Plant – April 2016*. Follow-up observations from the current EA assessment, which are associated with that finding, are discussed below.

Criterion:

The contractor must prepare, implement, and track to completion corrective actions to address findings identified in EA appraisal reports. Findings and other deficiencies identified in appraisal reports are managed in accordance with established issues management systems (DOE Order 226.1) and quality assurance programs (DOE Order 414.1 and 10 CFR Part 830). (DOE Order 227.1A)

In the aforementioned report, the following finding was documented:

Finding-NWP-01: *NWP management has not adequately implemented conduct of operations requirements in DOE Order 422.1 in the areas of procedural compliance, system maintenance, and engineering maintenance, resulting in degraded operations performance and non-conservative management decision making.*

Examples provided in the report to support this finding included inadequate qualifications processes;

performing work without correcting an incorrect post maintenance test; and conducting waste handling in the U/G without the required air conditioning equipment operable. These examples illustrated non-conservative decision-making by NWP management and a general lack of rigor applied to the WIPP conduct of operations program. DOE Order 426.2, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*, and DOE Order 422.1, Section 2.p, were cited as the directives applicable to this finding.

EA reviewed WIPP Forms WF 16-484, WF 16-428, WF 16-490, and WF 16-439 and determined that the corrective actions were reasonable to prevent recurrence of the finding. These actions included:

- Revisions to ConOps training to include stronger emphasis on management responsibilities for procedure compliance.
- Briefings to NWP management and staff to convey leadership and management behaviors related to procedure use and adherence including maintenance work instructions
- Sharing the information from the briefing with NWP staff during safety shares and an All Hands meeting.
- Operations and maintenance organizations also verified all qualification requirements were up-to-date.

During the on-site portion of the 2018 ConOps assessment, EA evaluated the performance of Operations and Maintenance management and staff and did not find procedure violations or inadequate management leadership to be an issue in the area of ConOps. The aforementioned corrective actions taken and the EA observations made during the 2018 ConOps assessment are sufficient to support resolution of this finding. Therefore the finding listed above has been addressed, and EA considers it to be adequately resolved.

6.0 FINDINGS

Findings are deficiencies that warrant a high level of attention from management. If left uncorrected, findings could adversely affect the DOE mission, the environment, the safety or health of workers and the public, or national security. DOE line management and/or contractor organizations must develop and implement corrective action plans for EA appraisal findings. Cognizant DOE managers must use site- and program-specific issues management processes and systems developed in accordance with DOE Order 227.1A to manage these corrective action plans and track them to completion. In addition to the findings, deficiencies that did not meet the criteria for a finding are listed in Appendix C, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

NWP

Finding F-NWP-1: NWP has not implemented proper authorization controls to operate mine ventilation systems, practices to ensure that operators receive accurate and unambiguous communications regarding changes to ventilation conditions, and procedures to ensure that the mine operates with a known, proper ventilation configuration. (DOE Order 422.1, Attachment 2, Sections 2.b, 2.d, and 2.h)

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified some OFIs to assist cognizant managers in improving programs and operations. While OFIs may identify potential solutions to findings and deficiencies identified in appraisal reports, they may

also address other conditions observed during the appraisal process. EA offers these OFIs only as recommendations for line management consideration; they do not require formal resolution by management through a corrective action process and are not intended to be prescriptive or mandatory. Rather, they are suggestions that may assist site management in implementing best practices or provide potential solutions to issues identified during the assessment.

NWP

OFI-NWP-1: Consider engaging underground workers, frequently and directly, to solicit ideas to resolve issues that inhibit effective communications and the transfer of information and knowledge among the groups responsible for conducting operations.

OFI-NWP-2: Consider formalizing a flexible turnover sheet format that can be shared across operational disciplines, and then establishing a protocol to routinely archive all turnover sheets in the SharePoint site developed for that purpose, or in some other easily-accessed location.

8.0 ITEMS FOR FOLLOW-UP

EA will follow up on the following items:

- Follow up to assess the effectiveness of initiatives to improve communications.
- Follow up on the resolution of WIPP Form WF 18-336 and evaluate any modifications of the WIPP abnormal event investigation process and how personnel/witness statements are obtained.
- Follow up to evaluate adequacy of corrective actions regarding the use of preoperational checklists.
- Follow up to review newly developed ground control strategy and procedures.

Appendix A Supplemental Information

Dates of Assessment

Onsite Assessment: April 23-27, 2018 and June 11-22, 2018

Office of Enterprise Assessments (EA) Management

William A. Eckroade, Acting Director, Office of Enterprise Assessments
Thomas R. Staker, Director, Office of Environment, Safety and Health Assessments
William E. Miller, Deputy Director, Office of Environment, Safety and Health Assessments
C.E. (Gene) Carpenter, Jr., Director, Office of Nuclear Safety and Environmental Assessments
Kevin G. Kilp, Director, Office of Worker Safety and Health Assessments
Gerald M. McAteer, Director, Office of Emergency Management Assessments

Quality Review Board

Steven C. Simonson
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EA Site Lead for Waste Isolation Pilot Plant

Alem E. Boatright

EA Assessors

Alem E. Boatright – Lead
Glenn W. Morris
Robert H. Peters
Sarah C. Rich
Gregory D. Teese
Peter M. Turcic

Appendix B
Key Documents Reviewed, Interviews, and Observations

Documents Reviewed

- CH/RH Waste Handling Shift Briefing Package, Swing Shift 05/03/2018
- EA04AD3001-6-0, *Prior to Download Checklist*, Revision 1
- Hoisting Shift Turnover Report, Day Shift 06/11/2018
- Hoisting Shift Turnover Report, Swing Shift 06/11/2018
- U/G Facility Operations Critical Component/Equipment Status, Day Shift 06/10/2018
- Underground Turnover Status Report, Swing Shift 04/23/2018
- Waste Handling Turnover Sheet, Swing Shift 04/04/2018
- Waste Handling Turnover Sheet, Swing Shift 04/10/2018
- Waste Handling Turnover Sheet, Swing Shift 04/16/2018
- WP 05-WH1025, *CH Waste Downloading and Emplacement*, Revision 23-FR3
- WP 10-WC3011, *Work Control Process*, Revision 39-FR1
- DOE/WIPP 07-3372, *Waste Isolation Pilot Plant Documented Safety Analysis*, Revision 5b, 4/2016
- EA04AD3001-SR22, *LCO Surveillance Data Sheet, LCO 3.3.5 Underground Lube Trucks Operation*, Revision 4, 10/4/2017
- EA04AD3001-SR26, *LCO Surveillance Data Sheet, LCO 3.3.8 Vehicle/Equipment Control*, Revision 5, 10/4/2017
- EA04AD3001-SR38, *LCO Surveillance Data Sheet, LCO 3.8.1 Waste Hoist Brakes*, Revision 5, 12/9/2016
- EA04AD3001-SR56, *LCO Surveillance Data Sheet, LCO 3.2.4 309 Bulkhead Operability During Download of Waste Containers*, Revision 1-FR1, 4/4/2018
- EA04AD3001-SR57, *LCO Surveillance Data Sheet, LCO 3.2.4 309 Bulkhead Operability During Download of Waste Containers*, Revision 2, 2/8/2017
- EA04AD3001-SR62, *LCO Surveillance Data Sheet, LCO 3.3.8 Vehicle/Equipment Control*, Revision 0, 10/4/2017
- EA04AD3001-SR63, *LCO Surveillance Data Sheet, LCO 3.3.8 Vehicle/Equipment Control*, Revision 0, 10/4/2017
- EA04AD3001-SR64, *LCO Surveillance Data Sheet, LCO 3.3.5 Underground Lube Trucks Operation*, Revision 0, 10/4/2017
- EA04AD3011-1-0, *Authorized Worker Lock Control Sheet*, Revision 1, 10/1/2017
- EA04AD3011-2-0, *Audit Control Sheet*, Revision 1, 10/1/2017
- EA04AD3011-3-0, *Absent Employee Check Sheet*, Revision 1, 10/1/2017
- EA04AD3011-4-0, *LOTO Escorted Form*, Revision 1, 10/1/2017
- EA04AD3011-5-0, *Lockout/Tagout Control Sheet*, Revision 1, 10/1/2017
- EA04AD3011-6-0, *Lockout/Tagout Control Sheet Continuation*, Revision 1, 10/1/2017
- EA04AD3011-7-0, *Tagout Index*, Revision 1, 10/1/2017
- EA04AD3011-8-0, *Tag Audit/Verification Control Sheet Continuation*, Revision 1, 10/1/2017
- EA04AD3011-11-0, *Absence of Energy Verification*, Revision 2, 10/1/2017
- EA04AD3011-12-0, *Complex LO/TO Checklist*, Revision 0-FR1, 12/4/2017
- EA04AU0534-1-0, WP 04-AU0534, *Underground Access Initiation/Termination Sign-Off Sheet*, Revision 5, 4/18/2017
- EA04AU2006-1-0, *Work Area Inspection Checklist*, Revision 0, 5/19/2015
- EA10WC3010-2-0, *Validation Checklist*, Revision 3, 4/13/2018
- EA12ER.25-1-0, *Underground Escape and Evacuation Map and Instructions*, Revision 2-FR3, 1/12/2018
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- WP 12-IS.03, *Electrical Safety Program Manual*, Revision 15, 8/28/17
- WP 12-IS0301, *Nationally Recognized Testing Laboratory Process*, Revision 2, 11/15/2012
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- WP 14-TR.01, *WIPP Training Program*, Revision 21, 4/24/2018
- WP 14-TR3310, *Training Determination*, Revision 4, 1/19/2018
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Interviews

- Contact Handled Waste Handling Crew Manager
- Mining and Ground Control Crew Manager
- Hoisting Shift Manager
- Miners (13)
- Mining Operations Manager
- Underground Operations Manager
- Underground Operations Technical Advisor
- Underground Facility Operations Manager
- Underground Facility Engineers (2)
- Waste Operations Manager
- Operations Manager
- Chief of Mining
- Operations Senior Technical Advisor
- Facility Operations Manager
- LO/TO Coordinator
- Facility Shift Managers (2)
- Director of Underground Mining
- Central Monitoring Room Operators (2)
- Contact Handled Waste Handling Engineers (2)
- Geotechnical Engineer
- Focus Groups:
 - Geotechnical Engineers & Ground Control SMEs (6)
 - Underground Facility Operations Staff (3)
 - Union Representatives (5)
 - Waste Handlers (10)
 - Miners (13)

Observations

- POD Meeting
- 5:45 Managers Beginning-of-Shift Meeting
- Mining and Ground Control Day Shift Beginning-of-Shift Meeting
- Waste Hoist Turnover and Beginning-of-Shift Hoist Checks
- Underground Facilities Engineer Turnover
- 3:40 Underground Beginning-of-Shift Meeting
- Contact Handled Waste Crew Beginning-of-Shift Meeting
- Continuous Miner Preoperational Checks
- Underground Salt Haul Trucks Preoperational Checks
- Back Shift Turnover Meeting (2)
- Respiratory Protection Class
- Experienced Miner Refresher Training
- FSM Turnover
- Underground Transport Preoperational Inspection
- Underground Waste Transportation and Emplacement (2)
- Engineering Department Zone Safety Committee Meeting

Appendix C Deficiencies

Deficiencies that did not meet the criteria for a finding are listed below, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

- NWP did not demonstrate that the operational practices established to communicate the results and locations of air flow measurements between UFEs and mining personnel, prior to commencing operations, were adequate, in accordance with DOE Order 422.1, Attachment 2, Section 2.d.
- NWP has not provided a documented fault tree analysis for either the underground bulkhead door system or the underground ventilation system, which is required to determine whether the systems require independent verification and/or frequency-based verification of the system lineup, in accordance with WP 04-GC3005.
- NWP did not appropriately perform system lineups for either the underground bulkhead door system or the underground plant air system, in accordance with WP 04-AD3034.
- NWP procedure WP 10-WC3012 does not require both reference use and continuous use procedures to be readily available at the job site during performance of the associated tasks, nor does it require continuous use procedures to be completed step-by-step. These missing requirements conflict with the expectations of WP 04-AD3034.
- NWP has not established and implemented procedures with sufficient detail for accomplishing ventilation control operations in the U/G or for identifying and preventing failures of roof and rib “skin” layers or the installed ground control support system (e.g., bolts, straps, and meshing), in accordance with DOE Order 422.1, Attachment 2, Section 2.p.