



Emergency Management Assessment at the Los Alamos National Laboratory

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Acronyms

AAR	After-Action Report
BC	Battalion Chief
CDC	Consolidated Dispatch Center
CRAD	Criteria and Review Approach Document
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
EAL	Emergency Action Level
ED	Emergency Director
EM-LA	Environmental Management Los Alamos Field Office
EOC	Emergency Operations Center
EOS	Emergency Operations System
EOSC	Emergency Operations Support Center
EPHA	Emergency Planning Hazards Assessment
ERO	Emergency Response Organization
ETSC	Emergency Technical Support Center
FMT	Field Monitoring Team
HAZMAT	Hazardous Material
ICP	Incident Command Post
IRC	Incident Response Commander
IZ	Isolation Zone
LAFD	Los Alamos County Fire Department
LANL	Los Alamos National Laboratory
NA-LA	National Nuclear Security Administration Los Alamos Field Office
N3B	Newport News Nuclear BWXT Los Alamos, LLC
OFI	Opportunity for Improvement
PA	Protective Action
PAR	Protective Action Recommendation
SIP	Shelter in Place
SOM	Shift Operations Manager
TA	Technical Area
Triad	Triad National Security, LLC
TRU	Transuranic
WebEOC	Web-Based Emergency Operations Center Software

**Emergency Management Assessment
at the Los Alamos National Laboratory
January 27 to March 13, 2020**

Summary

Scope

This U.S. Department of Energy's Office of Enterprise Assessments (EA) assessment evaluated a functional exercise on February 19, 2020, to ascertain the effectiveness of the Los Alamos National Laboratory (LANL) response to an emergency. The assessment team observed decision-making and task execution during the exercise and analyzed the observed performance to identify strengths and weaknesses. The assessment team also followed up on a 2015 EA assessment finding to evaluate the effectiveness of the corrective actions. Triad National Security, LLC (Triad) is the management and operating contractor at LANL, since December 2018, and is responsible for the site-level emergency management program.

Significant Results for Key Areas of Interest

LANL has established a well-staffed emergency response organization (ERO) supported by state-of-the-art equipment. Performance strengths were observed for implementing facility-level protective actions and site-level consequence assessment functions. Nevertheless, the assessment team noted that weaknesses in using the emergency operations system to establish situational awareness and a common operating picture diminished the effectiveness of key response elements (i.e., notifications and site-level protective actions). Responder errors also reduced the effectiveness of incident classification and implementation of offsite protective action recommendations. The assessment team identified 3 findings, 1 deficiency, and 11 opportunities for improvement.

Emergency Response Performance

The functional exercise involved the site-level ERO, facility workers, and offsite authorities who were to receive and verify notifications. Responders were presented with a scenario involving a transuranic waste transporter crashing into a transuranic waste drum staging facility and starting a fire that affected waste drums in the facility. The planned scenario involved four breached waste drums and a dispersion of transuranic waste by the fire.

LANL responded with a well-staffed ERO from multiple on site venues and a well-equipped emergency operations center. The consequence assessment team performed particularly well by taking a conservative approach in its analysis when there was doubt about whether a fire occurred and when the damaged drum inventories could not unequivocally be determined. Also, the Los Alamos County fire department battalion chief and the facility workers responded well by implementing immediate protective actions before the site-level response was active, and by conducting personnel accountability.

Despite state-of-the-art equipment, weaknesses in communications and the emergency operations system led responders to misunderstand the incident as a transporter crash and fuel fire that engulfed two transuranic waste drums that were not breached. This erroneous information was distributed throughout the ERO and to offsite authorities without subsequent correction. Also, the Triad incident response commander did not select the correct emergency action level to provide appropriate pre-determined protective actions for the known incident conditions.

There were multiple reasons for the ERO's misunderstanding of the exercise scenario. Most significantly, the Los Alamos County consolidated dispatch center sent out an incorrect message about the incident

conditions at the start of the exercise that was widely distributed and used by key decision-makers, and responders did not notice errors. Responders made other errors as well. Of significance:

- Protective actions directed site workers to traverse through a postulated hazardous atmosphere and take shelter in a facility unsuitable for that purpose.
- An emergency action level was applied without meeting entry conditions.
- Notifications to offsite authorities were not accurate, partially because they were not appropriately reviewed before distribution.
- Triad's formulation of protective action recommendations to offsite authorities were contrary to Triad's procedures and, in some cases, Triad inappropriately distributed protective action recommendations by social media.

Exercise Design, Conduct, and Evaluation

Triad, Newport News Nuclear BWXT Los Alamos, LLC, and the National Nuclear Security Administration Los Alamos Field Office designed and conducted a functional exercise that adequately tested seven focus areas and multiple functions. However, the planning, conduct, realism, and evaluation of exercises could be improved to better test the LANL emergency management program and achieve continuous program improvement.

2015 EA Assessment Finding Follow-up

During the 2020 exercise, the same type of miscommunications were observed as those that led to the 2015 EA assessment finding regarding the accuracy of initial notifications. Although follow-up notifications were improved since 2015, the corrective actions taken to resolve the 2015 finding were not fully effective.

Best Practices and Findings

There were no best practices identified as part of this assessment.

The assessment team identified three findings for Triad:

- Triad did not provide accurate and effective initial notifications to all appropriate stakeholders.
- Triad did not demonstrate an effective capability to identify and formulate pre-determined onsite protective actions and formulate offsite protective action recommendations. Triad identified a similar finding.
- Triad did not demonstrate an emergency operations system that effectively validates and coordinates incident information to establish and maintain situational awareness and a common operating picture among responders. Triad identified a similar finding.

Follow-up Actions

EA will follow up to evaluate the closure of findings, with emphasis on the processes for evaluating exercises and for verifying and validating that corrective actions are effective in preventing recurrence of weaknesses. The follow-up evaluation will include both Federal and contractor responsibilities.

Emergency Management Assessment at the Los Alamos National Laboratory

1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Emergency Management Assessments, within the independent Office of Enterprise Assessments (EA), assessed the emergency management program at the Los Alamos National Laboratory (LANL). The assessment team observed a functional exercise on February 19, 2020, to determine the effectiveness of the LANL emergency response organization's (ERO's) response to an emergency at key decision-making venues and follow up on a 2015 EA assessment finding. This assessment is part of a series of assessments of emergency management programs at sites throughout the DOE complex and was conducted in accordance with the *Plan for the Office of Emergency Management Assessments Evaluation of the February 2020 Emergency Management Exercise at the Los Alamos National Laboratory, January – March 2020*.

Triad National Security, LLC (Triad) became the management and operating contractor for the National Nuclear Security Administration (NNSA) at LANL during December 2018, and Newport News Nuclear BWXT Los Alamos, LLC (N3B) is the operating contractor for the Office of Environmental Management's facility, where the exercise scene occurred. The NNSA Los Alamos Field Office (NA-LA) provides Federal oversight at LANL NNSA facilities and the Environmental Management Los Alamos Field Office (EM-LA) provides Federal oversight of N3B's activities. The Los Alamos County fire department (LAFD) provides firefighting services under a cooperative agreement.

The exercise scenario postulated an Operational Emergency that is analyzed in the emergency planning hazards assessment (EPHA). The scenario involved a crash of a transuranic (TRU) waste transporter, carrying three shipping containers, into a TRU waste drum staging facility, where four waste drums were damaged. The shipping containers are robust enough to preclude dispersion of their contents, but the four drums in the facility were postulated as breached, resulting in a radioactive material release. In the scenario, the driver exits the transporter after the crash; workers help him away from the immediate scene; and the transporter's fuel tank leaks, explodes, and catches on fire, engulfing the transporter and some waste drums inside the facility. Per the EPHA, the scenario meets the definition of a General Emergency classification because of the possibility of an airborne release exceeding the offsite protective action (PA) criterion for radiation dose. The EPHA is based on conservative assumptions about the weather and the amount of hazardous material (HAZMAT) exposed in the incident. However, plume projections during the exercise did not exceed the PA criterion because of the actual weather conditions and the low amount of HAZMAT postulated in the scenario. Thus, the EAL appropriately bounded the consequences of the incident before the ERO knew all incident conditions.

2.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*, which EA implements through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. This report uses the terms "best practices, deficiencies, findings, and opportunities for improvement (OFIs)" as defined in DOE Order 227.1A.

As identified in the assessment plan, this assessment considered requirements related to DOE Order 151.1D, *Comprehensive Emergency Management System*. To implement the assessment plan, the assessment team used the following sections of Criteria and Review Approach Document (CRAD) 33-09,

DOE Order 151.1D Emergency Management Program CRAD: 4.4 Emergency Operations System, 4.7 Emergency Categorization, 4.8 Protective Actions, 4.9 Consequence Assessment, 4.11 Notifications and Communications, and 4.15 Exercises. The assessment included the site's exercise critique and a review of drafts of their evaluation conclusions but did not include the exercise after-action report (AAR) because of time considerations for finalizing the AAR and the influence that the assessment team has on its contents by sharing observations beforehand.

The assessment team examined key documents, such as emergency plans and implementing procedures, the exercise plan, job aids, and other relevant programmatic documentation supporting the assessment of response elements. The assessment team interviewed key personnel responsible for developing and executing the emergency management program and observed the conduct of the exercise and the initial evaluation activities, focusing on response processes and capabilities. The assessment team further investigated potential causes of unexpected responses, such as insufficient training, ambiguous procedural guidance, or lack of drills to attain proficiency. The members of the assessment team, the Quality Review Board, and management responsible for this assessment are listed in Appendix A.

EA conducted an assessment of the LANL emergency management program in September 2015, and this 2020 EA assessment examined the effectiveness of corrective actions implemented to resolve a finding in the previous report, *Office of Enterprise Assessments Review of the Los Alamos National Laboratory September 2015 Functional Exercise of Selected Emergency Response Capabilities – January 2016*. The results of the corrective action assessment are included in Section 3.1 of this report.

3.0 RESULTS

The response necessitated actions by facility workers, the site-level ERO, and offsite responders operating from multiple locations. The postulated incident occurred at a Technical Area (TA)-54 Area G facility. Witnesses reported the incident to the Los Alamos County consolidated dispatch center (CDC) and the TA-54 operations center, initiating the response. The N3B shift operations manager (SOM) led the immediate response efforts from the TA-54 operations center. The site-level ERO then mobilized to the TA-54 operations center; the emergency operations support center (EOSC), which serves as a 24/7 duty station where calls and alarms are received and notifications are initiated; the emergency technical support center (ETSC), where the consequence assessment team is stationed; and the emergency operations center (EOC). After a visit to the TA-54 operations center or EOSC, the on-scene commanders established a unified command at an incident command post (ICP) in a parking lot within TA-54 and outside of the PA area.

The response effort was multijurisdictional. NA-LA and Triad were the principal parties responsible for developing and executing the site-level response. EM-LA, N3B, and Los Alamos County also performed significant response efforts. A representative from EM-LA, which is responsible for Federal oversight of TA-54, served on the ERO in the EOC as a Senior Federal Official; N3B executed the facility-level response; and Los Alamos County provided services from its CDC and the LAFD. Centerra-Los Alamos also provided security representatives at the EOC and ICP. These entities demonstrated effective relationships and coordination during the exercise response. Triad personnel were familiar with the N3B facility hazards, processes for implementing local jurisdictional PAs, personnel accountability, and means for obtaining source term information to support dispersion modeling. Triad, N3B, and LAFD representatives co-located under a unified command as well. Additionally, Triad and N3B worked closely in the design, conduct, and evaluation of the exercise.

3.1 Communications and Notifications

The objective of this portion of the assessment was to determine whether the ERO maintained effective communications throughout the response and whether Triad performed initial notifications promptly, accurately, and effectively to all stakeholders.

3.1.1 Communications

LANL has established communication systems and process capabilities to support ERO communications. LANL has several state-of-the-art communication systems in the EOSC and EOC that include a mass notification system (Everbridge), a Web-based Emergency Operations Center software (WebEOC), a Geographic Information System, and other communications systems and equipment detailed in the *LANL Emergency Operations Communications Plan*. For communications with the field, the primary radio and cell phone reception used by the incident response commander (IRC), LAFD, SOM, and EOC provided adequate communication capability. Additionally, Triad effectively validated receipt of worker and offsite notifications; follow-up validation was one aspect of the EA 2015 finding that was effectively corrected. Finally, Triad issued a timely LANL situation report.

Nevertheless, the ERO did not communicate effectively throughout the response, due to the lack of information confirmation protocols (repeat-backs), delays in providing information, and use of unfamiliar terms and acronyms. (See **OFI-TRIAD-1**.) For example:

- The LAFD battalion chief (BC) did not confirm that the IRC and EOSC staff received the information provided to them by the BC during the initial incident scene size-up (assessment) prior to incident classification. As a result, the IRC and EOSC staff missed a report of a fire impacting the TRU waste drum staging facility and transporter.
- The EOC staff incorrectly issued several electronic public social media messages, circumventing the required process for distributing protective action recommendation (PAR) notifications to Los Alamos County officials, during the same timeframe as completing verbal offsite notifications updates. In contrast, the EOC staff did not promptly issue an updated Operational Emergency electronic notification form to correct the PARs after completing verbal notifications.
- During some communications, the ERO used some terms and acronyms that not all responders understood, such as “MP” (meaning mile post), “VAP” (meaning vehicle access point), “domes” versus “buildings,” “TRU” mistaken as “two,” and “containers” versus “drums.” Importantly, the CDC’s LAFD initial dispatch message contained errors that resulted, in part, from the use of the unfamiliar terms and acronyms noted above.

Consequently, ineffective communications contributed to reduced situational awareness and an incomplete common operating picture across the ERO, as further discussed in Section 3.5. Triad reported similar weaknesses in its past emergency exercise AARs.

These communication weaknesses resulted from insufficiently detailed procedures. (See **OFI-TRIAD-1**.) For example:

- Triad procedures do not require confirmation of voiced information (repeat-backs) among the IRC, EOSC staff, EOC communications unit, and field organizations (TA-54 operations center, BC, HAZMAT team, etc.).
- Triad procedures do not address methods for resolving conflicting objectives between the offsite notifications and public information messages to prevent social media messages from including PARs.

- Triad procedures do not define common terms to ensure consistent usage – for example, whether contaminated personnel are considered to be “trackable injured” personnel, appropriate terms to describe safe routing pathways, and identifying appropriate facilities for use as shelters (dome versus building, further discussed in Section 3.3).

3.1.2 Notifications

Triad promptly provided initial notifications to all stakeholders. The IRC and EOSC staff received the CDC’s LAFD initial dispatch message, prompting the IRC to co-locate with the EOSC staff. Within minutes, the EOSC staff activated the appropriate ERO groups. Also, the EOSC duty officer sent the employee PA notification to TA-54 personnel and immediately verified receipt of notification by contacting the N3B TA-54 SOM. Additionally, the EOSC duty officer promptly issued the initial ERO-FORM-009, *LANL Operational Emergency Notification Form*, to the offsite stakeholders. Before relocating to the ICP, the IRC directed activation of the EOC. In addition, the EOC emergency director (ED) appropriately verified that all initial notifications were completed. Importantly, the offsite liaison provided prompt verbal notification to offsite stakeholders after the ED determined that the PARs were incorrect. Finally, the EOSC staff issued timely awareness notices and a secondary-priority notification to the environmental water quality representative to go to the ICP.

Nevertheless, most Triad initial notifications were not effective because the messages contained inaccurate and incomplete information, which in some cases was not corrected throughout the response. The initial offsite notification form contained incorrect PAs, PARs, incident location, and description of the incident (two drums involved outside the facility and no fire) and did not provide facility-implemented PAs or specify that the crashed vehicle was a loaded TRU waste transporter, as known by some responders. Consequently, the notification form provided incorrect PARs to offsite stakeholders, as further discussed in Section 3.3, and detracted from establishing situational awareness, as further discussed in Section 3.5. (See **Finding F-TRIAD-1**, **OFI-TRIAD-1**, and **OFI-TRIAD-2**.)

EA’s evaluation of LANL’s 2015 exercise led to a similar finding for inaccurate and incomplete notifications, indicating that corrective actions supporting the closure of the 2015 finding were not fully effective. Improvements in accuracy were observed in follow-up notifications. Additionally, Triad’s past emergency exercise AARs have identified similar weaknesses.

Contributing to the notification weaknesses are missing details in the procedures that govern EOSC internal operations and IRC integration with the EOSC. While in the EOSC, the IRC had a large staff providing updates on field activities, response asset activation, incident status, and updates on a manual whiteboard. The IRC, as the primary decision-maker early in the response, has overall responsibility for managing the incident response and is expected to have the most complete and updated situational awareness within the team. However, the procedures do not make the IRC responsible for ensuring that key information is complete and accurate before distribution (e.g., for offsite notifications, the IRC knew the correct meteorological conditions, incident location, and that Pajarito Acres was within the advisory area on the planning map but none of these were reported in the initial notification form). (See **OFI-TRIAD-1** and **OFI-TRIAD-2**.) For example:

- Procedures assign the IRC responsibility for directing actions to protect LANL personnel but do not require the IRC to review and approve EOSC staff-developed employee PAs and safe routing messages for ERO members to the EOC.
- Procedures assign the IRC responsibility for ensuring the completion of initial offsite notifications but do not require the IRC to review and approve the EOSC duty officer-developed notification form.

- Procedures do not require the EOSC staff to repeat back information conveyed during EOSC voice communications to confirm that the information was received accurately.

Overall, LANL has established communication systems and process capabilities to support ERO communications, and Triad promptly provided initial notifications to all stakeholders. However, the ERO did not always communicate effectively throughout the response and issued inaccurate and incomplete initial notifications to most stakeholders, primarily due to insufficiently detailed procedures. Triad's past emergency exercise AARs have previously identified similar weaknesses.

3.2 Emergency Classification

The objective of this portion of the assessment was to determine whether Triad responders correctly classified the Operational Emergency as promptly as possible, but no later than 15 minutes after the responsible decision-maker (an IRC) was adequately informed of the incident.

Although the IRC classified the Operational Emergency as a General Emergency within 15 minutes, as required by ERO-EPIP-100, *LANL Incident Commander*, the IRC's selection of the emergency action level (EAL) was not based on known EAL entry conditions. At the time, the EOSC staff and the co-located IRC had received a report of a transporter accident involving two waste drums without a fire. Although an EAL is available for these conditions, the IRC selected an EAL for a transporter crash into a waste drum staging facility with a fire spreading among staged waste drums and the transporter's payload. During an EAL verification review, the ETSC staff recognized that this decision was incorrect and then questioned an EOSC operator (the IRC had left the EOSC to set up an ICP) about the incident conditions and EAL selection. The EOSC operator replied that there may have been a fire but there was no confirmation yet. Both EALs are General Emergencies but have significantly different PAs and PARs. (See **Deficiency D-TRIAD-1** and **OFI-TRIAD-3**.)

3.3 Protective Actions

The objective of this portion of the assessment was to evaluate the responders' capability to identify and implement pre-determined onsite PAs and offsite PARs for the General Emergency classification.

The N3B TA-54 SOM and LAFD BC provided appropriate immediate PAs within TA-54. The SOM correctly identified and implemented initial PAs in accordance with N3B-BEP-ERP-TRU-3002, *Emergency Response*, and appropriately ordered TA-54 Area G workers to stay clear of the incident scene and shelter in place (SIP). The BC then appropriately directed the SOM to evacuate Area G workers to an offsite fire station using a safe egress road. In preparation for the evacuation, the SOM ordered Area G workers to assemble at a safe upwind location and perform personnel accountability and ordered the rest of TA-54 to SIP.

The Triad IRC did not correctly identify and effectively implement the pre-determined PAs. Using ERO-EPIP-214, *PA Guides*, the IRC determined from the EAL an isolation zone (IZ) with a 159 meter radius around the incident scene and a PA area distance of 2,769 meters. Procedures require evacuation of personnel within an IZ. Without conferring with the TA-54 SOM or the LAFD BC, the IRC ordered (simulated) some Area G workers in six buildings to evacuate to Building 49 using the safest route and others to remain sheltered in place. This evacuation order required workers to travel through the IZ to a facility not suitable for a shelter because Building 49 is actually a TRU waste-staging dome. In addition, PA instructions contained conflicting and confusing information, ordering personnel to SIP in one statement in conjunction with instructions to avoid the same area. Furthermore, the instructions did not include a warning to avoid a road adjacent to TA-54 that was within the PA area. These weaknesses

resulted from insufficiently detailed procedures for defining and communicating appropriate facilities for shelters and for establishing safe pathways to shelters. (See **Finding F-TRIAD-2** and **OFI-TRIAD-4**.)

The IRC identified the pre-determined PARs provided in the selected EAL but did not apply the additional implementing instructions from ERO-EPIP-210, *Operational Emergency Categorization/Classification*. The EAL directed a SIP recommendation for two nearby offsite housing subdivisions regardless of weather conditions, in conflict with ERO-EPIP-210, which directs the use of a “360-degree Advisory Zone” recommendation for areas not downwind, as was the case for the two nearby subdivisions. Per ERO-EPIP-210, an Advisory Zone is a recommendation to avoid an area in range of a plume in case the wind shifts. Consequently, the Triad recommendations may have prompted local authorities to notify upwind offsite populations to SIP rather than to avoid the upwind area. (See **Finding F-TRIAD-2** and **OFI-TRIAD-5**.)

For the most part, initial field responders were adequately protected. The IRC and LAFD followed safe routing instructions to TA-54 and established the ICP at a safe location. Also, the IRC secured the scene and ascertained accountability of responders. However, the EOSC neglected to provide water quality personnel, dispatched later in the incident, with safe route information. (See **OFI-TRIAD-1**.) Additionally, habitability air sample monitoring was not conducted at the ICP or the TA-54 operations center. Although ER-630-001, *HAZMAT Group Supervisor and Hazardous Device Team Response Lead*, requires contamination monitoring at the ICP, the procedure does not provide guidance on monitoring types and methods (e.g., air sample, surface). Furthermore, N3B procedures do not require habitability air sample monitoring at the TA-54 operations center during HAZMAT releases to keep operations center staff safe. (See **OFI-N3B-1** and **OFI-TRIAD-6**.)

Overall, N3B and the LAFD effectively identified and implemented initial PAs for TA-54 workers and maintained personnel accountability. However, Triad did not implement effective PAs and PARs. Consequently, workers were ordered to shelter in a facility unsuitable for that purpose, and the pathway to the facility passed through the IZ. Additionally, Triad PARs were not implemented per procedure requirements, possibly placing offsite personnel in a sheltered condition rather than advising them to avoid the area. Finally, Triad did not implement air sample monitoring for habitability at the ICP, and likewise, N3B did not monitor for habitability at the TA-54 operations center. The respective response procedures do not require air monitoring to detect potential contaminants.

3.4 Consequence Assessment

The objective of this portion of the assessment was to determine whether Triad’s consequence assessment activities provided a conservative, timely initial assessment; accurate projections using incident conditions; and supportive assessments throughout an emergency.

The ETSC coordinator provided effective leadership to the ETSC staff, resulting in conservative and timely assessments, as required by ERO-EPIP-120, *ETSC Coordinator and Staff*. The ETSC coordinator collected initial and subsequent incident data; ensured that EAL and EPHA reviews were performed; directed the ETSC staff to monitor weather forecasts, develop plume and deposition plots, coordinate assessment results with the field monitoring team (FMT) and IRC activities, obtain actual source term data, post activities on WebEOC, use action item forms, EOC logs, and position checklists; and kept the ETSC staff and ED adequately informed of ETSC activities.

The ETSC staff conducted timely and conservative initial assessments. The ETSC staff promptly recognized that the EAL in use was not the most appropriate selection because the EAL was based on a fire scenario, even though no fire was reported. While ascertaining whether a fire occurred, the ETSC staff conservatively performed two timely initial assessments, with and without a fire based on the source

term for the EAL in use. The modelers used the National Atmospheric Release Advisory Center dispersion-modeling program for the primary projection and the Computer Assisted PA Recommendation System dispersion-modeling program for the corroborating projection. The ETSC staff correctly concluded that the PAs stated in the selected EAL adequately protected personnel from projected consequences for either condition.

The ETSC staff performed conservative and supportive ongoing assessments. To obtain actual source term quantities, the HAZMAT team would have to enter the waste staging facility to identify the affected drums by drum identification number for correlation with the facility inventory database. Although it was widely reported that the incident affected two drums early on, the number of affected drums was unknown during most of the exercise and could not be determined until facility entry. Once the HAZMAT team entered the facility (simulated), the exercise conduct did not provide for visual readings of the identification numbers due to postulated burnt labels. In the absence of identification numbers, the ETSC staff conservatively adjusted by analyzing the dispersion of the two drums with the highest inventory in the facility. The results projected that the PA criterion was not exceeded and identified potentially contaminated areas for use with field survey activities.

The ETSC staff effectively coordinated its activities with the field survey teams. The ETSC staff provided plume and deposition plots to the FMT and IRC (who interfaced with the HAZMAT team) for use in planning survey activities. The FMT and HAZMAT team developed their survey plans based on these plots and appropriately executed their plans. While the FMT and HAZMAT teams conducted surveys, the teams reported survey results to the ETSC staff where results were displayed on a Geographic Information System map available on WebEOC. The HAZMAT team surveyed near the incident scene and detected elevated readings (exercise data). The FMT performed surveys farther away (downwind up to the site boundary, and encircling the scene area) that measured no detectable activity. The ETSC staff correctly concluded that the measured readings and projected deposition plots were consistent and used that information as the basis for recommending to the ED a reduction in the area under PAs.

Overall, the ETSC staff performed a conservative and accurate initial assessment and ongoing supportive assessments throughout the emergency. The staff performed effective EPHA reviews to validate the correct selection of incident classifications (and identified an error) and pre-determined PAs, and took a conservative approach for projecting dispersions when there was uncertainty about whether a fire occurred and when actual source term information was not available. Also, the ETSC staff and field survey teams effectively integrated dispersion projections for survey planning and used projections and measurements, in conjunction with survey measurements, as the basis for recommending reductions in areas under PAs.

3.5 Emergency Operations System

The objective of this portion of the assessment was to determine whether the emergency operations system (EOS) provided centralized collection, validation, analysis, and coordination of information related to the emergency, while relieving the on-scene responders of burdens that others can perform elsewhere, to achieve a well-coordinated, well-understood, and effective response.

The EOS had adequate capabilities to collect incident information, provided needed expertise for incident analysis from a centralized and well-equipped facility, and was consistent with the operational concepts of the National Incident Management System. At the onset of the incident, the EOSC collected and disseminated response information until the EOC was operational. Once operational, the emergency management team within the EOC provided strategic management of the incident and support to the IRC,

allowing the IRC to freely manage the on-scene tactical response. The ERO implemented the EOS using a large set of procedures, checklists, and operator aids.

Nevertheless, the EOS was not effective in validating and coordinating information to achieve adequate situational awareness and a common operating picture. Key breakdowns occurred in important EOS functions. For example:

- The CDC's mapping database did not include the incident location (TA-54 Dome 153), so the CDC dispatcher requested the caller provide the dispatcher the nearest building to Dome 153, which was TA-54 Building 11. Consequently, the CDC provided the LAFD, IRC, and EOSC staff with the wrong building identification; the protective force was dispatched to the incorrect location; and the EOSC staff made notifications with the incorrect incident location. (See **OFI-TRIAD-7**.)
- EOSC operators did not demonstrate an effective process for resolving conflicting incident information from the TA-54 operations center, CDC, and BC, so the IRC did not have accurate information for initial decision-making.
- The IRC did not have adequate situational awareness with respect to whether two drums or the Dome 153 waste staging facility inventory (110 different waste containers) was involved, whether a fire occurred, and whether the release was outside or inside the dome. The IRC therefore lacked sufficient information to support effective initial decision-making. (See **OFI-TRIAD-8**.)
- The IRC did not contact the operations center staff before issuing PA messages, thereby limiting the ability to execute the pre-determined EAL PAs in coordination with those already implemented by the SOM and LAFD BC. Procedures contributed to the omission by not requiring the IRC to coordinate with the SOM to verify incident conditions in advance of issuing PA messages. Consequently, the IRC directed the EOSC duty officer to issue PAs over the mass notification system without knowing the PAs that were already implemented, and, as mentioned in Section 3.3, the instructions directed TA-54 personnel to traverse an unsafe area. (See **OFI-TRIAD-2** and **OFI-N3B-1**.)

Other response procedures omitted important details for effectively obtaining and maintaining situational awareness and a common operating picture. When the IRC classified the incident, he used multiple sources of information – ERO-Form-210, *Initial Line of Inquiry*, an initial EOSC operator brief, and updated information from different EOSC staffers – to select the EAL, and the information in those sources varied. Additionally, the EOSC used a manual whiteboard to record important information not required on the line of inquiry form, and the information on the board was not shared with ERO members outside the EOSC; the unshared information included the corrected incident location and meteorological conditions. However, the information recorded was not accurate (e.g., the dome involved, incorrect number of waste containers affected, no confirmed fire, and a two drum release outside the dome). Furthermore, procedures do not provide adequate methods for the IRC to validate incident information with the SOM and BC before classifying and responding to the incident, and, as discussed in Section 3.1.2, notification procedures lack instructions for ensuring that key information is complete and accurate. Consequently, the IRC lacked adequate situational awareness for decision-making and further disseminated incorrect incident information, some of which the ERO used for the duration of the response. Similarly, the ED based much of his initial decision-making on the incorrect information passed along in the line of inquiry form and the initial Operational Emergency notification form. In addition, ERO-EPIP-205, *EOC Operations*, also contributed to the misinformation because it does not provide details on how the ED and EOC cadre should validate information produced by the EOS. (See **OFI-TRIAD-2**.)

Furthermore, responders were not fully effective in using WebEOC to capture and disseminate incident information. Triad does not require the EOSC operators to use WebEOC, and when most of the EOSC staff relocated to the EOC communications unit, staffers did not highlight changes in the situation by recording some key field information in WebEOC or marking it as significant. Consequently, the EOC emergency management team, as the central point of the response, did not have the necessary information to establish and maintain situational awareness and a common operating picture among response components. (See **Finding F-TRIAD-3.**) Additionally, personnel at the TA-54 operations center had no access to WebEOC to provide or acquire incident information or enable personnel to identify posted errors. (See **OFI-TRIAD-9.**)

Overall, LANL has established an EOS with numerous capabilities to collect incident information and provide the expertise for incident analysis from a centralized and well-equipped facility. The EOS is primarily implemented through the EOC, is well staffed, and uses National Incident Management System operational concepts. Nevertheless, Triad did not effectively establish and maintain adequate situational awareness and a common operating picture everywhere. When responders received inaccurate information, it was further distributed without validation of its accuracy or completeness. Contributing to the problem, Triad and N3B procedures lack instructions for validating whether information is correct and complete. Lastly, the absence of WebEOC in the TA-54 operations center and the ineffective use of WebEOC by EOSC staffers further added to the problem. Consequently, the ERO did not have the necessary understanding of the incident to provide a fully effective response.

3.6 Exercise Design, Conduct, and Evaluation

The objective of this portion of the assessment was to evaluate Triad's ability to use an exercise to test, evaluate, and improve individual capabilities, multiple functions and activities within a function, and interdependent groups of functions in response to a hazard identified in an EPHA.

Triad, with support from N3B, NA-LA, and the LAFD, appropriately designed and conducted the exercise to adequately test most selected focus areas and response functions and validate associated plans and procedures. Triad identified seven focus areas to test with an exercise designed using the *Exercise Builder* software. The scenario, level of participation, and appropriate use of simulations enabled an adequate test of notifications and communications, incident classification, PA decision-making, the EOS, the development of HAZMAT facility entry and field monitoring plans, organizational interrelationships among contractors and response venues, and most consequence assessment activities.

Nevertheless, the exercise did not enable a demonstration of some consequence assessment activities as designed by the exercise planners. Specifically:

- A controller at the TA-54 operations center did not provide a prepared exercise inject for waste drum inventories to the TA-54 operations center staff when earned, per the exercise plan.
- An inject to enable the identification of four breached waste drums was not prepared for delivery to the HAZMAT team upon entry into the waste staging facility, resulting in the incorrect conclusion that no drums were breached.
- Injects were provided for contamination measurements without a source of the contamination (since no drums were identified as damaged), causing unnecessary confusion within the ETSC staff.
- The inject data developed for the FMT survey readings was below the sensitivity of the survey instruments, resulting in reports of "no detectable activity," while the exercise design was to report measured activity.

Furthermore, the exercise evaluation criteria were vague or missing and did not contain objective measures, leading to subjective evaluations and diminishing the ability to validate plans and procedures. Triad used the criteria from Appendix D of DOE Guide 151.1-3, *Emergency Management Guide*, and only loosely tied these criteria to the implementing procedures. Initially, using its exercise evaluation guides, Triad concluded that 72 out of 73 exercise objectives were met. Triad also identified some weaknesses during its post-exercise critique and continued to identify findings and deficiencies using its issues management process. (See **OFI-TRIAD-10**.)

Most significantly, Triad has not effectively corrected the previous weaknesses tested by the exercise to prevent recurrence. Past exercises identified weaknesses in PAs, notifications, and providing responder safe routing instructions; similar problems occurred during this exercise. Contributing to these recurrences is the lack of focus on validating corrective actions. For the 2020 exercise, Triad did not include a section in the exercise plan for “Previously Identified Issues,” as required by EMD-PLAN-120, *Exercise Program Plan*.

Overall, Triad demonstrated an adequate ability to test most of the focus areas identified in the exercise plan for a hazard analyzed in the EPHA. Triad selected a plausible EPHA scenario and presented it in a largely realistic manner, with appropriate simulation. However, the planning and presentation of the postulated breached drums and the associated contamination were not realistic or fully useful in validating some consequence assessment functions. Further, Triad evaluators were not fully effective in identifying weaknesses during the exercise or validating that corrective actions to resolve past weaknesses will prevent recurrence.

4.0 BEST PRACTICES

There were no best practices identified as part of this assessment.

5.0 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 findings. Cognizant DOE managers must use site- and program-specific issues management processes and systems developed in accordance with DOE Order 226.1, *Implementation of Department of Energy Oversight Policy*, to manage the corrective actions and track them to completion.

Finding F-TRIAD-1: Triad did not provide accurate and effective initial notifications to all appropriate stakeholders. (DOE Order 151.1D, Attachment 3, Paragraph 11)

Finding F-TRIAD-2: Triad did not demonstrate an effective capability to identify and implement pre-determined onsite PAs and offsite PARs to protect the health and safety of workers and the public. (DOE Order 151.1D, Attachment 3, Paragraph 9) Triad identified a similar finding (EMD-AAR-EX-FY20-006-Finding 2)

Finding F-TRIAD-3: Triad did not demonstrate an effective EOS that validates and coordinates incident information to establish and maintain situational awareness and a common operating picture among response components. (DOE Order 151.1D, Attachment 3, Paragraph 4) Triad identified a similar finding (EMD-AAR-EX-FY20-006-Finding 1).

6.0 DEFICIENCIES

Deficiencies are inadequacies in the implementation of an applicable requirement or standard. Deficiencies that did not meet the criteria for findings are listed below, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

Deficiency D-TRIAD-1: Triad did not select the correct EAL for known incident conditions to provide appropriate pre-determined PAs and PARs. (DOE Order 151.1D, Attachment 4, Paragraphs 8 and 9)

7.0 OPPORTUNITIES FOR IMPROVEMENT

The assessment team identified 11 OFIs to assist cognizant managers in improving programs and operations. While OFIs may identify potential solutions to findings and deficiencies identified in assessment reports, they may also address other conditions observed during the assessment process. These OFIs are offered 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.

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OFI-TRIAD-1: Consider improving communication and notification practices by:

- Establishing use of repeat-backs in procedures for voice communications with field responders.
- Incorporating a safe routing requirement associated with secondary priority notifications into checklists and procedures.
- Defining commonly used terms in procedures to promote consistent understanding across the ERO.
- Using plain language to limit the use of unfamiliar terms across organizations.
- Defining the information that is not permitted to be distributed via social media in EOC and joint information center procedures, as discussed in DOE Frequently Asked Question # 2002262103, *PARs to the Public*.
- Focusing drills to increase ERO proficiency and rigor in notification form review and approval to ensure that the information in the forms is accurate before sending the forms to offsite agencies.

OFI-TRIAD-2: Consider providing additional procedural guidance on how to validate information used in time-urgent IRC decision-making related to incident classification and formulating PAs by:

- Implementing a bridge-line conference call among the SOM, the LAFD BC, and the IRC to validate the initial incident information before issuing PAs.
- Requiring the IRC to approve the offsite and onsite PA notifications before distribution.
- Continuing the use of the bridge-line conference call every 15 minutes until the IRC establishes command at the ICP.
- Implementing the practice of using the IRC communicator to capture the key incident information and further disseminate the information to someone in the EOSC and EOC to enter in WebEOC for situational awareness by the entire ERO.
- Providing the ICP with access to WebEOC to enable validation of field information disseminated to the ERO and enable access to data and information generated by the ERO for improved situational awareness.

OFI-TRIAD-3: Consider improving incident classification by validating incident conditions and EAL entry conditions with facility personnel or credible on-scene witnesses.

OFI-TRIAD-4: Consider improving coordination in implementing facility-level and site-level PAs by:

- Revising procedures to require Triad decision-makers to confer with affected facility decision-makers before issuing site-level PAs.
- Pre-identifying suitable facilities for SIP PAs.

OFI-TRIAD-5: Consider improving the integration of EALs and the classification procedure by:

- Revising EALs with the necessary instructions to properly implement the classification procedure PAR requirements.
- Adding clarifying instructions discerning the differences between avoiding an area and evacuating an area.
- Validating with offsite authorities affected by PARs the intended actions for an “avoid the area” recommendation.
- Reviewing all General Emergency EALs to identify conflicts with the classification procedure requirements and expected offsite decision-maker actions, and then revising the EALs as necessary.

OFI-TRIAD-6: Consider revising ER-630-001 to include additional guidance on monitoring ICP and operations center habitability, including monitoring types (e.g., air sample, surface) and methods.

OFI-TRIAD-7: Consider performing an analysis of the Los Alamos County CDC computer-aided dispatch database to identify and resolve any LANL compatibility issues like those observed during the exercise, and then implementing compensatory or procedural changes to address recurrence of a similar problem at other EPHA facilities until a permanent solution is in place.

OFI-TRIAD-8: To ensure that the EOS provides a complete common operating picture and shared situational awareness during an emergency, consider:

- Analyzing the field and ERO information flow dynamics to define the critical paths of key information and to identify expected actions for achieving and maintaining situational awareness among all teams.
- Adapting an information flow structure that assigns specific responsibility for each key information set, including responsibility for verifying and validating essential incident information collected in WebEOC or other response records.
- Incorporating detailed guidance and direction for information management in the emergency plan, implementing procedures, and response checklists.

OFI-TRIAD-9: Consider expanding the use of electronic information systems to promote a common operating picture and shared situational awareness during an emergency by:

- Integrating WebEOC with daily automated log-keeping in the EOSC to improve proficiency in information management during an emergency.
- Providing the TA-54 operations center with access to WebEOC to provide or acquire incident information or enable personnel to identify posted errors.
- Using an integrated Geographic Information System for such functions as tracking responder locations, geographically mapping PA zones, and assessing facility damage.

OFI-TRIAD-10: Consider improving the design, conduct, and evaluation of exercises by:

- Revising the five-year exercise plan to require periodic exercising and tracking of emergency capabilities and resources, not just the 15 program elements.
- Revising the 90-day and 120-day exercise planning checklists to include a step at the appropriate time near the end of the planning period to review the selected objectives to ensure that all are measurable.
- Revising the 90-day and 120-day exercise planning checklists to include a step at the appropriate time near the end of the planning period to crosscheck all of the planned injects to ensure that the prepared injects will direct the exercise in accordance with the planned scenario and allow evaluation of the selected objectives.
- Revising exercise evaluation guides to ensure that all evaluator checklist questions are procedure-based, detailed, and specific to procedures and objectives.

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OFI-N3B-1: Consider revising N3B plans and procedures by:

- Requiring air monitoring during HAZMAT incidents to ensure habitability of the TA-54 operations center.
- Requiring the SOM to contact the IRC to support incident classification and PA decision-making.

8.0 ITEMS FOR FOLLOW-UP

Some items outside the scope of this assessment were identified for follow-up in 2021. First, finding F-TRIAD-1 of this 2020 EA assessment was a repeat from the 2015 EA assessment. A limited review of previous LANL exercise AARs revealed a pattern of repeated deficiencies/findings of a similar nature, indicating that corrective actions have not prevented recurrence. Also, the exercise evaluation guides completed during the next-day critique did not include key weaknesses that were later identified by the Triad issue development process or by EA, implying that the exercise evaluation guides or evaluators were ineffective in identifying deficiencies/findings. Finally, the Federal and contractor roles in oversight and assessment of these key functions should also be reviewed.

In summary, EA will follow up to evaluate the closure of findings, with emphasis on the processes for evaluating exercises and for verifying and validating that corrective actions are effective in preventing recurrence of weaknesses. The follow-up evaluation will include both Federal and contractor responsibilities.

Appendix A

Supplemental Information

Dates of Assessment

Onsite Assessment: January 27 to March 13, 2020

Office of Enterprise Assessments (EA) Management

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