Office of Enterprise Assessments Review of the West Valley Demonstration Project Emergency Management Program Technical Basis and Emergency Preparedness

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Acronyms

BDBE	Beyond Design Basis Event
BNA	Baseline Needs Assessment
CFR	Code of Federal Regulations
CHBWV	CH2M-HILL - B&W West Valley, LLC
Ci	Curies
CRAD	Criteria, Review, and Approach Document
DOE	U.S. Department of Energy
DOE-WVDP	U.S. Department of Energy, West Valley Demonstration Project
EA	Office of Enterprise Assessments
EAL	Emergency Action Level
EMCBC	Environmental Management Consolidated Business Center
EMG	Emergency Management Guide
EMIP	Emergency Management Implementing Procedure
EOC	Emergency Operations Center
EPHA	Emergency Planning Hazards Assessment
EPZ	Emergency Planning Zone
ERO	Emergency Response Organization
FHA	Fire Hazards Analysis
HAZMAT	Hazardous Material
HLW	High Level Waste
HSS	Office of Health, Safety and Security
IC	Incident Commander
LOA	Letter of Agreement
LSA	Lag Storage Area
MAA	Mutual Aid Agreement
MAR	Material at Risk
MOU	Memorandum of Understanding
NARAC	National Atmospheric Release Advisory Center
NFPA	National Fire Protection Association
NPE	Natural Phenomena Event
OE-1	HSS Operating Experience Level 1
OEBP	Operational Emergency Base Program
OEHMP	Operational Emergency Hazardous Material Program
OFI	Opportunity for Improvement
PAC	Protective Action Criterion
PAR	Protective Action Recommendation
PE	Plutonium Equivalent
PSO	Plant Shift Operations
RAP	Radiological Assistance Program
RHWF	Remote-Handled Waste Facility
TRU	Transuranic
TSC	Technical Support Center
WIPP	Waste Isolation Pilot Plant
WVDP	West Valley Demonstration Project
WVVHC	West Valley Volunteer Hose Company

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1.0 PURPOSE

The U.S. Department of Energy (DOE) independent Office of Enterprise Assessments (EA) was established in May 2014 and assumed responsibility for managing the Department's independent oversight program from the Department's former Office of Health, Safety and Security (HSS). This independent review of the emergency management program at the West Valley Demonstration Project (WVDP) was conducted prior to the creation of EA. HSS Independent Oversight performed this review to evaluate compliance with DOE Order 151.1C, *Comprehensive Emergency Management System*, for establishing a technically based emergency management program and developing the commensurate planning and preparedness elements. Additionally, the review was performed to determine WVDP's progress in implementing enhancements recommended in HSS Operating Experience Level 1 (OE-1), *Improving DOE Capabilities for Mitigating Beyond Design Basis Events* (BDBEs). This report discusses the scope, background, methodology, results, conclusions, findings, and opportunities for improvement (OFIs). This review was performed at WVDP during April 7-10, 2014.

DOE Order 227.1, *Independent Oversight Program*, establishes the responsibilities and authorities of the Department's independent oversight program, which is one element of DOE's multi-faceted approach to oversight as described in DOE Order 226.1B, *Department of Energy Oversight Policy*. Effective oversight, including independent oversight, of DOE Federal and contractor operations is an integral part of the Department's responsibility as a self-regulating agency to provide assurance of its safety and security posture to its leadership, its workers, and the public. The Independent Oversight program is designed to enhance DOE safety and security programs by providing DOE and contractor managers, Congress, and other stakeholders with an independent evaluation of the adequacy of DOE policy and requirements, and the effectiveness of DOE and contractor line management performance in safety, security, and other critical functions as directed by the Secretary.

2.0 SCOPE

As specified in the *Plan for the Independent Oversight of the Review of Emergency Management at the WVDP*, the Independent Oversight team reviewed the documented processes for establishing the technical basis of the emergency management program, the planning and preparedness activities associated with its implementation, the activities outlined by OE-1, and the disposition of OE-1 recommended enhancements. Independent Oversight activities included facility tours, document reviews, and interviews with the site's subject matter experts. The scope of this review includes aspects of the emergency management program related to emergency preparedness for severe natural phenomena events (NPEs). The facilities of interest include:

- Lag Storage-provides interim storage of WVDP wastes prior to final offsite disposal.
- Remote-Handled Waste Facility (RHWF) - functions to size reduce, sample and repackage various solid waste streams for placement into appropriate waste containers.
- Main Plant - constructed in 1963 to house the equipment used for reprocessing of spent nuclear fuel. Currently undergoing deactivation and decontamination.

The scope of this review includes two aspects of the emergency management program: technical planning basis, and emergency preparedness.

After touring the site's Main Plant, RHWF, and Lag Storage Facility, the review focused on Lag Storage because it represents the most significant form of dispersible hazardous material (HAZMAT) and will remain operational for an indefinite period. The key documents reviewed were the hazards survey and emergency planning hazards assessment (EPHA), which establish the technical basis of the program; the emergency plans and procedures that implement the program; and the record documenting the completion of WVDP OE-1 activities.

3.0 BACKGROUND

The WVDP is located in Ashford Township in Cattaraugus County, New York, approximately 3.4 miles northwest of West Valley, New York. The nearest village is Springville, 3.5 miles north of the Main Plant; the closest metropolitan area is Buffalo, New York, about 35 miles to the north. The WVDP occupies an approximately 200-acre area that was originally the site of a commercial nuclear fuel reprocessing plant. WVDP is located within a larger reservation of about 3,345 acres, called the Western New York Nuclear Service Center, which was acquired in 1961 by the New York Office of Atomic Development for the purpose of establishing a commercial nuclear industry.

The site was leased to Nuclear Fuel Services, Inc. to construct and operate a nuclear fuel reprocessing plant. The plant chemically reprocessed approximately 640 metric tons of spent nuclear fuel from both commercial and Federally-owned reactors in order to recover usable uranium and plutonium. The nearly 600,000 gallons of liquid, radioactive high-level waste (HLW) generated during reprocessing using the PUREX process was stored in an underground carbon steel tank contained within a concrete vault. Approximately 12,000 gallons of additional acidic HLW produced during THOREX processing of thorium-based fuel was stored in a separate underground stainless steel tank. This acidic waste was later transferred to the PUREX waste storage tank, which had been treated with excess caustic to neutralize the acidic waste stream. In 1980, the WVDP Act, Public Law 96-368, created the WVDP and directed DOE to solidify the HLW stored at the site into a durable, solid form suitable for shipment to a Federal repository, clean up and close the facilities used, and dispose of the low-level and transuranic (TRU) wastes collected during operations. The durable form of HLW was created through vitrification of the waste into borosilicate glass canisters. The vitrification activities were completed in 2002, and the canisters are being stored in the WVDP High-Level Waste Interim Storage area. In 2011, CH2M-HILL-B&W West Valley, LLC (CHBWV) became the prime contractor at WVDP. Currently, areas and cells within the Main Plant Process Building are undergoing deactivation, decontamination, and equipment removal in preparation for final decommissioning. Wastes from these activities are accumulating in the Lag Storage Facility.

The Environmental Management Consolidated Business Center (EMCBC) has line management oversight responsibility for WVDP. The EMCBC oversight responsibility originates from the Secretary of Energy as documented in the EM reorganization announced in February 2012, and flows down through the Under Secretary for Nuclear Security, National Nuclear Security Administration, the Assistant Secretary for Environmental Management, to the EMCBC Director. At the site level, the DOE-WVDP Director is responsible for oversight of CH2M-HILL-B&W West Valley, LLC (CHBWV), the prime contractor at WVDP.

In preparation for this assessment, a review for previous oversight activities performed in accordance with DOE Order 226.1B was conducted. The only prior external review of the WVDP emergency management program was in September 2000, when Independent Oversight conducted a transportation

emergency management review of the WVDP and national transportation program/transportation compliance evaluation/assistance program. Two findings were identified, and an overall program rating of satisfactory was assigned.

4.0 METHODOLOGY

As identified in the review plan, this review considered the requirements related to the WVDP emergency management program's technical planning basis and the corresponding emergency plans and preparedness activities for implementing the program, as well as examining WVDP's plans for the recommended enhancements identified in OE-1. DOE Order 151.1C, *Comprehensive Emergency Management System*; DOE 151.1 implementing guides; and OE-1 served as the basis of Independent Oversight's conclusions. Key aspects of these requirements are included in the inspection criteria and lines of inquiry set out in HSS Criteria, Review, and Approach Document (CRAD) 45-60, *2014 Emergency Management Technical Basis and Emergency Preparedness Review.*

The Independent Oversight team examined key site documents, such as the hazards survey, the EPHA, emergency plans, implementing procedures, and agreement correspondence between WVDP and offsite support entities. Independent Oversight also reviewed the WVDP documented safety analysis and supporting calculations, technical safety requirements, the baseline needs assessment (BNA), and the fire hazards analysis (FHA) for consistency with the assumptions used during the development of the emergency management program. The team conducted interviews with key personnel responsible for developing and executing the associated programs; observed facility operations and storage practices; and walked down portions of selected facilities, focusing on the types, forms, quantities, and storage practices for HAZMAT. The members of the Independent Oversight team, the quality review board, and EA management responsible for this review are listed in Appendix A. Appendix B lists the documents reviewed, personnel interviewed, and observations made during this review, relevant to the findings and conclusions of this report.

5.0 RESULTS

The results of this review are organized around the emergency management program technical planning basis program element, emergency plans and procedures, and the activities performed in response to OE-1, Action 1. The italicized statements introducing sections 5.1, 5.2, and 5.3 reflect the portion of the HSS CRAD 45-60 criteria addressed in that section. Independent Oversight identified four findings and 13 OFIs.

5.1 Technical Planning Basis

Review Criteria:

The emergency management program is technically based and is commensurate with the facility–specific hazards (DOE Order 151.1C and HSS CRAD 45-60).

DOE Order 151.1C requirements and associated guides, primarily DOE Guide 151.1-2, *Technical Planning Basis Emergency Management Guide* (EMG), provide detailed instructions on determining whether a site is an Operational Emergency Base Program (OEBP) or requires an Operational Emergency HAZMAT Program (OEHMP), and on establishing an appropriate response based on technical considerations. DOE 151.1C requires the hazards survey and EPHA (for HAZMAT programs) to document the methodologies and results of the analysis used to establish the technical planning basis.

DOE Order 151.1C, Attachment 2, paragraph 3.b.(1) requires an EPHA be developed to determine the extent and scope of the OEHMP, using acceptable assessment techniques. DOE G 151.1-2 provides acceptable assessment techniques for complying with DOE O 151.1C whenever a facility-specific quantitative assessment of the potential release of hazardous materials is required. Key steps include identifying and characterizing material posing an airborne hazard, analyzing HAZMAT dispersion mechanisms over the required spectrum of events, determining geographical areas where airborne concentrations may exceed planning thresholds, and planning for an emergency response that provides for personnel protection and event mitigation.

Independent Oversight reviewed the methodologies and available records that describe how CHBWV established the technical basis and the commensurate emergency planning and preparedness activities. The review included walkdowns of Lag Storage, Main Plant, and RHWF; reviews of the hazards survey, EPHA, and emergency action levels (EALs); and interviews with personnel responsible for the development and maintenance of the emergency management program and facility operations. WVDP has one hazards survey and one EPHA for the site. The Lag Storage Facility became the focus of this review because Independent Oversight determined that it had a significant quantity of dispersible HAZMAT and was the most vulnerable facility on site for a release. The material at risk (MAR) for this review is located in Lag Storage Area 3 (LSA-3), which is a floor array in a portion of the building. The building is a single-story, steel-framed, open warehouse type building. The building's exterior walls are light metal panels with interior fiberglass insulation from floor slab to roof. The roof is metal decking, and the floors are concrete with a 6-inch-high dike around the perimeter.

Independent Oversight found that WVDP is appropriately characterized as requiring an OEHMP and uses acceptable methodologies to develop EALs, the emergency planning zone (EPZ), and pre-planned protective actions. However, the existing records and operating practices are not sufficient for Independent Oversight to conclude that an appropriate MAR quantity was analyzed in the EPHA; the available records indicate that the MAR quantity that was analyzed does not represent a conservative and limiting quantity of HAZMAT. Additionally, WVDP has not analyzed BDBEs to establish a bounding scenario as a basis for emergency planning with offsite authorities. The primary contributors to this non-conservative analysis are the lack of HAZMAT inventory control limits at the Lag Storage Facility, insufficient inventory and characterization records to determine the quantities of dispersible and non-dispersible HAZMAT assumed for the MAR, and the expert-based screening and analysis process used to develop and maintain the hazards survey and EPHA. Collectively, these weaknesses contribute to an inappropriate technical basis and result in an incomplete set of EALs and pre-planned protective actions, as well as an insufficiently sized EPZ, all of which limit WVDP's ability to provide for a conservative and well-planned response.

The hazards survey and the EPHA establish the technical basis for an OEHMP so that the site's emergency management program is commensurate with identified hazards. DOE Order 151.1C requires the hazards survey to identify the HAZMAT in all site facilities and to document the application of screening criteria to the hazardous chemicals and radioactive material in the site's inventory. The results establish whether sufficient quantities of HAZMAT are collocated in a dispersible form to warrant a further quantitative analysis in an EPHA. The hazards survey is also required to identify the types of initiating events for emergency planning purposes. Once the qualitative assessment of HAZMAT is complete, the HAZMAT that require further quantitative assessment may be either analyzed using a full spectrum of initiating events, or screened out from further analysis (under conditions clarified by the quantitative assessment). The quantitative analysis in the EPHA serves as the technical basis for EALs, pre-planned protective actions, and the EPZ. Important calculations in the EPHA include the ground level consequences exceeding the applicable protective action criterion (PAC) at the greatest distance from the source (referred to as distance to PAC), the distance where consequences exceed higher than PAC concentrations (known as the threshold for early lethality), and consequences at receptors of

interests, such as occupied buildings (on and off site) and spots where food and water supplies are located.

5.1.1 Hazards Surveys

CHBWV uses an expert-based process to develop and maintain its site hazards survey and, although adequate, does not make use of an administrative procedure. (See Section 8.0, **OFI-CHBWV-1**.) The hazards survey appropriately examines all site facilities and provides a record of how screening criteria were applied during the qualitative assessment process. The hazards survey appropriately screened out all site chemicals from a quantitative analysis and identified the need for a quantitative analysis of radioactive material. To ensure that hazardous chemicals arriving on site receive an appropriate review, a CHBWV emergency planner signs off on chemical purchasing requisition material review forms and thereby monitors changes in chemical inventories. The CHBWV emergency planner also monitors for HAZMAT in facilities during periodic tours as part of the expert-based process. The site's total radioactive material inventory is static, but the material is relocated as part of the site's ongoing decontamination and equipment removal activities. Because the hazards survey indicates that the Lag Storage Facility contains a significant quantity of dispersible radioactive material and Independent Oversight determined it to be the most vulnerable facility for a release, this facility became the focus of this Independent Oversight review.

The WVDP hazards survey also documents the types of event scenarios applicable to CHBWV's quantitative analysis required by DOE Order 151.1C. The vulnerabilities identified for the Lag Storage Facility are from tornados, earthquakes, floods, fires, malevolent acts, and explosions.

5.1.2 EPHA

With the exception of the MAR quantity analyzed, CHBWV uses acceptable methodologies for quantitatively analyzing the release scenarios that CHBWV determines to be appropriate and documenting the results in an EPHA. CHBWV uses an expert-based process and does not use an administrative procedure to develop and maintain the EPHA. Instead, the EPHA was developed and is maintained by using a mix of standards and guides intended for authorization basis documents, as well as emergency management planning and preparedness guides, even though these standards and guides serve different purposes and use different criteria. (See Section 8.0, **OFI-CHBWV-2**.) Except for the non-conservatively low MAR quantity (discussed below), the quantitative assessment calculates the source term, representing the breathable portion of HAZMAT, consistent with the instructions in the EMG. The airborne release factor and respirable fraction used in the source term calculation are consistent with the emergency management handbook for burning of confined and unconfined drummed TRU waste material. The source term is then appropriately converted to a total effective dose equivalent using a dose conversion factor, exposures are calculated using breathing rates established by the International Council of Radiation Protection, and airborne concentrations are calculated using Gaussian dispersion modeling software. Calculations are performed for average and 95^{th} percentile worst-case meteorological conditions of ground level releases in accordance with the EMG for use in developing planning and response documents.

The quantitative analysis generally follows the EMG guidance to calculate the maximum distances to PAC and thresholds for early lethality for use in developing EALs, pre-determined protective actions, the EPZ, and projected exposures at a limited set of receptors of interest. However, the small MAR quantity used to calculate the source term is carried over into the EAL and EPZ calculations and other emergency planning activities, may affect site emergency planning and response tools. In addition, the only receptors of interest identified in the EPHA are the site boundary and facility boundary (the 100 meter one-hour exposure). The EMG recommends calculating estimated exposures for receptors of interest within the

EPZ wherever there are occupied buildings and ingestion pathways. (See Section 8.0, **OFI-CHBWV-2**.)

In regard to the MAR quantity, Independent Oversight's reviews of the hazards survey, the EPHA, and the facility's operational storage and inventory practices indicates that the MAR quantity used for the Lag Storage bounding scenario is non-conservative. The MAR is TRU waste, primarily plutonium and americium, located in a single array that serves as a waste accumulation area. This area, known as the LSA-3 array, is part of the building's concrete slab floor in a designated portion of the building. Much of the TRU waste is stored in 55-gallon drums and packaged to meet DOE/WIPP-02-3122, *TRU Waste Acceptance Criteria for the Waste Isolation Pilot Plant* (WIPP), although it is not defense waste and thus will not be permanently stored at WIPP. Because no permanent repository has been identified for the TRU waste in Lag Storage, this storage area will continue to operate for an indefinite period. LSA-3 also contains other radioactive material stored in robust B25 boxes and shipping containers, and its inventory will continue to increase as site decontamination and equipment removal proceed.

The significant quantity of TRU waste collocated in the LSA-3 array is not controlled by administrative limits to ensure that facility conditions remain as assumed in the quantitative analysis. TRU is stored on tightly packed metal pallets that hold up to six 55-gallon drums and can be stacked four pallets high. No storage inventory limits were established for the facility, the array, a pallet, or a drum (see Section 8.0, **OFI-CHBWV-2**) because the authorization basis analysis concluded that the consequences from a design basis fire involving a MAR quantity of 2,100 plutonium equivalent curies (PE-Ci), representing the site's total low-level radioactive material inventory, is consistent with a hazard category 3 nuclear facility. CHBWV converted the inventory of different radioactive isotopes to the equivalent of plutonium-239 for ease of analysis and to provide conservative projected consequences, given the highly reactive nature of the plutonium-239 isotope. The design basis fire is a 150-gallon fuel pool fire that bounds a fire fueled by a diesel-powered forklift, one of which was in use at the facility during this review. However, the EPHA did not analyze a 2,100 PE-Ci MAR, contrary to EMG instructions recommending that the EPHA use the scenarios and corresponding source terms analyzed in facility safety analysis documents. (See Section 8.0, **OFI-CHBWV-3**.)

CHBWV does not use the facility inventory tracking system to ensure that MAR quantities remain as assumed in the EPHA quantitative analysis. Facility operators track waste inventory in LSA-3 by drum and total inventory in units of PE-Ci, consistent with the units used in the quantitative analysis; however, as noted, no storage limits are established. During the Independent Oversight review, the operator inventory tracking system had a total inventory of 241 PE-Ci, discounting 54 additional drums in the array pending tracking system updates. The tracking system indicated that five drums exceeded 10 PE-Ci and that the highest drum contained 32 PE-Ci. In contrast, the effective MAR quantity used in the source term calculation documented in the EPHA is 10 PE-Ci, which was arrived at by assuming the array contains only 100 PE-Ci and that only 10 percent of the material would be affected by a fire (an assumption attributed to administrative controls that are not further specified). WVNS-DSA-001, *Documented Safety Analysis for Waste Processing and Support Activities*, states that there are no design features or administrative controls to prevent a large fire in the LSA-3 array. DOE Order 151.1C Attachment 2, paragraph 3. b.(c), requires that the EPHA be updated before significant changes in the HAZMAT inventory occur, so that planning and preparedness activities can be completed in advance; thus, the EPHA should have been updated before LSA-3 exceeded 100 PE-Ci. Furthermore, because DOE Order 151.1C, Attachment 2, paragraph 3. b.(e), requires the EPHA to document the assumptions, methodology, models, and evaluation techniques used in the EPHA, the EPHA must describe or reference the administrative controls underlying the assumption that MAR would be reduced by 90 percent. (See **Finding F-CHBWV-1** and Section 8.0, **OFI-CHBWV-2** and **OFI-CHBWV-3**.)

Finding F-CHBWV-1: Contrary to the requirements of DOE Order 151.1C, the EPHA was not updated prior to significant increases to the radioactive material inventory in the LSA-3 array and

does not document the administrative controls credited in the EPHA evaluation to reduce the MAR quantity.

The CHBWV expert-based process does not result in a record of hazard characterization and screening performed after the qualitative assessment that is documented in the hazards survey. Independent Oversight discussions with CHBWV subject matter experts determined that they consider the 10 PE-Ci MAR quantity to be conservative because of the non-combustible nature of some of the contaminated waste material. Although most of waste is in the form of anti-contamination clothing, some of the waste is contaminated metal, and some of the waste has been grouted to keep it from dispersing. The subject matter experts indicated that because the 32 PE-Ci drum was grouted material and thus is non-dispersible, it can be screened out of the MAR quantity. Although the EMG allows elimination of substances that were originally retained for analysis during the hazards survey screening, this next level of hazard screening is expected to be included in the EPHA as a record of the new characterization. DOE Order 151.1C, Attachment 2, paragraph 2.b.(4) requires that the EPHA include or reference a description of the screening process and the results of its application to the HAZMAT in the facility. Guidance for performing additional screening during a quantitative assessment is provided in DOE G 151.1-2, *Technical Planning Basis*, paragraph 2.4. Furthermore, facility operators have no means to distinguish waste drums that contain dispersible forms from those that do not, so they cannot segregate and manage the waste in such a way that the collocated material remains within the assumptions used for the quantitative assessment. (See **Finding F-CHBWV-2** and Section 8.0, **OFI-CHBWV-2** and **OFI-CHBWV-3**.)

Finding F-CHBWV-2: Contrary to the requirements of DOE Order 151.1C, the EPHA does not include or reference a description of the screening process performed after the qualitative assessment.

Additionally, CHBWV did not analyze plausible severe events solely because of their low probability of occurrence, contrary to the instructions provided in DOE G 151.1-2, *Technical Planning Basis*, paragraph 2.5.1. The EMG instructs the analysis of extreme malevolent events and BDBEs in order to represent the upper end of the consequence spectrum. Consequently, these emergency events should not be excluded from EPHA analysis solely because of their low calculated occurrence probabilities or their designation as incredible or beyond extremely unlikely. Nevertheless, CHBWV did not perform a quantitative analysis of tornados, earthquakes, floods, and aircraft crashes, which were identified in the hazards survey because they were determined to be incredible events using authorization basis methodologies. Eliminating these scenarios solely based on their low probability of occurrence is in direct conflict with the instructions provided for compliance with DOE Order 151.1C requirements. Therefore, CHBWV has not implemented acceptable assessment techniques for completing the quantitative assessment.

Although the analyses for facility authorization basis and EPHAs have common initial methodologies, they diverge because they have different purposes and use different thresholds for exposure criteria. Typically, design basis events, referred to as operational accident events, are assessed during the facility safety analysis process set out in 10 CFR 830, *Nuclear Safety Management*, Subpart B, *Safety Basis Requirements*. Facility safety analyses are nearly always an incomplete representation of the Operational Emergencies for which emergency planning is required by DOE Order151.1C. Normally, a facility safety analysis does not assess statistically lower-probability, higher-consequence events and severe events that, from a facility-design standpoint, would be beyond credible. This facility-design approach to risk analysis eliminates several event initiators (e.g., sabotage, malevolent acts, terrorism, BDBEs) that are not appropriate for emergency planning. On the other hand, DOE Order 151.1C requires assessment techniques that consider a full range of events: emergency events that result from operation of the facility, accidents, sabotage, malevolent acts, and earthquakes or other severe natural phenomena, including BDBEs. Severe events (natural phenomena and external) and malevolent acts, considered as BDBEs, are

included in the EPHA because they represent the upper end of the consequence spectrum and warrant prompt recognition and response for event mitigation and protection of the health and safety of personnel. At WVDP, the CHBWV expert-based process concluded that no credible natural phenomena events can occur that would damage WVDP structures and that an aircraft crash was incredible; therefore, the consequences of these events were not projected. For malevolent acts, CHBWV considers the analysis of the design basis fuel-pool fire event to bound malevolent acts, so again, no further analysis was performed. With regard to malevolent events, the EMG instructs the analysis of scenarios that represent minor, moderate, and extreme malevolent acts, consistent with a spectrum ranging from vandalism, to sabotage, to terrorism. For severe events, such as an earthquakes, aircraft crashes, and extreme malevolent acts, the EMG instructs the use of the total facility inventory of HAZMAT as the MAR to establish the bounding scenario. In this case, the Lag Storage MAR should rise from 10 PE-Ci to 2,100 PE-Ci, in the absence of any LSA-3 HAZMAT limits or any further documented screening for non-dispersible materials. An analysis of this type is likely to identify the need for additional planning and preparedness activities with offsite authorities and the need to plan for a site evacuation. (See **Finding F-CHBWV-3** and Section 8.0, **OFI-CHBWV-2** and **OFI-CHBWV-3**.)

Finding F-CHBWV-3: Contrary to the requirements of DOE Order 151.1C, accepted assessment techniques for a quantitative assessment were not used to determine the extent and scope of the OEHMP.

5.1.3 Emergency Management Program

CHBWV has appropriately established an OEHMP based on the quantities of dispersible radioactive material. However, emergency planning and preparedness activities are not commensurate with site hazards because the justification of the small MAR used in quantitative analysis is not well documented and no analysis of severe events was performed.

5.1.4 EALs

CHBWV has established technically based EALs by following the guidance established in the EMG to calculate the distances to PAC and establish event categorization and classification levels for the events analyzed in the EPHA. WVDP procedures identify Alerts and Site Area Emergencies in their EAL set, and there is a provision for a General Emergency in case a public road that passes through site property cannot be closed within an hour, as allowed by DOE policy. The EALs are correctly based on projected exposures at the site and the facility boundaries. However, the quantitative analysis does not use a maximum allowable quantity and only uses a small MAR that is not well justified. In addition, the complete spectrum of events has not been analyzed. (See Section 8.0, **OFI-CHBWV-4** and **OFI-CHBWV-5**.)

5.1.5 Protective Actions

CHBWV has established pre-planned protective actions that are linked to EALs, which are based on the analysis contained in the EPHA as required by DOE Order 151.1C. However, concerns were identified with the MAR and the limited spectrum of events in the EPHA used to determine protective actions. In addition, pre-planned protective actions are not available for a complete spectrum of events. (See Section 8.0, **OFI-CHBWV-4** and **OFI-CHBWV-5**.)

5.1.6 EPZ

CHBWV established an EPZ following the guidance in the EMG, which uses the EPHA analysis to

determine calculated distances to PAC and threshold for early lethality. However, concerns were identified in with the MAR and the limited spectrum of events in the EPHA used to determine the EPZ. (See Section 8.0, **OFI-CHBWV-4** and **OFI-CHBWV-5**.) A larger EPZ may require additional planning for offsite populations, the EOC, and the fire station, as further discussed in Section 5.2.

Overall, CHBWV has developed a hazards survey and an EPHA to establish the technical basis of the WVDP emergency management program. The hazards survey appropriately identifies HAZMAT for a quantitative assessment and plausible scenarios for consequence analysis. However, the quantitative assessment does not analyze a well-justified and appropriate MAR quantity and does not analyze a complete spectrum of events. Currently, the inventory in LSA-3 exceeds the MAR quantity assumed in the quantitative assessment, and the bounding event scenario is a forklift fuel leak fire in the LSA-3 array. Contributing to this non-conservative analysis are the lack of an EPHA development and maintenance procedure, the absence of Lag Storage Facility inventory limits, undocumented screening of TRU waste following the qualitative assessment, and the use of statistical analysis to eliminate low-probability events from further evaluation. Consequently, the EALs and protective actions may be incomplete and non-conservative. Furthermore, the EPZ may be undersized and may not completely identify where further emergency planning is required.

5.2 Emergency Preparedness

Review Criteria:

The emergency management program organizational structure and administration is sufficient to provide effective implementation and control of all HAZMAT emergency events (DOE Order 151.1C and HSS CRAD 45-60).

DOE Order 151.1C requires that emergency planning include development and maintenance of emergency plans and procedures, including the identification of personnel and resources needed for an effective response. These plans and procedures must be closely coordinated and integrated with offsite authorities that support the response effort and receive DOE emergency response recommendations. DOE Guide 151-1-3, *Programmatic Elements*, provides detailed guidance for complying with these order requirements.

Independent Oversight reviewed the WVDP emergency plan that describes the site's emergency planning for their OEHMP. The primary focus areas in the emergency plan include the emergency response organization (ERO), protective actions, offsite interfaces, and event termination and recovery. The correlation among the emergency plan, BNA, EPHAs, FHA, and offsite assistance agreements was also examined. The BNA and FHA were not reviewed in depth, but only as important support documents for the emergency management program. However, this assessment identified conflicts and potential concerns in these documents and their implementation, and they merit a more comprehensive evaluation.

5.2.1 Emergency Plan

Independent Oversight determined that the WVDP emergency plan provides an adequate description of the WVDP OEBP. WVDP-022, *WVDP Emergency Plan*, serves as both the emergency plan and the hazardous waste contingency plan, and it generally describes the provisions for the response to an Operational Emergency. The WVDP emergency plan is also a technical safety requirement administrative controls program as identified in WVDP-146, *WVDP Technical Safety Requirements*. For an OEBP, the plan appropriately describes the 15 elements in varying levels of detail and references applicable emergency procedures where appropriate.

Nevertheless, Independent Oversight determined that the WVDP emergency plan provides an incomplete description of the OEHMP and, due to weaknesses in the technical planning basis, may not have fully established the extent of emergency planning needed for a comprehensive program. Further, Independent Oversight identified several significant gaps in emergency planning resulting from the incomplete quantitative analysis discussed in Section 5.1; consequently, CHBWV may have improperly determined there was no need for emergency planning and preparedness with offsite authorities, and may not have appropriately established and documented the minimum requirements and response capabilities. Additionally, the plan does not include some of the recommended content from DOE Guide 151.1-3, *Programmatic Elements*, for the 15 program elements necessary for a comprehensive description of the WVDP OEHMP. For example, the emergency plan does not:

- Describe the spectrum of bounding events and BDBEs used in WVDP emergency planning
- Accurately identify the distance to PAC determinations, based on bounding events, used in event classification, protective action decision-making, response planning, offsite interfaces, and recovery planning
- Discuss the response requirements and capabilities of the field ERO – West Valley Volunteer Hose Company (WVVHC) and Cattaraugus County HAZMAT response – for significant fires, HAZMAT, and rescue events
- Discuss planning for habitability of onsite command centers
- Describe the backup power systems available for emergency facilities and key equipment
- Describe the time required to staff the site emergency operations center (EOC) and the technical support center (TSC) during normal and off-duty hours
- Provide floor plans of the site emergency facilities, such as the EOC, TSC, and joint information center.

As a result, the plan provides an incomplete description of the WVDP OEHMP and does not establish the appropriate extent of emergency planning, including offsite emergency planning and preparedness. The descriptions provided in the emergency plan lack the level of detail recommended by the EMG and do not adequately address the DOE Order 151.1C requirement to identify the personnel and resources needed for an effective response. Other planning and preparedness weaknesses are described in more detail in the following paragraphs for the program elements examined during this review. (See **Finding F-CHBWV-4** and Section 8.0, **OFI-CHBWV-6**.)

Finding F-CHBWV-4: Contrary to DOE 151.1C, the emergency plan does not fully describe some fundamental aspects of the OEHMP and may not have fully established the extent of emergency planning needed for a comprehensive program.

Emergency Response Organization

The emergency plan adequately describes time-urgent initial response actions for the Plant Shift Operations (PSO) supervisor, who assumes the position of incident commander (IC), and the site ERO so that the command position responsible for taking appropriate actions throughout the event progression is readily understood among the IC, TSC, and EOC. Additionally, CHBWV appropriately pre-planned the transfer of command responsibilities among the IC, TSC, and EOC based on established criteria, and CHBWV and the DOE-WVDP have appropriately staffed the TSC and EOC with an adequate number of response personnel to support strategic incident management and coordination.

Nevertheless, the emergency plan does not include the minimum required capabilities of site field emergency response, as derived from DOE Order 420.1C, *Facility Safety*. Specifically, the emergency plan does not describe the minimum required capabilities for fire and emergency medical response

provisions that focus on the mitigation of HAZMAT events and the technical rescue operations identified in the BNA. Furthermore, CHBWV terminated onsite fire response capabilities in 2013, as documented in the April 2, 2014, BNA revision, and the decision to do so may have been based on an inappropriately small bounding event as discussed in Section 5.1. CHBWV eliminated the WVDP fire brigade, which had been trained to meet National Fire Protection Association (NFPA) 600, *Standard on Industrial Fire Brigades*, and documented an inappropriate conclusion that "the reduction in process hazards no longer warranted the need for maintaining the fire brigade to NFPA and OSHA [Occupational Safety and Health Administration] standards." Consequently, this action placed greater reliance on a response by the all-volunteer WVVHC and Cattaraugus County, based on an application of NFPA 1720, *Standard for the Organization and Deployment of Fire Suppression Operation, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments*.

Independent Oversight identified other potential gaps in field response planning that are beyond the scope of the current review. One such gap is the lack of specific response procedures for interior structural firefighting in the Lag Storage Facility, where TRU waste (some is fissile material) is stored, to address whether the use of water and/or foam by WVVHC is appropriate. Independent Oversight determined, through interviews of CHBWV personnel, that the WVDP IC would provide an expert-based decision on the use of water and/or foam to the WVVHC at the time of an event. The WVVHC would heavily rely on this expert-based information and direction from the WVDP IC because WVVHC also has no firefighting procedures specific to the WVDP facilities. Additionally, the emergency plan and BNA only describe a CHBWV response to an incipient-level fire, and neither the BNA nor the emergency plan clearly defines expectations for responding to fires beyond the incipient stage. For events beyond the incipient stage, planning is limited to a letter of agreement (LOA) between WVDP and the West Valley Fire District No. 1 for around-the-clock availability of emergency services to the WVDP and associated facilities. Emergency services include firefighting, medical, rescue, and other such services as may be available from the West Valley Fire District. Furthermore, CHBWV has not established and documented minimum requirements and response capabilities for the WVVHC and the emergency services to be provided by Cattaraugus County. Lastly, the LOA with the West Valley Fire District does not obligate offsite fire fighters to perform onsite interior structural firefighting in areas containing radiological material. Collectively, these gaps indicate a need for a more thorough review of the WVDP BNA and associated program elements through an appropriately scoped CRAD. (See Section 9.0, Follow-Up Items.)

Although WVDP consistently identifies fires, explosions, and other energetic events as the principal mechanisms for dispersing HAZMAT, the Lag Storage Facility is not equipped with fire detection or automatic suppression systems where HAZMAT is stored. The Lag Storage FHA identifies that "a partially sprinklered facility without fire rated separations cannot be considered an improved risk facility" and notes the lack of a fire alarm system. The original acceptance of this condition, as documented in the FHA, is based on an expected three-year operational life expectancy of the facility. The FHA further states and that "should the operational life of the facility be significantly extended, the retrofitting the facility with sprinklers is warranted." The original FHA, dated July 2005, documents the lack of sprinklers, which now significantly exceeds the projected three-year operational life expectancy, and there currently is no projected end date for Lag Storage to serve as a radioactive material accumulation area. (See Section 9.0, Follow-Up Items.)

Facilities and Equipment

Onsite command centers, such as the TSC and PSO Hub, are located within range of potentially harmful atmospheres and lack habitability systems, but the emergency plan does not designate alternate locations to safely perform TSC and PSO Hub functions if the primary locations are not habitable. DOE Order 151.1C requires planning to ensure that command centers are located in an area that is not exposed to harmful concentrations of airborne contaminants or that an alternate facility is designated where the

command functions can be safely performed. The EMG further identifies the use of habitability systems to comply with the order requirements. Habitability systems consist of a means to detect harmful contaminants, provide a breathable atmosphere, maintain reliable power supplies, and allow personnel to survive the initiating event. (See Section 8.0, **OFI CHBWV-7**.)

Protective Actions

The WVDP emergency plan adequately describes protective action strategies for events that still allow workers to safely remain on site. CHBWV has several mechanisms available to promptly determine and implement protective actions for responders and site personnel. CHBWV has adequate notification and communication systems to provide accurate, timely notice of off-normal events to response organizations, facility personnel, and co-located site workers and facilities. The emergency plan and implementing procedures clearly assign the IC or the emergency director the responsibility to order sheltering and relocation protective actions. Additionally, CHBWV routinely conducts personnel safety exercises that include sheltering and relocation protective actions.

However, CHBWV lacks a plan for sitewide evacuation and accountability of employees in case workers cannot remain safely on site. Emergency planning does not assign the responsibility for ordering a sitewide evacuation and does not address the unique circumstances of a sitewide evacuation, including the determination of a specific location where WVDP employees would assemble and the measures for personnel accountability and decontamination activities. The emergency plan also does not address transport for employees who lack their own transportation. (See Section 8.0, **OFI-CHBWV-8**.)

Termination and Recovery

The emergency plan provides only a limited description of event termination and recovery operations and lacks the planning and associated preparedness activities needed for an effective response. The plan describes the basic framework for emergency event termination and recovery operations but includes no plans and procedures for postulated severe events. These documents should include short-term recovery actions, such as considering infrastructure damage and outages that may impede the normal response of onsite or offsite responders. Preparedness activities include training, drill, and exercise activities to practice and validate response concepts. Independent Oversight noted that most WVDP exercises that required the demonstration of termination and recovery objectives focused only on the implementation of the termination checklist and the identification of an initial recovery organization. Similarly, CHBWV exercises that involved severe events did not postulate consequences that result in significant structural damage or building collapse and generate resource requirements that the WVVHC cannot meet. (See Section 8.0, **OFI-CHBWV-9**.)

CHBWV has appropriately implemented a confined space entry program that includes rescue capability with the onsite Operations Response Team; however, CHBWV has not adequately planned for broader technical rescue capabilities in accordance with NFPA-1670, *Standard on Operations and Training for Technical Search and Rescue Incidents*. The current BNA, which is not subject to approval by DOE-WVDP, does not identify important technical rescue capabilities, such as structural collapse, rope rescue, confined space, trench and excavation, and water search and rescue. Additionally, assistance agreements with offsite organizations do not identify technical rescue capabilities or the intent for offsite organizations to provide specific capabilities at WVDP. (See Section 8.0, **OFI-CHBWV-10**.)

Overall, CHBWV has developed an emergency plan that documents the emergency management program at the WVDP and describes the provisions for response to an Operational Emergency. However, CHBWV used an incomplete technical basis that omitted bounding events and BDBEs to establish the needed extent of emergency planning. As a result, CHBWV may have improperly determined there was

no need for offsite emergency planning and preparedness based on inappropriate bounding events. Likewise, CHBWV may not have appropriately established and documented minimum requirements and response capabilities for the full spectrum of bounding events and BDBEs. Expanding the bounding events would significantly change the technical basis and would affect emergency planning fundamentals, such as classification, protective action decision-making, response planning, offsite interfaces, and recovery planning.

5.2.2 Emergency Procedures

Independent Oversight reviewed the set of WVDP emergency procedures used to respond to an Operational Emergency, as well as the correlation between the emergency procedures, emergency plan, and mutual aid agreements (MAAs). Independent Oversight also examined the emergency management implementing procedures (EMIPs) that describe how the emergency plan must be implemented to determine whether they clearly state the roles, responsibilities, and requirements associated with program administration, EROs, individual positions, operations, and interfaces.

Independent Oversight determined that CHBWV has general procedures for key aspects of the emergency management program but uses an expert-based, rather than a process/procedure-based, approach to decision making for most emergency responses. The expert-based system relies more heavily on the ERO to implement the emergency plan and to make time-urgent decisions based on their expert knowledge of a given situation.

WVDP-139, *WVDP Emergency Management Implementing and Administrative Procedures*, contains both the emergency management administrative procedures and the EMIPs for tactical field response and strategic command response. CHBWV has three EMIPs:

- EMIP-101, *General Instructions*, applies to all personnel on site during an emergency
- EMIP-102, *Emergency Field Response*, describes field response to onsite emergency events and offsite transportation emergency events
- EMIP-103, *Emergency Operations Management*, describes EOC and TSC functions and activation procedures for various ERO personnel and facilities.

Additionally, offsite EROs do not have response procedures specific to the WVDP and must rely on close interaction with the IC for site-specific response information. Because CHBWV and the offsite responders may not anticipate the full spectrum of potential emergencies, the IC may need to make decisions based on his/her own expert knowledge of a given situation. (See Section 8.0, **OFI-CHBWV-11**.)

Overall, CHBWV has developed emergency management administrative procedures and EMIPs for tactical field response and strategic command response. However, CHBWV uses an expert-based, rather than a process/procedure-based, approach to decision making for most emergency responses. Additionally, the offsite EROs responding to WVDP events also generally rely on an expert-based approach. In the absence of performance data, Independent Oversight could not fully evaluate the effectiveness of this approach. However, the approach has weaknesses in that in an emergency, CHBWV and offsite responders may be required to make time-urgent decisions for which they have very limited expert knowledge.

5.2.3 Offsite Support Planning

Independent Oversight reviewed the emergency plan, procedures, and offsite agreements that describe WVDP's relationship with offsite emergency responders (i.e., fire departments, police departments,

ambulance services, and hospitals). The exercise after-action reports were also examined to identify any issues related to interfaces with these offsite responders.

Independent Oversight determined that WVDP has established mechanisms to promote effective response with offsite emergency responders and provides them with information about site hazards and opportunities for site tours, training, and participation in WVDP exercises. Additionally, written agreements with offsite organizations are in place, receive periodic review, and are up to date. However, the exercise program has not conducted exercises to validate some offsite response and recovery capabilities.

WVDP has established adequate interfaces with offsite medical and law enforcement services through written correspondence. The emergency plan lists the current LOAs and memoranda of understanding (MOUs) between WVDP and various emergency support agencies. These include:

- Bertrand Chaffee Hospital – LOA for Medical Services
- West Valley Fire District 1 – LOA for Emergency Services
- Bertrand Chaffee Hospital and WVVHC – LOA for Basic Life Support Unit
- Cattaraugus County Sheriff's Office – MOU for Law Enforcement Services
- Cattaraugus County Office of Emergency Services – MOU for Emergency Services
- Erie County Medical Center Corporation – LOA for Emergency Medical Services
- Mercy Flight, Inc. – LOA for Air Ambulance Service.

WVDP has established the means to interface with offsite organizations in a manner that promotes an integrated and coordinated interaction with those organizations. All of the LOAs and MOUs are up to date; the most current is the one with the Cattaraugus County Office of Emergency Services, which was updated in 2013 to clarify a change for HAZMAT response. Additionally, all medical facilities and emergency medical services have agreed to accept and treat contaminated, injured site personnel. CHBWV frequently coordinates with numerous state and local agencies and organizations, who routinely participate in training, drills, and exercises. For example, participants in the 2013 triennial emergency response exercise included WVVHC, Rural Metro Ambulance Service, Mercy Flight, Bertrand Chaffee Hospital, Erie County Medical Center, Cattaraugus County 911 Dispatch, and Cattaraugus County Sheriff's Office. The 2013 exercise also supported the Bertrand Chaffee Hospital's state-mandated patient influx exercise and included an exercise objective testing a medical surge for a mass casualty event at the WVDP.

However, the exercise program has not conducted exercises to validate the available radiological assistance program (RAP) and National Atmospheric Release Advisory Center (NARAC) capabilities that may be needed to assess the potential or actual offsite consequences of a WVDP HAZMAT event; these capabilities could be very important if the technical basis is revised to expand the extent of offsite planning. In addition, CHBWV has not invited or demonstrated the HAZMAT response (Cattaraugus County HAZMAT teams/contractors) capability. Furthermore, the WVVHC has not demonstrated or practiced potential elements of emergency response, including beyond-incipient firefighting tactics, inside WVDP HAZMAT facilities due to concerns about contamination of their equipment. Lastly, the site has not validated event termination and recovery beyond implementation of the termination checklist and identification of an initial recovery organization. (See Section 8.0, **OFI-CHBWV-12**.)

Overall, CHBWV provides offsite response organizations with information on site hazards, training, and invitations to participate in site exercises. CHBWV also has documented agreements with these organizations and ensures that they are periodically reviewed and updated as needed. However, the

exercise program has not validated some offsite response and recovery capabilities for which WVDP has very limited or no available onsite resources.

5.3 OE-1 Program Enhancements

Review Criteria:

The emergency management program has been updated to incorporate Fukushima lessons learned described in OE-1(OE-1 and HSS CRAD 45-60).

OE-1 states that all program offices, in coordination with responsible contractors, shall evaluate their site emergency management programs' response to severe accidents/events (including BDBEs) that could have a sitewide impact, using the guidance attached to OE-1. The evaluations are required to be complete by the end of calendar year 2014.

OE-1 also states that hazards surveys shall be updated, in accordance with the existing maintenance requirement, to include additional multi-facility, sitewide events identified through lessons learned from the Fukushima nuclear accident, and that the OEBP shall be adjusted accordingly. OE-1 provides recommendations to enhance OEBPs, as well as OEHMPs, in responding to BDBEs: establishing self-help programs that provide basic life-sustaining needs while isolated from offsite assistance; developing "walk-away" strategies to stabilize HAZMAT, delay safety degradation, or prevent further damage; preparing site evacuation plans; providing pre-determined delegations of authority, consistent with continuity-of-operations plans; and adding severe event scenarios, including multi-facility HAZMAT release scenarios, to the drill and exercise program.

CHBWV has completed the OE-1 assessment of the site emergency management program using OE-1 guidance. DOE Order 151.1C requires updating of hazards survey every three years; at WVDP, this update is due in 2016, at which time CHBWV will update the hazards survey with multiple-facility sitewide events, as required by OE-1. CHBWV did not implement any of the OEBP enhancements recommended by OE-1 because CHBWV, in agreement with DOE-WVDP, inappropriately considered the OE-1 events as not credible and not to warrant any emergency planning. (See Section 8.0, **OFI-CHBWV-13**.) However, CHBWV is still considering whether to plan for the possibility of a site evacuation as recommended by OE-1.

6.0 CONCLUSIONS

Independent Oversight noted some positive practices during its review of the WVDP emergency management program. The WVDP emergency plan adequately describes time-urgent response actions for the PSO and site ERO and the transfer of command responsibilities. WVDP has also established interfaces with offsite medical services, law enforcement, and other responders through site tours, training, LOAs, and MOUs. CHBWV has a notification and communication system adequate to provide accurate and timely notice to response organizations, facility personnel, and other workers.

However, Independent Oversight determined that the emergency management program's technical planning basis was not established using conservative methodologies, as stipulated by DOE policy documents, to identify planning and preparedness needs. The EPHA does not properly document how the MAR was determined or how certain HAZMAT was eliminated from the quantitative analysis. Additionally, contrary to DOE guidance, BDBE event scenarios were excluded from analysis based solely on low calculated probabilities of occurrence. Furthermore, the plans and procedures based on the current

EPHA may not support appropriate and conservative event categorization and classification, protective actions, and offsite notification.

The emergency plan does not adequately address several areas of response, possibly because CHBWV uses an experience-based, rather than a process/procedure-based, approach for the two areas evaluated during this review. This approach clearly had an adverse impact on the development of EHPAs, EALs, and the EPZ. Additionally, both onsite and offsite EROs that respond to WVDP events also rely on an experience-based approach. While Independent Oversight lacked the performance data to fully determine the effectiveness of this approach during this review, the experience-based approach may force CHBWV and offsite responders to make time-urgent decisions in areas where their expertise is very limited.

Recommendations and NFPA requirements (or equivalent compensatory measures) stated in the FHA and BNA applicable to Lag Storage fire prevention have not been implemented. Additionally, because the WVDP onsite fire brigade was eliminated, the site now relies solely on the limited capabilities of the WVVHC.

Going forward, WVDP is required to fully develop its EPHA processes; develop a strategy for risk management, hazard mitigation, response, and recovery; and clearly articulate that strategy in the emergency plan and associated procedures. Exercises should then be developed to validate plans, procedures, and training, while a robust readiness assurance process provides feedback. Additionally, the EMCBC needs to evaluate the effectiveness of the CHBWV emergency management program consistent with DOE Orders 226.1B and 151.1C.

7.0 FINDINGS

As defined in DOE Order 227.1, *Independent Oversight Program*, findings are significant deficiencies or safety issues 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. Findings may identify aspects of a program that do not meet the intent of DOE policy or Federal regulation. Corrective action plans must be developed and implemented for Independent Oversight appraisal findings. Cognizant DOE managers must use site- and program-specific issues management processes and systems developed in accordance with DOE Order 227.1 to manage these corrective action plans and track them to completion.

Finding F-CHBWV-1: Contrary to the requirements of DOE Order 151.1C, the EPHA was not updated prior to significant increases to the radioactive material inventory in the LSA-3 array and does not document the administrative controls credited in the EPHA evaluation to reduce the MAR quantity.

Finding F-CHBWV-2: Contrary to the requirements of DOE Order 151.1C, the EPHA does not include or reference a description of the screening process performed after the qualitative assessment.

Finding F-CHBWV-3: Contrary to requirements of DOE Order 151.1C, accepted assessment techniques for a quantitative assessment were not used to determine the extent and scope of the OEHMP.

Finding F-CHBWV-4: Contrary to DOE 151.1C, the emergency plan does not fully describe some fundamental aspects of the OEHMP and may not have fully established the extent of emergency planning needed for a comprehensive program.

8.0 OPPORTUNITIES FOR IMPROVEMENT

As discussed above in the results, this Independent Oversight review identified 13 OFIs. These potential enhancements 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 minor issues identified during the conduct of the review. In some cases, OFIs address areas where program or process improvements can be achieved through minimal effort. These OFIs should be evaluated by the responsible line management organizations and accepted, rejected, or modified as appropriate, in accordance with site-specific program objectives and priorities.

OFI-CHBWV-1: Consider establishing an administrative procedure for the development and maintenance of the hazards survey. Important attributes to include in this procedure are:

- Acceptable methodologies for conducting the survey, such as the scope of the hazards survey, facility walkdown instructions, the use of specific HAZMAT documents (e.g., Superfund Amendments and Reauthorization Act [SARA] Title III reports, chemical requisition documents, and material review forms), and reviews of inventory tracking systems.
- The frequency of document reviews, facility walkdowns, and required updates.
- Assignment of responsibilities for hazards survey development and maintenance tasks.
- Approval authorities that include signatories from the emergency management organization and the HAZMAT facility operations organization.
- Required records.

OFI-CHBWV-2: Consider establishing an administrative procedure for the development and maintenance of the EPHA. Important attributes to include in this procedure are:

- A description of information required by DOE Order 151.1C, such as facility descriptions and operations, types and forms of HAZMAT, acceptable analytical methodologies and tools, the spectrum of events required to be analyzed, and the expectations for using documented safety analyses, the BNA, and the FHA as part of the procedure development and maintenance process
- The expected results of the quantitative assessment for use in developing EALs, pre-planned protective actions, and the EPZ; establishing a complete set of receptors of interest; and developing projected exposures and plume arrival times at the receptors of interest
- Agreed-upon operating limits for emergency planners and facility operations to ensure that the assumptions used in the EPHA remain consistent with operating practices
- Assignment of responsibilities for EPHA development and maintenance
- Approval authorities that include signatories from the emergency management organization and the HAZMAT facility operations organization
- Required records, such as further screening of HAZMAT after completion of the qualitative assessment.

OFI-CHBWV-3: Consider improving the integration of the facility design and authorization basis, facility operations, and emergency planning to ensure that the emergency management program appropriately encompasses hazards and provides the appropriate level of personnel protection. In doing so:

- Establish HAZMAT inventory operating limits and well-understood design and/or administrative controls that are clearly documented in the EPHA and required to be implemented at the facility
- Establish a means to enable operating personnel and emergency planners to distinguish between containers storing dispersible and non-dispersible forms of HAZMAT

- Ensure that the scenarios and MAR quantities analyzed in the EPHA encompass all authorization basis analyses.

OFI-CHBWV-4: Consider developing an analyzed set of scenarios that represent low probability, high consequence events, consistent with the EMG instructions. In doing so:

- Do not eliminate plausible scenarios based solely on a low probability of occurrence
- Include natural phenomena scenarios that are BDBEs
- Include scenarios that cause releases from multiple facilities
- Include a set of intentional acts representing insider sabotage, malevolent acts, and terrorism.
- Include a determination of consequences from an event that could cause complete facility damage, such as a major earthquake or large aircraft crash, with a MAR representing the total allowable HAZMAT inventory
- Develop the required EALs, pre-planned protective actions, EPZ, and offsite planning based on the calculated exposures from these scenarios.

OFI-CHBWV-5: When addressing **Finding F-CHBWV-1**, consider the need to update the EALs, pre-planned protective actions, and the EPZ using the results from a well-justified and documented MAR quantity.

OFI-CHBWV-6: Consider improving emergency planning and preparedness by:

- Providing information to appropriate state and county agencies on the distance to PAC and plume arrival times at specific offsite receptors for the bounding event scenarios
- Coordinating offsite protective action recommendations (PARs) with appropriate offsite agencies, based on the analysis of scenario results documented in the EPHA
- Confirming that initial PARs provided to offsite authorities include the distance to PAC and reflect a bounding estimate of consequences, and ensuring that the PAR provides the time available for carrying out the protective action before the plume arrives
- Ensuring that offsite response planning results in a clear understanding of the actions expected of each interface agency and the information needed to respond effectively
- Establishing the response requirements and capabilities of the field emergency response organization (WVVHC and Cattaraugus County HAZMAT response) for significant fires, HAZMAT, and rescue events
- Providing a description of backup power systems available for emergency facilities and key equipment in the emergency plan
- Defining the time required to staff the site EOC and the TSC during normal and off-duty hours.

OFI-CHBWV-7: Consider designating alternate locations to perform TSC and PSO Hub functions in case they are not habitable.

OFI-CHBWV-8: Consider having a procedure for conducting a sitewide evacuation, including:

- How accountability would be conducted (e.g., within onsite facilities before exiting the site, outside at onsite assembly areas, or at a pre-determined offsite assembly location)
- Where employees would assemble off site
- How employees who lack their own transportation will be brought to the offsite assembly areas.

OFI-CHBWV-9: Consider improving site-specific planning for severe events by:

- Planning for response to severe events that could have a significant and widespread impact on the site and surrounding community emergency response infrastructure
- Integrating severe event response planning with applicable state and Federal catastrophic event plans
- Developing functional (e.g., protective force operations, power and utilities, fire protection, telecommunications, and shift operations) emergency response procedures, matrices, or checklists needed to respond to a severe event
- Developing a generic incident action plan template for a multiagency response at the WVDP; include in the template a statement of objectives, incident command system organization, tactics and assignments, and supporting materials (e.g., maps, communications plan, medical plan, traffic plan, and special precautions)
- Pre-determining the most likely types of additional resources needed by the site, the availability of those resources, and the logistical requirements once the resources arrive at the site
- Continuing to include severe event scenarios in the WVDP drill and exercise program
- Conducting tabletop exercises with appropriate Federal, state, and local response agencies and organizations that would respond to a WVDP event caused by a severe NPE, a manmade disaster, or terrorism
- Updating response plans and procedures to reflect information extrapolated from severe event planning workshops, drills and exercises, and lessons learned from past disasters.

OFI-CHBWV-10: Consider improving site-specific planning for technical rescue operations by:

- Establishing and documenting, in the BNA, the levels of functional capability, in accordance with NFPA-1670, for technical rescue operations (structural collapse, rope rescue, vehicle and machinery rescue, confined space rescue, and water and trench/excavation search and rescue)
- Establishing the minimum job performance requirements for personnel who provide a specific functional capability
- Documenting, in the BNA, specific functional rescue capabilities relied on through MAAs
- Providing a summary of technical rescue capabilities in the WVDP emergency plan.

OFI-CHBWV-11: Consider improving ERO decision-making for a broad range of emergency response events by:

- Establishing and documenting, in EMIPs, the expected actions of the IC and the field ERO to ensure that they can act decisively and avoid off-script actions (i.e., providing a criteria-based decision rationale that minimizes expert-based decision-making)
- Revising existing EMIPs to ensure that the immediate and subsequent expected response actions are clearly defined and that each procedure has clear direction for branching to other emergency response procedures
- Conducting drills with the IC and ERO to ensure that procedurally required actions are demonstrated for a variety of response scenarios
- Defining expected actions for extinguishing fires, including incipient and beyond-incipient stage fires, subsequent response if the fire is not extinguished, and actions to protect people.

OFI-CHBWV-12: To ensure validation of all emergency management program elements over a five-year period and to optimize the usefulness of annual exercises, consider:

- Using a scheduling matrix to assist with long-range planning for future exercises and short-range planning for the current year's exercises
- Ensuring that all response program elements are tested and validated over a five-year period

- Coordinating, via DOE-WVDP-, the participation of DOE radiological emergency response assets (e.g., NARAC, the Radiation Emergency Assistance Center/Training Site, and RAP) in the exercise plan, as appropriate.

OFI-CHBWV-13: Consider revisiting the enhancements recommended by OE-1 in light of the fact that emergency planning and preparedness activities are not to be rejected based on the credibility of an initiating event that is established solely on a calculated probability of occurrence.

9.0 FOLLOW-UP ITEMS

The LSA-3/LSA-4 Complex FHA outlines the NFPA fire protection requirements and recommendations applicable to that DOE facility. During the facility walkdown, it was observed that required fire protection equipment (fire detection, alarms, or sprinklers) was not installed and that diesel and propane forklifts were improperly stored. Because fire protection was outside the scope of the CRAD used for this evaluation, these deficiencies were not included as findings. However, these observations strongly indicate a need for an external fire protection assessment.

Additionally, the Independent Oversight program comprises only one element of DOE's multi-faceted approach to oversight as described in DOE Policy 226.1B, *Department of Energy Oversight Policy*. Because this review encompassed only selected emergency management elements identified in DOE Order 151.1C, future DOE oversight activities should consider focusing on other elements of the emergency management program, including readiness assurance, training and drills, exercises, termination, and recovery. After the EMCBC has completed a thorough program assessment of the WVDP emergency management program and validated corrective actions, Independent Oversight will again assess the program for compliance with DOE Order 151.1C.

Appendix A
Supplemental Information

Dates of Review

Onsite Review: April 7-10, 2014

Office of Enterprise Assessments

Glenn S. Podonsky, Director, Office of Enterprise Assessments
William A. Eckroade, Deputy Director, Office of Enterprise Assessments
Thomas R. Staker, Director, Office of Environment, Safety and Health Assessments

Quality Review Board

William A. Eckroade
Thomas C. Davis
Thomas R. Staker
Michael A. Kilpatrick

Office of Emergency Management Assessments Reviewers

Randy L. Griffin – Lead
John D. Bolling
Thomas Rogers

Appendix B
Key Documents Reviewed, Interviews, and Observations

Documents Reviewed

- 10 CFR 830, *Nuclear Safety Management*
- *2013 WVDP SARA 312 Tier II Emergency And Hazardous Chemical Inventory Report For The WVDP*
- Department of Homeland Security, *National Response Framework*, January 2008
- DOE Guide 151.1-2, *Technical Planning Basis EMG*, 7/11/07
- DOE Guide 151.1-3, *Programmatic Elements EMG*, 7/11/07
- DOE Guide 151.1-4, *Response Elements EMG*, 7/11/07
- DOE Guide 420.1-3, *Implementation Guide for DOE Fire Protection and Emergency Services Programs*, 9/27/07
- DOE Order 151.1C, *Comprehensive Emergency Management System*, 11/2/05
- DOE Order 227.1, *Independent Oversight Program*
- DOE Order 420.1C, *Facility Safety*, 12/4/12
- DOE Policy 226.1B, *Department of Energy Oversight Policy*
- EMIP-101, *General Instructions*, 10/30/13
- EMIP-102, *Emergency Field Response*, 1/22/14
- EMIP-103, *Emergency Operations Management*, 1/22/14
- HSS CRAD 45-60, Emergency Management Program Inspection Criteria and Review Approach Document, 2014 *Emergency Management Program Technical Basis and Emergency Preparedness Review*, Rev. 0, 2/13/14
- Letter, DOE to CHBWV, CHBWV Contract No. DE-EM0001529, Request for Review and Implementation of OE-1: 2013-01, 11/25/13
- Letter, CHBWV to DOE, Contract No. DE-EM0001529 Response to Request for Review and Implementation of OE-1: 2013-01, 11/13/13
- NFPA 600, *Standard on Industrial Fire Brigades*
- NFPA-1670, *Standard on Operations and Training for Technical Search and Rescue Incidents*, 2009
- NFPA 1720, *Standard for the Organization and Deployment of Fire Suppression Operation, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments*
- WV-3718, *Material Review Form*, Rev. 12
- WVDP *Emergency Readiness Assurance Plan*, Rev. 24, 10/3/13
- WVDP-022, *WVDP Emergency Plan*,12/18/13
- WVDP-065, *Manual for Radiological Assessment of Environmental Releases at WVDP*, Rev. 6, 4/26/12
- WVDP-139, *WVDP Emergency Management Implementing and Administrative Procedure*
- WVDP-146, *WVDP Technical Safety Requirements*, Rev. 10, 2/12/14
- WVDP-178, *WVDP Pre-Fire Plan*, Rev. 11, 9/26/12
- WVDP-193 *WVDP EPHA*, Rev. 22, 6/24/13
- WVDP-227, *WVDP Facility Identification and Categorization Matrix*, Rev. 26, 2/12/14
- WVDP-273, *WVDP Hazards Survey*, Rev. 16, 6/24/13
- WVDP-519, *WVDP Fire Protection Baseline Needs Assessment*, 4/2/14
- WVNS-CAL-388, *Accident Analysis for Aircraft Crash into WVDP Facilities*, Rev. 0, 5/10/12
- WVNS-DSA-001, *Documented Safety Analysis for Waste Processing and Support Activities*, Rev.7, 2/12/14
- WVNS-FHA-015, *Fire Hazards Analysis for the LSA-3/LSA-4 Complex*, Rev. 4, 6/6/12

Interviews

- CHBWV subcontractor Emergency Management Subject Matter Expert
- CHBWV Processing, Packaging, and Transportation Manager
- CHBWV Fire Protection Engineering
- CHBWV PSO Supervisor
- CHBWV Safeguards and Security Manager
- CHBWV Senior Emergency Management Specialist
- CHBWV Training Manager
- Waste Generators Services Principle Engineer
- DOE-WVDP Emergency Management
- DOE-WVDP Fire Protection Engineering
- DOE-WVDP Nuclear Safety Subject Matter Expert
- WVVHC First Assistant Chief

Observations

- Tours of the Main Plant, RHWF, and Lag Storage buildings
- Radioactive Waste Storage in the LSA-3 array