FINAL ENVIRONMENTAL ASSESSMENT FOR DENSE PLASMA FOCUS SIMULATOR AT WHITE SANDS MISSILE RANGE, NEW MEXICO

April 2024

Submitted by:

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U.S. ARMY WHITE SANDS MISSILE RANGE,
NEW MEXICO,
FINDING OF NO SIGNIFICANT IMPACT

NAME OF THE PROPOSED ACTION:
Environmental Assessment for Dense Plasma Focus Simulator at White Sands Missile Range, New Mexico

DESCRIPTION OF THE PROPOSED ACTION:
This environmental assessment (EA) has been prepared to analyze the affects from activities associated with installation and operation of a Dense Plasma Focus (DPF) Simulator at White Sands Missile Range (WSMR). Environmental analysis of the proposed action has focused on renovating buildings and DPF test operation activities. Test operation activities will occur within the two newly renovated buildings and will include the operation of the DPF Simulator as a neutron source for survivability testing of DoD mission-critical systems.

PURPOSE AND NEED: The purpose of the proposed action is to develop and provide a neutron radiation source for the Survivability, Vulnerability, and Assessment Directorate (SVAD) at WSMR. This test environment is needed to enhance survivability testing of DoD mission-critical military systems which will support United States security interests and those of allied forces.

ALTERNATIVES CONSISDERED:
Two alternatives to the proposed action were considered, including use of existing structures to house and control the complete DPF system and the no action alternative. The preferred alternative is to utilize existing structures to house the DPF and its components, including a control room and test space for personnel. Features of the facility will include a 24-meter-tall exhaust ventilation system to protect the workforce from radioactive emission. The location is a short distance from other SVAD test facilities at WSMR and would reduce transportation needs for systems requiring testing at multiple installations.

The No-Action Alternative would be to not install and operate the DPF Simulator at WSMR. This alternative would preclude environmental impacts associated with DPF Simulator installation and operation at WSMR. However, the no action alternative would not meet the neutron fluence requirements nor the need for enhancing the military defensive capabilities of U.S. and allied forces. In addition, the SVAD capabilities would continue to have limited abilities to keep pace with the increasing demand for neutron test environments and be limited to the Fast Burst Reactor.

ENVIRONMENTAL CONSEQUENCES: The Environmental Assessment (EA) contains the results of an impact analysis of the No-Action Alternative, Preferred Alternative, and Alternative 1 on the affected environment. Valued Environmental Components were analyzed in the EA. No significant impacts on the environment have been identified.

Migratory birds could utilize building entryways, eves, or rafters for nesting and overgrown vegetation can provide habitat for nesting birds. If construction or vegetation clearing are to be conducted during the nesting season, a nesting bird survey would be conducted to ensure no impacts to these species would occur.

U.S. ARMY WHITE SANDS MISSILE RANGE,
NEW MEXICO,
FINDING OF NO SIGNIFICANT IMPACT

The formal boundary of LC-33 was determined eligible as a Historic District, with the previous identified National Historic Landmark (NHL) boundary included within the LC-33 Historic District. One structure is not part of the NHL but is included within the LC-33 Historic District and was determined to be individually eligible to the National Register of Historic Places, in addition to being a contributing element of the LC-33 Historic District. The second structure was determined to be a contributing element to the district's significance but was determined not to be individually eligible.

The DPF facility is being designed in a way that preserves as much of the original site elements as possible. Most of the renovations are confined to the interior spaces of the two structures. WSMR Cultural Resource Program staff have reviewed the proposed modifications and have determined the proposed modification will not result in an adverse effect to any historic properties within the LC-33 Historic District.

CONCLUSIONS: The proposed action would result in no significant impacts on the environment. Accordingly, the U.S. Army and WSMR have determined that an environmental impact statement (EIS) pursuant to the National Environmental Policy Act is not required, and this Finding of No Significant Impact is hereby submitted. WSMR will follow all applicable federal, state, and local laws and regulations and best management practices.

3 JUL 24

GEORGE C. TURNER, JR.
COL, FA50
Commanding

Date

U.S. ARMY WHITE SANDS MISSILE RANGE
WHITE SANDS MISSILE RANGE, NEW MEXICO 88002-5048
ENVIRONMENTAL ASSESSMENT

TITLE: Dense Plasma Focus Simulator

PROPONENT:

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11 June 24
Date

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14. ABSTRACT
This environmental assessment (EA) evaluates the effects of establishing and operating a Dense Plasma Focus (DPF) Simulator at White Sands Missile Range (WSMR). The proposed action has been analyzed to determine environmental impacts that will occur due to these activities.
Mitigations are specified to diminish or eliminate impacts associated with the preferred alternative. Provided that the proposed activities and the environments in which they occur do not change, these activities will not have a significant impact on the environment. Therefore, a Finding of No Significant Impact (FNSI) on the environment has been concluded. Accordingly, the U.S. Army and WSMR have determined that an environmental impact statement pursuant to the National Environmental Policy Act (NEPA) is not required for the proposed actions described in this EA.

15. SUBJECT TERMS
Environmental Assessment (EA), National Environmental Policy Act (NEPA), Finding of No Significant Impact (FNSI), White Sands Missile Range (WSMR), Dense Plasma Focus (DPF), Survivability, Vulnerability, and Assessment Directorate (SVAD), and Major Range and Test Facility Base (MRTFB).

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LIST OF ACRONYMS

ACM	Asbestos containing material
ALARA	As low as reasonably achievable
ALI	Annual Limit Intakes
APE	Area of potential effect
ARMS	Archaeological Records Management System
BMP	Best Management Practices
CEQ	Council on Environmental Quality
CFM	Cubic feet per minute
CFR	Code of Federal Regulations
Ci	Curie
CONEX	Container Express
DAC	Derived Air Concentration
D-D	Deuterium – Deuterium
DoD	Department of Defense
DOPAA	Description of Proposed Action and Alternatives
DOT	Department of Transportation
DPF	Dense Plasma Focus
D-T	Deuterium Tritium
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FBR	Fast Burst Reactor
FONSI	Finding of No Significant Impact
Ft	Foot
HBMS	Hazardous Building Materials Survey
HT	Tritium Gas
HTO	Tritiated Water Vapor
HVAC	Heating Ventilating and Air Conditioning
IDS	Intrusion Detection System
IWFMP	Integrated Wildland Fire Management Plan
kCi	Kilocurie
LC	Launch Complex
LINAC	Linear Accelerator
LLW	Low-level Radioactive Waste
m	Meter
m3	cubic meters
m/s	Meters per second
MAB	Missile Assembly Building
mi2	square miles
mrem	Millirem
MRTFB	Major Range and Test Facility Base
NEA	Neutron Environment Analysis
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NRC	Nuclear Regulatory Commission
NRHP	National Register of Historic Places
PCB	Polychlorinated biphenyl
pCi	Picocurie
PE	Polyethylene
PPE	Personal Protective Equipment
RPPB	Real Property Planning Board
RDT&E	Research, Development, Testing and Evaluation

S&T	Science and technology
SAP	Satellite Accumulation Point
SDS	Safety Data Sheet
SME	Subject Matter Expert
SNDN5	San Andres weather station
SOP	Standard Operating Procedure
SV	Survivability and Vulnerability
SVAD	Survivability, Vulnerability and Assessment Directorate
Sq. ft.	Square Feet
T&E	Test and Evaluation
TEMF	Tactical Equipment Maintenance Facility
TES	Threatened Endangered or Sensitive
U.S.	United States
VEC	Valued Environmental Component
WSMR	White Sands Missile Range

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1.0 INTRODUCTION

This document evaluates possible environmental effects associated with the development and installation of a Dense Plasma Focus (DPF) Simulator capable of operating with tritium gas at a Major Range and Test Facility Base (MRTFB). A MRTFB is a designated core set of DoD research, development, testing and evaluation (RDT&E) infrastructure and associated workforce that must be preserved as a national asset to provide RDT&E capabilities to support the DoD acquisition system. Locating the DPF Simulator at White Sands Missile Range (WSMR) supports WSMR's role as a MRTFB.

This device was developed to electromagnetically compress a plasma, reaching energy densities high enough to achieve fusion (Figure 1). The DPF Simulator would be used to provide a neutron radiation environment for testing and evaluating effects on circuitry for military systems.

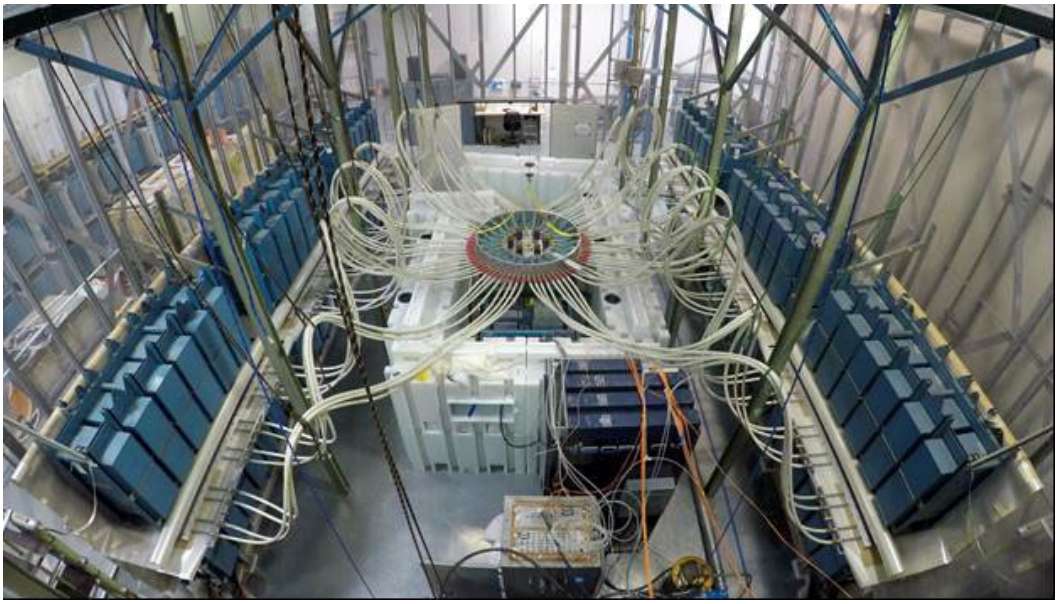

Figure 1. DPF Prototype Developed Under NDPF Project (Photo by Verus Research)

1.1 Tiering

Documents that have been reviewed and incorporated by references include:

- Final Environmental Impact Statement for Development and Implementation of Range-Wide Mission and Major Capabilities at White Sands Missile Range, New Mexico (WSMR EIS; WSMR 2009),
- White Sands Missile Range Integrated Natural and Cultural Resources Management Plan and Environmental Assessment 2015-2019 (INCRMP, WSMR 2015).

1.2 Purpose and Need

The Survivability, Vulnerability, and Assessment Directorate (SVAD) at WSMR was developed to provide simulated environments and technical expertise necessary to perform complete weapon effects tests and evaluation programs on military systems. Major weapon effects test facilities currently in place at WSMR include a Fast Burst Reactor (FBR), a Linear Electron Accelerator, an Electron Beam Accelerator, a Gamma Radiation Facility, and a Solar Thermal Test Facility.

WSMR requires additional capability for survivability testing. The current effort to develop a DPF Simulator as a neutron source for survivability testing of Department of Defense (DoD) mission-critical systems is the result of an effort to look for enhancements to the FBR. In 2011, the Neutron Environment Analysis of Alternatives Report commissioned by the DoD Science and Technology Reliance Panel identified the need for a fusion-spectrum, ultra-short-pulsed neutron test capability. A DPF appeared to be the most cost-feasible solution to fill this requirement if the technology could be matured. Since that time, the technology has developed considerably.

DPF Simulators can operate with different hydrogen isotopes; deuterium-tritium (D-T) neutron generators produce fusion reactions between deuterium and tritium, whereas deuterium-deuterium (D-D) neutron generators produce fusion reactions using only deuterium. While there are no occupational exposure limits established for deuterium, tritium is a beta-emitting radioactive isotope of hydrogen and as such is a regulated material. However, a D-D DPF Simulator does not produce the high yield and higher neutron energy that a D-T DPF provides. The addition of tritium increases the system's capacities to make it suitable for survivability and vulnerability testing of military systems. Successful testing and development of a D-T DPF will support United States (U.S.) security interests and those of allied forces.

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action (Preferred Alternative) - Install DPF in Existing Structures at WSMR Launch Complex 33

WSMR has been identified as the preferred MRTFB transition partner for a D-T DPF Simulator due to their significant experience and infrastructure related to Survivability and Vulnerability (SV) testing. WSMR's SVAD is recognized as the center of excellence and expertise for nuclear effects Test and Evaluation (T&E). After careful consideration of options, the preferred alternative identified was to utilize existing structures at WSMR to house the DPF Simulator and its components (Figure 2). Readily available utilities will further minimize cost. The preferred site was also identified due to its remote location and the sparse occupation of the area. The remote location, current infrastructure, and relative short distance from other radiation facilities (reducing transportation needs for systems requiring testing at multiple facilities) all factored into selection of the site.

The Proposed Action would require renovating and retrofitting the existing structures but would not include modifying the exterior of the structures. These structures are large enough to house all the necessary equipment for the DPF along with room for storage, a tritium lab, and the ability to expand testing capabilities in the future. The site would require new Heating Ventilating and Air Conditioning (HVAC) air handling units, 24 meter tall exhaust ventilation stack, new electrical transformer and emergency generator. The existing structure has concrete walls of sufficient thickness to serve as an added layer of radiation protection for workers during tests. This location is approximately 15 minutes away from the SVAD main campus. The relative short drive makes it ideal when other environments such as Gamma, X-Ray, and low dose radiation are needed to complete testing. The structures are in the historic district of Launch Complex (LC) 33.

2.1.1 Construction / Renovation Activities for the (Preferred Alternative)

Asbestos abatement was recently conducted in follow-up to a 2020 hazardous building materials survey (HBMS). Water and electric utilities are in place. Renovations will be confined to the interior of the building and include new interior lighting, new power outlets, new HVAC system for cooling/heating/outdoor air needs, and a new exhaust fan for the bathroom. Additionally, the existing bathroom will be re-furbished and a new fire alarm system with remote annunciation will be installed since one does not exist. If needed, the existing fire hydrant will be upgraded. Telecommunications for phone system and data will be provided. Road surfaces, parking surfaces, and existing exterior lighting will remain as is.

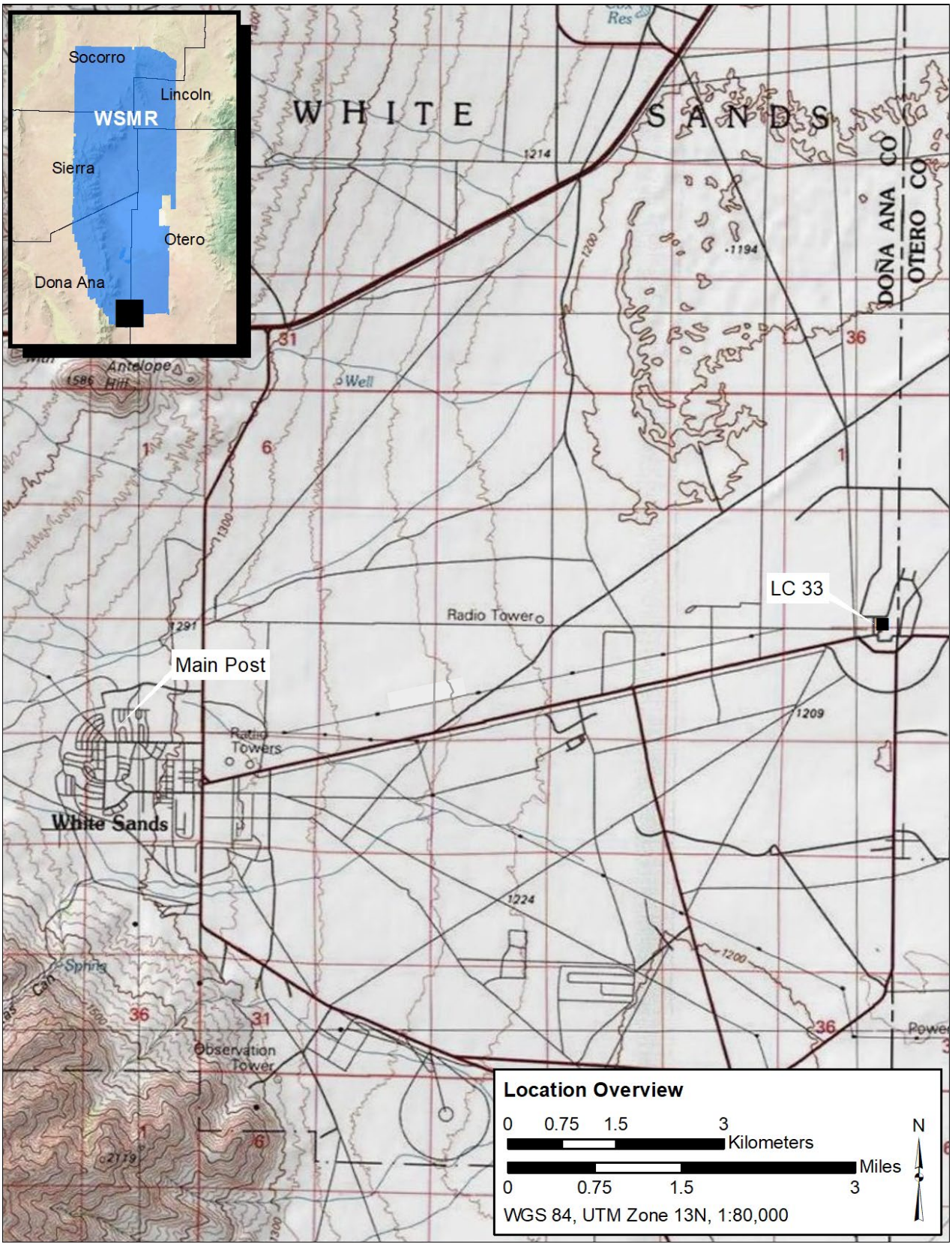

Figure 2. Location of LC-33 and Main Post

The DPF Simulator building will house the Tritium Lab Room, which includes the tritium hardware and ancillary hardware to support the DPF. It will also have storage space for spare parts and tools and clear areas designated for maintenance and equipment disassembly/assembly. A Gowning Room will be provided where personnel would change prior to and after exiting the Tritium Lab Room. Within the interior of the building, the capacitor power system and temporary storage for radiation and tritium contaminated low-level radioactive waste (LLW) would be located. For radiation shielding of neutrons to protect personnel, inside the building, a three-to-five-foot wall of borated polyethylene blocks surrounding all sides of the DPF simulator chamber will be installed. Outside the building, a new electrical transformer and emergency generator will be installed. The transformer will tie into existing power. A new 5ft diameter liquid nitrogen tank will be installed outside the building. Interior to the building, new power panel/breakers/disconnects, step down transformers, power outlets throughout, LED lighting throughout, exit lighting throughout, emergency lighting throughout would be installed.

For safety purposes new fencing and exterior lighting will be installed at the facility. Security measures will follow applicable Army regulations. During the construction/installation phase there may be a need for portable latrines and dumpsters for waste removal. Waste generated during construction would be hauled off to approved disposal locations. Small portable generators may also be used.

2.1.2 Site Operation Activities

Operation activities require the following personal for testing events and maintenance:

- One person to operate the DPF Controls
- One person to operate the Data Acquisition System
- One person Certified and Trained with Tritium Gas Operations
- One Physicist for support of chamber/plasma operation
- One maintenance person for support and troubleshooting
- Two radiation safety officers/personnel for monitoring

The DPF would be permitted to produce neutron radiation in the State of New Mexico. An appropriate neutron shielding consisting of a 3-to-5-foot wall of borated Polyethylene (PE) blocks surrounding all sides of the DPF simulator chamber will be installed. During testing, this room of borated PE blocks will be completely closed. For access to the DPF chamber, during non-testing times, one side of this wall will be movable and able to be opened. Neutron radiation sensing devices will be located inside the borated PE room to measure neutron fluence. Radiation sensors will be located outside of the testing cell and throughout the inside of the building to measure radiation levels.

Approximately 20 kilocuries (kCi) of tritium will be needed to operate the device with an estimated 40-60 kCi of tritium available onsite at a given time - the additional supply would be on hand for backup in the event a full system evacuation should be required due to contamination. Tritium detection sensors will be located in the main exhaust duct and throughout the facility in key locations. The Tritium Lab Room and the neutron shielding block PE room will be provided with continuous exhaust air 24/7 and cooled with 100% outside air. Two exhaust fans will be provided for redundancy in the event one fails. These two spaces will not recirculate any air to avoid contamination with any other spaces in the building and will be maintained at a negative air pressure with respect to adjacent spaces to prevent any migration of potentially contaminated air. Negative air pressure monitors will be provided to alert personnel of any abnormal conditions. Any tritium detected beyond allowable limits will activate alarm systems inside/outside of the test facility. A back-up generator will be provided to power critical and essential power loads to maintain exhaust air systems, tritium systems, and DPF systems in the event of a power failure. The DPF will be fitted with a recycling system to capture and reuse tritium, minimizing the need for tritium disposal. Transportation and storage of tritium or associated waste would comply with state and federal requirements.

2.1.3 Post-Operational Requirements

A Decommissioning Funding Plan will be developed and included with the permit application for Nuclear Regulatory Commission (NRC) licensing. The Decommissioning Funding Plan contains a site-specific cost estimate for decommissioning, describes the method for assuring funds for decommissioning, describes the means for adjusting both the cost estimate and funding level over the life of the facility, and contains the certification of financial assurance and the signed originals of the financial instruments provided as financial assurance.

2.2 (Alternative 1) – Install DPF at WSMR in One Existing Structure

This alternative would seek to utilize one existing structure on WSMR to completely house the DPF Simulator and its components. This location is a previously disturbed site with an existing structure to contain, ventilate, and monitor the DPF Simulator. Readily available utilities would minimize cost. The remote location of the site, current infrastructure, and relative short distance from other radiation facilities (reducing transportation needs for systems requiring testing at multiple facilities) all factored into the selection of the site as a potential alternative.

This alternative would require renovating and retrofitting the existing structure in addition to constructing new building space and a new 40-foot CONEX to accommodate all DPF equipment, ancillary equipment and tester control space. A single structure could be used to house some of the equipment for the DPF, but not all. While the existing structure is concrete, it would require internal radiation shielding from the effects of neutron generation. A complete upgrade of the electrical, mechanical, HVAC, plumbing, fire alarm and low voltage systems would be required. The disruptions to the site from the new building addition and new 40-foot CONEX container would be extensive.

After consideration, housing the DPF Simulator in a single existing structure was determined to be too small to avoid significant modifications to the historic as-built environment. Such modifications were expected to significantly delay construction timeframe, increase the facility modernization budget, and cause impacts to a historic site that could otherwise be avoided. The selection of a single structure to contain the DPF Simulator for the preferred alternative would not be practical.

2.3 No Action Alternative

The no action alternative would allow the DPF Simulator to remain in deuterium mode at the Albuquerque research facility where it was developed. Under this alternative, the DPF Simulator would not be disassembled and transported to a MRTFB, and it would not be converted to use with tritium. This alternative would preclude environmental impacts associated with installation and operation at a MRTFB. However, the no action alternative would not meet the neutron fluence requirements nor the need for enhancing the military defensive capabilities of U.S. and allied forces, and not serve the purpose for which this device is being developed. In addition, the SVAD capabilities would not keep pace with the increasing demand for neutron test environments and would be limited to the FBR.

3.0 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

3.1 Use of the Current DPF Facility in Albuquerque

The DPF Simulator currently being tested and evaluated for consideration for this program is located at a research facility in Albuquerque, New Mexico. This device is currently operating in D-D mode. One alternative evaluated was to convert the DPF Simulator from D-D mode to D-T mode and leave it at its current location. However, the current location is not permitted to operate with tritium and is not a MRTFB. Higher population density in the vicinity of the current facility, as well as lack of access to the military equipment and systems that need to be tested with the DPF Simulator, make this option unsuitable.

3.2 Construct New Building for DPF at FBR Facility on WSMR

The FBR facility on WSMR was considered as a potential location for installation of a DPF Simulator. However, the FBR facility requires a higher level of security than that which the DPF Simulator would require. Collocating the DPF Simulator in the same facility as the FBR would mean that the higher security measures would need to be implemented for those accessing the DPF Simulator as well. This would require allocation of additional security resources and would be less cost effective and more time consuming in getting equipment and personnel into the facility. It is not an effective use of resources, and the increased traffic into the higher security facility could lead to more room for a security error. Additionally, new construction would be necessary to accommodate a DPF Simulator at this location. This would cause additional ground disturbance and use of resources. New construction would be more costly, less efficient and require more time to construct, imposing an unnecessary impact on resources.

4.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES OF PROPOSED ACTION AND ALTERNATIVES

The Proposed Action and alternatives are being reviewed in accordance with Environmental Analysis of Army Action (32 CFR Part 651 [2002]), NEPA (United States Code [USC] 4331 et seq.), and the regulations of the President's Council on Environmental Quality (CEQ) that implement NEPA procedures (40 Code of CFR] 1500-1508). Potential adverse environmental impacts from the Proposed Action will be minimized by following prescribed mitigations. **Table 1** summarizes some of the key factors that contributed to the selection of the preferred alternative.

Table 1. Comparison Summary of Proposed Action and Alternatives

	CONVERT CURRENT FACILITY TO USE WITH TRITIUM	CO-LOCATE AT FBR FACILITY ON WSMR	NO ACTION – CONTINUE TO OPERATE AT CURRENT FACILITY WITH DEUTERIUM	USE ONLY ONE EXISTING STRUCTURE AT WSMR	USE OF TWO EXISTING STRUCTURES AT WSMR (PREFERRED ALTERNATIVE)
SAFETY	Densely Populated area poses increased risk to public Increased traffic importing military systems to area Inadequate shielding for tritium	Higher security requirements Increased traffic could increase security risks	Deuterium is less hazardous than tritium	Secure location Away from public Thick concrete walls for radiation shielding	Secure location Away from public Thick concrete walls for radiation shielding
COST	No new construction Permitting may be costly if not impossible Transporting military systems to facility for testing would be costly	New building construction Expensive security requirements Near other testing facilities reduces transportation costs	No cost	New construction expensive in addition to retrofit Reduces transportation costs since it is near other testing facilities High Cost of retrofitting and new construction Cost of mitigating historic site effects	More cost effective than new construction Reduces transportation costs since it is near other testing facilities Cost of renovating interior minor exterior.
RESOURCES	Minimal resources for construction More resources used in transporting military systems to location	Requires resources for new building construction	No resources for construction, would not be used for testing military systems	Some resources for sight improvements and construction	Some resources for site improvements
TIMING	Indefinite – facility is not likely to obtain a permit for tritium.	Permitting for tritium will take some time Permitting and constructing a new building will take a significant amount of time	N/A	Permitting will take some time Construction time shorter than building new facility Cultural resource mitigation may delay process extensively	Permitting will take some time Building changes/upgrades would not take as long as new construction Cultural mitigation expected to be minimal

	CONVERT CURRENT FACILITY TO USE WITH TRITIUM	CO-LOCATE AT FBR FACILITY ON WSMR	NO ACTION – CONTINUE TO OPERATE AT CURRENT FACILITY WITH DEUTERIUM	USE ONLY ONE EXISTING STRUCTURE AT WSMR	USE OF TWO EXISTING STRUCTURES AT WSMR (PREFERRED ALTERNATIVE)
DISTANCE	Far from other testing facilities/military systems needing tested	Close to other testing facilities/military systems needing tested	N/A	Close to other testing facilities/military systems needing tested	Close to other testing facilities/military systems needing tested
CULTURAL RESOURCES	Would not affect cultural resources	Site could be selected to avoid cultural resources	Would not affect cultural resources	Modifies individually eligible historic site	Affects historic site but does not require significant exterior modifications

Nineteen valued environmental components (VECs) were analyzed for potential environmental impacts under the Proposed Action. Table 2 summarizes the degree to which each VEC would be affected, and each was given a rating of very low, low, moderate, and high based upon opinions from environmental professionals on WSMR and other subject matter experts (SMEs) consulted. This section discusses the VECs in detail.

Table 2. Valued Environmental Components

VEC	RATING*	**Rationale/Special Considerations**
Land Use	Very Low	The proposed DPF location is within WSMR boundaries and falls within the Augmented Test Zone (Land Use Classification C) (WSMR 2009). The Proposed Action would not alter land use classifications.
Airspace	Very Low	No WSMR airspace will be required for DPF test activities.
Air Quality	Medium	The Proposed Action could increase fugitive dust slightly during the construction phase. The DPF ventilation system will be designed to protect the workforce from transient emissions in the work area. Emergency generator will only run during main power loss with minimal run time and may require a state air quality permit. Supplier shall provide a generator-engine that is certified by the engine-manufacturer to conform to the latest NSPS emission-standards, in accordance with 40 CFR Part 60. A corresponding EPA Certificate-of-Conformity shall be included with the purchased generator.
Cultural Resources	Low	The proposed structures are designated as historic buildings. Most of the renovations are confined to interior spaces. Exterior modifications would involve addition of a 79 ft tall vent stack, a new fence around the perimeter and concrete pads for transformer, generator, and nitrogen tank. Proposed exterior modifications are in-line with the historical context of the structures.
Geology / Soils	Very Low	Construction for this facility would impact soils from site preparation using heavy equipment. Total area of ground disturbance would be minimal as needed for trenching for utilities and concrete pad and fence installation. Best Management Practices (BMPs) may include application of dust suppressants and other soil erosion control measures.
Biological Resources	Medium	The Proposed Action would take place in a previously disturbed area. The clearing of vegetative overgrowth will have an impact to vegetation and animals locally around the DPF facility. Impacts to nesting birds will be mitigated through nest surveys. Proposed exterior lighting will be selected that mitigates impacts to migratory birds. Fencing may serve to exclude larger wildlife from radiation produced during testing. Animals in the vicinity could be affected by accidental tritium exposure, but it will not affect overall populations of any species.
Threatened and Endangered Species	Very low	Threatened, endangered or sensitive (TES) flora or fauna species are not expected to occur in the DPF project area.
Water Resources	Low	The Proposed Action would have a low effect on water resources. Any water needed for dust suppression during construction would be minimal. Water use at the facility will be limited to hand washing/restroom facilities for a small staff (approximately 2 to 10 people).

VEC	RATING*	**Rationale/Special Considerations**
Safety	Medium	The Proposed Action would follow all required WSMR and project safety Standard Operating Procedures (SOPs). Safety fencing, building walls and additional shielding will mitigate radiation exposure to staff during testing. Tritium will be stored in primary containment within secondary confinement equipped to ventilate away from the facility through a stack. The DPF structure will act as tertiary confinement and will not be occupied by staff during testing. Radiation exposure to anyone outside the facility is calculated to be less than 25 millirems (mrem) annually, even under emergency circumstances. Radiation exposure will be well below the limits set forth by the EPA and NRC.
Noise	Low	Noise from heavy equipment would be generated during site preparation. Proper hearing protection will be donned in accordance with SOPs.
Solid Waste	Low	Solid waste generated during construction and site operations such as trash and construction debris, will be disposed in coordination with Compliance, Solid Waste Management. If any asbestos, lead based paint and/or polychlorinated biphenyl (PCB) related waste is generated it will be disposed in accordance with Federal, State and WSMR regulations.
Hazardous Material & Waste	Moderate	Heavy construction equipment has potential for leaks or spills which would be addressed by SOPs. These will be handled in accordance with the WSMR Hazardous Waste Permit, State and Army regulations. Low Level Radioactive wastes will be generated during operations of the DPF as well as at the time of decommissioning. These will be handled in accordance with WSMR Radiation Permit and the NRC.
Facility and Infrastructure	Moderate	The Proposed Action would house the DPF within two existing WSMR buildings. The interior will be remodeled to support DPF testing. Existing electric and water utilities will be utilized. Exterior work will include a new exhaust stack. Several small concrete slabs will be added for nitrogen tank, transformer, and emergency generator. Existing electrical power pole has capacity for new renovation.
Transportation	Low	Transportation of tritium will follow applicable packaging and transport requirements as outlined by the U.S. Nuclear Regulatory Commission (10 CFR 71) and Army Regulation 11-9 (1999). Radioactive shipments regulated by Department of Transportation (DOT) 49 CFR will enter or depart WSMR through the inspection station bypassing populated areas. Traffic flow would be temporarily impacted during the construction/installation phase.
Socioeconomics	Very Low	The Proposed Action would have a small impact on socioeconomics, increasing the DPF workforce from 7-10 during testing.
Environmental Justice	Very Low	The Proposed Action would not adversely affect any residential or public areas – radiation exposure to anyone outside the facility is calculated to be less than 25mrem annually, even under emergency or off-normal circumstances.
Energy	Low	The Proposed Action would not significantly affect electrical energy consumption on WSMR.
Frequencies	Very Low	The Proposed Action would not require frequency coordination for test activities.
Wildland Fire	Low	The Proposed Action would have no significant effect on wildland fire potential. Integrated Wildland Fire Management Plan (IWFMP) (WSMR 2018) and SOPs for fire prevention will be followed. Mowing of overgrown vegetation as well as annual weed treatment and routine removal of wind-blown debris such as tumbleweeds from the fence line will reduce fire risk.
Greenhouse Gas & Climate Change	Very Low	There would be a slight increase in vehicle emissions during construction as vehicles would be used to transport parts and crews would work to install the DPF and upgrade the facility. Approximately 5-10 staff will be required only during testing events and maintenance activities which will cause a very minor increase in commuter traffic, offset by any prior driving routines of the individuals.

4.1 Air Quality

The building housing the DPF will require installation of a 24/7 exhaust air ventilation and radioactive emission collection system or a thorough assessment of potential routine and emergency emissions. (Cicotte 2020). Emissions will be addressed in the NRC license conditions. All tritium gas will be captured and recycled for reuse apart from an emergency release event where it will be exhausted.

The DPF ventilation system will be designed to protect the workforce from transient emissions in the work area. The ventilation system would collect air within the facility and discharge it through a vertical stack. The stack would be designed tall enough to ensure that in the event of an emergency, accident, or inadvertent release, the maximum concentration of tritium gas and/or tritiated water vapor entering the surrounding atmosphere where humans may be located would not exceed acceptable concentration levels.

The amount of radiation a person is exposed to is measured in doses of mrem. The average person is typically exposed to about 620 mrems per year from day-to-day activities and the environment in which they live. Standards set forth by the U.S. NRC allow exposures of up to 5,000 mrem per year for those

who work with and around radioactive material, and 100 mrem per year for members of the public. This amount is in addition to the radiation a person receives from natural background sources (NRC 2021). Regulations concerning Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of radionuclides for occupational exposure are discussed further in 10 CFR 20, Appendix B to Part 20.

The DPF system operates with a tritium gas fill pressure of much less than one atmosphere. The outside atmospheric pressure will be greater than the internal system pressure, therefore a fault case scenario will leak gas into the system rather than a significant amount of gas leaking out of the system. Therefore, the probability of a large tritium gas release from the system is unlikely. In general, the public dose limit is 100 mrem per year and regulatory guidelines limit the release to 25% of the limit or 25 mrem maximal dose exposure for a member of the public (Appendix A).

Software modeling was conducted to evaluate the highly unlikely scenario of a full release of tritium gas under test. It was determined that a conservative estimate of the worst-case scenario would be a full release of tritium under test with certain meteorological parameters (Appendix A). This would occur with an inversion layer capping the mixing height a few meters above exhaust stack, at freezing temperatures, with minimal (<0.25m/s) wind through the area. An inversion layer is a layer of atmosphere which tends to prevent the air below from rising, thus trapping any pollutants that are present. Analysis of the San Andres weather station (SNDN5) data indicates that these weather conditions occur about one day per year. Figure 3 shows the boundary within which dose greater than 15mrem are possible under these conditions. The results indicate that the maximum dose to the public does not exceed 25 mrem at any point and remains confined to the base area.

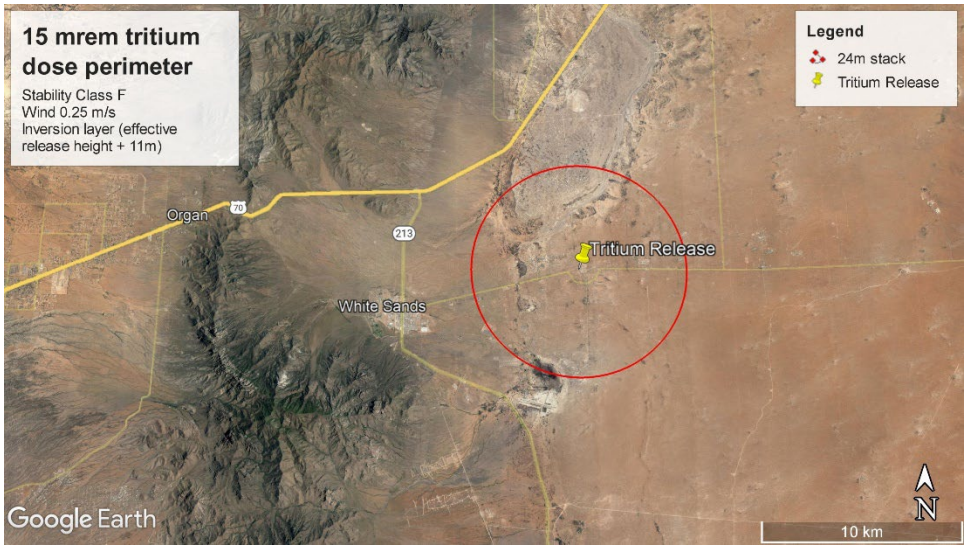

Figure 3. Map of tritium release zone for 0° F, 0.25 m/s (0.6mph)

The modeling results indicate that maximal doses are highest when wind speeds are very low with the worst-case scenario being a low-wind with a temperature inversion capping the mixing layer barely above the stack height. Using an exhaust velocity of 30 meters per second (m/s) (5000 cubic feet per minute [CFM]) with a 24 m exhaust stack and a prohibition of tritium operations when the wind speed is below 0.25 m/s precludes any receptor from receiving a dose exceeding 25 mrem.

For additional perspective, an incident occurred in 1974 at a Savannah River Plant that caused 479kCi of tritium to be released from an exhaust stack. This is many times higher than the total amount of tritium that would be onsite for the DPF facility at any time. The tritium in this instance reached the ground in a forested area. Potential radiation dose rates from this acute tritium release were evaluated and calculated in three different ways. In all accounts the potential dose a person could have received was calculated to be lower than 1 mrem (Watts, 1978).

4.2 Cultural Resources

The proposed area of potential effect (APE) for the proposed undertaking has been fully surveyed for historic properties. An electronic search of the archaeological records management system (ARMS) and WSMR archaeological database was conducted to identify any previously recorded cultural resources in the area. No prehistoric resources were identified; however, a portion of LC-33 was designated a National Historic Landmark (NHL) in 1983 due to its significance as the Nation's first major rocket launch facility and subsequent focal point of testing activities through the mid-1950s to today (WSMR 2009). A detailed inventory and National Register of Historic Places (NRHP) evaluation of the complete built environment at LC-33 was conducted between 2017 and 2020 (Myers and Esser 2020). The formal boundary of LC-33 was determined eligible as a Historic District, with the previous identified NHL boundary included within the LC-33 Historic District. One structure is not part of the NHL but is included within the LC-33 Historic District and was determined to be individually eligible to the NRHP, in addition to being a contributing element of the LC-33 Historic District. The second structure was determined to be a contributing element to the district's significance but was determined not to be individually eligible.

The DPF facility is being designed in a way that preserves as much of the original site elements as possible. Most of the renovations are confined to the interior spaces of the two structures. Exterior modifications would involve addition of a 79 ft tall vent stack, a new fence and three 6ft x 6ft concrete pads for transformer, generator, and nitrogen tank. No trenching between the buildings would occur, and interconnectivity requirements will use existing conduit paths.

WSMR Cultural Resource Program staff have reviewed the proposed modifications and have determined the proposed modification will not result in an adverse effect to any historic properties within the LC-33 Historic District.

4.3 Biological Resources

4.3.1 Flora

Vegetation consists mainly of shrubs of mesquite, yucca, snakeweed, four-wing saltbush, tarbush, and creosote intermixed with desert grasses of tobosa, bush muhly, dropseeds, black grama, Lehmann's lovegrass and alkali sacaton. Refer to **Section 3.7.3** of the WSMR EIS for information regarding flora of the region (WSMR 2010).

Existing roads and parking areas will not be upgraded but could be improved later. Some brush clearing or mowing is anticipated due to regrowth of vegetation during vacancy. Proposed activities such as mowing/grubbing, trenching and placement of small concrete pads would have minimal impacts to vegetation.

Whenever human activity in an area increases there is an increased potential for noxious and invasive plants to spread. Noxious and invasive plants also often take advantage of newly disturbed soils and often accumulate along fence lines. Appropriate steps would be taken to prevent the introduction or spread of noxious or invasive plants during construction, such as washing or removing vegetative debris from vehicles, boots, and equipment prior to use in new areas and sourcing fill dirt if needed from weed-free borrow pits.

During the operational phase of the DPF, there is potential for airborne emissions to be absorbed by surrounding vegetation. Tritium can become deposited on vegetation as it travels through air in the form of a gas, either as tritium gas (HT) or as tritiated methane. From there it can oxidize into tritiated water vapor (HTO) which can be absorbed by the vegetation. HTO can also fall onto plants in rain drops and be absorbed through the leaves or roots. Once in the form of HTO, it goes along with the movement of water in the environment (evaporating, precipitating, absorbing, and following surface water or groundwater movement). Tritium has a half-life of about 12.35 years. Experimental tritium exposure on various vegetables found no noticeable effect on biomass production (Boyer C, et al, 2009).

4.3.2 Fauna

Fauna occurring in the area include oryx, pronghorn, jackrabbit, pack rat and other rodents, and a variety of snakes, lizards, and birds consistent with mesquite shrub habitat. Refer to **Section 3.7.4** of the WSMR EIS for information regarding fauna of the region (WSMR 2010).

Vacant buildings can sometimes become habitation for wildlife. Both buildings identified for use show evidence of rodents. subject buildings will need to be decontaminated prior to use to prevent human exposure to hantavirus. Measures will be implemented to exclude rodents and other nuisance wildlife from entry. Migratory birds such as barn swallows could utilize building entryways, eves, or rafters for nesting and overgrown vegetation can provide habitat and cover for numerous species of migratory nesting birds. If construction or vegetation clearing or mowing activities are to be conducted during the nesting season, a nesting bird survey would be conducted to ensure no impacts to these species would occur. Overall, construction impacts would be minimal and are not likely to adversely affect wildlife populations. During operations, human activity in the area will also deter many species from using the area.

Lighting can affect birds and wildlife. Lighting will be designed in accordance with the New Mexico Night Sky Protection Act which requires that outdoor lighting be fitted with shielding that directs light downward, rather than upward or laterally to prevent sky glow and associated impacts to nocturnal migrating birds (WSMR 2015).

Mammals, birds, reptiles, insects, and other species of wildlife within proximity of the facility could experience an increased exposure to HT or HTO from facility emissions. Security fencing may serve to exclude larger wildlife from the facility. While the specific effects of a given exposure is not known for all species that could occur in the project area, increased tritium in the environment could impact animals in the vicinity. Any tritium released into the environment could become incorporated into organic matter. Animals could ingest organically bound tritium by eating plants or other animals in the area. Experiments on animals have shown that ingesting organically bound tritium can yield a dose that is twice as high as the comparable intake of tritiated water (Diabate, 1993). Tritium exposure can pose a risk of damage to DNA, with one study concluding that invertebrates are more sensitive to the effects of tritium than are vertebrates (Adam-Guillermin, 2012). Tritium does pose some health risks to animals if it is ingested or inhaled. The biological half-life ranges from around 7 to 14 days, so bioaccumulation of tritium is not a significant concern (Helmenstine 2021). Although individual animals in the area could be exposed to tritium, it would not have a significant effect on any population.

Operation of the DPF is not anticipated to have a significant effect on wildlife populations. Any potential emissions are unlikely and would occur only during an emergency release event in a relatively small area and over a brief period of time, lasting only a few minutes. Operational safety precautions are being designed to prevent such emergency release condition. The DPF exhaust stack would be designed tall enough to ensure that in the event of an emergency, accident, or inadvertent release, the maximum concentration of tritium gas and/or tritiated water vapor entering the surrounding atmosphere would not exceed acceptable concentration levels. Operation of the DPF system would not occur during periods of very low wind speeds with a temperature inversion layer barely above the stack height.

4.4 Safety

All required WSMR and project safety SOPs will be followed for construction and operations activities associated with the DPF. All appropriate personal protective equipment (PPE) would be utilized by personnel onsite. During testing, radiation will be emitted from the DPF. SVAD will develop and implement a Radiation Protection Plan. Safety fencing will be installed at an appropriate distance around the facility to keep people away from radiation hazards. Shielding will be implemented where appropriate based on building design. A warning system will be installed to alert workers in the event of an accidental tritium release or emergency. A backup generator will be installed to power essential systems in the event of a power failure, such as to power exhaust fans for ventilation. Clear zones, gates, and emergency exits

will be identified in safety planning documents. The building will be equipped with an exhaust ventilation system conducting 7 air changes per hour.

Tritium (Hydrogen-3) produces beta radiation, which is hazardous to humans, however it is the least radiotoxic of all nuclides with a low radiotoxicity or dose factor. Exposure limits would not exceed those found in the applicable federal and state regulations ([10 CFR Part 50, 10 CFR 20.1301(e), and 10 CFR 20.1301(a)(1)]). Limits are further discussed in **Appendix I**. SOPs would be in place to keep radiation exposure as low as reasonably achievable (ALARA) as well as below mrem limits established by the NRC (NRC 2019).

Tritium exposure can occur through ingestion, inhalation, puncture, wound skin contamination or absorption (University of Wyoming). Tritiated water is expelled from the human body with a biological half-life of approximately 10 days (Boyer C. et al, 2009). Information on safe handling practices for tritium is identified in the Safety Data Sheet (SDS) for tritium (University of Wyoming). The SDS should be obtained from the manufacturer and kept available onsite. Proper handling and storage precautions would be followed, and all precautions and lab practices outlined in the SDS and SOPs would be followed, including proper use of appropriate PPE such as use of appropriate glove layers. If an inadvertent exposure is known to occur, a urine bioassay would be used to evaluate intake. Tritium will be stored in primary containment within secondary confinement. The secondary confinement will have the ability to be vented away from the facility if the primary containment fails. Furthermore, the structure will serve as tertiary containment, with no staff present in the building during testing.

4.5 Hazardous Materials, Hazardous Wastes, and Low Level Waste

In 2020, a HBMS identified the presence of asbestos containing materials (ACMs), lead, and other hazardous materials which were subsequently removed from the facility through abatement (Zia 2020). The structures will require decontamination for rodent feces prior to use.

After the DPF is assembled at WSMR it will begin by operating in deuterium mode. Tritium will be introduced gradually to the process over a transition period of several months. Once fully operational, the facility is anticipated to produce approximately two hundred pounds of LLW annually (Verus 2021). LLW may include the DPF chamber or any components inside the chamber like anodes, reentrant port components, windows, or insulators (Brady 2021). Anodes and reentrant port are expected to be replaced every three months. The reentrant port will hold various test articles that will be monitored after exposure to determine if the test articles qualify as LLW but are not expected to be a significant contribution to the waste stream. These spent parts may be temporarily staged in a designated area within the facility while awaiting transport offsite. Joint Munitions Command would collect this LLW periodically along with LLWs from other WSMR facilities and haul it off for disposal. The NRC license conditions for LLW storage will be implemented. The DPF system will store any tritium gas waste (heavy water, protium) as part of the total system within the containment of the DPF itself and this gas waste is expected to be miniscule in amount. Minimal emissions would occur in compliance with permit and license conditions.

Other anticipated waste includes occasional failed capacitors (potentially hazardous waste but not considered LLW); approximately one to two capacitors per year are anticipated to be replaced. The need for a Satellite Accumulation Point (SAP) for hazardous waste during operations is anticipated. Storage and disposal of hazardous wastes would comply with state and federal requirements and regulations.

Liquid nitrogen, argon gas, helium, deuterium and other hazardous or potentially hazardous materials will be used onsite for operations and/or maintenance of the facility. SDSs will be available for hazardous materials and SOPs will be followed. Upon decommissioning, all exhaust ductwork, exhaust grilles, and exhaust fans (total of 2) would be disposed of as LLW.

4.6 Facilities and Infrastructure

The Proposed Action would house the DPF within two existing WSMR buildings. Existing electric and water utilities will be utilized. New interior work includes new LED lighting, power outlets, small HVAC units, and new fire alarm system. For exterior, small concrete slabs will be added for nitrogen tank, transformer, emergency generator. A new perimeter fence will be added. Existing electrical power pole has capacity for new renovation.

A Real Property Planning Board (RPPB) siting action will be submitted to DPW-Master Plans and approved prior to commencing construction activities. A cable locate request will be submitted prior to any exterior excavation to prevent damage to existing underground utilities.

4.7 Environmental Justice

The Proposed Action would occur on WSMR land isolated from the general population. The nearest housing is located at WSMR's Main Post, approximately 6.5 miles away. Facility design and quantities of hazardous materials being used ensures this is well outside of the limits of any potential hazard area from an inadvertent release of tritium emissions. The average person is typically exposed to about 620 mrems per year from day-to-day activities and the environment in which they live. Standards set forth by the U.S. NRC allow exposures of up to 100 mrem per year for members of the public in addition to the radiation a person receives from natural background sources (NRC 2021). Design modeling data shows that no populations would have the potential to be impacted anywhere near this threshold and exposure would be negligible (estimated at less than 25 mrem annually if an accidental release occurred) to any populations. Therefore, the Proposed Action would not disproportionately affect minority or low-income populations or children.

4.8 Greenhouse Gas Emissions and Climate Change

The Proposed Action would slightly increase greenhouse gas emissions from vehicles and heavy equipment during the construction and test phase. During testing, onsite staff could increase from 5 to 10 personnel which could cause a very slight increase in commuter traffic from surrounding communities to WSMR. Specific contributions from DPF construction and testing activities to global or regional climate change cannot be specifically identified based on existing scientific knowledge. Climate change processes are understood only at a general level. Activities at the DPF facility are minimal and would not be expected to have more than a negligible effect to climate change.

5.0 CUMULATIVE IMPACTS

CEQ defines cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7). These impacts can include any action taken by any federal or state agency, recognized Native American tribes, private entities, or local governments.

5.1 Impacts of the No Action Alternative

Selection of the no action alternative would avoid the cumulative impacts identified for the proposed action. Soil, biological, air quality, and other resources would remain essentially in their present conditions, without the additional burden of the proposed construction upgrades. The no action alternative would result in the least overall cumulative environmental impact.

5.2 Impacts of the Proposed Action

Other past, present, and foreseeable activities occurring within the project area include planned construction of three Missile Assembly Buildings (MAB), construction of a Tactical Equipment Maintenance Facility (TEMF), and construction of a temporary fueling building at LC-32. The MABs and TEMF construction are approximately 2 miles from the proposed DPF location and LC-32 is approximately 1.5 miles away. The MABS and TEMF facility will create approximately 75 acres of new disturbance and the temporary building at LC-32 and the DPF construction will occur within previously disturbed areas and would not add any new ground disturbance. These construction activities would all contribute cumulatively to impacts on the soils within this area, with slight increases in dust and soil erosion.

Soil disturbing activities from the Proposed Action alternative would also impact soils from site preparation using heavy equipment but would be confined to a previously disturbed area. Soil disturbance from construction would minimally increase the tendency for airborne dust. The implementation of BMPs including, but not limited to, dust suppression and other soil erosion control measures, would reduce the effects to soils and the impact would not be significant. Potential disturbance from the proposed action is not expected to have significant cumulative impact to soils and vegetation.

The Proposed Action to conduct DPF testing at the newly renovated buildings at LC-33 could increase fugitive dust emissions and emissions from vehicles slightly during the construction phase. Emergency generators will only run during main power loss with minimal run time. Emissions of unacceptable amounts of tritium gas from the DPF test facility are highly unlikely to occur. Exposure from an incidental release to anyone outside the facility is calculated to be less than 25 mrem annually, which falls below regulatory guidelines and are anticipated to be negligible. Potential increases in air emissions from the proposed action are not expected to have significant cumulative impacts on air quality.

6.0 CONCLUSION

This EA evaluates the impacts of establishing and operating a Dense Plasma Focus (DPF) Simulator at WSMR. The proposed action has been analyzed to determine environmental impacts that will occur due to these activities. Best management practices are proposed to reduce or eliminate impacts associated with the preferred alternative. Provided that the proposed activities and the environments in which they occur do not change, these activities will not have a significant impact on the environment. If the proposed actions and environmental conditions described in the EA do not change, and the BMP measures are followed, then these activities will not have a significant impact on the environment.

Therefore, a Finding of No Significant Impact (FNSI) on the environment has been concluded. The FNSI is included at the front of this EA. Accordingly, the U.S. Army and WSMR have determined that an environmental impact statement (EIS) pursuant to the NEPA is not required for the proposed actions described in this EA.

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Claudia Trueblood, Science Coordinator, Office of Strategic Initiatives env.review@env.nm.gov **New Mexico Environment Department** P.O. Box 5469 Santa Fe, NM 87502-5469 michaelene.kyrala@state.nm.us	Susan Rich Forest and Watershed Health Coordinator Forest and Watershed Health Office **EMNRD-Forestry Division** 4001 Edith Blvd. NE Albuquerque, NM, 87107 susan.rich@state.nm.us
Abe Franklin Surface Water Quality Bureau, Watershed Protection Section **New Mexico Environment Department** P.O. Box 5469 Santa Fe, NM 87502-5469 abraham.franklin@state.nm.us	Blake Roxlau Environmental Design Section Manager Environmental Design Division **New Mexico Department of Transportation** P.O. Box 1149 Santa Fe, NM 87504 blake.roxlau@state.nm.us
Mark Watson **New Mexico Dept. of Game & Fish** P.O. Box 25112 Santa Fe, NM 87504 mark.watson@state.nm.us	Stephanie Garcia Richard Land Commissioner **The New Mexico State Land Office** P.O. Box 1148 Santa Fe NM 87504 sgarciarichard@slo.state.nm.us 505.827.5760
Federal	
Susan Millsap **U.S. Fish and Wildlife Service** New Mexico Ecological Services Field Office 2105 Osuna Road NE Albuquerque, NM 87113-1001 nmesfo@fws.gov	Corrie Borgman Biologist **U.S. Fish and Wildlife Service** Migratory Birds P.O. Box 1306 Albuquerque, NM 87103-1306 Corrie_Borgman@fws.gov
Amy Lueders Regional Director **U.S. Fish and Wildlife Service** PO Box 1306 Albuquerque, NM 87103-1306 RDLueders@fws.gov	Robert Houston Compliance Assurance and Enforcement Division **U.S. Environmental Protection Agency** Region 6 1445 Ross Avenue, Suite 1200 Dallas, TX 75202 houston.robert@epa.gov
Jennifer Romero Refuge Manager **San Andres National Wildlife Refuge** **U.S. Fish and Wildlife Service** 5686 Santa Gertrudis Drive Las Cruces, NM 88012 jennifer_romero@fws.gov	Spencer Robison NEPA **Holloman AFB** **49th Civil Engineer Squadron** Asset Management Flight 49 CES/CEIE 550 Tobosa Avenue Holloman Air Force Base, NM 88330-8458 Spencer.robison@us.af.mil

Federal continued	
Marie Frias Sauter Superintendent **White Sands National Park** **U.S. National Park Service** P.O. Box 1086 Holloman Air Force Base, NM 88330 marie_frias@nps.gov	Scott Cooke District Manager **Las Cruces District Office** **Bureau of Land Management** 1800 Marquess Street Las Cruces, NM 88005-3371 wchildre@blm.gov
Yvette M. Waychus Environmental Division Chief **USAG Fort Bliss, DPW-ED** 624 Pleasonton Rd. Fort Bliss, TX 79916 Yvette.m.waychus.civ@army.mil	Mark Matthews, Field Manager **Socorro Field Office** **Bureau of Land Management** 901 S. Highway 85 Socorro, NM 87801-4168 blm_nm_comments@blm.gov
Libraries	
Alamogordo Public Library 920 Oregon Avenue Alamogordo, New Mexico 88310	Thomas Branigan Memorial Library 200 E. Picacho Avenue Las Cruces, New Mexico 88001

10.0 AGENCY COMMENTS

New Mexico Department of Game and Fish
Project ID: NMERT-3289

PROJECT INFORMATION

Project Title:	Draft Environmental Assessment and FONSI for Dense Plasma Focus Simulator at White Sands Missile Range
Project Type:	MILITARY, GENERAL (OPERATIONS, INFRASTURCTURE), NEW FACILITIES OR OPERATIONS AREAS
Latitude/Longitude (DMS):	32.401106 / -106.391364
County(s):	DONA ANA; OTERO
Project Description:	This Draft EA analyzes the affects from activities associated with installation and operation of a Dense Plasma Focus (DPF) Simulator at White Sands Missile Range. Environmental analysis focused on renovating buildings and DPF test operation activities. Test operation activities will occur within two newly renovated buildings and will include the operation of the DPF Simulator as a neutron source for survivability testing of DoD mission-critical systems.

REQUESTOR INFORMATION

Project Organization:	
Contact Name:	Ginny Seamster
Email Address:	virginia.seamster@dgf.nm.gov
Organization:	New Mexico Department of Game and Fish
Address:	1 Wildlife Way, Santa Fe NM 87507
Phone:	5056297738

OVERALL STATUS

This report contains an initial list of recommendations regarding potential impacts to wildlife or wildlife habitats from the proposed project; see the Project Recommendations section below for further details. Your project proposal is being forwarded to a New Mexico Department of Game and Fish (Department) biologist for review to determine whether there are any additional recommendations regarding the proposed actions. A Department biologist will be in touch within 30 days if there are further recommendations regarding this project proposal.

New Mexico Department of Game and Fish
Project ID: NMERT-3289

About this report:

- This environmental review is based on the project description and location that was entered. The report must be updated if the project type, area, or operational components are modified.
- This is a preliminary environmental screening assessment and report. It is not a substitute for the potential wildlife knowledge gained by having a biologist conduct a field survey of the project area. Federal status and plant data are provided as a courtesy to users. The review is also not intended to replace consultation required under the federal Endangered Species Act (ESA), including impact analyses for federal resources from the U.S. Fish and Wildlife Service (USFWS) using their Information for Planning and Consultation tool.
- This report contains information on wildlife species protected under the ESA and the Wildlife Conservation Act (WCA), Species of Greatest Conservation Need (SGCN), and Species of Economic and Recreational Importance (SERI). Species listed under the ESA are protected from take at the federal level and under the WCA are protected from take at the state level. SGCN are identified in the State Wildlife Action Plan (SWAP) for New Mexico; all of these species are considered to be of conservation concern but not all of them are protected from take at the state or federal level. The harvest of all SERI is regulated at the state level. The Department has no authority to designate critical habitat for species listed under the WCA; only the USFWS can designate critical habitat for species listed under the ESA.
- The New Mexico Environmental Review Tool (ERT) utilizes species observation locations and species habitat suitability models, both of which are subject to ongoing change and refinement. Inclusion or omission of a species within a report cannot guarantee species presence or absence within your project area. To determine occurrence of any species listed in this report, or other wildlife that may be present within your project area, onsite surveys conducted by a qualified biologist during appropriate, species-specific survey timelines may be necessary.
- The Department encourages use of the ERT to modify proposed projects for avoidance, minimization, or mitigation of wildlife impacts. However, the ERT is not intended to be used in a repeatedly iterative fashion to adjust project attributes until a previously determined recommendation is generated. The ERT serves to assess impacts once project details are developed. The New Mexico Crucial Habitat Assessment Tool, the data layers from which are included in the ERT, is the appropriate system for advising early-stage project planning and design to avoid areas of anticipated wildlife concerns and associated regulatory requirements.

New Mexico Department of Game and Fish
Project ID: NMERT-3289

Assessment and FONSI for Dense Plasma Focus Simulator at White

NIHNM, USGS, USFS, US Census Bureau, NMDGF
Esri, NASA, NGA, USGS
Texas Parks & Wildlife, CONANP, Esri, TomTom, Garmin, Foursquare, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA, USFWS

New Mexico Department of Game and Fish
Project ID: NMERT-3289

Special Status Animal Species Potentially within 1 Miles of Project Area

Common Name	Scientific Name	USFWS (ESA)	NMDGF (WCA)	NMDGF SGCN/SERI	USFS	USFS SCC	BLM
Barking Frog	Craugastor augusti			SGCN			
Northern Leopard Frog	Lithobates pipiens			SGCN	Sensitive Species	USFS R3 SCC	BLM SENSITIVE
Eared Grebe	Podiceps nigricollis			SGCN			
Clark's Grebe	Aechmophorus clarkii			SGCN			
American Bittern	Botaurus lentiginosus			SGCN			BLM WATCH
Common Black-Hawk	Buteogallus anthracinus		T	SGCN	Sensitive Species		BLM WATCH
Aplomado Falcon	Falco femoralis		E	SGCN			
Peregrine Falcon	Falco peregrinus		T	SGCN			BLM WATCH
American Peregrine Falcon	Falco peregrinus anatum		T	SGCN	Sensitive Species		
Snowy Plover	Charadrius nivosus nivosus			SGCN			
Long-Billed Curlew	Numenius americanus			SGCN			BLM WATCH
Yellow-Billed Cuckoo	Coccyzus americanus	LT		SGCN			
Western Burrowing Owl	Athene cunicularia hypugaea			SGCN	Sensitive Species	USFS R3 SCC	BLM SENSITIVE
Common Nighthawk	Chordeiles minor			SGCN			
Lewis's Woodpecker	Melanerpes lewis			SGCN		USFS R3 SCC	BLM WATCH
Southwestern Willow Flycatcher	Empidonax traillii extimus	LE	E	SGCN			
Bank Swallow	Riparia riparia			SGCN			
Pinyon Jay	Gymnorhinus cyanocephalus			SGCN		USFS R3 SCC	BLM SENSITIVE
Juniper Titmouse	Baeolophus ridgwayi			SGCN		USFS R3 SCC	BLM WATCH
Pygmy Nuthatch	Sitta pygmaea			SGCN			
Mountain Bluebird	Sialia currucoides			SGCN			
Bendire's Thrasher	Toxostoma bendirei			SGCN		USFS R3 SCC	BLM SENSITIVE
Sprague's Pipit	Anthus spragueii			SGCN			BLM SENSITIVE

New Mexico Department of Game and Fish
Project ID: NMERT-3289

Special Status Animal Species Potentially within 1 Miles of Project Area

Common Name	Scientific Name	USFWS (ESA)	NMDGF (WCA)	NMDGF SGCN/SERI	USFS	USFS SCC	BLM
Loggerhead Shrike	Lanius ludovicianus			SGCN		USFS R3 SCC	BLM WATCH
Bell's Vireo	Vireo bellii		T	SGCN			BLM SENSITIVE
Gray Vireo	Vireo vicinior		T	SGCN	Sensitive Species	USFS R3 SCC	BLM WATCH
Black-Throated Gray Warbler	Setophaga nigrescens			SGCN			BLM WATCH
Black-Chinned Sparrow	Spizella atrogularis			SGCN			BLM WATCH
Vesper Sparrow	Pooecetes gramineus			SGCN			
Chestnut-Collared Longspur	Calcarius ornatus			SGCN			BLM SENSITIVE
Cassin's Finch	Haemorhous cassinii			SGCN			BLM WATCH
Spotted Bat	Euderma maculatum		T	SGCN	Sensitive Species	USFS R3 SCC	BLM SENSITIVE
Pale Townsend's Big-Eared Bat	Corynorhinus townsendii pallescens			SGCN	Sensitive Species	USFS R3 SCC	BLM SENSITIVE
Mountain Lion	Puma concolor			SERI			
Mule Deer	Odocoileus hemionus			SERI			
Desert Bighorn Sheep	Ovis canadensis mexicana			SERI			
Gray-Checkered Whiptail	Aspidoscelis tesselata		E	SGCN			BLM SENSITIVE
Western Ribbon Snake	Thamnophis proximus		T	SGCN	Sensitive Species		
Rock Rattlesnake	Crotalus lepidus			SGCN			
Desert Massasauga	Sistrurus catenatus edwardsii			SGCN			

Common Name hyperlink takes you to species account in bison-m.org; Scientific Name hyperlink takes you to information in NatureServe Explorer; ESA = Endangered Species Act, C = Candidate, LE = Listed Endangered, LT = Listed Threatened, XN = Non-essential Experimental Population, for other ESA codes see this website; WCA = Wildlife Conservation Act, E = Endangered, T = Threatened; SERI = Species of Economic and Recreational Importance; SGCN = Species of Greatest Conservation Need; USFS = U.S. Forest Service, Sensitive Species = A species likely to occur on USFS lands that is of concern for a potential reduction in population viability; SCC = Species of Conservation Concern; BLM = Bureau of Land Management, BLM SENSITIVE = A species that occurs on BLM lands and whose viability is at risk, BLM WATCH = Species that may be added to the sensitive species list in future pending new information regarding species status.

Special Status Plant Species Potentially within 1 Miles of Project Area

Common Name	Scientific Name	USFWS (ESA)	NMAC	NMRPCS	USFS	USFS SCC	BLM
Organ Mountain Pincushion Cactus	Escobaria organensis		E	SS			BLM WATCH

NMAC = New Mexico Administrative Code, E = Endangered; NMRPCS = New Mexico Rare Plant Conservation Strategy, SS = NM Rare Plant Conservation Strategy Species; USFS = U.S. Forest Service, Sensitive Species = A species likely to occur on USFS lands that is of concern for a potential reduction in population viability; SCC = Species of Conservation Concern; BLM = Bureau of Land Management, BLM SENSITIVE = A species that occurs on BLM lands and whose viability is at risk, BLM WATCH = Species that may be added to the sensitive species list in future pending new information regarding species status.

New Mexico Department of Game and Fish
Project ID: NMERT-3289

Project Recommendations

Your proposed project activities may require a custom review for assessment of potential effects to wildlife. See the "OVERALL STATUS" section above to determine the likelihood that your project will be reviewed further based on its location. A Department biologist will confirm whether any additional conservation measures are needed. You should expect to receive any additional project recommendations within 30 days of your project submission. If the "OVERALL STATUS" section indicates that no further consultation with the Department is required based on its location, then you will only receive additional project feedback from the Department if a biologist deems it necessary.

Burrowing owl (*Athene cunicularia*) may occur within your project area. Burrowing owls are protected from take by the Migratory Bird Treaty Act and under New Mexico state statute. Before any ground disturbing activities occur, the Department recommends that a preliminary burrowing owl survey be conducted by a qualified biologist using the Department's burrowing owl survey protocol. Should burrowing owls be documented in the project area, please contact the Department or USFWS for further recommendations regarding relocation or avoidance of impacts.

Your project area intersects an Important Plant Area (IPA) that contains one or more species of plants listed as threatened or endangered by the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) under New Mexico Statutes Annotated (NMSA) 75-6-1 or by the USFWS under the federal ESA. Although IPAs have no legal designation, they have been identified as areas that support either a high diversity of sensitive plant species or contain the last remaining locations of New Mexico's most endangered plants. The Department recommends that you consult with EMNRD's Endangered Plant Program Coordinator regarding any state-listed plants and the USFWS's Information for Planning and Consultation (IPAC) system for any federally-listed plants and reaching out to the appropriate federal species lead(s) with the New Mexico Ecological Services Office of USFWS. The Department does not have any authority to designate or advise on state- or federally-listed plants.

Your project could affect important components of wildlife habitat, including fawning/calving or wintering areas for species such as deer and elk, or general high wildlife movement and activity areas for large mammals. Mitigation measures should focus on high use sites and movement areas based on collar data and expert knowledge of Department and land management agency personnel. Management recommendations within these areas may include the following.

- Restrictions on noise-generating activities during wintering and calving/fawning seasons, specific timing of which may vary throughout the state. These activities would include oil and gas well pad development and operations that expose wildlife to loud noises from drilling, compressors, and pumping stations within 400 feet of the source.
- Modifying fences along high use areas to make them wildlife friendly and facilitate large animal movement.

New Mexico Department of Game and Fish
Project ID: NMERT-3289

Disclaimers regarding recommendations:

- The Department provides technical guidance to support the persistence of all protected species of native fish and wildlife, including game and nongame wildlife species. Species listed within this report include those that have been documented to occur within the project area, and others that may not have been documented but are projected to occur within the project vicinity.
- Recommendations are provided by the Department under the authority of § 17-1-5.1 New Mexico Statutes Annotated 1978, to provide "communication and consultation with federal and other state agencies, local governments and communities, private organizations and affected interests responsible for habitat, wilderness, recreation, water quality and environmental protection to ensure comprehensive conservation services for hunters, anglers and nonconsumptive wildlife users".
- The Department has no authority for management of plants or Important Plant Areas. The New Mexico Endangered Plant Program, under the Energy, Minerals, and Natural Resources Department's Forestry Division, identifies and develops conservation measures necessary to ensure the survival of plant species within New Mexico. Plant status information is provided within this report as a courtesy to users. Recommendations provided within the ERT may not be sufficient to preclude impacts to rare or sensitive plants, unless conservation measures are identified in coordination with the Endangered Plant Program.
- Additional coordination and/or consultation may also be necessary under the federal ESA or National Environmental Policy Act (NEPA). Further site-specific mitigation recommendations may be proposed during ESA consultation and/or NEPA analyses or through coordination with affected federal agencies.

United States Department of the Interior
NATIONAL PARK SERVICE
White Sands National Monument
P.O. Box 1086
Holloman AFB, NM 88330
(575)479-6124

IN REPLY REFER TO:
L7619(WHSA)

March 12, 2024

Department of the Army
White Sands Missile Range
100 Headquarters Avenue
ATTN: MT-R Range Support
Mr. Jeffrey A. Smith
White Sands Missile Range, NM 88002-5000
Subject: Draft Environmental Assessment, Dense Plasma Focus Simulator

Dear Mr. Smith,

Thank you for the opportunity to review the White Sands Missile Range (WSMR) Test Center draft Environmental Assessment (EA) for Dense Plasma Focus Simulator at White Sands Missile Range, New Mexico.

Through the Organic Act of 1916, the National Park Service (NPS) is charged with protecting park resources for the enjoyment of future generations. White Sands National Monument was established on January 18, 1933 under the presidential proclamation of President Herbert Hoover "*for the preservation of the white sands and additional features of scenic, scientific, and educational interest ...*" , and the Monument was officially established as a National Park through the 2020 National Defense Authorization Act December 20, 2019 "*... to protect, preserve, and restore its scenic, scientific, educational, natural, geological, historical, cultural, archaeological, paleontological, hydrological, fish, wildlife, and recreational values and to enhance visitor experiences, there is established in the State the White Sands National Park as a unit of the National Park System.*"

NPS asks for information regarding the following:

1. In our review of the draft EA, NPS understands that the proposed structure and use will be contained to a closed facility. Please provide clarification.

2. NPS seeks further understanding about communication with local entities in the event of a contamination or an evacuation. Should accidental tritium release or emergency occur, what is the community communications plan? NPS requests communication and immediate notification.

We appreciate the opportunity to review the Draft EA. If you wish to reach me for clarification, please leave a message (575)479-6124 x210 or email me at marie_frias@nps.gov.

Sincerely,

MARIE SAUTER Digitally signed by MARIE SAUTER Date: 2024.03.12 18:22:04 -06'00'

Marie Frias Sauter

Superintendent

Cc:

David Bustos, Resources Program Manager, White Sands National Park, National Park Service

Karen Skaar, Environmental Protection Specialist, National Park Service Intermountain Region

From: Guerrero, Myra CIV USARMY ID-READINESS (USA) <myra.guerrero2.civ@army.mil>
Sent: Friday, March 22, 2024 4:07 PM
To: USARMY Garrison WSMR Environmental Assessments
<USARMYGarrisonWSMREnvironmentalAssessments@army.mil>
Cc: Offutt, Shane P CIV USARMY (USA) <shane.p.offutt2.civ@army.mil>; Garcia, Elisa CIV USARMY ID-READINESS (USA) <elisa.garcia15.civ@army.mil>
Subject: Fort Bliss Comments for the Environmental Assessment (EA) for a Dense Plasma Focus Simulator at, White Sands Missile Range, New Mexico

Good afternoon,

Fort Bliss thanks you for the opportunity to review the document. Attached are our comments.

Respectfully,

Mrs. Myra Guerrero

NEPA Program Manager

Directorate of Public Works

Environmental Division

Conservation Branch

Building 624, Room 126

624 Pleasonton Rd

USAG Fort Bliss, TX 79916

Desk: (915)568-1455

DSN: 978-1455

Ft. Bliss Comments

Common Comment and Response Worksheet (Version 3)

Date		Comment Identification					Draft Environmental Assessment-Finding No Significant Impact Dense Plasma Focus	
Item	Source	Section	Page	Para	Line	Class	Comment	Response
1.	Air Program Manager Rita Crites	4.0	9				Table 2. Greenhouse Gas & Climate Change analysis is only on vehicles and transportation during construction but not for operations. Has that been analyzed?	
2.	Air Program Manager Rita Crites	4.1	9				Was a Risk Management Plan for releases of Tritium gas provided?	
3.	Elia Perez-Fort Bliss CRM Program	9.0	23				Bill Childress is no longer the District Manager for the BLM-Las Cruces District Office. May want to double-check.	
4.								

MICHELLE LUJAN GRISHAM
GOVERNOR

JAMES C. KENNEY
CABINET SECRETARY

March 29, 2024

Department of the Army
US Army Garrison White Sands
Environmental Division (Bldg. 163/DPW)
ATTN: Customer Support Branch
White Sands Missile Range, New Mexico 88002-5000

Submitted electronically to: USARMYGarrisonWSMREnvironmentalAssessments@army.mil

RE: Draft Environmental Assessment to evaluate impacts associated with the Dense Plasma Focus Simulator at White Sands Missile Range.

Respected Acting Chief Smith,

The New Mexico Environment Department (NMED) reviewed the Draft Environmental Assessment to evaluate impacts associated with the Dense Plasma Focus Simulator at White Sands Missile Range (WSMR). NMED offers the attached comments for WSMR's consideration to ensure compliance with applicable federal and NMED regulations and standards during the proposed renovation and retrofitting of existing structures.

Strong intergovernmental coordination is essential to ensure protection of human health and the environment. In the attachment, NMED offers a few areas of potential environmental impacts for you to evaluate.

Thank you for providing the opportunity to review the project materials. Please reach out to us with questions or concerns you may have. We ask you to send all questions and comment requests to env.review@env.nm.gov, it helps expedite a timely review of your request.

Sincerely,

Jonas Armstrong Digitally signed by Jonas Armstrong Date: 2024.03.29 15:26:41 -06'00'

Jonas Armstrong, Director
Office of Strategic Initiatives

Attachment (1)

SCIENCE | INNOVATION | COLLABORATION | COMPLIANCE

1190 Saint Francis Drive, PO Box 5469, Santa Fe, New Mexico 87502-5469 | (505) 827-2855 | www.env.nm.gov

Attachment

Introduction

The New Mexico Environment Department (NMED) reviewed the Draft Environmental Assessment (Draft EA) to evaluate impacts associated with the Dense Plasma Focus Simulator at White Sands Missile Range (WSMR). The purpose of the proposed action is to develop and provide a neutron radiation source for the Survivability, Vulnerability and Assessment Directorate. According to the Draft EA, this test environment is needed to enhance survivability testing of Department of Defense (DoD) mission-critical military systems which will support United States security interests and those of allied forces.

Comments

Air Quality

NMED supports the use of radiation sensors at the facility and the use of Best Management Practices to minimize dust during construction outside the facility. In Section 2.1.2 Site Operation Activities (page 4) and Section 4.1 Air Quality (page 9), the Draft EA emphasizes the use of a 24/7 negative air pressure, non-recirculating air ventilation system in the tritium lab, tritium detection sensors, and tritium alarm systems to protect personnel from transient airborne exposure. On page 8 of the Draft EA, Table 2 highlights the use of Best Management Practices for dust suppression during trenching for utilities, site preparation for the three 6 ft. x 6 ft. concrete pads, and fence installation around the facility.

Table 2 also indicates a backup generator will provide power to maintain the exhaust air systems, tritium system, and the DPS system in the event of power failure. Reportedly, the generator engine will be "certified by the engine manufacturer to conform to the latest NSPS emission standards, in accordance with" federal regulation. In addition, other portable generators may be used during the construction/installation phase. We recommend that the White Sands Air Permit Contact be consulted regarding this project and the use of additional generators.

On page 2 of the EA, Section 2.1.1, regarding the preferred alternative, indicates "asbestos abatement was recently conducted in a follow-up to a 2020 hazardous building materials survey." Therefore, interior renovations should not encounter asbestos containing material, and an asbestos survey is not required prior to renovation work. However, any unexpected asbestos waste generated during this project must be properly handled. Asbestos waste is considered a special waste under NMED's Solid Waste Rules, which require unique handling, transportation, and disposal requirements to assure protection of the environment and the public health, welfare, and safety.

Petroleum Storage Tanks

The proposed project does not contain any actions that will impact storage tank systems currently regulated under NMED's relevant regulations (20.5 NMAC), but the request proposes the installation of an emergency generator. If the storage tank system for the generator is 1320 gallons and greater, then it is within NMED regulations and must meet installation requirements.

There are no facilities with active tank systems within ½ mile of the proposed site nor confirmed release sites that are active or directly associated with the outlined project area, only one confirmed release site with a "no further action" status within a ½ mile of the project area.

Release Name: HAWK Facility (Release ID: 2622; Facility ID: 31379), Facility Name is US Army LC 32 Building 20548 with an address of R5ET 225 511 QSE Black Hawk, White Sands Missile Range.

If an abandoned storage tank system or petroleum contaminated soil or water is discovered during construction, the Petroleum Storage Tank Bureau must be notified (20.5.118 NMAC, etc.). Contact the Leak of the Week here during business hours: https://www.env.nm.gov/petroleum_storage_tank/ (see box to the right, Report a Leak or Spill) or call 505-476-4397. During non-business hours, call 505-827-9329.

Facilities where NMED's petroleum storage tank database shows all petroleum storage tanks have been removed or closed and where the database does not show a release and facilities unknown to the Petroleum Storage Tank Bureau are not included in this comment.

Surface Water Quality

Construction activities may affect Surface Waters of the State as defined in 20.6.4.7 NMAC, which includes intermittent and ephemeral arroyos within the construction area and are subject to 20.6.4.97 and 20.6.4.98 NMAC. Thus, operations must ensure protection of all surface waters of the state at all times, including General Criteria at 20.6.4.13 NMAC, established to sustain and protect existing or attainable uses of surface waters of the State. Surface waters of the State shall be free of any water contaminant in such quantity and of such duration as may with reasonable to avoid the probability of injuring human health, animal or plant life or property, or unreasonably interfering with the public welfare or the use of property.

The Applicant is required to report all spills immediately to NMED as required by the New Mexico Water Quality Control Commission regulations (20.6.2.1203 NMAC). For non-emergencies during normal business hours, call 505-428-2500. For non-emergencies after hours, call 866-428-6535 or 505-428-6535 (voice mail, twenty-four hours a day). For emergencies only, call 505-827-9329 twenty-four hours a day (New Mexico Department of Public Safety).

In addition to the above regulatory standards, SWQB requires the following practices to avoid contamination and to protect surface and groundwater quality:

- Fuel, oil, hydraulic fluid, lubricants, and other petrochemicals must have a secondary containment system to prevent spills and should be stored outside of the flood-prone zone.
- Work should be performed, when practicable, in the dry season and postponed during wet and muddy conditions.
- Appropriate spill clean-up materials such as absorbent pads must be available on-site at all times during road construction, site preparations, drilling and reclamation to address potential spills.

General

Page 22 of the Draft EA incorrectly identifies the NMED's Environmental Impact Review Coordinator as Michaelene Kyrala. Please update the contact to Claudia Trueblood, Science Coordinator, Office of Strategic Initiatives, env.review@env.nm.gov.

Response to Agency Comments

Reviewer	Comment	Response
New Mexico Department of Game and Fish (NMDGF)	Overall Status - This report contains an initial list of recommendations regarding potential impacts to wildlife or wildlife habitats from the proposed project; see the Project Recommendations section below for further details. Your project proposal is being forwarded to a New Mexico Department of Game and Fish (Department) biologist for review to determine whether there are any additional recommendations regarding the proposed actions. A Department biologist will be in touch within 30 days if there are further recommendations regarding this project proposal.	Comments noted. No additional comments were received from the Department biologist.
White Sands National Park (WSNP)	In our review of the draft EA, NPS understands that the proposed structure and use will be contained to a closed facility. Please provide clarification.	The DPF system will be entirely housed within two existing WSMR buildings. All DPF test activities will occur within these indoor facilities.
WSNP	NPS seeks further understanding about communication with local entities in the event of a contamination or an evacuation. Should accidental tritium release or emergency occur, what is the community communications plan? NPS requests communication and immediate notification.	The Proposed Action would not adversely affect any residential or public areas – radiation exposure to anyone outside the facility is calculated to be less than 25 mrem annually, even under emergency or off-normal circumstances. Radiation exposure will be well below the limits set forth by the EPA and NRC. But if necessary WSMR would notify all potentially affected parties.
Fort Bliss Environmental Division (Air Program Manager)	Table 2. Greenhouse Gas & Climate Change analysis is only on vehicles and transportation during construction but not for operations. Has that been analyzed?	Operation of the DPF system requires the use of electrical power which will primarily come from existing firm power sources. Some air emissions would come from infrequent use of an emergency generator which will only run during main power loss with minimal run time.
Fort Bliss Environmental Division (Air Program Manager)	Was a Risk Management Plan for releases of Tritium gas provided?	Standard Operational Procedures (SOP) are currently being developed and will be in place prior to the operation of the DPF facility to keep radiation exposure as low as reasonably achievable (ALARA) as well as below mrem limits established by the NRC.
Fort Bliss Environmental Division (CRM Program)	Bill Childress is no longer the District Manager for the BLM-Las Cruces District Office. May want to double-check.	Replaced Bill Childress with Scott Cooke as BLM District Manager
NMED	The New Mexico Environment Department (NMED) reviewed the Draft Environmental Assessment to evaluate impacts associated with the Dense Plasma Focus Simulator at White Sands Missile Range (WSMR). NMED offers the attached comments for WSMR's consideration to ensure compliance with applicable federal and NMED regulations and standards during the proposed renovation and retrofitting of existing structures.	NMED comments provided regulatory guidance for air quality, petroleum storage tanks and surface water quality. The project proponent will comply with all State and Federal regulations as indicated.

11.0 PROOF OF PUBLICATION

Las Cruces Sun News.
PART OF THE USA TODAY NETWORK

Affidavit of Publication
Ad # 0005880401
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ENVIORNMENTAL DIVISI ON BUILDING
BUILDING 163 SPRINGFIELD ST.

WHITE SANDS MISSILE RANGE, NM 88002

I, a legal clerk of the **Las Cruces Sun News**, a newspaper published daily at the county of Dona Ana, state of New Mexico and of general paid circulation in said county; that the same is a duly qualified newspaper under the laws of the State wherein legal notices and advertisements may be published; that the printed notice attached hereto was published in the regular and entire edition of said newspaper and not in supplement thereof in editions dated as follows:

02/23/2024

Despondent further states this newspaper is duly qualified to publish legal notice or advertisements within the meaning of Sec. Chapter 167, Laws of 1937.

Legal Clerk

Subscribed and sworn before me this February 23, 2024:

State of WI, County of Brown
NOTARY PUBLIC

My commission expires

KATHLEEN ALLEN
Notary Public
State of Wisconsin

Ad # 0005880401
PO #: Public Notice
# of Affidavits 1

This is not an invoice

U.S. ARMY WHITE SANDS MISSILE RANGE,
NEW MEXICO,
DRAFT FINDING OF NO SIGNIFICANT IMPACT

NAME OF THE PROPOSED ACTION:
Environmental Assessment for Dense Plasma Focus Simulator at White Sands Missile Range, New Mexico

DESCRIPTION OF THE PROPOSED ACTION:
This environmental assessment (EA) has been prepared to analyze the affects from activities associated with installation and operation of a Dense Plasma Focus (DPF) Simulator at White Sands Missile Range (WSMR). Environmental analysis of the proposed action has focused on renovating buildings and DPF test operation activities. Test operation activities will occur within the two newly renovated buildings and will include the operation of the DPF Simulator as a neutron source for survivability testing of DoD mission-critical systems.

PURPOSE AND NEED: The purpose of the proposed action is to develop and provide a neutron radiation source for the Survivability, Vulnerability, and Assessment Directorate (SVAD) at WSMR. This test environment is needed to enhance survivability testing of DoD mission-critical military systems which will support United States security interests and those of allied forces.

ALTERNATIVES CONSISDERED:
Two alternatives to the proposed action were considered, including use of existing structures to house and control the complete DPF system and the no action alternative. The preferred alternative is to utilize existing structures to house the DPF and its components, including a control room and test space for personnel. The location is a short distance from other SVAD test facilities at WSMR and would reduce transportation needs for systems requiring testing at multiple installations.

The No-Action Alternative would be to not install and operate the DPF Simulator at WSMR. This alternative would preclude environmental impacts associated with DPF Simulator installation and operation at WSMR. However, the no action alternative would not meet the neutron fluence requirements nor the need for enhancing the military defensive capabilities of U.S. and allied forces. In addition, the SVAD capabilities would continue to have limited abilities to keep pace with the increasing demand for neutron test environments and be limited to the Fast Burst Reactor.

ENVIRONMENTAL CONSEQUENCES: The Environmental Assessment (EA) contains the results of an impact analysis of the No-Action Alternative, Preferred Alternative, and Alternative 1 on the affected environment. Valued Environmental Components were analyzed in the EA. No significant impacts on the environment have been identified.

Migratory birds could utilize building entryways, eves, or rafters for nesting and overgrown vegetation can provide habitat for nesting birds. If construction or vegetation clearing are to be conducted during the nesting season, a nesting bird survey would be conducted to ensure no impacts to these species would occur.

The formal boundary of LC-33 was determined eligible as a Historic District, with the previous identified National Historic Landmark (NHL) boundary included within the LC-33 Historic District. One structure is not part of the NHL but is included within the LC-33 Historic District and was determined to be individually eligible to the National Register of Historic Places, in addition to being a contributing element of the LC-33 Historic District. The second structure was determined to be a contributing element to the district's significance but was determined not to be individually eligible.

The DPF facility is being designed in a way that preserves as much of the original site elements as possible. Most of the renovations are confined to the interior spaces of the two structures. WSMR Cultural Resource Program staff have reviewed the proposed modifications and have determined the proposed modification will not result in an adverse effect to any historic properties within the LC-33 Historic District.

CONCLUSIONS: The proposed action would result in no significant impacts on the environment. Accordingly, the U.S. Army and WSMR have determined that an environmental impact statement (EIS) pursuant to the National Environmental Policy Act is not required, and this Finding of No Significant Impact is hereby submitted. WSMR will follow all applicable federal, state, and local laws and regulations and best management practices.

POINT OF CONTACT: The environmental assessment which supports this Finding of No Significant Impact is available for public reading at the following locations: WSMR Library, 465 Rock Island, WSMR, NM; Public Affairs Office, Building 1782, WSMR, NM; Thomas Branigan Memorial Library, Las Cruces, NM; and the Alamogordo Public Library, Alamogordo, NM; or viewed online at https://home.army.mil/wsmr/index.php/about/garrison/directorate-public-works-dpw/environmental. All members of the public are invited to submit written comments within 30 days of this notice. Address all correspondence to:
Department of the Army
White Sands Missile Range
100 Headquarters Avenue
ATTN: MT-R Range Support
White Sands Missile Range,
NM 88002-5000
Phone: (575) 678-1941
Comments can also be emailed to James.J.Thompson.120.civ@army.mil
#5880401, Sun News, Feb 23, 2024

Alamogordo Daily News

AFFIDAVIT OF PUBLICATION

Ad No.
0005880606

ENVIORNMENTAL DIVISON BUILDING
163 SPRINGFIELD ST.
WHITE SANDS MISSILE RANGE NM 88002

I, being duly sworn, on my oath say that I am the Legal Coordinator of the **Alamogordo Daily News,** a newspaper of daily circulation, published and printed in the English language at the City of Alamogordo, Otero County, and State of New Mexico. That the Alamogordo Daily News has been regularly published and issued for more than nine months prior to the date of the first publication hereinafter mentioned.

2/23/2024

Amy Kolbott
Legal Clerk

Subscribed and sworn before me this
28th of March 2024

Kathleen Allen
State of WI, County of Brown
NOTARY PUBLIC

1-7-25
My Commission Expires

Ad#: 0005880606
P O :
# of Affidavits :

KATHLEEN ALLEN
Notary Public
State of Wisconsin

U.S. ARMY WHITE SANDS MISSILE RANGE, NEW MEXICO, DRAFT FINDING OF NO SIGNIFICANT IMPACT

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Department of the Army
White Sands Missile Range
100 Headquarters Avenue
ATTN: MT-R Range Support
White Sands Missile Range,
NM 88002-5000
Phone: (575) 678-1941
Comments can also be emailed to James.j.Thompson.120.civ@army.mil
#5880606, Daily News, February 23, 2024

APPENDIX A - AREES OFF-NORMAL TRITIUM RELEASE DOSIMETRY MODELING

AREES Off-Normal Tritium Release Dosimetry Modeling

In support of WSMR Environmental Assessment Report

By

Carl Willis
&
Michael Butcher PhD.

October 27, 2022

Verus Research
6100 Uptown Avenue
Suite 260
Albuquerque, NM 87110

Executive Summary

The following report is an initial summary of simulation results for the Off-Normal release of tritium gas from Dense Plasma Focus (DPF). The DPF system operates with a tritium gas fill pressure of much less than an atmosphere, therefore a fault case scenario will leak gas into the system rather than a significant amount of gas out of the system. The probability of a large release from the system is unlikely. In general, the public dose limit is 100 mrem per year and regulatory guidelines limit the release to 25% of the limit or 25mrem maximal dose exposure for a member of the public.

It was determined that a conservative estimate of the worst-case scenario would be a full release of tritium under test with the following meteorological parameters. An inversion layer capping the mixing height a few meters above exhaust stack, at freezing temperatures, with minimal (<0.25m/s) wind through the area. Analysis of the San Andres weather station (SNDN5) data indicates that these weather conditions occur about 1 day per year. Figure 1 shows the boundary within which dose greater than 15mrem are possible under these conditions. The results indicate that the maximum dose to the public does not exceed 25mrem at any point and remains confined to the base area.

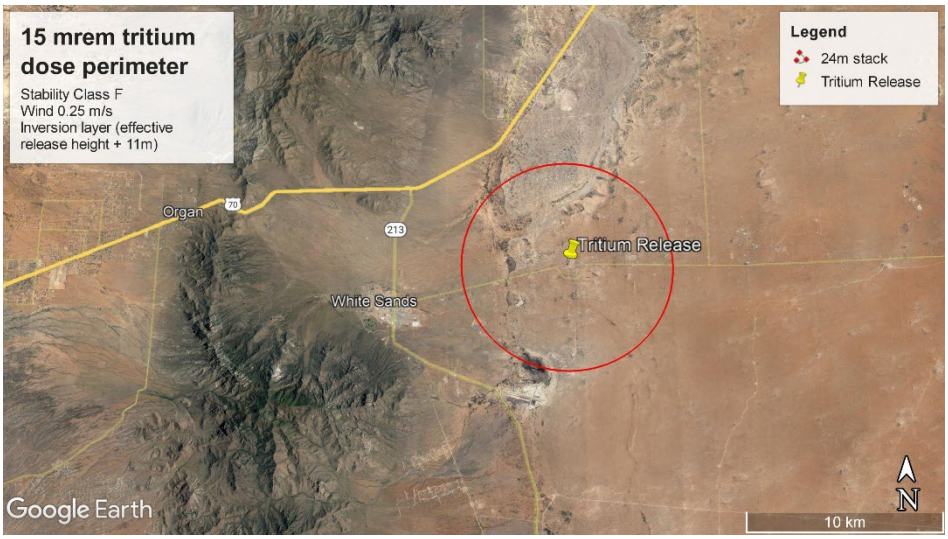

Figure 1. Map of tritium release zone for 0° F, 0.25 m/s (0.6mph), with an inversion layer capping mixing a few meters above stack height indicates the 15 mrem dose boundary. Note: the maximum dose does not exceed 25mrem at any time.

- Maximal doses are highest for highly stable conditions when wind speeds are very low with the worst-case scenario being a low-wind with a temperature inversion capping the mixing layer barely above the stack height.
- A 24 m stack reduces the extent of maximal dose to less than 25mrem under class F conditions.
- Using an exhaust velocity of 30 m/s [5000 CFM] with a 24 m stack and a prohibition of tritium operations when the wind speed is below 0.25 m/s precludes *any* receptor from receiving a dose ~~of~~ exceeding 25 mrem.
- Predictions made with this software package should be considered very conservative because:
    - they reflect multiple conservative approximations in the model inputs
    - the focus is on uncommon worst-case weather.

Defining the accident source term

This risk assessment concerns an off-normal release of tritium to the atmosphere during operation of the AREES DPF.

Tritium quantity at risk

At-risk tritium is tritium in the DPF chamber and communicating piping and instruments. This excludes tritium that is stored in metal beds or in delivery cylinders in gloveboxes. We distinguish an off-normal release from chronic releases or outgassing due to waste generation. The type of accident that would lead to an off-normal release ~~loss~~ would entail simultaneous major breach of both the primary and secondary containment barriers in the DPF, e.g., by a pulsed power fault or mechanical shock during DPF operation.

Operating the AREES neutron source involves filling an evacuated chamber to a sub-atmospheric pressure with a fuel mixture comprising deuterium and tritium in elemental molecular gaseous form. By approximating the volume of the DPF chamber at 270 L and a typical fill pressure for high-drive shots at 20 Torr at 300 K ("room temperature"), we define the maximum quantity of fuel gas at risk during operation. This quantity is 0.289 moles by the ideal gas law. Nominal volume ratio of tritium to deuterium is 1:1, although a somewhat larger (or smaller) ratio may be desirable to tailor neutron yield and spectra. At 1:1, the tritium activity at risk is 8.32 kCi, which is likely to be representative of most operational fills; at 2:1, it rises to 11.1 kCi. Some further tritium will remain in piping and instrument systems communicating with (and isobaric with) the DPF chamber. Encompassing all plausible fuel ratios and conservatively accounting for the aforementioned holdup volume, we believe 15 kCi is a conservative upper bound on the at-risk tritium activity in AREES. HotSpot inputs for the source in plume modeling are found in Table 1.

Tritium chemical form

Tritium dosimetry depends strongly on the physical and chemical form of the element. For the purposes of dosimetric evaluation in this work, an off-normal release of tritium to the atmosphere is considered to comprise two volatile forms, elemental hydrogen gas (HT) and tritium oxide vapor (HTO). The actual material at risk in the process is elemental hydrogen gas. However, it is readily converted to HTO through combustion, and to a lesser extent through nuclear exchange in the environment. The accident analysis assumes a maximum 50% conversion to HTO, based upon inputs from Subject Matter Experts (SME) inputs to Verus Research (VR).

Dose receptors of interest

The dose receptor of interest in this analysis is a hypothetical member of the public (MoP) located at ground level. "Member of the public" refers to all persons who are not specifically designated radiation workers by WSMR, including many (if not most) WSMR personnel and WSMR contractors and clients. No assumption is made that MoP's are excluded from any premises at WSMR (except for the AREES high bay, which will be completely evacuated) during the operation of AREES.

Regulatory limits and EPA guidance

MoP's are limited to no more than 100 mrem (0.1 rem) total effective dose equivalent (TEDE) in a year from a licensed operation in accordance with federal regulation (10 CFR 20.1301). For tritium, all dose is committed dose from internal exposure. In setting bounds for acceptable consequences to a public dose receptor, we make two assumptions: (1) that off-normal release will be a rare event on the timescale of a year, and (2) that committed dose from tritium is the only contributor of consequential dose from AREES operation to the receptor.

Dose evaluation methodology

The Gaussian plume modeling code HotSpot (Version 3.1.2) has been selected to evaluate *possible* doses to human receptors from a off-normal tritium release under worst-case weather assumptions, with stack height and exhaust velocity being parameters of interest. The goals are to identify values of these parameters that prevent a MoP in any location from receiving dose in excess of the annual regulatory limit

under any weather condition during which tritium operations could occur, and to identify the extent of the populated area potentially impacted by lower but still consequential doses.

HotSpot is a *"…fast-running, local-scale, steady-state Gaussian plume model for radiological releases developed at LLNL that provides predictions of time-integrated effects (such as dosage from the entire plume passage). HotSpot was created to provide emergency response personnel and emergency planners with a fast, field-portable set of software tools for evaluating incidents involving radioactive material. The conservative assumptions used in the model also make it suitable for safety and hazard analyses."*

The two specific types of information desired from scenarios modeled in HotSpot are

- Dose to the maximally exposed receptor
- Maximum distance from the source at which consequential doses are possible.

Worst-case weather for the purposes of this analysis thus refers to those combinations of atmospheric stability, mixing height, and wind speed that maximize *either* the dose to the maximally exposed receptor *or* the distance to a receptor receiving a dose of consequence.

We consider doses of consequence to be **(A)** doses more than 25 mrem and **(B)** doses more than 100 mrem. In the former case, the concern is that a MoP could receive a substantial fraction of their annual regulatory dose allowance through exposure to the plume. In the latter case, the regulatory dose allowance could be exceeded (and the simulated parameters would be deemed inadequate).
This analysis does not attempt to quantify the *probability* of any specific outcome (e.g., the probability of receiving doses above a certain value in certain geographical locations); HotSpot does have the ability to incorporate local weather data to make these kinds of calculations. This is considered a further step and requires detailed weather records from a representative station at or near WSMR.

Dose models

HotSpot inputs

Input constants for the HotSpot models are summarized in Table below. Variables of interest are the Pasquil stability class (A-F), the wind speed (≥ 0.1 m/s), and the wind direction. Stack height and exhaust velocity are parameters. Low temperatures and a strong inversion layer are also considered as part of the worst-case configuration. This analysis has not yet considered the probability of any scenario evaluated, which adds complexity to the analysis. Accordingly, wind direction is considered arbitrary to produce general contour plots at the test site.

Additionally:

- Momentum rise must be manually enabled (it is disabled by default) to correctly calculate effective release height (H_e) when a scenario is loaded.
- Atmospheric temperature inversion, if enabled, allows capping the mixing layer at a user-provided height $\geq H_e + 11$ m. *The user must independently verify that this inequality holds true in every scenario;* HotSpot disables inversion capping without warning if it is false, leading to nonconservative dose calculations. The worst-case (highest dose) scenario involving inversion in HotSpot thus entails setting the mixing height per the equality shown above and is considered in this analysis, although the likelihood of its physical occurrence is probably remote. Average daytime mixing heights are expected to be in the hundreds of meters. Operational temperature is considered to be 0° F to correspond to a strong inversion layer.

Table 1. Hot Spot Source and Environmental Variables

Parameter	Value
Activity at risk	15 kCi (8.3 kCi nominal 50% DT fill, plus accommodation for >50% fill, plus holdup volume)
Tritium chemical form	50% HTO / 50% HT (material is released as HT with some conversion to HTO; non-combustion scenario)
Physical stack height	16 m OR 24 m
Stack diameter	0.305 m (12 inches)
Stack velocity	15 m/s (3000 ft/min), based on design ventilation rate of 2700 CFM (3440 ft/min velocity), OR 30 m/s (6000 ft/min), based on design ventilation rate of 5000 CFM (6366 ft/min velocity)
Terrain	Standard / rural
Sample time	10 min
Receptor height	1.5 m (average height of a human being on the ground)
Wet deposition	Rainout disabled
Temperature	0°F
Dose conversion	EPA FGR 13 (based on ICRP 60/70; conservative in comparison to FGR 11)

Model results

Figures 2 and 3 illustrate 25-mrem distance-wind speed relationships for class A and class F atmospheric stability, respectively. Exhaust velocity is 15 m/s throughout, and curves for both 16 m and 24 m stacks are shown. Minimum mixing height caps are selected according to the method described above. An important qualitative difference is readily apparent in these figures: the class A relationships follow an exponential curve and are relatively linear on a semi log plot, while the class F relationships follow a power law and are linear on a log-log plot. In the latter case, the model that fits the data does not allow extrapolation of impacted distance at zero wind speed. The contours drawn by low-speed, high-stability scenarios also suffer from a departure from realism in the sense that the time required to transport the plume to distant receptors receiving consequential doses becomes longer than a day at the lowest allowable wind speeds in HotSpot (i.e., 0.1 m/s (0.22 mph)), whereas atmospheric stability realistically follows a diurnal cycle.

We interpret the result in Figure 2 to mean that an administrative limit on wind speed during tritium operations should be adopted to limit the geographic extent of possible doses of consequence. Using data from the U.S. Forest Service San Andres weather station (SNDN5), located approximately 20 miles NNW of the AREES site, 27 out of 9162 days had average winds below 0.25 m/s and 50 had winds below 0.5 m/s. Discussion with WSMR personnel indicated that there is a meteorological station located at Launch Complex 32 (LC32), which is adjacent to, Launch Complex 33 (LC33), the location of the AREES system. Verus Research (VR) recommends that the AREES site has access to this data for operational and safety decisions. Local environmental data will refine these worse case scenarios as well as provide a valuable safety tool.

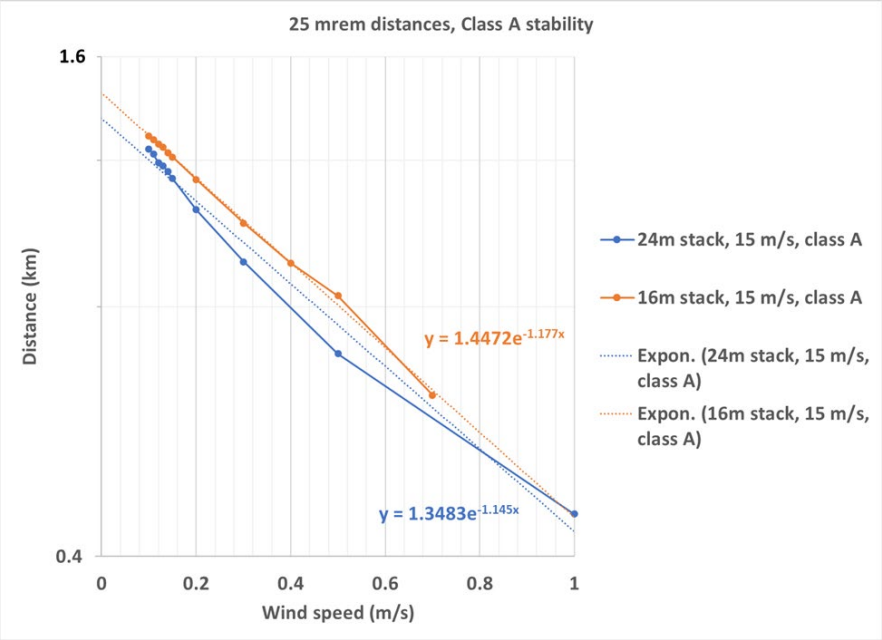

Figure 2. Distances to farthest receptor receiving 25 mrem: Class A, 15 m/s (2700CFM) exhaust.

These averages notably include nighttime when winds are calmer and when AREES operation would be unlikely. On this basis, we conclude that restricting AREES tritium operations to days when average wind speed exceeds 0.25 m/s (~0.55 mph) is unlikely to disrupt operations more than one day out of the year and would allow bounding the maximum distance at which a consequential dose would be received in an accident. These distances can be readily obtained from Figure 2.

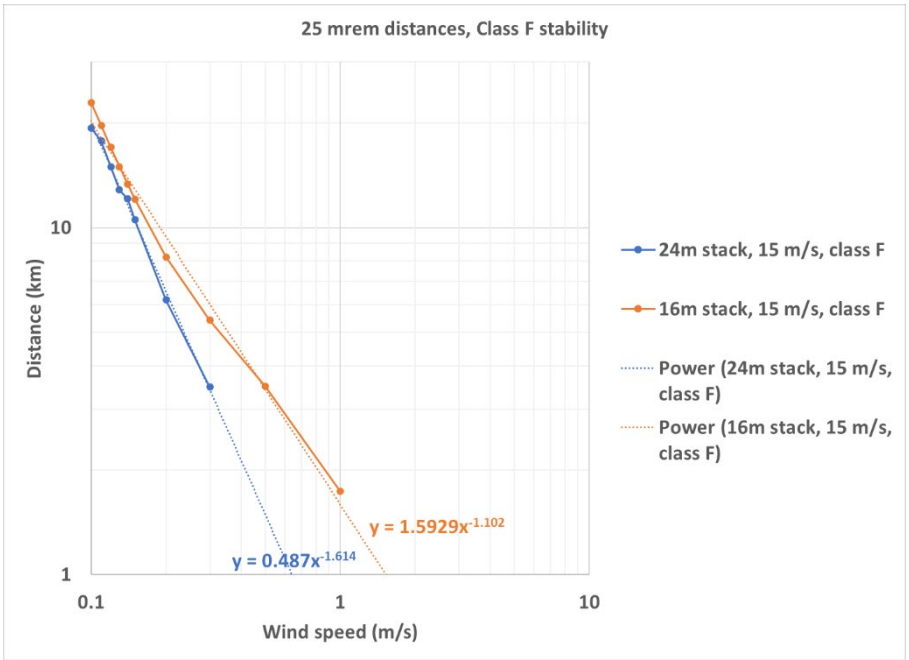

Figure 3. Distances to farthest receptor receiving 25 mrem: Class F, 15 m/s (2700CFM) exhaust.

Figures 4–9 display dose-distance plots for various stack heights, stability classes, and exhaust velocities, assuming the minimum allowable mixing layer height in HotSpot and a wind speed of 0.25 m/s (0.5mph). The bold red line is the only trace that is accurate on the each of the dose graphs. The non-bold lines are defaults in HotSpot that are not necessarily accurate. No doses exceed 100 mrem, and when 24 m stack exhausting at 30 m/s (5000CFM) is specified, no doses exceed 25 mrem. Summary of the graphical simulation results are shown in Table 2, where Class F are the "worse case" scenarios.

Table 2. Summary of Simulation Conditions

Air Condition	Stack (m)	Flow (CFM)	Velocity (m/s)	Max Possible Dose at Distance
Class A	16	2700	15	60 mrem @ 400 m
Class F	16	2700	15	70 mrem @ 1700 m
Class A	24	2700	15	50 mrem @ 430 m
Class F	24	2700	15	32 mrem @2200 m
Class A	24	5000	30	20 mrem @ 700 m
Class F	24	5000	30	20 mrem @ 3000m

Overall, the stack height change from 16m to 24m shows the greatest reduction, of more than 50%, in dose between constant flow rates of 2700 CFM, Class F scenario. A flow rate change from 2700 to 5000 CFM has a smaller but significant change to total dose. For example, the 24m stack, the increased flow rate decreases the dose by almost 40%.

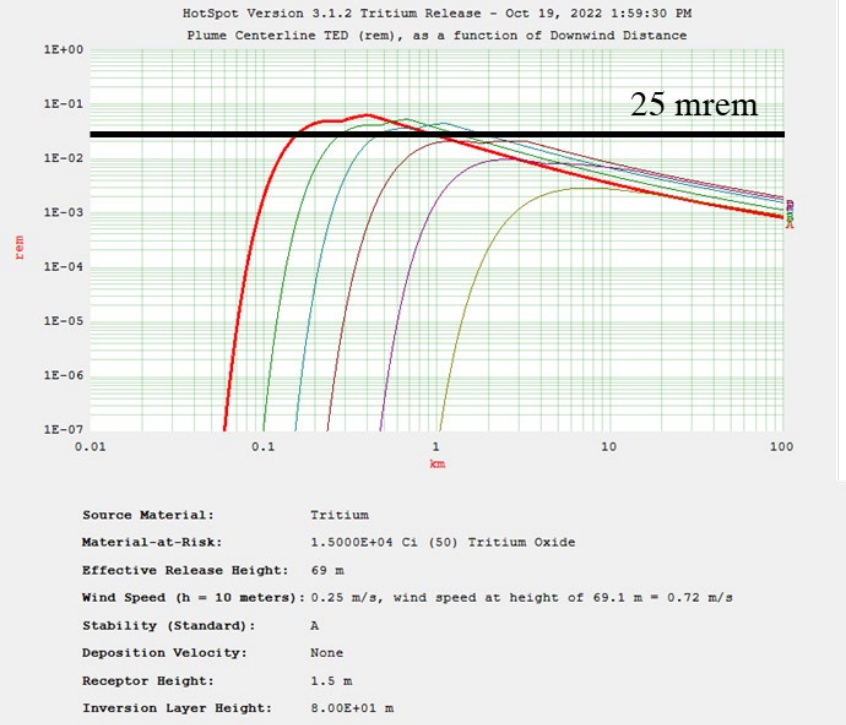

Figure 4. Graph of HotSpot Tritium Dispersal (Bold Red trace): Stability Class "A", Stack Height = 16 m, Flow Rate = 2700 CFM, velocity = 15 m/s. Plots for classes B-F are inaccurate.

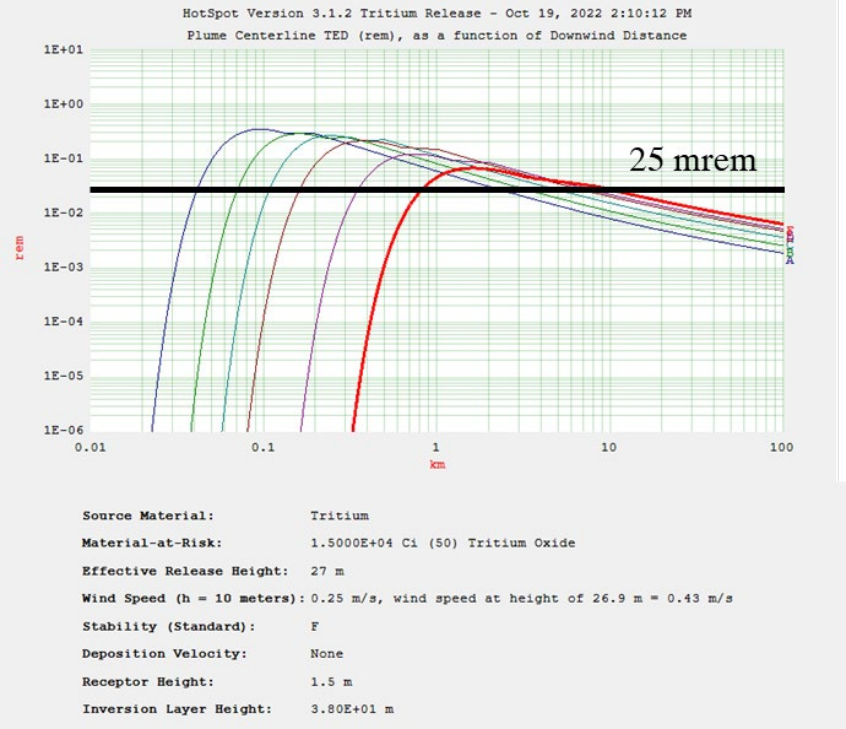

Figure 5. Graph of HotSpot Tritium Dispersal (Bold Red trace): Stability Class "F", Stack Height = 16 m, Flow Rate = 2700 CFM, velocity = 15 m/s. Plots for classes A-D are inaccurate.

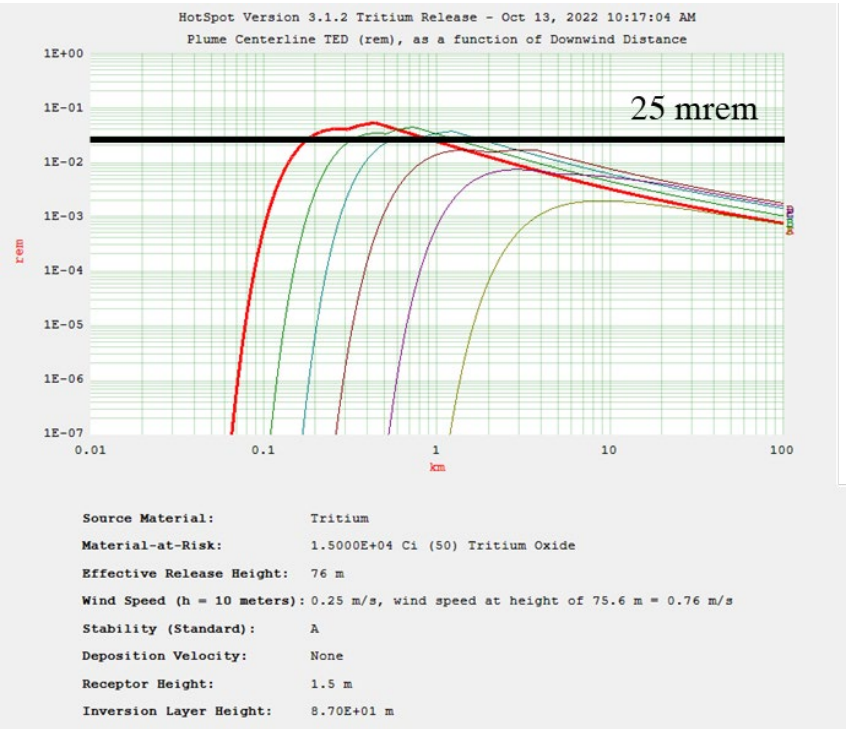

Figure 6. Graph of HotSpot Tritium Dispersal (Bold Red trace): Stability Class "A", Stack Height = 24 m, Flow Rate = 2700 CFM, velocity = 15 m/s. Plots for classes B-F are inaccurate.

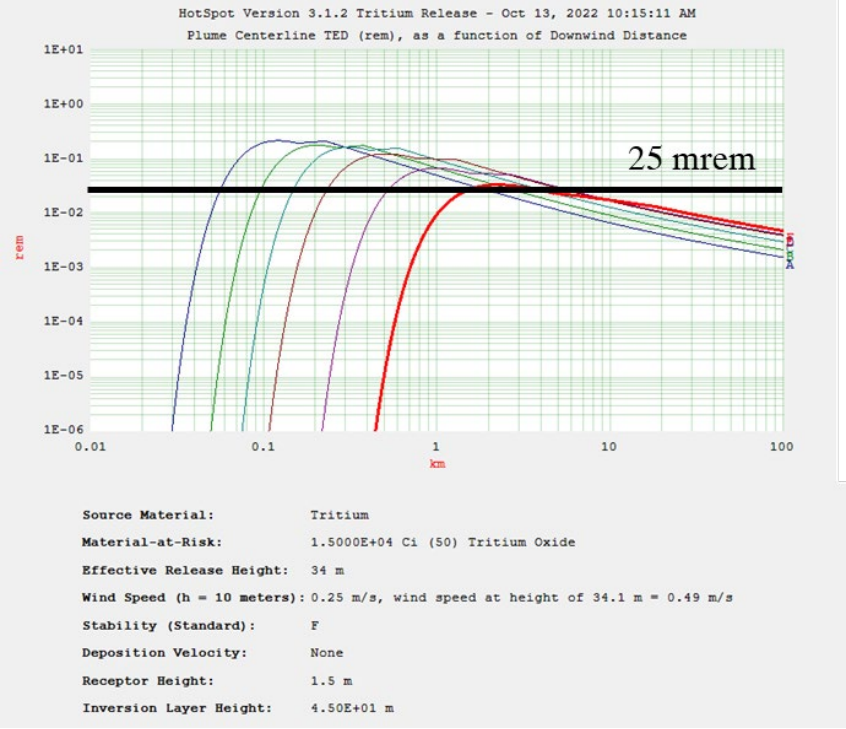

Figure 7 Graph of HotSpot Tritium Dispersal (Bold Red trace): Stability Class "F", Stack Height = 24 m, Flow Rate = 2700 CFM, velocity = 15 m/s. Plots for classes A-D are inaccurate.

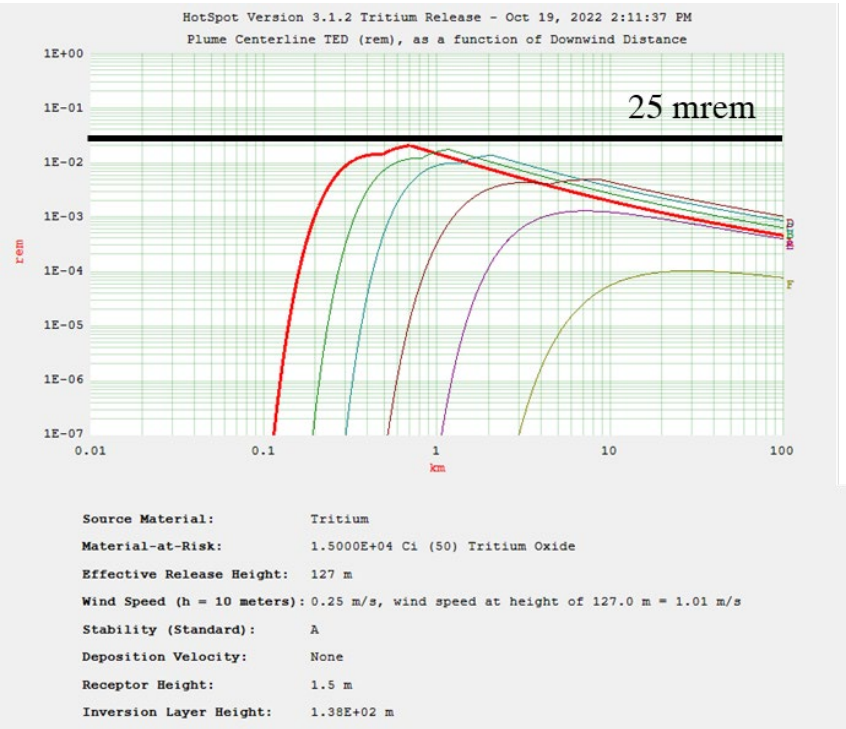

Figure 8. Graph of HotSpot Tritium Dispersal (Bold Red trace): Stability Class "A", Stack Height = 24 m, Flow Rate = 5000 CFM, velocity = 30 m/s. Plots for classes B-F are inaccurate.

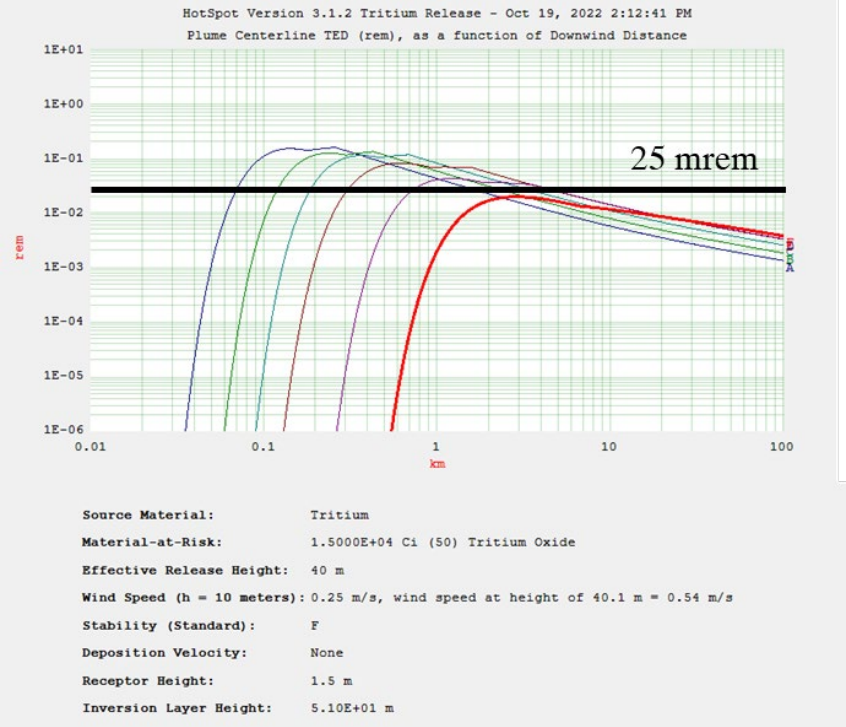

Figure 9. Graph of HotSpot Tritium Dispersal (Bold Red trace): Stability Class "F", Stack Height = 24 m, Flow Rate = 5000 CFM, velocity = 30 m/s. Plots for classes A-D are inaccurate.

Figure 9 and Figure 10 show perimeters demarcating the most distant extent of the 25 mrem contours for class A and class F stability when the exhaust flow rate is 15 m/s. The perimeters from 16- and 24-m stacks are similar for class A, while a large difference is noted for class F, clearly demonstrating the benefit obtained with the additional 8 m of height.

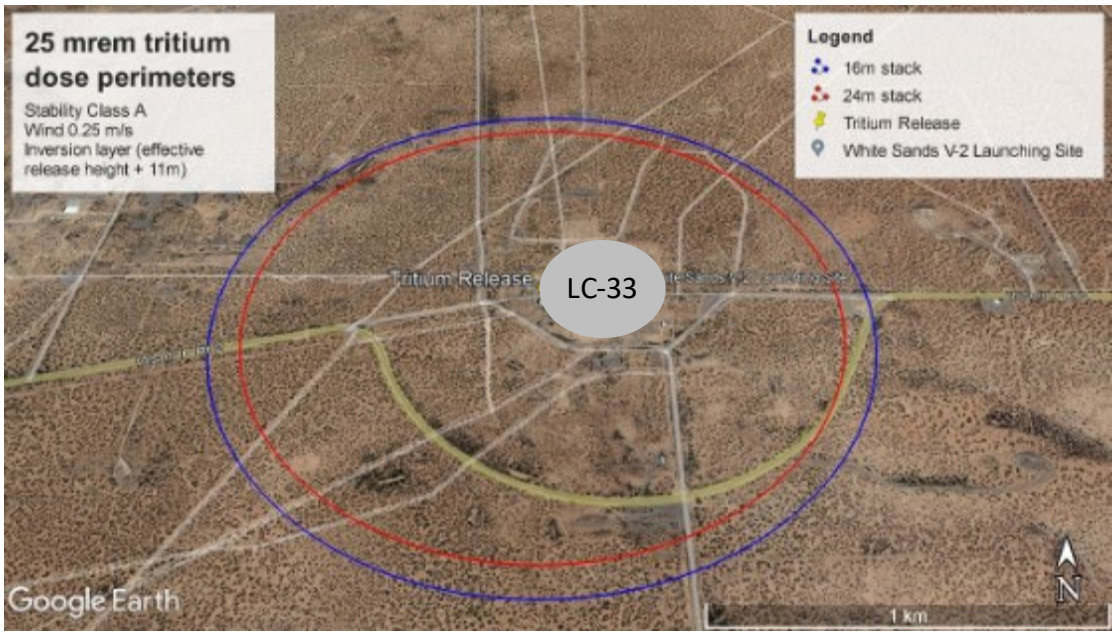

Figure 10. Tritium Dispersal 25 mrem: Class "A", Stack Height = 16 & 24 m, Flow Rate = 2700 CFM, velocity = 15 m/s.

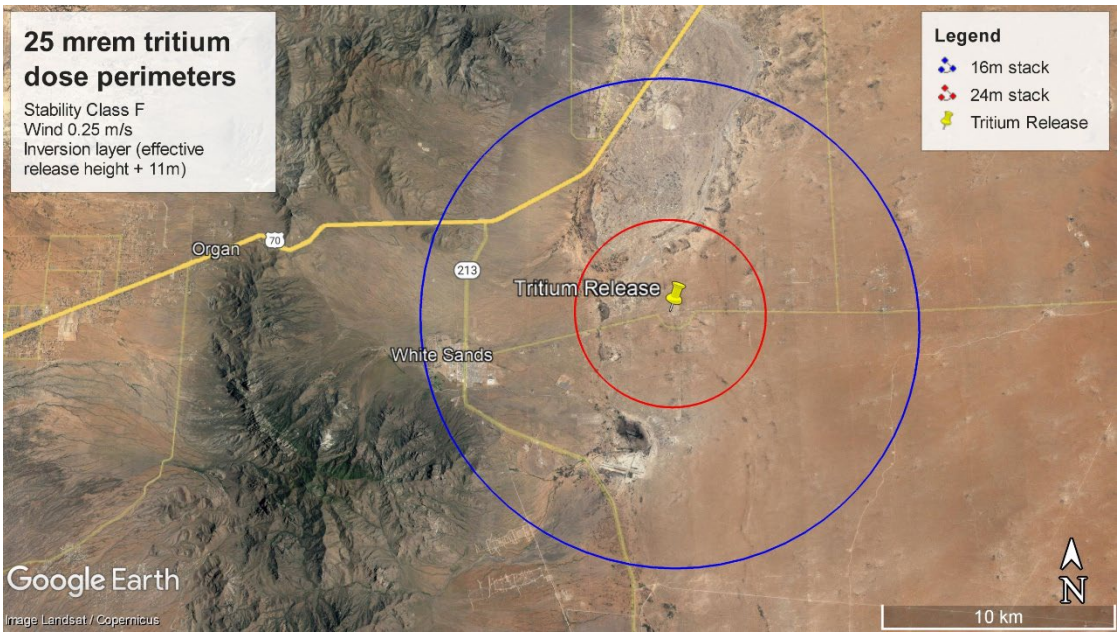

Figure 11. Tritium Dispersal 25 mrem: Class "F", Stack Height = 16 & 24 m, Flow Rate = 2700 CFM, velocity = 15 m/s.

Figure 11 shows perimeters at 15 mrem for class F stability when the exhaust rate is 30 m/s (5000CFM). The benefit of the taller stack is clear from the ring locations at the site. Comparison of Figure 10 and Figure 11 indicate the differences in the stack height as well as the effect of the increased flow rate of up to 5000CFM. All the configurations are well below the 100mrem limitation for MoP.

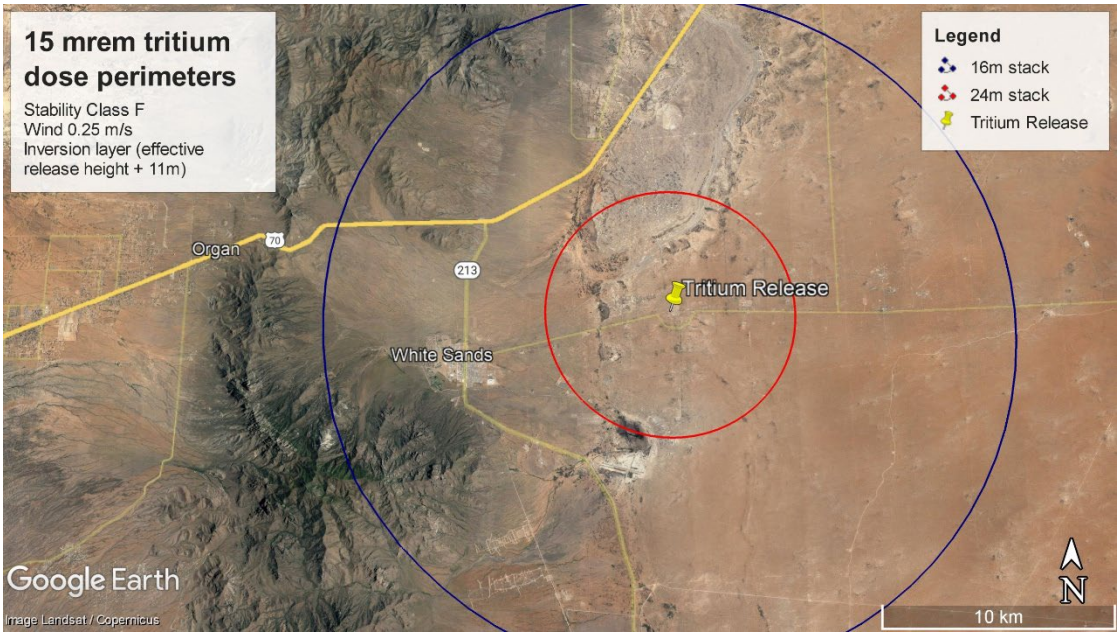

Figure 12. Tritium Dispersal 15 mrem: Class "F", Stack Height = 16 & 24 m, Flow Rate = 5000 CFM, velocity = 30 m/s.

Dose mitigation strategy

The approach advocated by Verus Research to mitigate public dose from an off-normal tritium release on AREES is to:

- Constrain operations to times when wind speed averaged over an hour preceding the operation exceeds 0.25 m/s
- Discharge exhaust at such a height and velocity that committed dose to the maximally exposed receptor always lies below 100 mrem, regardless of atmospheric stability or mixing layer cap height, satisfying requirements in 10 CFR 20
- Design exhaust stack and ventilation system for 24m and 2700 CFM.
- Relying on evacuation, or on Radworker classification of all personnel in certain impacted areas, would create overwhelming logistical challenges at WSMR and can be avoided.

Summary and conclusions

- Maximal doses are higher for highly stable conditions when wind speeds are very low. As wind speed increases, the excess maximal dose for class F versus class A decreases, and the relationship is slightly reversed by 0.25 m/s.
- The worst-case weather scenario is always a low-wind scenario with temperature inversion capping the mixing layer barely above the stack height. Such conditions produce both the highest doses to the maximally exposed receptor and the largest distances of consequential exposure at the $\geq$25 mrem level.
- Based on a weather record from the San Andres weather station near WSMR, an administrative prohibition on tritium operation when wind speeds are below 0.25 m/s would be expected to impact operations on fewer than one day per year, would hold maximal dose below 100 mrem for both 16 m and 24 m stacks at the 15 m/s (2700CFM) exhaust velocity, and would limit the extent of the 25 mrem consequential dose contour to WSMR property. Verus Research recommends adopting this control.
- Specifying a 24 m stack reduces the extent of the 25 mrem contour to 4.3 km under class F conditions, sparing the population of the White Sands settlement under worst-case weather. Maximal doses are held to approximately 50 mrem (at 400 m downstream in class A and 2.2 km in class F).
- Increasing exhaust velocity to 30 m/s [5000CFM] (with a 24 m stack and a prohibition on tritium operation below 0.25 m/s wind speed) precludes *any* receptor from receiving dose of 25 mrem or higher.
- Predictions made in these models should be considered very conservative because they reflect multiple conservative approximations in the model inputs (activity at risk, tritium chemical form, exhaust velocity, and inversion layer presence and location) and focus on uncommon worst-case weather.