Environmental Assessment for Implementation of the Area Development Plan

Letterkenny Munitions Center (LEMC)

Letterkenny Army Depot, Pennsylvania

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
ACHP	Advisory Council on Historic Preservation
ADP	Area Development Plan
AMC	Army Materiel Command
AP	Allegheny Power
ARMD	Rocket Motor Destruction
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CITE	Center of Industrial and Technical Excellence
DoD	Department of Defense
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESQD	Explosive Safety Quantity-Distance
FNSI	Finding of No Significant Impact
gpm	gallons per minute
GSF	Gross square feet
ICRMP	Integrated Cultural Resources Management Plan
ICUZ	Installation Compatible Use Zone
IPaC	Information, Planning, and Consultation System
ITV	Internally Transportable Vehicle
LEAD	Letterkenny Army Depot
LEMC	Letterkenny Munitions Center
LIDA	Letterkenny Industrial Development Authority
LTL	Less than Truck Load
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act

Abbreviation	Term/Phrase/Name
NEW	Net Explosive Weight
NOA	Notice of Availability
NOI	Notice of Intent
NRHP	National Register of Historic Places
PGC	Pennsylvania Game Commission
POV	Privately Owned Vehicle
PPE	Personal Protective Equipment
RCRA	Resource Conservation and Recovery Act
SGL	State Game Lands
TEU	Twenty-foot Equivalent Units
TTC	Thermal Treatment Chamber
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USMC	U.S. Marine Corps
VOC	volatile organic compound

1.0 INTRODUCTION

1.1 Background

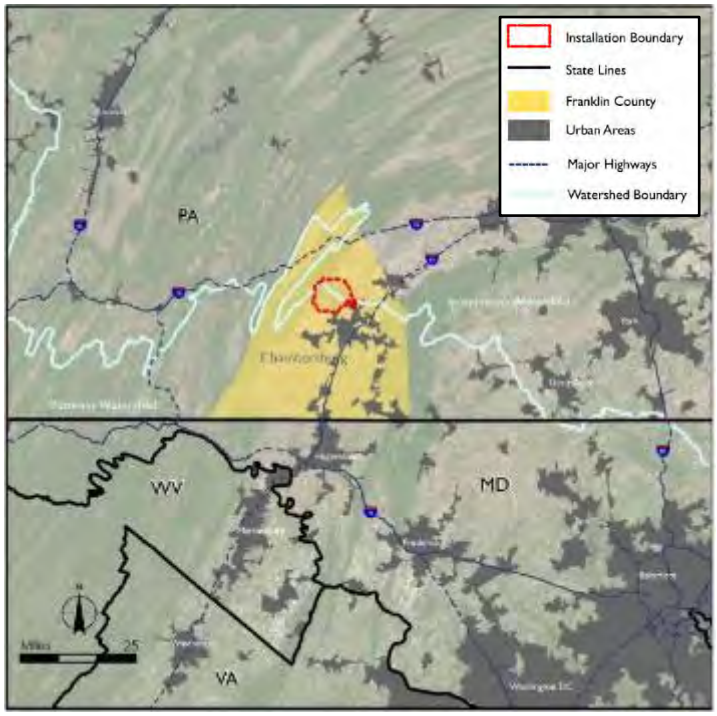
The Letterkenny Munitions Center (LEMC) is located within the Letterkenny Army Depot (LEAD or Installation) in Franklin County, Pennsylvania (Figure 1-1). LEMC is a U.S. Army, Government-Owned facility under the command of the U.S. Army Materiel Command (AMC). LEMC conducts regional and global contingency distribution of munitions, provides missile maintenance, and conducts demilitarization of munitions for the U.S. Army in support of all Department of Defense (DoD) and international partners to provide readiness to the warfighter. LEMC spans approximately 16,971 acres, which accounts for approximately 91 percent of LEAD's total size.

LEAD was established in 1942 when the War Department laid plans for 12 new ordnance depots to control the oncoming demand of war materiel. A 21,000-acre area in Letterkenny Township was chosen because of its proximity to the eastern seaboard and Washington DC. During World War II, LEAD's mission was to reduce the surplus of war materiel and to store and ship ammunition, trucks, parts, and other supplies to the U.S. Army and other U.S. Armed Forces where needed.

LEAD transitioned from operating under the U.S. Army Industrial Operations Command to the U.S. Army Aviation and Missile Command on October 1, 1999. In that same year, the Directorate of Ammunition Operations was renamed LEMC with command and control transferred to Crane Army Ammunition Activity. In 2016, the Secretary of the Army designated LEMC as the Center of Industrial and Technical Excellence (CITE) for surveillance, receipt, storage, issue, testing, and repair for the Army Tactical Missile System and Guided Multiple Launch Rocket System missiles.

LEMC's facilities include 17 explosive operating buildings, 2.3-million square feet of explosive storage space, 902 igloos (bunker-like munitions storage), 10 aboveground magazines (munitions storage), and 26 rail docks.

Figure 1-1: Location Map for Letterkenny Munitions Center



In November 2018, LEMC and various stakeholders participated in an Area Development Plan (ADP) Workshop. During the workshop, participants analyzed existing conditions at LEMC, formed a vision, and developed a plan that provides for short (0-5 years), mid (6-10 years), long-range (10+ years), and capacity real property projects within a defined planning area. From the workshop exercises and direct participant input, the LEMC ADP was compiled. The ADP would replace the current modernization approach at LEMC, which has reflected an inefficient piecemeal approach to siting and improving facilities based on the most "developable" land available. The current approach offers the fewest operational constraints but may not enhance the long-term functionality or flexibility of LEMC to accommodate various future missions.

1.2 Purpose, Need, and Scope

1.2.1 Purpose

LEMC proposes to implement its current ADP to consolidate and modernize existing facilities, upgrade supporting infrastructure, and provide a plan for preserving the future capacity through sustainable growth to support ongoing and future missions with as little negative impact on the environment as possible.

1.2.2 Need

Modern facilities and infrastructure are needed to support the short-, mid-, and long-range operational goals of the LEMC District. By developing a new approach to consolidate or collocate production facilities and storage functions (as well as parking and equipment staging areas), operations would become more streamlined. By properly siting future facilities in the most efficient and environmentally friendly layout, a proposed series of projects would optimize production flow into the future while best protecting environmental resources.

The following aging facilities and infrastructure need to be improved, removed, and/or replaced to support the ongoing mission:

- Munitions Storage – Nearly all the igloos need repair and modernization. The D- and G- area Igloos, and the aboveground magazines are obsolete and in disrepair. Most of the aboveground magazines are not being used for their intended purposes. Consolidation and strategic relocation of the igloos is also needed to condense munition storage.
- Buildings/Facilities – there are numerous buildings and facilities at LEMC that need modernization, demolition, relocation, and/or consolidation to optimize operations, allow for adaption of multiple uses to serve future missions, and preserve the Installation's capacity for future missions.
- Water Distribution System - The capacity of the existing water distribution system is inadequate for the current mission and not suitable to serve LEMC's fire protection needs. The existing facilities do not meet the current fire protection codes; and continue to operate under a waiver. Because of the number of facilities as well as the overall area within LEMC, additional capacity in the form of a new 12-inch (or greater) water line is needed to comply with current fire protection codes.
- Natural Gas System - A full evaluation of the natural gas system which serves the LEMC is recommended before any additional facilities can be connected. There are current projects underway at LEMC which will convert the Installation over to natural gas from propane. As new facilities are added, they would need new infrastructure to receive natural gas. A reliable and redundant supply of natural gas is needed to modernize the current mission.
- Wastewater System - The existing LEMC wastewater system is an aging collection of privatized holding tanks that must be routinely pumped out. Due to the topography of the area, the new sewer system will also need combinations of lift stations, force mains, and gravity flow pipes. The LEMC district needs a new sewer system that is connected to a public sanitary sewer system that can serve the Installation efficiently within the existing topographic constraints.

- Electrical Distribution System - The overall condition of the existing electrical distribution lines is considered reliable, but insufficient due to inadequate electrical system layouts. A handful of LEMC facilities operate on a generator as they are not connected to the overall electrical distribution system. Further, the entire complex has only one electrical meter which prohibits analysis of individual facility consumption demand. LEMC needs an upgraded electrical distribution center that provides a reliable and redundant source of power to all facilities.

- Fiber Communications Lines - The height of the overhead fiber communication lines above certain roadways is a concern for larger trucking operations. Communication lines need to be extended to allow for a redundant supply between the east and west ends of LEMC.

- Roadways and Gate Systems - Many of the existing roadways and gate systems have not been adequately maintained and are failing. LEMC includes 123 miles of paved roadways and additional unpaved roadways. The unpaved roadway network includes direct connections between storage areas. The Voelz Gate, which is heavily utilized, lacks adequate space for overnight, queuing, and exiting truck traffic. Trucks are frequently required to queue in non-designated space, creating security issues. Virginia Avenue from Massachusetts Avenue to Pennsylvania Avenue, Wyoming Avenue, part of Massachusetts Avenue along the K-area, Georgia Avenue from Massachusetts Avenue to Bazooka Road, the southeast perimeter section of the C-area, and two areas within the A-area are in poor condition and present immediate problems to the mission viability. Currently, each of these are paved roadways but are not sufficient in condition and need immediate repair.

1.2.3 Applicable Regulations Considered

The intent of the National Environmental Policy Act (NEPA) is to protect, restore, and enhance the environment by considering the environmental consequences of proposed actions during the decision-making process. The Council on Environmental Quality (CEQ) was established under NEPA to oversee federal policy in that process by issuing regulations [40 Code of Federal Regulations (CFR) parts 1500 – 1508]. The EA was prepared in compliance with:

- AR 200-1, 28 Sep 2007, Environmental Protection and Enhancement
- Clean Air Act [42 United States Code (U.S.C.) 7401 *et seq*.]
- Clean Water Act (3 U.S.C. 1251 *et seq*.)
- Department of Defense Pest Management Program (DoDI 4150.07)
- Endangered Species Act (16 U.S.C. 1531 *et seq*.)
- EO 11990, *Protection of Wetlands*

- EO 13112, *Invasive Species*, as amended by EO 13751
- EO 13693, *Planning for Federal Sustainability In the Next Decade*
- EO 13751, *Safeguarding the Nation from Impacts of Invasive Species* (amendment to EO 13112)
- Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136 *et seq*.)
- Noxious Weed Control and Eradication Act of 2004 (Public Law 93-629) (amendment to the Plant Protection Act [7 U.S.C. 7701 *et seq*.])
- The Sikes Act (16 U.S.C. 670 *et seq*.)

1.2.4 Scope of Environmental Analysis

This environmental assessment (EA) identifies and evaluates the potential environmental, cultural, and socioeconomic effects of implementing the LEMC ADP. Short-, mid-, and long-range projects have been identified in the ADP and are presented in Section 2.1. This EA evaluates the short- and long-term direct, indirect, and cumulative effects from the proposed projects and potential environmental consequences. However, many details are not available to fully analyze the effects of each project, but the projects are included for real property planning and capacity for future development. LEMC will conduct additional NEPA analysis (either a Record of Environmental Condition [REC], EA, or Environmental Impact Statement [EIS]) when project details become available. These analyses may be tiered from this EA in accordance with 40 CFR Part 1502.20 and 32 CFR Part 651.14(c).

Additionally, LEAD has proposed to implement a separate ADP for the Industrial Core District, which supports the main mission of the installation. The LEAD Industrial Core District ADP identifies additional short-, mid-, and long-term installation-wide projects. A separate EA is being prepared for the Industrial Core District ADP, and LEAD is conducting follow-on planning to implement the prioritized short-term projects from both ADPs. The LEAD Industrial Core District ADP will include a template REC that can also be used for RECs tiering from the LEMC ADP EA.

1.2.5 Decision to be Made

Based on the information and environmental impact analysis presented in this EA, the LEMC Commander will decide whether the proposed action outlined in the LEAD ADP is in the best interest of the environment, socioeconomic conditions, and the mission. If the action is deemed appropriate, the LEMC Commander must then decide whether the impacts noted warrant a Finding of No Significant Impact (FNSI), require the publication of a Notice of Intent (NOI) to prepare an EIS, or require other actions consistent with NEPA and its implementing regulations.

1.2.6 Public Involvement

Public involvement is guided by 32 CFR part 651.36-37 and 32 CFR 651 Subpart G. This EA will be made available to the public for review for 30 days. A Notice of Availability (NOA) of the EA will be published in the *Chambersburg Public Opinion* newspaper. At the end of the 30-day public review period, LEMC will consider the comments that individuals, agencies, or organizations submit. As appropriate, LEMC will either execute a final EA, issue a decision document, and proceed with implementing the proposed action, publish an NOI to prepare an EIS, or take other actions consistent with NEPA and its regulations.

Consideration of the views and information of all interested parties promotes better decision-making. Agencies, organizations, Native American Tribes, and members of the public (including minority, low-income, and disadvantaged persons) can participate in the decision-making process through review of the EA and submitting comments. The U.S. Fish and Wildlife Service (USFWS) and Pennsylvania State natural and cultural resources agencies were contacted at the outset of the EA concerning the proposed actions (Appendix A).

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action

The Proposed Action is the implementation of the LEMC ADP. The Preferred Alternative is the High Growth Scenario identified in the LEMC ADP and would consolidate future growth into the northeast quadrant of the LEMC District. Aging igloo areas would be targeted for demolition and others strategically relocated. The Preferred Alternative would support the following: increased mission capabilities through the creation of modern facilities, strategic relocation of aboveground magazines into the modern facilities, demolition and replacement of Igloo Areas D & G, and replacement of the aging and nearly obsolete igloo facilities at the western quadrant locations. Further, the Preferred Alternative would eliminate the existing sprawling development pattern of operations facilities by consolidating future developments to the northeast quadrant of the LEMC. The Preferred Alternative would require implementation of a long-range (approximately 25 years) strategy. However, the Preferred Alternative was selected because it prioritizes logistics accessibility and operational efficiency over operational “developable” areas while creating minimal impacts to the environment. The Preferred Alternative is the idealistic long-range vision for LEMC (Figure 2-1).

Implementation of this scenario would take place over time in a phased manner by the projects listed by priority in Table 2.2-1. The projects would be strategically prioritized to capitalize on previous modernization efforts to the greatest extent possible. Approximately 26 improvement/modernization projects have been identified that would enhance the long-term growth opportunities at LEMC by developing a more consolidated layout of operations facilities. The 4th column in Table 2.2-1 includes the corresponding illustration reference IDs for each project, as available, and these IDs are shown on Figure 2-2.

Figure 2-1: Proposed Action (Preferred Alternative)

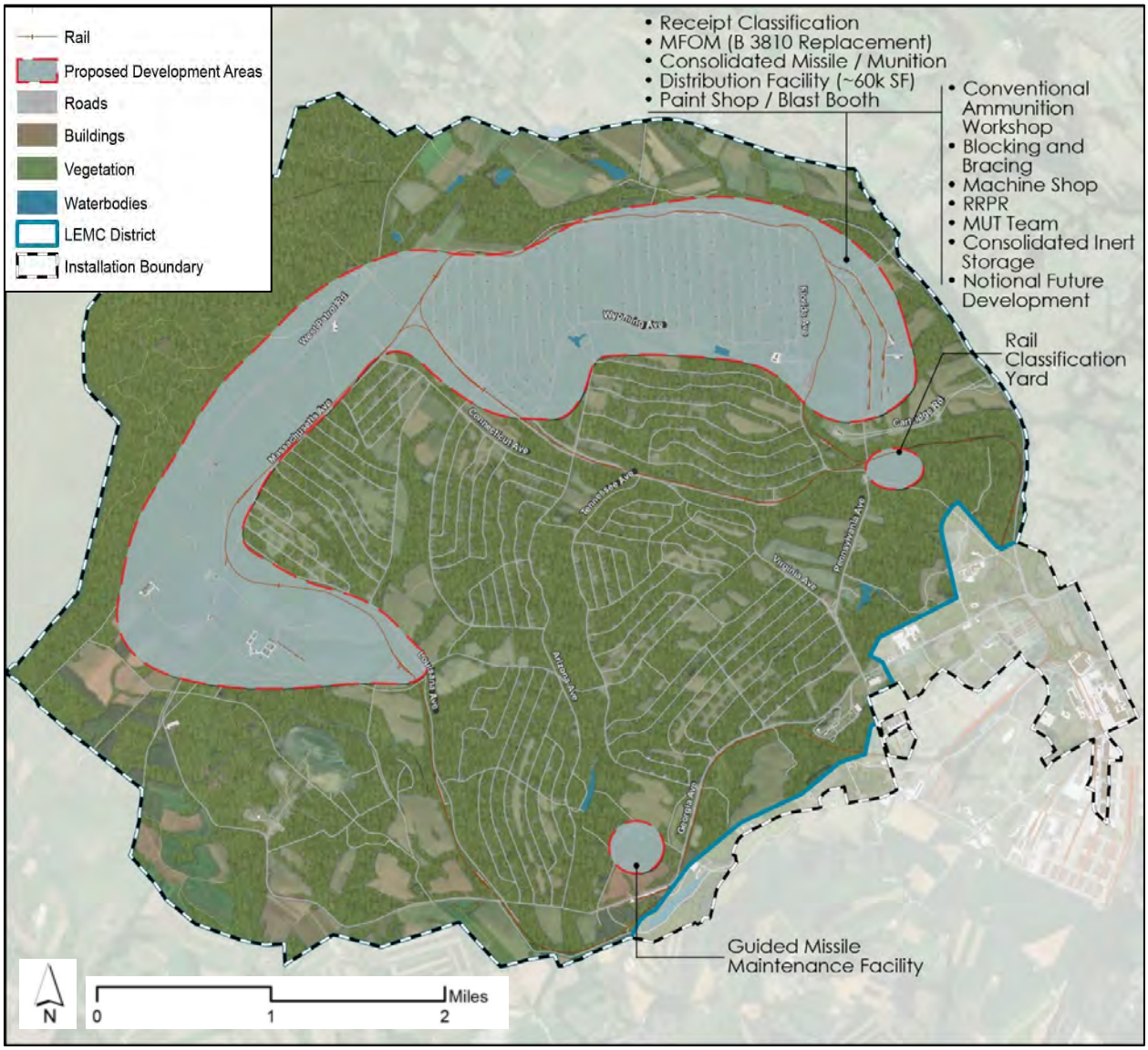


Table 2.2-1:
Letterkenny Munitions Center Project List

Project	Project Category	Project Number	Illustrative Reference	Description
SHORT-RANGE (0 – 5 YEARS)				
Guided Missile Maintenance Facility	New Construction	66632	1	LEMC conducts missile maintenance for two missile compatibility types. Operations are conducted in two undersized and poorly configured facilities: Buildings 5300 and 5311 (originally designed for Small Arms storage). The two missile types cannot be collocated due to their explosive components requiring operations on one missile type to stop and be removed from the facility entirely before work on the other missile type can begin. This "facility changeover," due to incompatibility, can create a maintenance backlog in excess of 1,000 missiles requiring certification. This backlog adversely impacts system readiness and fielding of contingency operations. Future workload projections from two of the Air Force teams could increase the facility changeover frequency by approximately 50%, further impacting LEMC's mission readiness.
Precision Strike Missile System (PrSM)	New Construction	94216	2	Due to current capacity and existing building configuration at LEMC, there is an immediate need for an operational facility space to support certain expanding missile strike programs. Readiness requirements of the U.S. Army and U.S. Marine Corps (USMC) mean LEMC must execute two sustainment programs simultaneously. Certain expanding missile strike programs are scheduled for production in FY22, if not sooner, with an immediate requirement to maintain readiness. Production line capability is needed to support customer requirements for the U.S. Army's production increase demand of 150% in FY20 and beyond. This organic production line will alleviate the current constraints with the prime vendor and increase production capacity to support realized warfighting requirements for Partner Nation's operations (Foreign Military Sales (FMS)). These requirements have been identified, however LEMC does not currently have adequate facilities to support these future U.S. Army, USMC, and National Security readiness requirements.

Table 2.2-1:
Letterkenny Munitions Center Project List

Project	Project Category	Project Number	Illustrative Reference	Description
Rail Modernization	Infrastructure Upgrade	91782	N/A	This project is required to upgrade 22 miles of the rail network located in the LEMC's ammunition storage area from the 80-lb rail (circa 1942) to 136-lb rail to accommodate increased weight of locomotives and materiel. A complete inspection and repair of the main rail line and sidings will be performed. Ties, tie plates, switches, joint bars, bolts, and other accessories will be replaced as needed.
Expand Roadway at Voelz Gate	Infrastructure Upgrade/New Construction	LEAD 532415	3	This project would result in the construction of a compressed stone lot for staging of incoming trucks in the area of the Voelz Gate. This upgrade is needed to streamline and queue incoming trucks in order to allow for separation of scheduled trucks versus dropped trucks. As LEMC's workload will be continuing to increase over the next 5 years, expansion of the current area will allow a smoother transition of incoming and outgoing trucks to meet scheduled shipments and deliveries. LEMC will not change the future scope or purpose of this interchange.
Consolidated Munition Distribution Facility	New Construction	86433	4	Currently, there is no facility at LEMC designed to load both full truck loads and Less than Truck Load (LTL) shipments. LEMC utilizes an LTL building which was designed based on the LTL shipping demands of the 1980s. LEMC attempts to consolidate loads whenever possible using the LTL facility. This process has resulted in congested aisleways and inefficient workflow. The current measures being implemented to mitigate the issue are not enough to keep up with current and future demand. A new consolidated munition distribution facility is needed.

Table 2.2-1:
Letterkenny Munitions Center Project List

Rail Classification Yard	Infrastructure Upgrade	86433	5	A rail classification yard is used to stage, sort, and classify inbound and outbound loaded and empty rail cars. LEAD does not have a rail classification yard within the secure area of the Installation. Absence of a rail classification yard at LEMC means that rapid movement of munitions is hampered. Relying on a privately managed rail classification yard that is deteriorating and utilized for both commercial and military purposes means longer waits to stage, sort, and classify ammunition laden rail cars. While the current rail sidings available to LEMC at Classyard 1 are capable of handling 120-ton locomotives, the continuing deterioration means money is spent on upkeep and not on improving operational efficiencies. Relying on a rail classification yard that is outside the U.S. Army fence line means a continued security threat until the ammunition-laden rail cars are picked up by CSX Rail. A new rail classification yard is required in order to revitalize LEMCs ammunition out-loading capabilities.
LEMC Privately Owned Vehicle (POV) Parking Expansion	New Construction	TBD	6	100 additional parking spaces are needed for employee vehicles in order to grow/add additional employees within the very short-term (6-12 months).
Inert Storage	New Construction	CAAA15-18MC-64	7	Construction of a 50-foot-deep by 100-foot-wide structure to store inert materials within the existing 10,000 square foot structure. Currently, approximately 1.5 million different ammunition materials are being stored in various locations in poor conditions. As a result, the ammunition materials are being damaged to the point that they are no longer functional. There are also other ammunition materials stored in earth-covered magazines, which does not support optimal utilization of the space. The value of the inert ammunition materials inventory in this space is approximately $39 million.
Upgrade Utility Infrastructure – Overall	Infrastructure Upgrade	TBD	N/A	The existing utility infrastructure (gas, water, electric, and communications) at LEMC is aging and in need of repair, modernization, and/or replacement.

Table 2.2-1:
Letterkenny Munitions Center Project List

Project	Project Category	Project Number	Illustrative Reference	Description
Paint Shop Addition	New Construction	CAAA15-18MC-68	8	This project would allow for the construction of a building to house the future paint booth that is needed in preparation for future missions. The existing 3-sided paint booth supports LEMC mission requirements, both internal and external customers, by priming and top coating ammunition components that are being renovated. On average, LEMC currently uses the existing paint booth approximately 2,086 hours or more per year to maintain production quantities. The existing equipment has not exceeded its listed useful life, however due to its primitive design, the current paint booth does not provide a controlled heated environment. Current dimensions are only 12 feet high, 8 feet deep, and 30 feet wide. This configuration has the potential to create a hazardous work environment as it does not remove 100 percent of the contaminants for the breathable air within the facility. The current building access to the paint booth and the current paint booth size also prohibits LEMC's ability to accept other types of work including priming/painting of Bearcat vehicles, Eagle Eye trailers, and Internally Transportable Vehicles (ITVs).
Secure Holding Area for Loaded Trailers	New Construction	TBD	9	This project would designate approximately 0.9 acres north of Building 5426 as a secure area for trailers that have been loaded but are not ready to depart the LEMC.

Table 2.2-1:
Letterkenny Munitions Center Project List

Project	Project Category	Project Number	Illustrative Reference	Description
Blast Booth Addition	New Construction	TBD	8	The existing blast booth equipment supports LEMC mission requirements for both internal and external customers by abrasively cleaning ammunition components to be renovated. On average, LEMC currently uses the existing grit blast booth approximately 4,134 hours or more per year to maintain production quantities. This replacement is vital to the mission of the employees of the area. The existing equipment has not exceeded its listed useful life, but LEMC has requested personnel air samples be taken to test for lead, cadmium, and hexavalent chromium during abrasive blasting operations inside the abrasive blast booth. Testing revealed that the levels of lead, cadmium, and hexavalent chromium are at or above both the exposure limit and the action level. Due to its primitive design, the current blast booth does not recover any of the blast media or dust. This creates a high hazard environment due to the lack of a media recovery system. A new blast booth with media recovery capability is needed.
Inert Storage – Wood Storage	New Construction	TBD	10	Construction of a structure for wood storage: This building needs to provide 10,000 square feet of storage with 20-foot (tall or wide) doors on each end and the required number of pedestrian doors to meet code. The proposed project location east of Building 5321 is currently used for 20-foot Equivalent Units (TEU) storage. This project is needed to remediate the loss of dunnage due to exposure to the elements, requiring costly repairs and rework. The current process creates the need to evaluate how much of the ammunition material is being wasted due to inadequate or inefficient storage. It is currently being stored in earth-covered magazines, thus taking storage away from other potential workload items flowing through the facility. This also creates warehousing issues due to various product classification requirements.

Table 2.2-1:
Letterkenny Munitions Center Project List

Project	Project Category	Project Number	Illustrative Reference	Description
Ready Magazine	New Construction	CAAA15-18MC-65	11	Construction of a 4,000 square foot structure to store the materials used to complete the daily schedule at the point of use. Currently, materials such as detonation shots, burn pans, and static fire tubes are staged at a number of different earth-covered magazine locations which are used to complete the daily schedule in the demilitarized area. This project will consolidate the materials in one area to increase accountability and efficiency by decreasing travel and preparation time for the overall demilitarization process.
Inert Storage	New Construction	TBD	12	Construction of a large metal building to provide 10,000 square feet of consolidated storage of ammunition material. The current inventory will be consolidated into one building that utilizes the space both horizontally and vertically. The new construction will include a building complete with siding, roof, concrete slab, foundation, and no utilities. This project will allow for the permanent removal and relocation of ammunition materials from the leaking earth-covered magazines to a weather-proof storage facility.
Breakroom for Building 5321	Renovation	TBD	13	Construction of a new breakroom at Building 5321 is needed as the existing breakroom no longer supports the manning of the building. The new breakroom would improve the quality of the work environment (QWE). Demolition of the existing office and breakroom is required to provide a doorway near the existing window to a new breakroom and training area to be constructed outside the existing building footprint.
Facility for SDO at X-11-G	Renovation/New Construction	TBD	N/A	Expansion of Dock X-11-G by 20 feet towards Virginia Avenue. This project is needed as LEMC's workload is increasing and mission requirements need this expansion to support operations.

Table 2.2-1:
Letterkenny Munitions Center Project List

Project	Project Category	Project Number	Illustrative Reference	Description
Restoration of Transportation Infrastructure (Rail)	Infrastructure Upgrade	TBD	N/A	This project is required to repair 4 miles of the rail network located in the southern section of LEMC's ammunition storage area. A complete inspection and repair of the south rail section will be performed including replacement of ties, tie plates, switches, joint bars, bolts, and rail segments. Completion of this project will result in a fully functional rail network for LEMC to provide safe and efficient transportation of munitions, material, and equipment via rail at LEAD. LEMC, a Tier 1 facility for the U.S. Army Strategic Mobility Program, is responsible for receiving munitions for recertification and/or storage, as well as shipping munitions in support of the joint warfighter. LEMC is the CITE for surveillance, receipt, storage, issue, testing, and repair for the U.S. Army Tactical Missile System and Guided Multiple Launch Rocket System missiles.

Table 2.2-1:
Letterkenny Munitions Center Project List

Project	Project Category	Project Number	Illustrative Reference	Description
MID-RANGE (6 – 10 YEARS)				
Rocket Motor Destruction (ARMD) Facility Addition	New Construction	89246	N/A	Construction of a 30-foot by 80-foot insulated/heated pre-engineered steel building on a concrete slab with an attached mechanical room that has a minimum eave height of 22 feet and an integral 5-ton crane with minimum hook height of 14.5 feet. This facility will include electric service, water for domestic and fire protection uses, storm drainage to existing retention basin, paved access road, and paved parking lot. The facility will be designed to a minimum life of 40 years in accordance with the Department of Defense (DOD) Unified Facilities Criteria (UFC 1-200-02) including energy efficiencies, building envelope and integrated building systems performance. This facility will provide for segmenting of solid propellant rocket motors that are too large (805lbs Net Explosive Weight (NEW) Max per firing cycle) to be fired intact at the Ammonium Perchlorate Rocket Motor Disposal (ARMD) system's Thermal Treatment Chamber (TTC) at LEAD.
Repair Electrical Distribution System, Ammunition Area	Infrastructure Upgrade	91417	N/A	This project is required to modernize the electrical distribution system serving the west side of LEMC. The proposed work consists of modernization of the electrical distribution system in the Ammunition Area through installation of approximately 3 miles of poles and conductors from the Demolition Ground to Building 1456 on Georgia Avenue; replacement of porcelain cutouts on approximately 40 fused switches; and installation of additional switches to eliminate single points of failure in the electrical distribution system. The potential for extended outages and accompanying loss of production means the current system is failing to meet the production needs of the LEMC.
Inert Storage	New Construction	TBD	12	Construction of a large metal building to provide 10,000 square feet of consolidated storage for ammunition material. The current inventory will be consolidated into one new building where the space can be utilized both horizontally and vertically. The new building will be complete with siding, roof, concrete slab, foundation and no utilities. This will allow for the permanent relocation of ammunition materials from the leaking earth-covered magazines.

Table 2.2-1:
Letterkenny Munitions Center Project List

Project	Project Category	Project Number	Illustrative Reference	Description
Upgrade Existing 20-foot Equivalent Units (TEU) Storage Lots	Renovation	TBD	N/A	Convert the existing stone lots that are currently the storage location for 20-foot TEU. This will provide a stable concrete base for the use of material handling equipment.
Restoration of Transportation Infrastructure (Roads)	Infrastructure Upgrade	87046	N/A	This project is required to provide for the safe transportation of munitions, materiel, and equipment via the road network at LEAD. Included in this project are repairs to approximately 11 miles of asphalt road surfaces throughout LEMC's industrial area. Repairs include removal and replacement of stone base, asphalt base course, and asphalt wearing course as required to restore road surfaces to a safe operating condition for motor vehicles. Some of the roads included in this project are Virginia Avenue from Massachusetts Avenue to Pennsylvania Avenue, Wyoming Avenue, part of Massachusetts Avenue along the K-Area, Georgia Avenue from Massachusetts Avenue to Bazooka Road, the southeast perimeter section of C-Area, and two areas within the A-Area. These roads are in poor condition and present immediate problems to the mission viability. Currently, each of these are paved roadways but are insufficient in condition and need immediate repair.
Inert Storage	New Construction	TBD	12	Construction of a large metal building to provide 10,000 square feet of consolidated storage for ammunition material. The current inventory will be consolidated into one new building where the space can be utilized both horizontally and vertically. The new building will be complete with siding, roof, concrete slab, foundation and no utilities. This will allow for the permanent relocation of ammunition materials from the leaking earth-covered magazines.
Security Upgrades (New Post #2)	New Construction	TBD	N/A	Access Control Point for a Limited/Controlled Access Area
Building 5321 Addition	New Construction	TBD	N/A	Construction of a 30-foot by 90-foot structure with 480-volt service in support of the bonne saw and nail puller, essential to streamlining the preparation of dunnage. This structure is needed in response to an increase in production demand.

Table 2.2-1:
Letterkenny Munitions Center Project List

Project	Project Category	Project Number	Illustrative Reference	Description
Inert Storage	New Construction	TBD	N/A	Construction of a large metal building to provide 10,000 square feet of consolidated storage for ammunition material. The current inventory will be consolidated into one new building where the space can be utilized both horizontally and vertically. The new building will be complete with siding, roof, concrete slab, foundation and no utilities. This will allow for the permanent relocation of ammunition materials from the leaking earth-covered magazines.
Project for Modernization of Building 3700	Renovation	94432	N/A	This project will provide upgrades to the building exterior envelope, superstructure, site, and interior configuration and finishes, and code compliant building improvements for HVAC, electrical, communications, and fire systems. Building exterior and envelope improvements include installing site and dock lighting; installing canopy above overhead doors; installing lightning protection system; replacing overhead doors; and replacing exterior windows. Superstructure improvements include replacing the roof system. Interior construction includes repairing concrete floors; installing a static grounding system in production areas; installing interior doors; improving interior lighting fixtures; and painting interior walls.
Inert Storage	New Construction	TBD	N/A	Construction of a large metal building to provide 10,000 square feet of consolidated storage for ammunition material. The current inventory will be consolidated into one new building where the space can be utilized both horizontally and vertically. The new building will be complete with siding, roof, concrete slab, foundation and no utilities. This will allow for the permanent relocation of ammunition materials from the leaking earth-covered magazines.

Table 2.2-1:
Letterkenny Munitions Center Project List

Project	Project Category	Project Number	Illustrative Reference	Description
LONG-RANGE (10+ YEARS)				
Igloo Modernization – Overall	Renovation	90406	N/A	Work to be performed under this project includes repair and modernization to earth-covered magazines, which would include replacing existing single-width access door with double-width access doors for 49 Igloos in C Area only and epoxy injection repair of interior cracks and exposed rebar in concrete arches; repair or replacement of failed air vents; repairs to failing lightning protection systems (air terminals and conductors) damaged by weather and grounds maintenance activities. This project also would include repairs to failing asphalt access aprons and other miscellaneous repairs for failing igloos in Areas B, C, K.
Inert Storage	New Construction	TBD	N/A	Construction of a large metal building to provide 10,000 square feet of consolidated storage for ammunition material. The current inventory will be consolidated into one new building where the space can be utilized both horizontally and vertically. The new building will be complete with siding, roof, concrete slab, foundation and no utilities. This will allow for the permanent relocation of ammunition materials from the leaking earth-covered magazines.
Igloo Road Repairs – Overall	Renovation/New Construction	90407	N/A	The single-lane roads traveling through the igloo areas have become dilapidated since their construction in the 1950's and they require modernization. The current width of these roads ranges from 9 – 11 feet with no shoulder. Due to the size of the current commercial vehicle fleet, the roads need to be widened to 12 feet with an additional 3-foot shoulder to ensure the safe transportation of ammunition to and from igloo storage.
Inert Storage	New Construction	TBD	N/A	Construction of a large metal building to provide 10,000 square feet of consolidated storage for ammunition material. The current inventory will be consolidated into one new building where the space can be utilized both horizontally and vertically. The new building will be complete with siding, roof, concrete slab, foundation and no utilities. This will allow for the permanent relocation of ammunition materials from the leaking earth-covered magazines.

Table 2.2-1:
Letterkenny Munitions Center Project List

Project	Project Category	Project Number	Illustrative Reference	Description
Modernization of Building 3701	Renovation	TBD	N/A	Built in 1956, Building 3701 totals 5,878 gross square feet (GSF). The facility was originally constructed as a Storage Building, General Purpose, Depot Level. The facility is currently used as inert storage for LEMC training materials and inter supplies. The facility contains asbestos in the roof and walls, which has prevented renovation projects in the past. Removal of the asbestos containing materials and upgrades to the facility are required for the facility to remain in use.
Aboveground Magazine Repair	Renovation	86673	N/A	This project is required to provide essential repairs to 10 above-ground magazines used for storage of small arms ammunition and missile components at Letterkenny Army Depot. These magazines, constructed in 1942, provide essential storage for conventional ammunition and missiles for the LEMC. These have begun to experience extensive deterioration due to age and weatherization. The concrete docks are severely deteriorated, resulting in loss of concrete surfacing, exposed steel reinforcement, and failure of joint materials. Cargo doors are no longer functional and have been closed to use, leading to inefficiencies in storage operations and space utilization. Asbestos roofs on two magazines are cracked and are in failing condition, exposing the building contents to potential damage from roof failure as well as from contamination with asbestos. Other components such as louvers and ventilators, lightning protection system, air terminals and conductors, gutters and downspouts, and bonding need repair. Without extensive repairs, these magazines will become unsafe for use, limiting LEMC's ability to perform its primary functions of receipt, storage, and issue of ammunition and explosives.
Inert Storage	New Construction	TBD	N/A	Construction of a large metal building to provide 10,000 square feet of consolidated storage for ammunition material. The current inventory will be consolidated into one new building where the space can be utilized both horizontally and vertically. The new building will be complete with siding, roof, concrete slab, foundation and no utilities. This will allow for the permanent relocation of ammunition materials from the leaking earth-covered magazines.

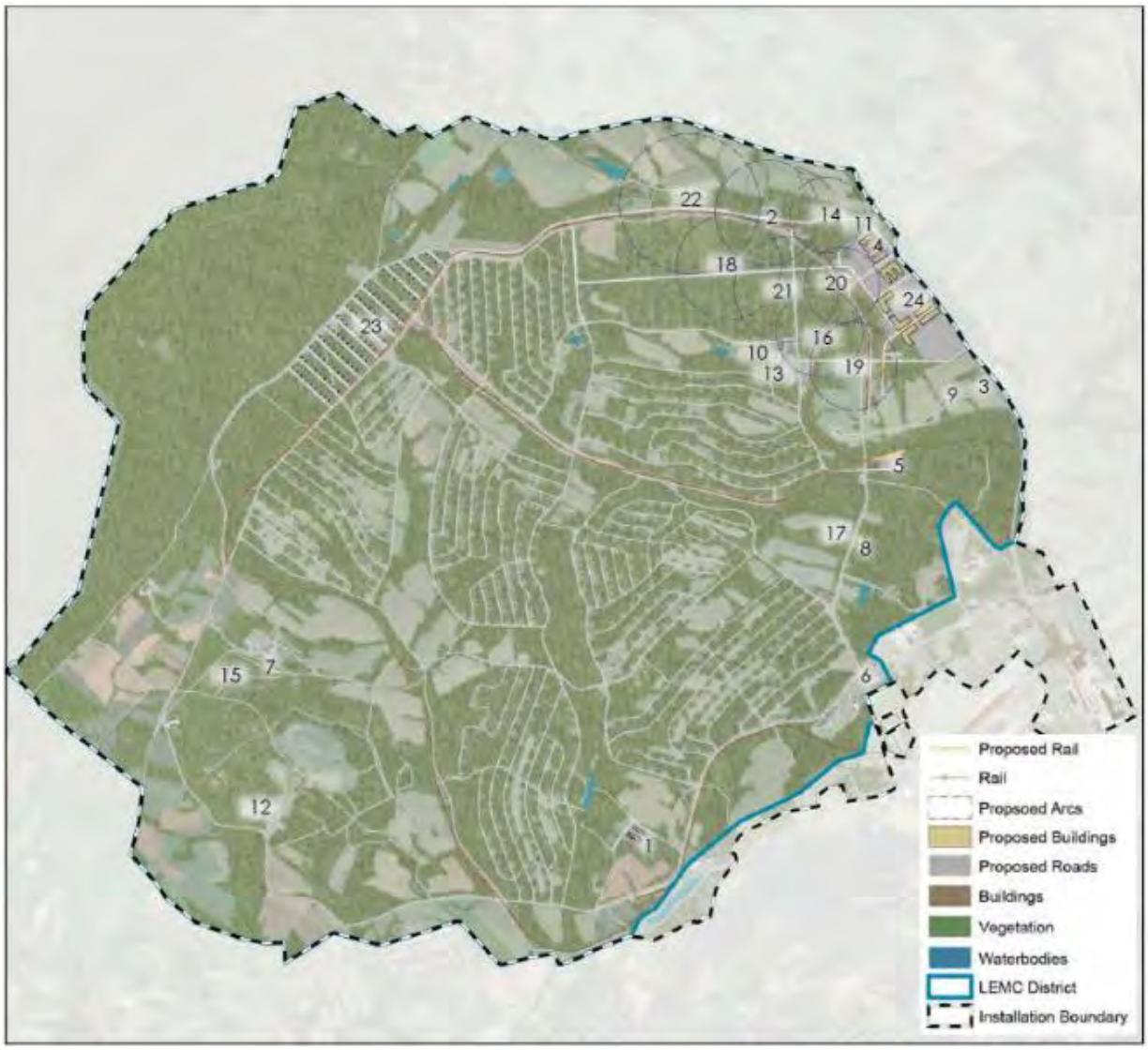
Table 2.2-1:
Letterkenny Munitions Center Project List

Project	Project Category	Project Number	Illustrative Reference	Description
Modernization of Building 3702	Renovation	TBD	N/A	Built in 1956, Building 3702 totals 5,878 GSF. The facility was originally constructed as a Storage Building, General Purpose, Depot Level. The facility is currently used as inert storage for LEMC training materials and inter supplies. The facility contains asbestos in the roof and walls, which has prevented renovation projects in the past. Removal of the asbestos containing materials and upgrades to the facility are required for the facility to remain in use.
Earth-covered Magazine Repair	Renovation	86671 / 86672	N/A	This project is required to provide essential repairs to 100 earth-covered magazines in A-Area, 108 in the B-Area, 119 in the C-Area, 100 in the D-Area, 100 in the G-Area, 102 in the E-Area, 151 in the F-Area, and 122 in the K-Area. These magazines are used for storage of conventional ammunition and explosives as well as for missiles by the LEMC. These magazines, most of which were constructed in 1942, are in failing condition due to age and heavy usage. Many of the magazines are no longer water-tight due to excessive cracking in the concrete arches, allowing water into the storage areas. Other components such as vents, doors, and lightning protection systems also need repair. Without extensive repairs, these magazines will become unsafe for use, limiting LEMC's ability to perform its primary functions of receipt, storage, and issue of ammunition and explosives.
Building 4755 Replacement (Ammunition Demilitarization Facility)	New Construction	TBD	14	Building 4755 houses the initial de-mating operations that prepare MLRS rocket motors for disposal.
Satellite Fire Station	New Construction	TBD	15	Required to meet the needed response times for safe operations throughout LEMC.
Building 3626 Replacement (Receipt Classification)	New Construction	TBD	16	Replace the existing building at a new centralized operational location.
Conventional Ammunition Workshop	New Construction	TBD	17	Replace the existing building at a new centralized operational location.
Building 3810 Replacement Multiple Launch Familiy of Missiles (MFOM)	New Construction	TBD	18	Replace the existing building at a new centralized operational location.

Table 2.2-1:
Letterkenny Munitions Center Project List

Project	Project Category	Project Number	Illustrative Reference	Description
Building 3750 Replacement (MFOM)	New Construction	TBD	19	Replace the existing building at a new centralized operational location.
Building 8001 Replacement (MFOM)	New Construction	TBD	20	Replace the existing building at a new centralized operational location.
Building 5647 Replacement (ARMD)	New Construction	TBD	21	Replace the existing building at a new centralized operational location.
Building 2755 Replacement (Surveillance)	New Construction	TBD	22	Replace the existing building at a new centralized operational location.
Building 2383 Replacement (MUTT)	New Construction	TBD	N/A	Replace the existing building at a new centralized operational location.
D-Area Igloos Replacement	New Construction	TBD	18	This project will relocate the existing igloos into the areas vacated by LEMC's maintenance buildings listed above.
CAPACITY				
Future Munitions Operations Support	New Construction	TBD	24	Construction of new munitions operations support warehouses and administrative space to accommodate future expanded mission and future increased capacity.

Figure 2-2: Project Index Map for Letterkenny Ammunitions Center



Project List:

1) Guided Missile Maintenance Facility
2) Precision Strike Missile System (PrSM)
3) Expand Roadway at Voelz Gate
4) Consolidated Munition Distribution Facility
5) Rail Classification Yard
6) LEMC POV Parking Expansion
7) Inert Storage
8) Paint Shop / Blast Booth Addition
9) Secure Holding Area for Loaded Trailers
10) Inert Storage- Wood Storage
11) Ready Magazine
12) Inert Storage
13) Breakroom for 5321
14) Building 4755 Replacement (Ammunition Demilitarization Facility)
15) Satellite Fire Station
16) Building 3626 Replacement (Receipt Classification)
17) Conventional Ammunition Workshop
18) Building 3810 Replacement (MFOM)
19) Building 3750 Replacement (MFOM)
20) Building 8001 Replacement (ARMD)
21) Building 5647 Replacement (RRPR)
22) Building 2755 Replacement (Surveillance)
23) D-Area Igloos Replacement
24) Future Munitions Operations Support

*Projects locations TBD not graphically represented.

2.2 Screening Criteria

The four most significant screening criteria considered when analyzing possible project and alternative scenarios included:

- Operational constraints;
- Environmental constraints;
- Developable areas; and
- Logistics accessibility and operational efficiency

2.2.1 Operational Constraints

Explosive Safety Quantity-Distance (ESQD) Arcs are safety buffers intended to protect explosive mission functions from encroaching on development while protecting life and property from explosive hazards. Inhabited development, incompatible with explosives operations, is prohibited within ESQD Arcs. There are also facility safety buffers that cannot overlap other inhabited facilities. Operational constraints are a primary limiting factor for future development in the LEMC District. While these constraints are restrictive, they do not prohibit development of in-kind missions (i.e. explosives-related facilities within igloo buffers).

2.2.2 Environmental Constraints

LEMC is mostly covered in dense vegetation because of the sprawling layout of the igloos. Other major land cover includes agricultural fields, streams and wetlands, and environmental restoration sites. Hunting and fishing are permitted on the Installation in certain areas. There are six observed state-protected animal species at LEMC and eight known cemeteries within the district boundary.

2.2.3 Developable Areas

After identifying areas constrained by ESQD Arcs, environmental considerations, and facility buffers, areas that are mostly open and have few constraints to development were highlighted. Areas with existing ESQD Arcs and facility buffers that can be consolidated and/or relocated were also identified as developable. In total there are approximately 3,556 acres of high buildable area, 7,822 acres of medium buildable area, and 5,470 acres of low buildable area inside the LEMC district.

2.2.4 Logistics Accessibility and Operational Efficiency

The current development pattern at LEMC is piecemeal and sprawling based on developable land and operational constraints. This pattern works with the current operational conditions but is inefficient in terms of transit times and costly in terms of infrastructure maintenance funding. LEMC evaluated alternatives that would eliminate the sprawling development pattern and consolidate operational facilities to one area

of the Installation. This approach would result in lower infrastructure repair costs and would facilitate increased mission capabilities through creation of modern, adaptable, and flexible facilities and modern igloos.

2.3 Alternatives Considered but Eliminated from Further Consideration

Each of the Alternatives evaluated is intended to provide distinct future development scenarios. The planning requirements and anticipated results for two other alternatives are described below. However, these alternatives were not carried forward for analysis because they do not meet the purpose and need to consolidate and modernize existing facilities while providing a long-range plan for sustainable growth to support ongoing and future missions.

2.3.1 Alternative 1 – Limited Growth Scenario

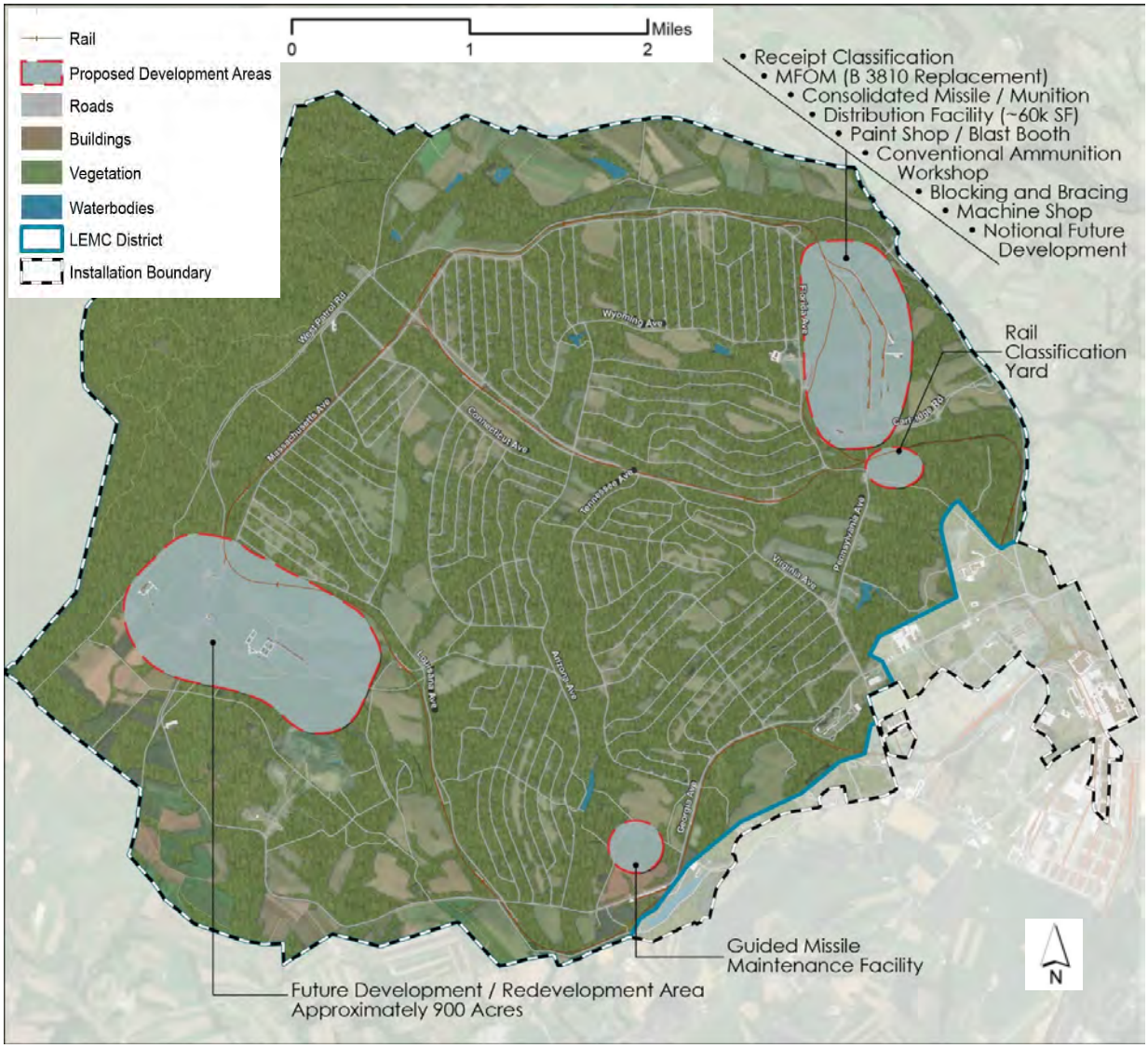
Alternative 1 presents a limited growth scenario. Figure 2-3 presents an overview of Alternative 1 developments. The current planning and development pattern within LEMC would remain unchanged. Alternative 1 would only allow for improvements within certain areas of LEMC, which would continue the existing sprawling development pattern rather than consolidate operations. Because Alternative 1 would not result in the creation of adaptable, flexible facilities connected by modern infrastructure, it would not meet the purpose and need described in Sections 1.2.1 and 1.2.2. Therefore, Alternative 1 was eliminated from further consideration and will not be further analyzed in this EA.

Figure 2-3: Alternative 1 – Limited Growth Scenario

2.3.2 Alternative 2 – Moderate Growth Scenario

Alternative 2 would result in key redevelopment areas, which are geographically separated to the east and west of LEMC (Figure 2-4). This scenario would increase mission capabilities by providing modern facilities. Alternative 2 would strategically relocate aboveground magazines into new modern facilities/development areas and centralize infrastructure support and site accessibility, beginning in the northeast quadrant of LEMC. Alternative 2 would not eliminate or prevent the continued sprawling development pattern across the Installation. Alternative 2 would not aid in the consolidation of facility functions nor would it create adaptable, flexible facilities connected by modern infrastructure. Therefore, Alternative 2 would not meet the purpose and need of the ADP as described in Sections 1.2.1 and 1.2.2. For these reasons, Alternative 2 was eliminated from further consideration and will not be analyzed further in this EA.

Figure 2-4: Alternative 2 – Moderate Growth Scenario



2.4 No Action Alternative

Under the No Action Alternative, the LEMC ADP would not be implemented. Without modernization of facilities and infrastructure, facility expansions would continue to sprawl along the path of least resistance. The ability to consolidate operations without a plan in place is a challenge. LEMC would have less flexibility in facility uses and mission viability would be compromised. As a result, the No Action Alternative does not fulfill the Proposed Action's purpose and need. It is included in this analysis because it provides a baseline against which the beneficial and adverse impacts of the other alternatives can be compared.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The affected environment sections describe the existing conditions of the natural, cultural, and social resources, against which environmental effects of the Proposed Action and No Action Alternative are evaluated. The existing environmental conditions are presented first for each environmental resource or condition, followed immediately thereafter by an evaluation of the consequence(s) of the Proposed Action and No Action Alternative.

The environmental consequences sections present a general analysis of the environmental effects on each resource area associated with the proposed construction, demolition, and infrastructure improvement projects outlined in the ADP and this EA. The significance of an action is measured in terms of its duration, whether the impacts are direct or indirect, the magnitude of the impacts, and whether they are adverse or beneficial. Definitions of these terms are described below:

- Short-term: Effects that would occur only with respect to a particular activity for a finite period, or only during the time required for construction or installation activities.
- Long-term: Effects that are more likely to be persistent and chronic, extending beyond the completion of construction.
- Direct: Effects that are caused by an action and occur around the same time at or near the location of the action.
- Indirect: Effects that are caused by an action and might occur later in time or be farther removed in distance but still be a reasonably foreseeable outcome of the action.
- Negligible: When the impacts are localized and perceptible but not measurable at the lowest level of detection.
- Minor: When the impact is localized and slight, but detectable.
- Moderate: When the impact is readily apparent and appreciable.
- Significant: When the impact is severely adverse, major, and/or highly noticeable.
- Adverse: When the impact has an unfavorable or undesirable outcome on the man-made or natural environment.
- Beneficial: When the impact would have a positive outcome on the man-made or natural environment.

The Proposed Action and No Action Alternative environmental consequences for each resource area are summarized in Table 3.0-1 and further discussed in following sections.

Table 3.0-1
Summary of Environmental Consequences for the Proposed Action and No Action Alternative

Resource Area	Proposed Action	No Action Alternative
Land Use	• New construction projects would have long-term minor direct adverse impacts from proposed projects that would require conversion of undeveloped land to developed land. • Impacts from infrastructure upgrades or renovations are not expected.	There would be no changes or impacts to land use.
Aesthetics and Visual Resources	• The Proposed Action would have short-term and minor impacts from activities associated with construction and remodeling. • Long-term beneficial impacts as buildings would be improved upon and/or newly constructed are expected.	There would be no change to the current aesthetics and visual resources.
Geology, Topography, and Soils	• The Proposed Action would have long-term negligible to minor direct adverse impacts on geology and topography from grading and other earth-moving activities during demolition, construction, and road and infrastructure improvements. • The Proposed Action would have short-term and long-term moderate adverse direct impacts on soils from disturbance during demolition, construction, and improvement projects due to soil compaction, conversion to impervious surfaces, and erosion during earth moving activities.	There would be no changes or impacts on existing geology, topography, and soils.
Biological Resources	• Short- and long-term negligible adverse effects to vegetation would be expected during new construction, renovation, and infrastructure upgrade activities due to trampling, temporary removal, and permanent removal of vegetation. • Short-term minor direct and indirect adverse effects to fish and wildlife due to disturbances from noise, construction activities, and heavy equipment use are expected. Long-term minor direct adverse impacts to fish and wildlife due to the addition of developed impervious areas and habitat loss associated with conversion of undeveloped areas to developed are also expected. • - Minor to no impact on federally listed species and minor to moderate impacts on state-listed species due to habitat loss as a result of tree clearing are expected.	There would be no changes or impacts to vegetation, fish, wildlife, or protected species.
Water Resources	• The Proposed Action would have long-term minor to moderate effects to streams and wetlands from removal of vegetative cover or conversion of vegetated areas to impervious surfaces. • No direct impacts to groundwater are expected.	There would be no changes or impacts to surface water or groundwater.

Table 3.0-1
Summary of Environmental Consequences for the Proposed Action and No Action Alternative

Resource Area	Proposed Action	No Action Alternative
Air Quality, GHGs, and Climate Change	• The Proposed Action would have short-term adverse direct impacts to air quality from increased emissions from equipment associated with construction, renovation, and infrastructure projects. • The Proposed Action would have temporary GHG releases from increased vehicular traffic and construction equipment; therefore, are not expected to have long-term impacts to the climate. • No long-term impacts from operation activities are expected.	There would be no changes or impacts to air quality, GHGs, or climate change.
Hazardous and Toxic Substances	• The Proposed Action would have short-term minor adverse effects of hazardous materials associated with the use of hazardous materials such as paints, solvents, sealants, and fuel during construction, demolition, renovation, and infrastructure projects • The Proposed Action would have minor long-term impact from the increased use of hazardous materials and generated hazardous waste as a result of increased operations and production.	There would be no changes or impacts to hazardous and toxic substances.
Noise	• The Proposed Action would have minor short-term adverse noise impacts from new construction, renovations, and infrastructure upgrades. • The Proposed Action would have minor long-term impacts on the noise environment due to increased train traffic and operational noise in new facilities.	There would be no changes or impacts to noise.
Cultural Resources	• The Proposed Action would have long-term minor to moderate impacts on the cultural resources from new development on cultural or archeological resources.	There would be no changes or impacts to cultural resources.
Socioeconomics	• The Proposed Action would have moderate and short-term beneficial direct and indirect impacts on the local economy resulting from construction, renovation, and infrastructure upgrade activities. • No impacts to minorities, low-income families, or children are expected.	There would be no changes or impacts to socioeconomics.
Traffic and Transportation	• The Proposed Action would have moderate temporary adverse impacts from a temporary increase to existing traffic conditions and road work during construction. • The Proposed Action would have long-term beneficial direct impacts as improvements to the existing roadway and railroad networks progress, traffic flow would improve.	There would be no long-term improvements to traffic and transportation.
Utilities	• The Proposed Action would have short-term negligible direct adverse impacts when facilities are disconnected from and connected to the electrical system and potable water supply. • The Proposed Action would have long-term beneficial impacts on the potable water system, electrical system, and communications system from proposed infrastructure upgrades. • No impact on the stormwater system are expected.	There would be no changes or impacts to utilities.

Table 3.0-1 Summary of Environmental Consequences for the Proposed Action and No Action Alternative		
Resource Area	**Proposed Action**	**No Action Alternative**
Recreation	• The Proposed Action would have a short-term negligible direct adverse impact on recreation during construction. • No long-term impacts from operation activities are expected.	There would be no changes or impacts to recreation.
Human Health and Safety	• The Proposed Action would have a short-term minor direct adverse impact on human health and safety from increased use and storage of regulated materials during construction. • The proposed Action would have minor long-term impact from the increased use of hazardous materials and generated hazardous waste as a result of increased operations and production.	There would be no changes to impacts to human health and safety

3.1 Land Use

3.1.1 Affected Environment

LEMC occupies 16,971 acres of LEAD's 18,668 acres. Its facilities include 17 explosive operating buildings, 2.3 million square feet of explosive storage space, 902 igloos, 10 above-ground magazines, and 26 rail docks. As depicted in Figure 3-1, LEMC's land use includes ammunition storage (Zone I) and a buffer zone (Zone II). The ammunition storage area consists of approximately 12,000 acres of semi-improved and unimproved land. Zone I associated activities include ammunition storage, tactical missile storage & assembly, open burning/open detonation, a firing range, agricultural out leasing, wildlife management, and recreational hunting and fishing (Tetra Tech 2013). Zone I includes Explosive Safety Quantity-Distance (ESQD) arcs. ESQD arcs are safety buffers intended to protect explosive mission functions from encroaching development while protecting life and property from explosive hazards. Inhabited development, incompatible with explosives operations is prohibited within ESQD arcs.

The buffer zone consists of approximately 4,500 acres of semi-improved and unimproved land. Zone II associated activities include agricultural out leasing, forestry management, wildlife management, and recreational hunting and fishing (Tetra Tech 2013). LEMC has approximately 9,600 acres of agricultural land in the ammunition storage area and buffer area that are leased to area farmers for crop production.

LEMC is bordered by agricultural lands to the north and south, the state forest and state game management land to the west, and LEAD cantonment to the east. More than 85 percent of the land in Franklin County is either pasture and grassland, row crops, or forest (Tetra Tech 2013). There are several residential developments and a commercial shopping strips along U.S. 11 that service the LEAD and Chambersburg.

As depicted in Figure 3-2, LEMC is bordered by the Buchanan State Forest to the west and Pennsylvania State Game Lands (SGL) occur to the north and east of the Installation (Tetra Tech 2013). Several farms along the LEMC border are classified as protected agricultural land under the state Agricultural Easement program (Tetra Tech 2013). Figure 3-3 illustrates the locations of active agricultural outlease parcels within the Installation.

3.1.2 Environmental Consequences

3.1.2.1 Proposed Action

The Proposed Action would have a long-term minor direct adverse impact on land use. For projects categorized as “new construction” in Table 2.2-1, land that is currently undeveloped would become developed. However, the proposed new construction projects are primarily located on land that has been previously disturbed and the new development would be compatible with adjacent and surrounding land uses. Projects categorized as “infrastructure upgrades” or “renovations” in Table 2.2-1 would have no impact because there would be no change or modification to the existing land use classification in those areas.

3.1.2.2 No Action Alternative

Under the No Action Alternative, the ADP and proposed projects would not be implemented. There would be no changes or impacts on land use. However, it is anticipated that future development would still occur, as the need for modernization and expansion will not cease; and, those future development projects would be analyzed through the preparation of project specific NEPA documentation, as appropriate.

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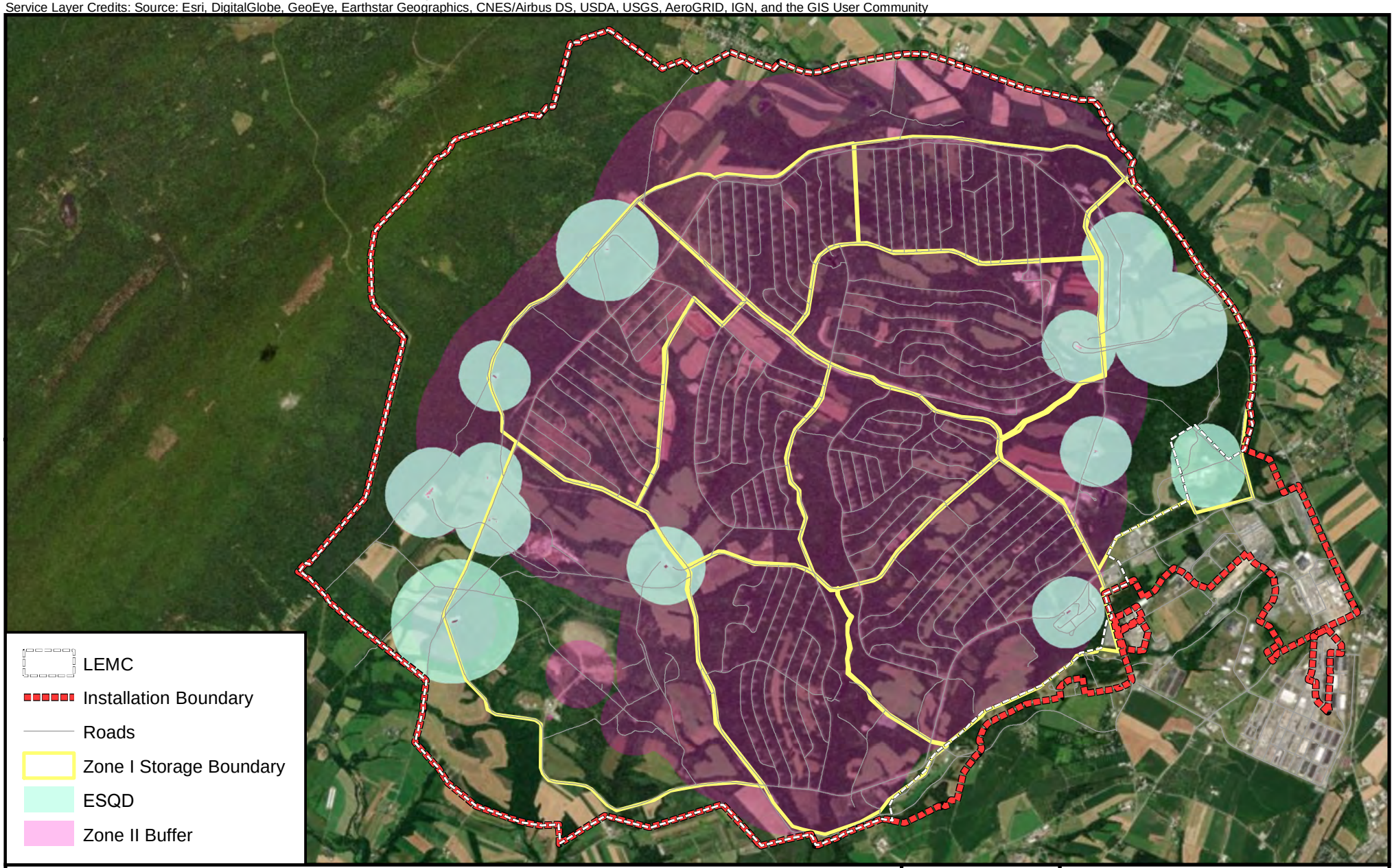

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Figure 3-1
Munitions Buffers
LEMC ADP EA

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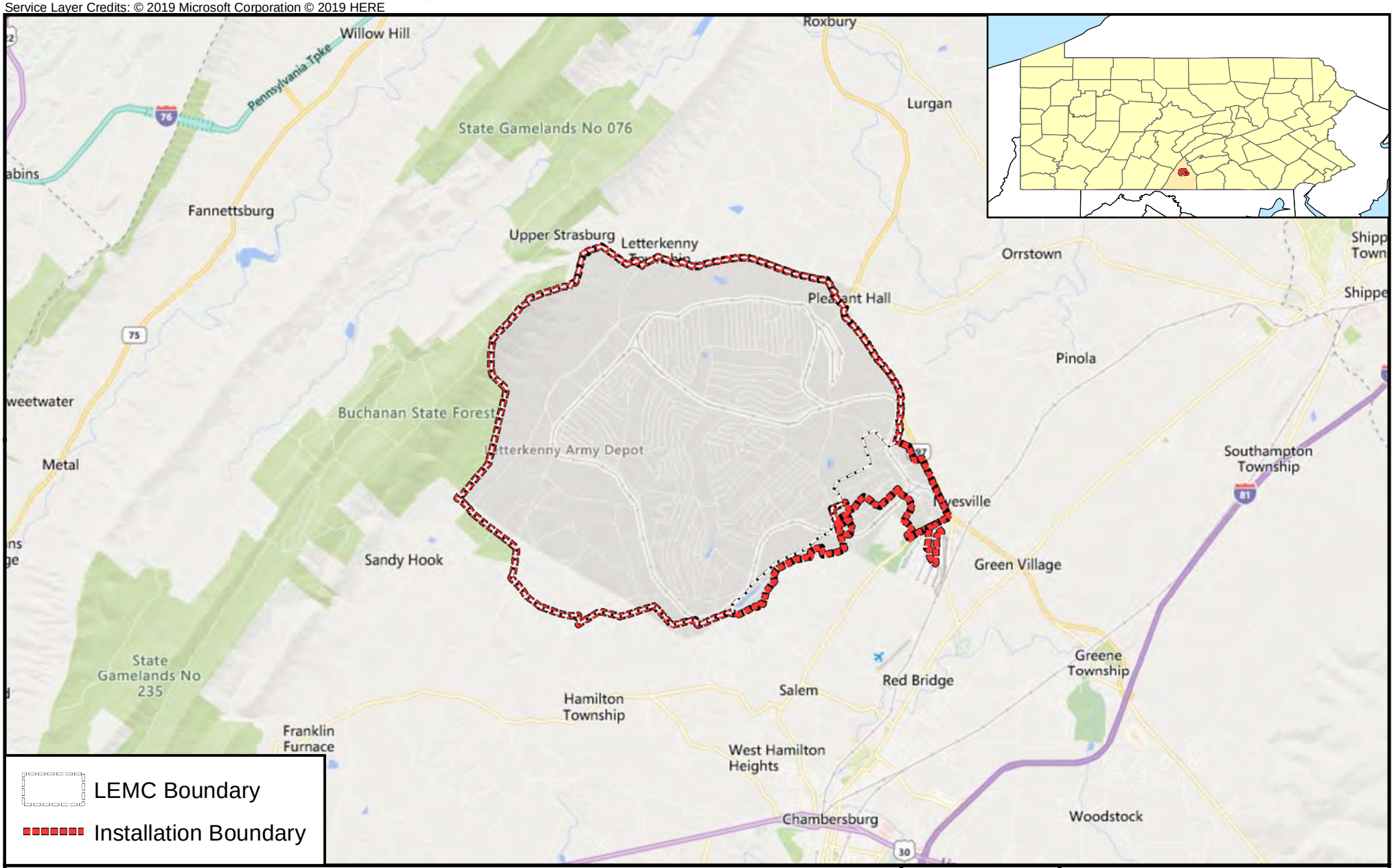

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Figure 3-2
LEAD Surrounding Land Use
LEMC ADP EA

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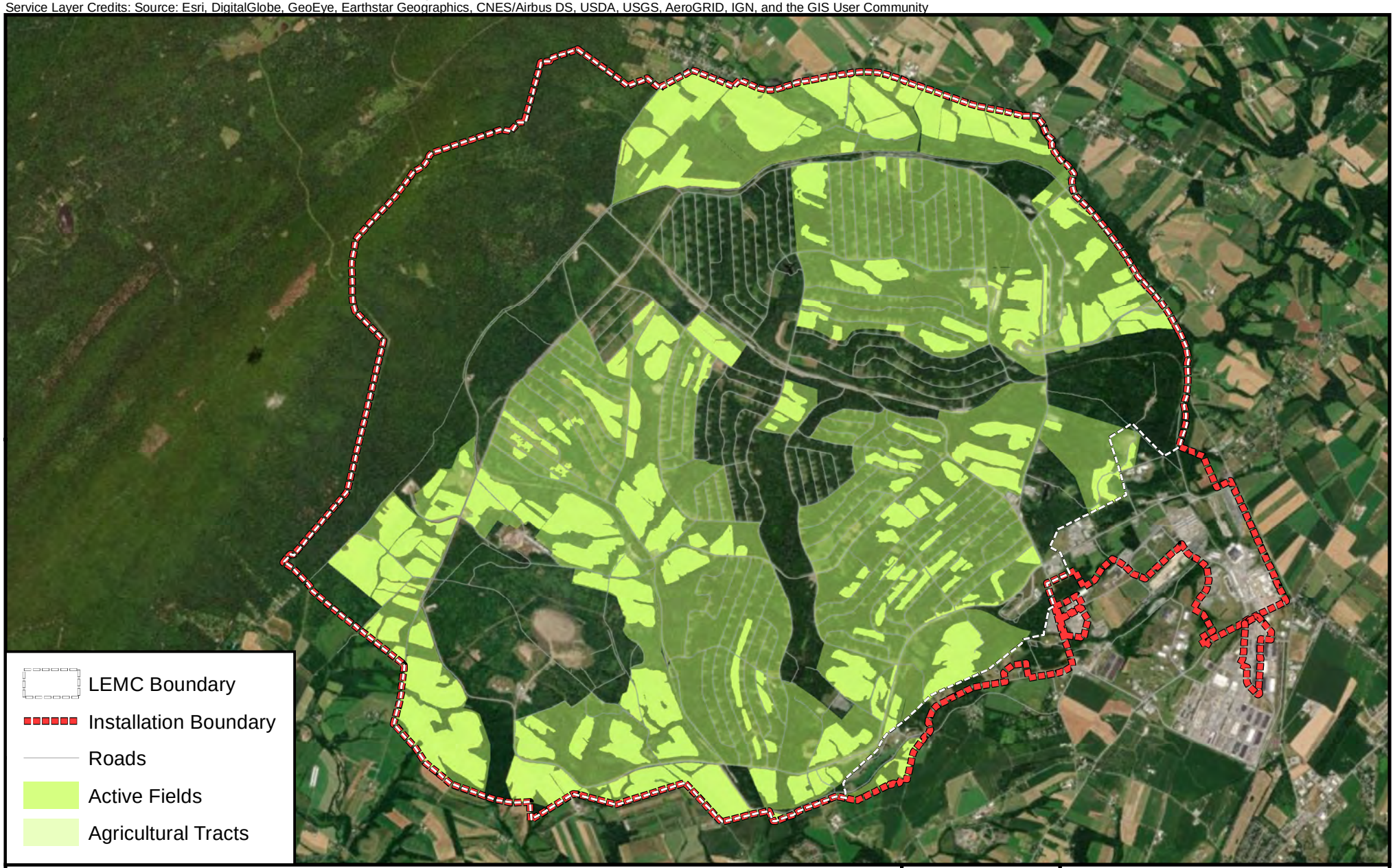

NORTH

0 1 2 4
Miles

BURNS McDONNELL

Figure 3-3
LEAD Agricultural Outleasing Program
LEMC ADP EA

Source:

Issued: 10/30/2019

3.2 Aesthetics and Visual Resources

3.2.1 Affected Environment

LEMC consists of semi-improved and unimproved lands. The semi-improved lands include the over 900 earthen munitions storage igloos, open burning/open detonation area in the southwest, firing range, roads, railroads, and agricultural out lease fields (row crops and pasture lands). The storage and assembly facilities are scattered in the eastern, northeastern, and southwestern areas of LEMC, but most of the built structures reside in the LEAD project area. The unimproved areas of LEMC consist of forests, streams, and wetlands. There is housing/residential developments on the Installation. However, there is no housing within the LEMC. Outside the Installation, there are rural residences along the northeast border and higher density residential developments to the southeast.

3.2.2 Environmental Consequences

3.2.2.1 Proposed Action

The Proposed Action would not block or disrupt existing viewsheds. There would be short-term and minor impacts during construction, remodeling, and new construction that would ultimately result in long-term beneficial impacts on the aesthetics and visual resources in the area as buildings would be improved upon and/or newly constructed. The new construction would be concentrated in the northeast portion of LEMC and away from the higher density housing that exists south of the Installation. There would be limited tree removal and demolition during the Proposed Action with new developments constructed on undisturbed and previously disturbed areas alongside similar facilities. The projects would be constructed over a period of approximately 20 years, so impacts would be spread out over time and would occur at several locations. By phasing the construction timing and location of different projects, adverse impacts on aesthetics and visual resources would be minimized.

3.2.2.2 No Action Alternative

Under the No Action Alternative, the ADP and proposed projects would not be implemented. There would be no change to the current aesthetics and visual resources. However, it is anticipated that future development would still occur, as the need for modernization and expansion will not cease; and, those future development projects would be analyzed through the preparation of project-specific NEPA documentation, as appropriate.

3.3 Geology, Topography, and Soils

3.3.1 Affected Environment

3.3.1.1 Geology

LEMC straddles the South Mountain Anticlinorium geologic formation to the east and the Massanutten Synclinorium geologic formation to the west. The eastern portion of LEMC is underlain by carbonate rocks (limestones and dolomites) and the western portion is underlain by shales. The munitions center is underlain by five Ordivician-aged geologic formations: the Chambersburg formation, St. Paul Group, Rockdale Run formation, Pinesburg Station formation, and Martinsburg formation. To date, no petroleum or mineral resources have been found on LEMC and no mining activities have occurred within or adjacent to its boundaries (Tetra Tech 2013).

3.3.1.2 Topography

LEMC is in the Susquehanna-Potomac Segment of the Great Valley Section of the Ridge and Valley Province (PDCNR, 2018). The western portion of the munitions center crosscuts Broad Mountain, and the rest of LEMC is in the Cumberland Valley. Surface elevations range from approximately 600 to 800 feet above mean sea level, except for the northwest portion of LEMC where the elevation increases to more than 2,300 feet (Tetra Tech 2013).

3.3.1.3 Soils

According to the Franklin County Soil Survey, three soil associations occur on LEMC. The Weikert-Berks-Beddington soil association covers most of LEMC. It is characterized as shallow to deep and well-drained. These acidic soils are weathered from shale, siltstone, and acid sandstone. They are prevalent in valley bottoms. The Laidig-Very Stony Land-Buchanan association is also acidic and deep, and ranges from somewhat poorly to well-drained. These soils are formed in colluvium from sandstone on Broad Mountain along the western border of the depot. The Murrill-Laidig association is made up of less acidic, deep, well-drained soils formed from colluvium at the base of the eastern side of Broad Mountain (Tetra Tech 2013).

There are no highly erodible soils identified at LEMC, but four soils series were identified as moderately erodible and occur in the mountainous northeast area of LEMC. These soils series include:

- Buchanan extremely stony loam, 8 to 25 percent slopes;
- Hagerstown silty clay, 15 to 25 percent slopes, eroded;
- Laidig extremely stony sandy loam, 25 to 45 percent slopes; and
- Weikert shaly silt loam, 25 to 70 percent slopes (Tetra Tech 2013).

LEAD has approximately 1,000 acres of designated prime farmland soils under the federal Farmland Protection Policy Act and 9,760 acres of farmland soils classified as "farmland soils of statewide importance." All the soils in LEMC outside of streams, wetlands, and the mountainous area to the northwest are either prime farmland or soils of statewide importance. The areas designated as prime farmland are concentrated to the western area of LEMC at the base of the mountains. The rest of LEMC is classified as farmland soils of statewide importance (Tetra Tech 2013). Many of the prime farmland areas are being actively farmed by local farmers through LEMC's agricultural out lease program.

3.3.2 Environmental Consequences

3.3.2.1 Proposed Action

The Proposed Action would have long-term negligible to minor direct adverse impacts on geology and topography from grading and other earth-moving activities during demolition, construction, and road and infrastructure improvements. Impacts would be negligible in areas where the land has already been graded and prepared for construction including existing roads and infrastructure improvements. Impacts would be minor where new construction is proposed.

The Proposed Action would have short-term and long-term moderate adverse direct impacts on soils from disturbance during demolition, construction, and improvement projects. Impacts on soils could include compaction from heavy equipment and construction of impervious surfaces, as well as erosion from disturbance of soils during earth-moving activities. None of the proposed projects occur in areas with moderately erodible soils. Effective erosion control procedures and best management practices (BMPs) would be used during construction to minimize impacts on soils. BMPs could include installing silt fencing and sediment traps, applying water to disturbed dry soil, and revegetating/stabilizing disturbed areas as soon as possible after disturbance.

There would be a similar impact on the soils if a spill or leak of petroleum projects or hazardous materials were to occur. In the event of a spill, LEAD's Integrated Contingency Plan (ICP) would be followed to quickly contain and clean up the spill (H.F. Lenz Company 2016).

The Proposed Action would also have long-term adverse impacts on soils classified as prime farmland and farmland of statewide importance as many of the proposed projects would occur on these soils. LEMC would aim to avoid impacts to protected soils when siting the proposed projects for development. However, federal lands are exempt from prime farmland protection, and therefore, no impacts to prime farmland are anticipated.

3.3.2.2 No Action Alternative

Under the No Action Alternative, the ADP and proposed projects would not be implemented. There would be no changes or impacts on existing geology, topography, and soils. However, it is anticipated that future development would still occur, as the need for modernization and expansion will not cease; and, those future development projects would be analyzed through the preparation of project specific NEPA documentation, as appropriate.

3.4 Biological Resources

3.4.1 Vegetation

3.4.1.1 Affected Environment

Approximately 34 percent of LEAD land is second- and third-growth forest, 52 percent is open fields, and 13 percent is developed with scattered landscaped vegetation. Woody species in the approximately 6,264 acres of forest land on the Installation are primarily of the oak-hickory association, including: red oak (*Quercus rubra*), black oak (*Quercus velutina*), white oak (*Quercus alba*), chestnut oak (*Quercus prinus*), and various hickory species (*Carya spp*.), with lesser numbers of yellow poplar (*Liriodendron tulipifera*), white ash (*Fraxinus americana*), and red maple (*Acer rubrum*) (TetraTech, 2013).

Understory species include hawthorn (*Crataegus spp*.), redbud (*Cercis canadensis*), blackhaw (*Viburnum prunifolium*), hackberry (*Celtis spp*.), tatarian honeysuckle (*Lonicera tatarica*), autumn olive (*Elaeagnus umbellata*), spicebush (*Lindera benzoin*), and dogwood (*Cornus racemosa*) (TetraTech, 2018).

Ground cover species include dogbane (*Apocynum spp*.), hyacinths (*Hyacinthus spp*.), clover (*Trifolium spp*.), goldenrod (*Solidago sp*.), sedges (*Carex spp*.), rushes (*Juncus spp*.), wild mustard (*Brassica spp*.), broom sedge (*C. scoparia*), spring beauty (*Claytonia caroliniana*), cattail (*Typha latifolia*), raspberries and blackberries (*Rubus spp*.), wild garlic (*Allium vineale*), various grasses, Japanese barberry (*Berberis thunbergii*), burdock (*Arctium spp*.), mayapple (*Podophyllum peltatum*), and multiflora rose (Rosa *multiflora*) (TetraTech 2018).

The approximately 9,250 acres of open habitat vegetation on the Installation consists of grassland fields in the agricultural out lease program. The open areas are primarily buffer areas along roadways, around munitions igloos, and field borders that also serve as fire breaks.

The forest habitat on LEMC is healthy overall. The greatest threats to habitat are the spread of invasive species and deer overbrowse (TetraTech 2018). Invasive species include tree of heaven, reed canary grass

(*Phalaris arundinacea*), mile-a-minute weed (*Persicaria perfoliata*), Japanese barberry, wineberry (*Rubus phoenicolasius*), multiflora rose, wild privet (*Ligustrum vulgare*), Japanese stilt grass (*Microstegium vimineum*), common reed (*Phragmites australis*), garlic mustard (*Alliaria petiolata*), field garlic (*Allium oleraceum*), sericea lespedeza (*Lespedeza cuneata*), and vine- and shrub-form honeysuckles (TetraTech 2018). These rapidly growing species crowd out native vines and shrubs and do not create quality habitat for other native species (TetraTech 2018). Reed canary grass has been noted as a problem in some of the wetlands on LEMC and is becoming a dominant plant in several areas (TetraTech 2018).

Forests Pests

The gypsy moth (*Lymantria dispar dispar*), eastern ash borers (*Agrilus planipennis*), spotted lanternfly (*Lycorma delicatula*), and hemlock woolly adelgid (*Adelges tsugae*) have caused catastrophic deforestation in other parts of the country and are closely monitored in the LEMC area (TetraTech 2018). Occasional gypsy moth infestations have occurred in the western buffer zone of LEMC (TetraTech 2018). Advanced stages of hemlock woolly adelgid infestation were observed in the buffer zone at the foot of and on the eastern slopes of Broad Mountain (TetraTech 2018). No evidence of eastern ash borers or spotted lanternflies have been observed on LEMC (TetraTech 2018).

3.4.1.2 Environmental Consequences

3.4.1.2.1 *Proposed Action*

The Proposed Action would result in short- and long-term negligible to minor effects on vegetation. The projects would occur in previously disturbed areas, which would result in limited clearing of non-forested upland and urban upland communities, and undisturbed areas.

Short- and long-term negligible adverse effects on vegetation would be expected during new construction, renovation, and infrastructure upgrade activities due to trampling, temporary removal, and permanent removal of vegetation. The impact would be negligible to minor because trees and vegetation would be replaced or relocated if appropriate and practicable. Additionally, all disturbed ground would be reseeded with appropriate species.

None of the proposed projects would occur in the far western buffer area of the Installation where past gypsy month and hemlock woolly adelgid infestations have occurred. Therefore, the construction and operation activities associated with the projects are not expected to impact or spread these infestations.

3.4.1.2.2 *No Action Alternative*

Under the No Action Alternative, the ADP and proposed projects would not be implemented. There would be no changes or impacts to vegetation. However, it is anticipated that future development would still occur, as the need for modernization and expansion will not cease; and, those future development projects would be analyzed through the preparation of project-specific NEPA documentation, as appropriate.

3.4.2 Fish and Wildlife

3.4.2.1 Affected Environment

Mammals

According to the 2013 INRMP, wildlife inventories and field observations conducted between 1987 and 2005, identified thirty-five species of mammals at LEAD. Additionally, a small mammal survey was conducted in 2003 by the LEAD Natural Resources Office in conjunction with Shippensburg University to determine the abundance and distribution of species. Some of the common species of mammals identified include the Virginia opossum (*Didelphis virginiana*), Eastern cottontail (*Sylvilagus floridanus*), Eastern chipmunk (*Tamias striatus*), gray squirrel (*Sciurus carolinensis*), beaver (*Castor canadensis*), red fox (*Vulpes Vulpes*) and the white-tailed deer (*Odocoileus virginianus*). A mist netting survey was also conducted in 2000 for the endangered Indiana bat (*Myotis sodalis*). During the survey, several common species of bat were identified, including the big brown bat (*Eptesicus fuscus*) and red bat (*Lasiurus borealis*). The federally threatened northern long-eared bat (*Myotis septentrionalis*) was also identified on the Installation. Though the Indiana bat was not observed during the survey, the USFWS Information, Planning, and Consultation System (IPaC) states that the Indiana bat has potential to be affected by activities on LEMC (USFW 2019).

Birds

Wildlife inventories, field observations, and subsequent surveys conducted by the LEAD Natural Resource Office, the Pennsylvania Game Commission (PGC), and the Audubon Society identified more than 100 avian species at LEAD (Tetra Tech 2013). The diverse avian habitats attract migratory species like warblers and vireos that use LEMC as a stopover. Nesting species such as the great blue heron (*Ardea horodias*), Canada geese (*Branta canadensis*), and killdeer (*Charadrius vociferous*) have been observed in spring and summer months. Year-round residents include the ring-necked pheasant (*Phasianus colchicus*), eastern wild turkey (*Meleagris gallopavo*), and woodpeckers (*Picoides* sp.). Grass-land dependent species include the grasshopper sparrow (*Ammodramus savannarum*), field sparrow (*Spizella pusilla*), bobolink (*Dolichonyx oryzivorus*), common yellowthroat (*Geothlypis trichas*), and song sparrow (*Melospiza*

melodia). Other species on LEMC include the European starlings (*Sturnus vulgaris*) and brown-headed cowbirds (*Molothrus ater*) (Tetra Tech 2013).

Herpetofauna and Fish

Nineteen species of reptiles have been identified at LEAD as part of the threatened and endangered species inventories, subsequent surveys, or as field observations. The LEAD Natural Resources Office and Shippensburg University conducted reptile surveys from 2003 to 2005 to determine the abundance and distribution of reptile species. Observed species include the wood turtle (*Clemmys insculpta*), common snapping turtle (*Chelydra s. serpentina*), eastern box turtle (*Terrapene carolina*), midland painted turtle (*Chrysemys picta marginata*), five-lined skink lizard (*Eumeces fasciatus*), northern water snake (*Nerodia sipedon*), northern copperhead (*Agkistrodon contortrix*), and black rat snake (*Elaphe obsoleta*).

The LEAD Natural Resources Office and Shippensburg University conducted amphibian surveys from 2003 to 2005 to determine the abundance and distribution of amphibian species. Twenty-four species were observed during these surveys. Another species-specific survey was conducted for box turtles (*Terrapene* sp.), marbled salamanders (*A. opacum*), frogs, and spotted newts (*Notophthalmus* sp.). LEMC includes a vernal pond community within an area of forest bordering Buchanan State Forest in the northwestern portion of LEMC. The vernal ponds on LEMC and in nearby areas house many species including: marbled salamanders, spotted salamanders, Jefferson's salamanders (*A. jeffersonianum*), wood frogs (*Rana sylvatica*), spring peepers (*Pseudacris crucifer*), green frogs (*R. clamitans*), pickerel frogs (*R. palustris*), toads (*Bufo* spp.), and red-spotted newts (*N. viridescens*) (Tetra Tech 2013). There is a lack of survey data related to the condition of fisheries on LEMC.

3.4.2.2 Environmental Consequences

3.4.2.2.1 *Proposed Action*

The Proposed Action would result in short-term minor direct and indirect adverse effects on wildlife due to disturbances from noise, construction activities, and heavy equipment use. The Proposed Action would also result in long-term minor direct adverse impacts due to the addition of developed impervious areas. Impacts would be minor because the projects are in previously disturbed as well as undisturbed areas. In addition, most species in the vicinity of the project area are tolerant of noise and human activity. Development may impact vernal pool and wetland communities and would require mitigation.

3.4.2.2.2 *No Action Alternative*

Under the No Action Alternative, the ADP and proposed projects would not be implemented. There would be no changes or impacts to fish and wildlife. However, it is anticipated that future development would still

occur, as the need for modernization and expansion will not cease; and, those future development projects would be analyzed through the preparation of project-specific NEPA documentation, as appropriate.

3.4.3 Threatened and Endangered Species

3.4.3.1 Affected Environment

Federally- Listed Species: Three surveys were conducted for federally listed species that may be on LEMC. The most recent survey, conducted by Tetra Tech in 2000, included three targeted species: bog turtle (*Glyptemys muhlenbergii*), Indiana bat, and northeastern bulrush (*Scirpus ancistrochaetus*) (Tetra Tech 2013). The 2000 survey of all LEMC wetlands found no potential bog turtle habitat on LEMC (Tetra Tech 2013). No Indiana bats were observed on LEMC either. However, due to the limited nature of the bat survey, it cannot be concluded that there are no Indiana bats present (Tetra Tech 2013). The 2015 survey identified the federally threatened northern long-eared bat as occurring on the Installation. Viable northeastern bulrush habitat was found on LEMC, but no species evidence was observed. It is unlikely that the species is present (Tetra Tech 2013).

Table 3.4-1 shows federal- and state-protected species that have been known to occur in the project area. This information states the preferred habitat the species can be found in as well as its current state and federal status whether that be endangered, threatened, undetermined or delisted.

Table 3.4-1. Federal and State Protected Animals with Potential to Occur on the Subject Property

Common Name	Scientific Name	Federal Status	State Status	Preferred Habitat
Mammals				
Indiana Bat	*Myotis sodalis*	FE	PE	Caves and mines. Foraging habits include riparian areas, upland forests, ponds, and fields.
Northern long-eared bat	*Myotis septentrionalis*	FT		Forests and hunt over small ponds, in forest clearings, and along forest edges. Hibernates in caves and underground mines. Maternity roosts are in tree cavities, under exfoliating bark, and in buildings.
Allegheny Woodrat	*Neotoma magister*		PT	Rocky cliffs and talus slopes. The woodrat makes hidden mounds and stick piles among the rocks.
Reptiles				
Bog Turtle	*Glyptemys muhlenbergii*	FT	PE	Slow, shallow, muck-bottomed rivulets of sphagnum bogs, calcareous fens, marshy/sedge-tussock meadows, spring seeps, wet cow pastures, and shrub swamps.

Table 3.4-1. Federal and State Protected Animals with Potential to Occur on the Subject Property				
Common Name	**Scientific Name**	**Federal Status**	**State Status**	**Preferred Habitat**
				Usually containing an abundance of sedges or mossy cover.
Timber Rattlesnake	*Crotalus horridus*		DL	Mountainous or hilly deciduous or mixed deciduous-coniferous forest, often with rocky outcroppings, steep ledges, and rockslides.
Eastern Spadefoot Toad	*Scaphiopus holbrookii*		PT	Sandy, gravelly, or soft, light soils in wooded or unwooded terrain.
Plants				
Northeastern Bulrush	*Scirpus ancistrochaetus*	FE	PE	Open, tall herb-dominated wetlands often at the water's edge, or in a few centimeters of water, but it may also be in fairly deep water or away from standing water.
Lance-leaved Loosestrife	*Lysimachia hybrida*		PE	Moist to mesic black soil prairies, open woodlands, thickets, swamps, gravelly seeps, limestone glades, and old fields with hardpan clay or sandy soil.
Brown Sedge	*Carex buxbaumii*		TU	Variety of wet places; most commonly listed habitats are bogs and wet meadows. Others include fens, marshes, wet shores, swamps, "marly bogs and marshes", prairie swales, wet river bottom prairie, alluvial meadows, and springs.
FT = Federally Threatened, FE = Federally Endangered, PE = Pennsylvania Endangered, PT = Pennsylvania Threatened, DL = Delisted, TU = Tentatively Undetermined Sources: Natural Heritage, 2019 and USFW, 2019				

State-Listed Species: Although an Installation-wide flora survey has not been conducted, several surveys were conducted with the following state-listed species identified as occurring or potentially occurring at LEMC. Allegheny woodrat (*Neotoma floridana magister*), lance-leaved loosestrife (*Lysimachia hybrida)*, timber rattlesnake (*Crotalus horridus*), eastern spadefoot toad (*Scaphiopus holbrookii*), and brown sedge (*Carex buxbaumii*) (Tetra Tech 2013). Three Allegheny woodrats were trapped during a small mammal survey conducted by the LEAD Natural Resources Office with Shippensburg University in 2003 and 2004 (Tetra Tech 2013). Lance-leaved loosestrife was identified on LEMC by Tetra Tech during the 2000 endangered species survey (Tetra Tech 2013). No brown sedge has been observed on LEMC (Tetra Tech 2013). Until an Installation-wide flora survey is completed, impacts to listed plants cannot be determined.

3.4.3.2 Environmental Consequences

3.4.3.2.1 *Proposed Action*

The Proposed Action would have minor to no impact on federally listed species and minor to moderate impacts on state-listed species. Specific surveys would be conducted on a project by project basis prior to

construction or clearing activities to determine if bats or other protected species or suitable habitat are present, which would result in a direct impact. Tree clearing and potential loss of habitat would have a negligible to minor indirect impact on protected species. There are likely to be greater impacts to state listed species due to the larger number occurring on the Installation and wider variety of habitats compared to the federally listed species.

3.4.3.2.2 *No Action Alternative*

Under the No Action Alternative, the ADP and proposed projects would not be implemented. There would be no changes or impacts to fish, wildlife, nor protected species. However, it is anticipated that future development would still occur, as the need for modernization and expansion will not cease; and, those future development projects would be analyzed through the preparation of project specific NEPA documentation, as appropriate.

3.5 Water Resources

The following sections describe surface water, wetlands, and ground water resources within the Installation. Figure 3-4 includes the locations of wetlands, waterbodies, and FEMA-designated floodplains within the Installation.

3.5.1 Surface Water

3.5.1.1 Affected Environment

LEMC is approximately 40 miles southwest from the Susquehanna River. LEMC is split into two watersheds (TetraTech 2013). Surface water runoff from the northeastern portion of LEMC discharges to Lehman Run, Keasey Run, Muddy Run, or Rowe Run, which are all contained in the Susquehanna River Watershed (TetraTech 2013). Surface water runoff from the southwestern portion of LEMC discharges to Dennis Creek, Back Creek, Rocky Spring Branch, or Conococheague Creek, all contained within the Potomac River watershed (TetraTech 2013). The Susquehanna River and Potomac River both drain into the Chesapeake Bay making LEMC subject to the Chesapeake 2000 agreement and Pennsylvania's Watershed Implementation Plan (TetraTech 2013).

Seven named streams (listed above) and numerous unnamed streams are located on LEMC. Streams cutting through the limestone of the Chambersburg formation tend to be ephemeral and intermittent, flowing through valleys in winter and spring or after heavy rains (TetraTech 2013). In contrast, streams in the upper shale units of the Martinsburg formation are perennial and flow through narrow, steep-walled valleys (TetraTech 2013).

Ten manmade impoundments, ranging in surface area from 3 to 17 acres, are located on LEMC. Rocky Springs Lake, Lake Letterkenny, and Shirley's Pond are found in the southern portion of LEMC. Cole's Pond, Henry's Pond, Bud's Lake, Wally's Pond, Baker's Pond, and two waterfowl ponds are found in the northern portion of LEMC (TetraTech 2013).

A total of seven wetland types are present at LEAD: lacustrine, palustrine, aquatic bottom, palustrine emergent, palustrine forested, palustrine open water, palustrine unconsolidated bottom, palustrine scrub shrub, and riverine. Previous estimations have concluded that there are approximately 300 acres of wetlands on LEAD, most of which are expected to also be on LEMC. These wetland habitats have been largely avoided during development at LEMC and support a diversity of vegetation, amphibians, reptiles, and mammals.

3.5.1.2 Environmental Consequences

3.5.1.2.1 *Proposed Action*

The Proposed Action would likely impact streams and wetlands in the project area causing long-term minor to moderate effects on water resources. Prior to construction, stream and wetland delineations would be conducted and LEMC would identify individual project locations to maximize avoiding impacts to wetlands and streams in accordance with EO 11990. Where impacts to streams are unavoidable, effective erosion control procedures and best management practices (BMPs) would be used during construction to minimize impacts. All necessary permits for each proposed project would be acquired and appropriate mitigation would be achieved prior to construction. All requirements of Eos 11988 and 11990 would be fulfilled for any projects involving floodplains or wetlands.

3.5.1.2.2 *No Action Alternative*

Under the No Action Alternative, the ADP and proposed projects would not be implemented. There would be no changes or impacts to surface water. However, it is anticipated that future development would still occur, as the need for modernization and expansion will not cease; and, those future development projects would be analyzed through the preparation of project specific NEPA documentation, as appropriate.

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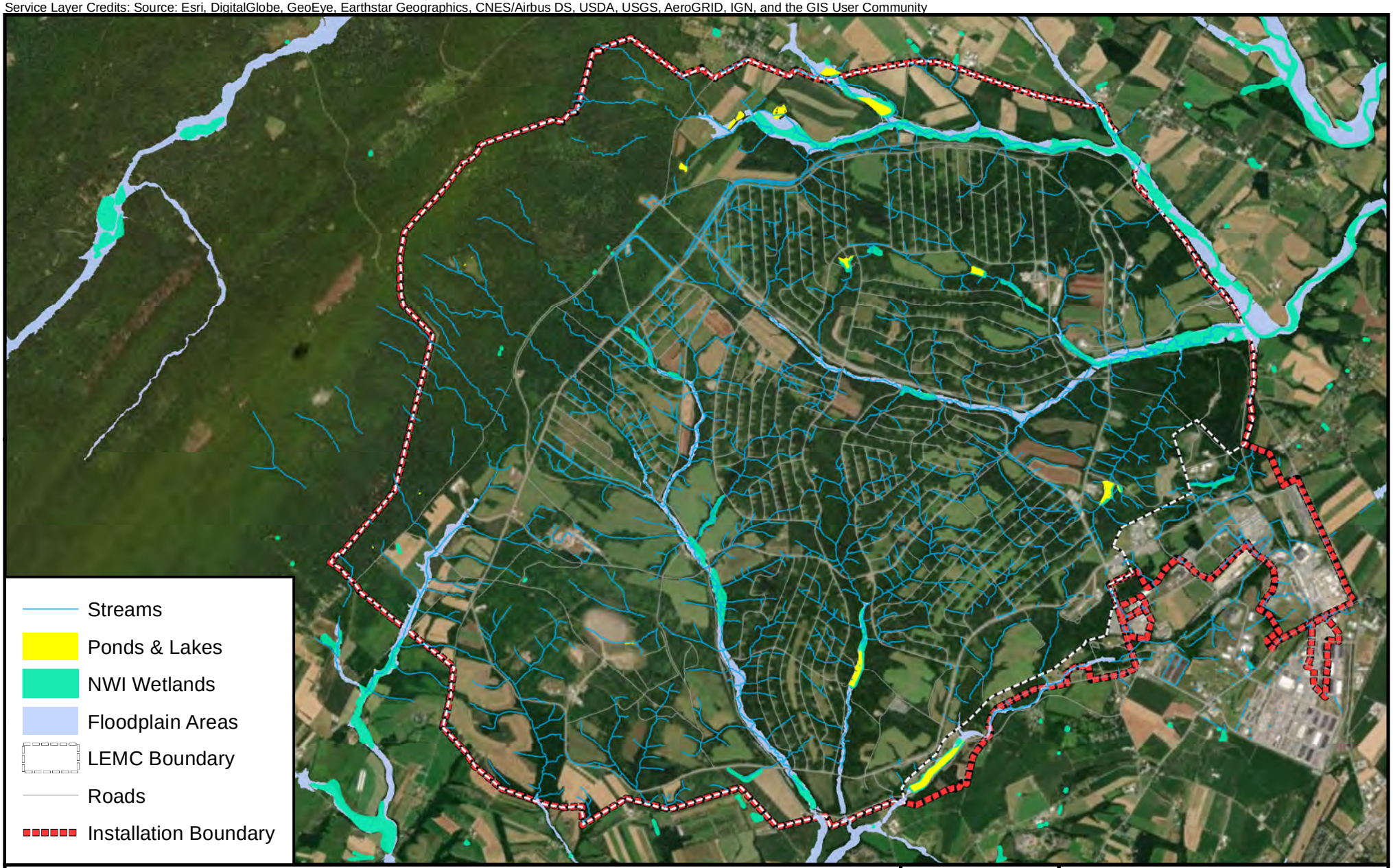
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



NORTH

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Figure 3-4
LEAD Water Resources
LEMC ADP EA

Source:

Issued: 10/30/2019

3.5.2 Groundwater

3.5.2.1 Affected Environment

LEMC is largely underlain by the Martinsburg formation, an aquifer yielding water with occasional high iron, manganese, and hydrogen sulfide gas concentrations. Average well yields of 100 gallons per minute (gpm) can be expected with higher yields in low topographic expressions and lower yields in upland locations (Tetra Tech 2013). There is no demand for drinking water from the aquifer because LEMC acquires drinking water from Letterkenny Reservoir (TetraTech 2013).

Yield from the carbonate aquifers ranges from 0.01 to 950 gpm due to the secondary porosity in the carbonate. Prime locations in the St. Paul group would yield between 150 to 200 gpm. However, the Chambersburg formation only produces about 40 gpm. Calcium and magnesium deposits can make this water unsuitable for certain industrial uses (Tetra Tech 2013). The average depth to the water table within the Valley and Ridge Province is approximately 40 feet (Swain, et. al; 2004).

3.5.2.2 Environmental Consequences

3.5.2.2.1 *Proposed Action*

The Proposed Action would not have direct impacts on groundwater. The facilities would not require use of groundwater, and new construction, renovation, and infrastructure improvement activities would not require excavation to the depth of groundwater.

3.5.2.2.2 *No Action Alternative*

Under the No Action Alternative, the ADP and proposed projects would not be implemented. As with the Proposed Action, there also would be no changes or impacts to groundwater under the No Action Alternative.

3.6 Air Quality, GHGs, and Climate Change

3.6.1 Affected Environment

The United States Environmental Protection Agency (USEPA) Region 3, and the Pennsylvania Department of Environmental Protection (Pennsylvania DEP) regulate emissions to protect air quality in the state of Pennsylvania. The Clean Air Act (CAA) has allowed the EPA to establish primary and secondary National Ambient Air Quality Standards (NAAQS) for eight pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter 10 microns or less in diameter (PM_{10}), particulate matter 2.5 microns or less in

diameter ($PM_{2.5}$), sulfur dioxide (SO_2), ozone, and lead. The EPA also regulates the emissions of carbon dioxide equivalents (CO_2e), sulfuric acid mist (H_2SO_4), and volatile organic compounds (VOCs), but does not have ambient air standards for these three pollutants. The EPA had delegated permitting actions with respect to air quality to the Pennsylvania DEP. Currently, LEMC is operating as a Major Facility, Permit Number 28-05002, issued on December 7, 2018. Any changes to or addition of operating sources must be reviewed and included in the air permit, as required by the EPA and Pennsylvania DEP.

The CAA also established special air quality and visibility protection to large national parks and wilderness areas. These specially designated areas are called Class I areas and are subject to more stringent thresholds than normal ambient air areas, called Class II areas. The closest 1 Class I area is Shenandoah National park, that is 130 kilometers (km) from LEMC, Dolly Sods and Otter Creek Wilderness Areas are 175 km and 195 km away, respectively.

An area or county is considered in “attainment” if it meets the NAAQS for a specific pollutant and considered in “non-attainment” if a city, county, or area do not meet the NAAQS for a pollutant. The USEPA Green Book, where attainment area information is detailed, classifies Franklin County as an attainment area for all pollutants. Previously, the county had been classified as a non-attainment county for ozone, but those ozone standards were revoked in 1997. Therefore, Franklin County is in attainment with the NAAQS standards, and is not subject to conformity regulations.

The CAA has also established a collection of eleven northeastern states, called the Ozone Transport Region (OTR), that are subject to NOx and VOC restrictions in order to reduce the amount of these pollutants from travelling upwind to the Midwest and South. These eleven states—Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont—are required to submit a state implementation plan (SIP) and install a more restrictive level of controls for the precursors of ozone (NOx and VOC), even if the state meets the ozone standards. Therefore, any emission units would be required to meet these stricter standards.

The EPA operates a network of air monitoring stations across the county to monitor ambient concentrations of air pollutants. Existing ambient air quality for Letterkenny can be estimated using measurements from nearby monitors. This monitored data is summarized in Table 3.6-1, below.

Table 3.6-1
Ambient Air Quality Monitored Values near the Letterkenny Facility

Pollutant	Averaging Period	Air Quality Standard (µg/m3)	Monitored Data (µg/m3)	Monitor Location
CO	1-hour	40,000	805	Monitor 42-001-0001 Narsto Site—Arendtsville
	8-hour	10,000	690	
NO_2	1-hour	188	29.1	Monitor 42-001-0001 Narsto Site—Arendtsville
	Annual	100	2.3	
SO_2	1-hour	196.5	14.4	Monitor 42-001-0001 Narsto Site—Arendtsville
	3-hour	1,300	18.3	
$PM_{2.5}$	24-hour	35	18.5	Monitor 42-001-0001 Narsto Site—Arendtsville
	Annual	12	7.6	
PM_{10}	24-hour	150	38.5	42-071-0007 Abraham Lincoln Jr High Grofftown Rd
Ozone	8-hour	25.16	0.12	42-055-0001 Forest Road - Methodist Hill
Lead	3-month	0.15	0.07	42-071-0009 Mount Joy

Source: Environmental Protection Agency, Air Data: Air Quality Data Collected at Outdoor Monitors Across the U.S., Monitor Values Reports

Greenhouse Gases and Climate Change

LEMC is in the Lower Susquehanna climatic division with a classified climate of humid continental. The mean annual temperature is 53 degrees Fahrenheit, with an average of 14 days over the temperature of 90 degrees Fahrenheit in the summer and 20 days below 32 degrees Fahrenheit in the winter. Days typically have cloudy cover with 70 days in the year being overcast. Throughout the valley there is a consistent growing season of 160 to 170 days. The average snowfall is 31 inches and the average precipitation is 41 inches. The wettest months are the summer months, May through August (TetraTech, 2013).

Greenhouse gases (GHGs) are atmospheric gases that trap heat close to the surface to the earth, and therefore increase the greenhouse effect on global temperatures. Most GHGs occur naturally in the atmosphere but increases in their concentration result from human activities such as burning fossil fuels. Global temperatures are expected to continue to rise as human activities continue to add carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and other greenhouse (or heat-trapping) gases to the atmosphere. Whether rainfall will increase or decrease is difficult to project for specific regions (USEPA 2011; IPCC 2007).

EO 13834, *Efficient Federal Operations*, outlines the need of federal agencies to meet congressional requirements for energy and environmental performance by balancing increases in efficiency, performance

optimization, eliminating unnecessary use of resources, and protecting the environment. *Implementing Instructions for EO 13834* was issued in April 2019 and provided additional instructions to Federal agencies to implement EO 13834, including agency planning, reporting requirements, and accountability.

3.6.2 Environmental Consequences

3.6.2.1 Proposed Action

None of the projects listed in the ADP include the installation of new emission sources. Based on preliminary project information, no new operational emission sources are currently expected to be added to the facility as a part of the Proposed Action. Therefore, no long-term changes to emissions are expected from the proposed projects and air quality is not expected to change in the area due to projects at the LEMC facility.

While operating emissions from the projects are not expected to increase based on the projects listed in Table 2.2-1, emissions from the construction of the projects, while temporary in nature, would occur. Construction impacts from the proposed action would be adverse and minor to moderate. Construction emissions from each project are listed below in Table 3.6-2, organized by expected project date. Construction emissions would vary from project to project based on the duration of construction, type and number of construction equipment needed for the project, number of workers, and amount of earthmoving activities. The estimated emissions below were calculated with assumptions the duration of six construction phases: site preparation, demolition, grading, building construction, paving, and architectural coatings. Not all projects would have all six construction phases. Assumptions were made for each project on phase duration, types and sizes of construction equipment needed for each phase, hours of operation for construction equipment, number of workers for each project, and amount of earth moving needed as a part of each project. These assumptions are noted in the calculation tables in Appendix B.

While emissions estimates for the construction of the projects listed have been calculated, as projects become more detailed and finalized, these calculations need to be revisited and refined as more detailed construction information becomes available. It should also be verified that no new emissions sources nor changes to current emissions would occur from any of the projects reviewed. If new sources are added or current emissions increase from any of the projects, the emissions increases would need to go through a detailed analysis to determine if any permitting actions need to be taken for the project and/or if additional NEPA is required.

The projects discussed in this report are expected to have only temporary GHG releases from increased vehicular traffic and construction equipment; therefore, are not expected to have long-term impacts to the

climate. Additionally, updated and new buildings would be more efficient and sustainable and must meet the requirements issued through EO 13834 via the Office of Federal Sustainability. This increased efficiency would decrease the overall energy demand from the facility. Because the Proposed Alternative's GHG emissions are short-term and temporary in nature, and the addition of newer, more efficient buildings and infrastructure, it is not expected that the Proposed Alternative would have an impact on climate change.

3.6.2.2 No Action Alternative

Under the No Action Alternative, the ADP and proposed projects would not be implemented. There would be no changes or impacts to air quality, GHGs, or climate change. However, it is anticipated that future development would still occur, as the need for modernization and expansion will not cease; and, those future development projects would be analyzed through the preparation of project-specific NEPA documentation, as appropriate.

Table 3.6-2:
Construction Emissions Calculations for Projects at LEMC

Project	Project Number	Illustrative Reference	Emissions Estimates (tons per year)									
			NOx	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
SHORT-RANGE (0 – 5 YEARS)												
Guided Missile Maintenance Facility	66632	1	13.14	63.69	4.20	1.22	0.80	0.80	1,171.98	0.05	0.01	1,176.21
Precision Strike Missile System (PrSM)	94216	2	2.02	8.25	0.62	0.20	0.11	0.11	237.82	0.01	2.05E-03	238.68
Rail Modernization	91782	N/A	26.30	164.94	9.58	1.67	1.39	1.35	14,162.42	0.07	0.04	14,175.16
Expand Roadway at Voelz Gate	LEAD 532415	3	2.15	4.27	0.58	0.26	0.11	0.10	232.73	0.01	1.94E-03	233.54
Consolidated Munition Distribution Facility	86433	4	19.60	122.49	6.76	1.63	1.19	1.18	1,976.93	0.08	0.02	1,984.20
Rail Classification Yard	86433	5	10.27	57.08	3.51	0.81	0.56	0.55	3,238.89	0.03	0.01	3,243.04
LEMC POV Parking Expansion	TBD	6	0.13	0.20	0.03	0.02	0.01	0.01	22.97	9.69E-04	1.97E-04	23.06
Inert Storage	CAAA15-18MC-64	7	1.37	7.05	0.45	0.12	0.08	0.08	184.16	0.01	1.50E-03	184.79
Upgrade Utility Infrastructure – Overall	TBD	N/A	14.36	225.35	7.42	0.27	0.65	0.62	714.52	0.04	0.01	719.10
Paint Shop Addition	CAAA15-18MC-68	8	2.02	8.20	0.62	0.20	0.11	0.11	232.69	0.01	1.96E-03	233.52
Secure Holding Area for Loaded Trailers	TBD	9	0.13	0.22	0.04	0.02	0.01	0.01	31.15	1.01E-03	2.22E-04	31.24
Blast Booth Addition	TBD	8	2.02	8.20	0.62	0.20	0.11	0.11	232.69	0.01	1.96E-03	233.52
Inert Storage – Wood Storage	TBD	10	1.37	7.05	0.45	0.12	0.08	0.08	184.16	0.01	1.50E-03	184.79
Ready Magazine	CAAA15-18MC-65	11	1.42	7.74	0.47	0.12	0.08	0.08	196.40	0.01	1.61E-03	197.08
Inert Storage	TBD	12	1.37	7.05	0.45	0.12	0.08	0.08	184.16	0.01	1.50E-03	184.79
Breakroom for Building 5321	TBD	13	1.37	7.03	0.44	0.12	0.08	0.08	176.05	0.01	1.48E-03	176.68

Table 3.6-2:
Construction Emissions Calculations for Projects at LEMC

Project	Project Number	Illustrative Reference	Emissions Estimates (tons per year)									
			NOx	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Facility for SDO at X-11-G	TBD	N/A	1.49	7.96	0.49	0.13	0.08	0.08	195.91	0.01	1.73E-03	196.64
Restoration of Transportation Infrastructure (Rail)	TBD	N/A	8.17	47.26	2.76	0.71	0.46	0.45	785.24	0.03	0.01	788.22
MID-RANGE (6 – 10 YEARS)												
Rocket Motor Destruction (ARMD) Facility Addition	89246	N/A	2.02	8.19	0.62	0.20	0.11	0.11	231.31	0.01	1.94E-03	232.13
Repair Electrical Distribution System, Ammunition Area	91417	N/A	0.22	0.26	0.06	0.03	0.01	0.01	31.98	1.34E-03	2.72E-04	32.09
Inert Storage	TBD	12	1.37	7.05	0.45	0.12	0.08	0.08	184.16	0.01	1.50E-03	184.79
Upgrade Existing 20-foot Equivalent Units (TEU) Storage Lots	TBD	N/A	1.74	3.91	0.48	0.21	0.08	0.08	191.82	0.01	1.62E-03	192.51
Restoration of Transportation Infrastructure (Roads)	87046	N/A	2.58	9.73	0.78	0.27	0.13	0.13	302.51	0.01	0.64	493.39
Inert Storage	TBD	12	1.37	7.05	0.45	0.12	0.08	0.08	184.16	0.01	1.50E-03	184.79
Security Upgrades (New Post #2)	TBD	N/A	4.25	16.92	1.30	0.43	0.23	0.23	506.81	0.02	4.30E-03	508.62
Building 5321 Addition	TBD	N/A	2.02	8.19	0.62	0.20	0.11	0.11	231.31	0.01	1.94E-03	232.13
Inert Storage	TBD	N/A	1.37	7.05	0.45	0.12	0.08	0.08	184.16	0.01	1.50E-03	184.79
Project for Modernization of Building 3700	94432	N/A	1.48	7.95	0.49	0.13	0.08	0.08	195.91	0.01	1.73E-03	196.64

Table 3.6-2:
Construction Emissions Calculations for Projects at LEMC

Project	Project Number	Illustrative Reference	Emissions Estimates (tons per year)									
			NOx	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Inert Storage	TBD	N/A	1.37	7.05	0.45	0.12	0.08	0.08	184.16	0.01	1.50E-03	184.79
LONG-RANGE (10+ YEARS)												
Igloo Modernization – Overall	90406	N/A	72.84	387.88	23.95	6.49	4.02	4.01	10,040.28	0.39	0.08	10,074.15
Inert Storage	TBD	N/A	1.37	7.05	0.45	0.12	0.08	0.08	184.16	0.01	1.50E-03	184.79
Igloo Road Repairs – Overall	90407	N/A	3.70	14.83	1.14	0.39	0.19	0.18	398.82	0.02	3.57E-03	400.31
Inert Storage	TBD	N/A	1.37	7.05	0.45	0.12	0.08	0.08	184.16	0.01	1.50E-03	184.79
Modernization of Building 3701	TBD	N/A	1.48	7.89	0.49	0.13	0.08	0.08	195.85	0.01	1.61E-03	196.53
Aboveground Magazine Repair	86673	N/A	1.49	7.92	0.49	0.13	0.08	0.08	204.90	0.01	1.65E-03	205.59
Inert Storage	TBD	N/A	1.37	7.05	0.45	0.12	0.08	0.08	184.16	0.01	1.50E-03	184.79
Modernization of Building 3702	TBD	N/A	1.48	7.88	0.49	0.13	0.08	0.08	188.21	0.01	1.59E-03	188.88
Earth-covered Magazine Repair	86671 / 86672	N/A	1,490.42	7,984.47	491.59	133.00	82.57	82.18	196,696.38	8.36	1.73	197,421.69
Building 4755 Replacement (Ammunition Demilitarization Facility)	TBD	14	2.03	8.24	0.63	0.20	0.11	0.11	245.29	0.01	2.07E-03	246.15
Satellite Fire Station	TBD	15	2.02	8.19	0.62	0.20	0.11	0.11	231.31	0.01	1.94E-03	232.13
Building 3626 Replacement (Receipt Classification)	TBD	16	2.03	8.24	0.63	0.20	0.11	0.11	245.29	0.01	2.07E-03	246.15
Conventional Ammunition Workshop	TBD	17	2.03	8.24	0.63	0.20	0.11	0.11	245.29	0.01	2.07E-03	246.15

Table 3.6-2:
Construction Emissions Calculations for Projects at LEMC

Project	Project Number	Illustrative Reference	Emissions Estimates (tons per year)									
			NOx	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Building 3810 Replacement (MFOM)	TBD	18	2.03	8.24	0.63	0.20	0.11	0.11	245.29	0.01	2.07E-03	246.15
Building 3750 Replacement (MFOM)	TBD	19	2.03	8.24	0.63	0.20	0.11	0.11	245.29	0.01	2.07E-03	246.15
Building 8001 Replacement (MFOM)	TBD	20	2.03	8.24	0.63	0.20	0.11	0.11	245.29	0.01	2.07E-03	246.15
Building 5647 Replacement (ARMD)	TBD	21	2.03	8.24	0.63	0.20	0.11	0.11	245.29	0.01	2.07E-03	246.15
Building 2755 Replacement (Surveillance)	TBD	22	2.24	8.46	0.68	0.23	0.12	0.12	297.28	0.01	2.26E-03	298.21
Building 2383 Replacement (MUTT)	TBD	N/A	2.03	8.24	0.63	0.20	0.11	0.11	245.29	0.01	2.07E-03	246.15
D-Area Igloos Replacement	TBD	18	168.54	902.90	55.59	15.04	9.34	9.29	22,242.83	0.95	0.20	22,324.85
CAPACITY												
Future Munitions Operations Support	TBD	24	27.81	201.03	10.23	2.15	1.51	1.47	2,688.10	0.12	0.03	2,700.38

3.7 Hazardous and Toxic Substances

3.7.1 Affected Environment

Storage and assembly facilities are scattered across the eastern, northeastern, and southwestern areas of LEMC, but the majority of the built structures reside in the LEAD project area. LEAD contains Installation Restoration Program (IRP) sites as referenced on Figure 3-5. The IRP sites occurring on LEMC include 14, 15, 17, 18 , 28, 39, 42, 43, 45, 46, 47, 50, 53, 54, and 56 (Weston 2011).

Several hazardous-waste site investigations and remediation projects at LEAD have involved groundwater contamination, particularly in and around the cantonment area. These investigations have indicated the presence of volatile organic compound (VOC) contamination. The principal issue of concern is recharge of contaminated groundwater to surface water bodies of LEMC since groundwater is not directly used as a water resource.

LEAD is known as a Resource Conservation and Recovery Act (RCRA) permitted treatment, storage, and disposal facility. LEAD is also considered a large quantity generator due to the volume of hazardous waste generated.

LEAD was established in 1941 prior to the implementation of the Toxic Substances Control Act of 1976 (TSCA) in which the regulation of asbestos containing materials (ACM) began. As such, it is likely that ACM is present in the over 900 earthen munitions storage igloos and other structures on the LEMC.

Similarly, lead may occur on LEMC as lead-based paint (LBP) in buildings constructed before 1978. LBP chips that fall from the exterior of buildings can cause soil contamination. Remaining LBP is likely found within the earthen munitions storage igloos and other structures on the LEMC.

AMMUNITION AREA

BRAC ACTIVE SITES

Site	OU No.	Description
001	SE OU8	Building 57
002	SE OU8	Building 37- Cleaning Area
008	SE OU8	Building 228- Battery Acid Disposal Pit
023	SE OU8	Building 51 RAD Storage Area
026A	PDO OU6	Former Pesticide Storage Building (2325) (CASD)
026B	PDO OU6	New Pesticide Storage Building (CASD)
034	SE OU4	Stormwater Outfall- Conococheague
037	PDO OU6	Landfill 3 (Pad 5 Landfill- Sandbag Road)
060B	SE OU8	Lot 29 Ingot Storage Area
072	SE OU8	GW Discharge to Storm Drainage
073A*	SE OU8	Storage of Sediment from Remediation Efforts
073B*	SE OU8	Sediment Storage Pile
080	SE OU7	Storage Area Near Building 32/33 (Truck Open Storage Area
082	SE OU7	Waste Oil Sumps
092	SE OU8	Demolished Buildings 16 and 17
093A	PDO OU6	Former PDO Scrapyard (CASD)
093B	PDO OU6	Recreational Area (CASD)
100	SE OU10	Building 12
101	SE OU10	Building 37 Groundwater
110B	PDO OU6	Vehicle/Equipment Storage Area West of the Test Track
111A	PDO OU6	Sinkhole Area (CASD)
111B	PDO OU6	Quarry Landfill Area (CASD)
113	PDO OU6	Tannin Resin Storage at Buildings 651/652
115	SE OU8	Tank Farm Storage Area
117A	PDO OU6	Building 683 and 688 Drum Storage Pads
117B	PDO OU6	Vehicle Wash Drainage and Roof Tar Storage
118A	SE OU8	Building 433, Locomotive Fueling Area
118B	SE OU8	ASTs at Golf Course Storage Buildings
118D	SE OU8	Former Storage Area West of Building 446
118E	SE OU8	Building 422 North
118F	SE OU8	Building 433 West
125	COMPLIANCE	PCB
126C	SE OU8	Building 437 UST
126D	SE OU8	UST Across from Building 425
126G	PDO OU6	Former Uncurbed AST at the Road Maintenance Area
127	SE OU8	Industrial Sewer Soils
128	SE OU10	SE Groundwater
129	PDO OU6	Storage Areas (RCRA) Pads 676 (Pad 1) and 696: Building 675
130	PDO OU8	Former Storage Shed near Buildings 38-1/S38-2

ER, A ACTIVE SITES

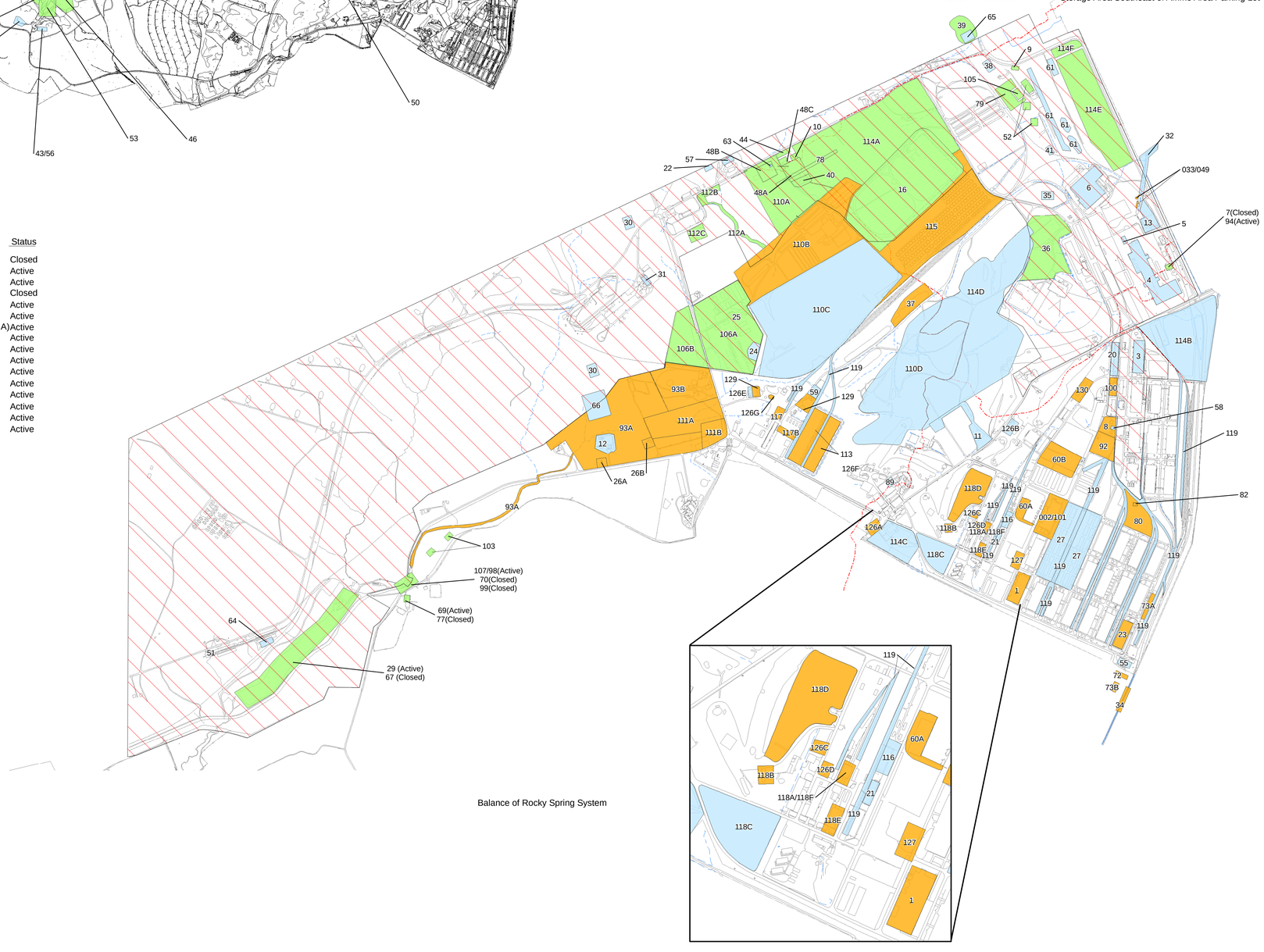
Site	OU No.	Description
009	SE OU5	Clay-Lined FTA 9 (Area B)
010	PDO OU4	PDO OBP
016	SE OU8	Test Track Area
029	PDO OU2	Rocky Spring Lake (VOCs)
033	SE OU8	Area F (Sediment Burial Site)
036	SE OU9	Landfill 2 (Area J)
039	AMMO	Landfill 5 (Area G)- Security Landfill
040	PDO OU6	Open Trench Landfill (Adjacent to Oil Burning Pit)
044	PDO OU6	Bermed Area Northwest of OBP
046	AMMO	Demo Ground 2
048A	PDO OU6	Transfer/Burning Revetments
048B	PDO OU6	Wood Pile Storage Area West of the OBP
048C	PDO OU6	Paint Can Shredding Area
049	SE OU8	Area E (Oil Burning Pit Used in the 70's)
050	AMMO	TNT Washout Plant
052	SE OU1	Disposal Area Lagoons (K Areas)
053	AMMO	Burning Ground 2
072*	SE OU4	Stormwater Sewers
074*	SE OU4	Industrial Sewers
078	PDO OU4	PDO OBP Groundwater Divide
079	SE OU5	Waste Disposal Trenches (Area A)
081	SE OU3A	Disposal Area VOC- Contaminated Groundwater
	SE OU3B	Area Upgradient of VOC-Contaminated Source in SE OU 3A
110A	PDO OU6	Former Vehicle Storage North of Test Track
112A	PDO OU6	Ammo Drum Storage Pad
114A	SE OU8	Former Vehicle Storage Area North of Test Track
114E	SE OU8	Former Test Track in the Disposal Area
114F	SE OU8	Northern Portion of Former Test Track (Environmental Contractor Staging Area)
128	SE OU10	SE Industrial Area VOC-Contaminated Groundwater South of Gate 6 (Conococheague Drainage System)
131	SE OU11	Northern Southeast Industrial Area VOC-Contaminated Groundwater North of Gate 6
083	SE OU 2	Industrial Waste Sewers- Soils
094	SE OU3	Building 349 Sump
098	PDO OU2/OU5	Rocky Spring Springhouse
103	PDO OU2/OU5	Old Pumping Wells Rocky Spring
105	SE OU5	Spill Site within Area A
106A	PDO OU5	DRMO Scrapyard Demilitarization Activities
106B	PDO OU5	DRMO Open Storage; Vehicle and Equipment Storage
107	PDO OU5	Rocky Spring PCB Sediments
112B	PDO OU6	Former Building Foundations near the Ammo Drum Storage Pad
112C	PDO OU6	Storage Area Southeast of Ammo Area Parking Lot

CLOSED SITES

Site	Description
003	Building 1 (ER, A)
004	Building 350 (ER, A)
005	Building 351 (ER, A)
006	Building 370 (ER, A)
007	Building 349 (ER, A)
011	Backwash Discharge Area from the Wastewater Treatment Plant (BRAC)
012	Building 2326 MSTP (ER, A)
013	IWTP Lagoons/Area D/Bldg. 360 (ER, A)
014	Building 370D Chemical Lab 55 (ER, A)
015	Acid Burning Pits (ER, A)
017	Projectile Range (ER, A)
018	CS Test Site (ER, A)
019	Weapons Storage Area, IGLOOS (ER, A)
020	Building 11 RAD Storage (ER, A)
021	Building 431 Calibration Lab (ER, A)
022	Building 3223 RAD Disposal Storage (ER, A)
024	Former Drum Storage Revetments (ER, A)
025	Previous Pesticide Area, Bldg. G (ER, A)
027	Open Storage Sheds (Dock 45 Spill of Malathion) (BRAC)
028	Small Sewage Treatment Plant (ER, A)
030	Digested Sludge Spread on Ground (ER, A)
031	Building 2357 (ER, A)
032	Industrial Waste Ditch- Rowe Run (ER, A)
035	Landfill 1 (Area H) (ER, A)
038	Landfill 4 (Area C) (ER, A)
041	Burial Area for Beryllium Phos Tubes (Landfill 1) (ER, A)
042	Neutralization Pit (ER, A)
043	Residue Burial Site (ER, A)
045	Demo Ground 1 (ER, A)
047	Burning Ground 1 (ER, A)
051	Deactivation Furnace (ER, A)
054	Ammunition Box Piles (ER, A)
055	Transformer Pad (BRAC)
056	Residue Drum Storage, Ammo Area (ER, A)
057	Waste Oil UST- Auto Shop Bldg. 3238 (ER, A)
058	Classified Paper Incinerator (ER, A)
059	Waste Storage Areas, Pads 2, 3 and 4 (BRAC)
060A	Lot 48 Ingot Storage Area
061	Ore Pile Locations (DA) (ER, A)
063	Firemans Training Area (1983) (ER, A)
064	Storage Area- Bldg. 1467 (ER, A)
065	Buried Drum Site #1 (ER, A)
066	Buried Drum Site #2 (BRAC)
067	Rocky Spring Lake Mercury (ER, A)
070	Rocky Spring (Mercury) (ER, A)
075	Soils SE (ER, A)
089	PDO OU6- Lead Paint Release onto Soil from Water Tower (BRAC)
099	Rocky Spring Weir Box (ER, A)
110C	Vehicle Storage West of Tank Farm (BRAC)
110D	Open Vehicle Storage Area (BRAC)
114B	Former Vehicle Storage- Gate 6 (BRAC)
114C	Vehicle Storage- Building 500 Area (BRAC)
114D	Open Vehicle Storage Area (BRAC)
116	Radioactive Materials Storage at Building 441 (BRAC)
118C	Building 400 Series Fire Training Area
119	Railroad Tracks- Herbicide Usage (BRAC)
123	Radon, Tritium (BRAC)
124	Asbestos (BRAC)
126A	Gate 1 Guardhouse, Building 511 (BRAC)
126B	Building 581 UST (BRAC)
126E	696 UST Removal (BRAC)
126F	Former Uncurbed AST at Building 532 (BRAC)

DSERTS OFF-POST SITES

Site	Description	Status
062	Guilford Alternative Water System (ER, A)	Closed
068	Rowe Run Spring (ER, A)	Active
069	Carty Well (ER, A)	Active
071	Rowe Run Drainage Farm Sampling (ER, A)	Closed
076	SE Off-Post Groundwater (ER, A)	Active
077	PDO Off-Post Drinking Water (ER, A)	Active
084	SE Off-Post Residential Well Study (Metals) (ER, A)	Active
086	Helman Spring (ER, A)	Active
087	Helman Spring East (ER, A)	Active
088	Witmer Spring (ER, A)	Active
090	Hawbaker Spring (BRAC)	Active
091	Dozens Spring (BRAC)	Active
095	Chamber Spring (BRAC)	Active
096	Nelson Spring (ER, A)	Active
097	Allen Well (ER, A)	Active
104	Nelson Spring East (ER, A)	Active



ER, A- Environmental Restoration, Army
DSERTS- Defense Site Environmental Restoration Tracking System
AST- Aboveground Storage Tank
UST- Underground Storage Tank
DRMO- Defense Reutilization and Marketing Office
IWTP- Industrial Wastewater Treatment Plant
OBP- Oil Burn Pit
PDO- Property Disposal Office
SE- Southeast Area
RCRA- Resource Conservation and Recovery Act*
* These sites are listed under both BRAC and ER, A.
Work related to transfer issues will be funded under BRAC;
ongoing work funded through ER, A will continue.

LEGEND:

- Buildings
- Army Retained
- Roads
- Drainage
- Dividing line between SE and PDO areas
- BRAC Active Sites
- ER, A Active Sites
- Closed Sites

N W E S

800 400 0 800 Feet

Letterkenny Army Depot
Chambersburg, PA

Figure 3-5
Location of AEDBR Sites at Letterkenny Army Depot

U.S. Army Corps of Engineers
Baltimore District

WESTON SOLUTIONS

Revision #

Date:
01/06/2011

3.7.2 Environmental Consequences

3.7.2.1 Proposed Action

Short-term minor adverse effects of hazardous materials and petroleum products would be expected. Prior to demolition or renovation, ACM and LBP surveys would be required. If ACM and LBP are discovered in the structures slated for demolition or renovation, abatement activities would ensue. Asbestos abatement during construction and renovation is implemented per Asbestos Hazard Emergency Response Act (AHERA) regulations.

Construction, renovation, and infrastructure upgrade activities require the use of hazardous materials such as paints, solvents, sealants, and fuel. The quantity of hazardous materials used during these activities would be minimal and their use would be for a short duration. Contractors would be responsible for the management of hazardous waste according to federal, state, and LEMC regulations. Contractors would implement BMPs to prevent releases and ensure that any release that occurs would not result in contamination.

Projects requiring site activity would avoid impacts to IRP sites. If any site activities ensued near IRP sites, all demolition, renovation or construction would be coordinated with the IRP Manager.

The Proposed Action would have a minor long-term impact from the increased use of hazardous materials and generated hazardous waste at LEMC as a result of increased operations and production. However, the hazardous materials would be properly stored in facilities in accordance with applicable state and federal laws. Any spills or releases would be properly documented and cleaned up. Hazardous wastes would be documented and properly disposed of in accordance with applicable regulations.

3.7.2.2 No Action Alternative

Under the No Action Alternative, the ADP and proposed projects would not be implemented. There would be no changes or impacts to hazardous and toxic substances. However, it is anticipated that future development would still occur, as the need for modernization and expansion will not cease; and, those future development projects would be analyzed through the preparation of project-specific NEPA documentation, as appropriate.

3.8 Noise

3.8.1 Affected Environment

LEMC is primarily surrounded by agricultural land. However, there are several nearby noise receptors that need to be considered as a part of the noise analysis. To the north and northeast there are rural residences as close as 0.05 miles from the property boundary. Upper Strasburg and Pleasant Hall are small residential communities that are located 1 mile and 0.5 miles, respectively, north of LEMC. To the south and southeast rural residences are as close as 0.5 miles from the property boundary. Cheesetown, Green Village, and the northern most portion of Chambersburg are all approximately one mile south/ southeast of LEMC.

An Installation Compatible Use Zone (ICUZ) analysis was performed for LEAD to identify noise levels in the facility. Although an ICUZ was not conducted for LEMC specifically, it is expected that the results would be similar to those of the analysis conducted for LEAD. This analysis determined that the current sources of noise originating at LEAD include demolition activities, firing ranges, vehicular traffic, rail equipment, the combat vehicle test track, the helipad, and miscellaneous equipment operations. The ICUZ analysis states that Zone II noise levels are considered “normally unacceptable” by Army Regulation 200-1; however, it does not affect the ambient noise environment beyond LEAD’s boundary. Zone II noises identified in the project area are the functional firing range, inactive demolition ground on the mountain, and the demolition ground (TetraTech 2013). Currently, detonations at the demolition ground total approximately 2,100/year (TetraTech 1998).

3.8.2 Environmental Consequences

3.8.2.1 Proposed Action

The Proposed Action would result in minor short-term adverse noise impacts from new construction, renovations, and infrastructure upgrades. These activities include the use of heavy equipment such as bulldozers, dump trucks, jackhammers, pavers, and other pieces of equipment that generate noise levels ranging from 90 to 94 dBA at a distance of 50 feet. Projects would be concentrated in the northeastern portion of LEMC which would affect approximately six rural residences located directly across the street from LEMC. However, noise impacts would only last for the duration of construction, renovation, and infrastructure upgrade activities. These impacts could be minimized by restricting active construction between 7:00 a.m. and 5:00 p.m. and using equipment exhaust mufflers. The short-term increase in noise levels would not cause significant adverse effects on the surrounding populations.

The Proposed Action would have minor long-term impacts on the noise environment due to increased train traffic and operational noise in new facilities. However, vehicular traffic volumes would decrease when the operational buildings are consolidated on the eastern side of LEMC. The number and frequency of detonations is not proposed to increase. No proposed increase in the number or frequency of detonations is anticipated on the Installation.

3.8.2.2 No Action Alternative

Under the No Action Alternative, the ADP and proposed projects would not be implemented. There would be no changes or impacts to noise. However, it is anticipated that future development would still occur, as the need for modernization and expansion will not cease; and, those future development projects would be analyzed through the preparation of project specific NEPA documentation, as appropriate.

3.9 Cultural Resources

3.9.1 Affected Environment

LEAD maintains an Integrated Cultural Resources Management Plan (ICRMP) to aide in management of the cultural resources on the Installation in accordance with appropriate federal laws and other applicable Army regulations. Cultural resources can be found in various locations throughout LEMC and LEAD. A total of 20 archeological sites have been identified in the LEAD area through documented research, three of which are potentially eligible for the National Register of Historic Places (NRHP). One of these sites is prehistoric and two are known historic sites. No additional fieldwork or investigation of these sites has been performed.

In the 1999 architectural survey conducted to support the ICRMP, a World War II district was identified, which contains a complete complex of igloo magazines, safety shelters, administrative buildings, and road and railroad networks, but the recommended district was never listed on the NRHP.

Approximately 902 Igloo storage structures can be found in the LEMC area. These structures were determined to be eligible for the NRHP through the Advisory Council on Historic Preservation's (ACHP) Program Comment for World War II and Cold War Era Ammunition Storage Facilities, signed in 2005. However, it was noted in the updated ICRMP as of May 2007, Section 106 coordination is no longer required for undertakings involving World War II and Cold War facilities constructed at LEAD, which includes LEMC.

Eight cemeteries are present within LEAD, seven of which are also found within LEMC. Three of these cemeteries are private while four are church affiliated. There is a total of approximately 520 headstones.

Internments occurred as early as 1831 ending with the oldest being made around 1940. Cemeteries do not typically qualify for inclusion on the NRHP unless there are famous persons known to be buried in them or they are associated with important historic events. The cemeteries at LEMC do not meet either of these criteria and none are eligible for inclusion on the NRHP.

No historic tanks or guns are included in the current cultural inventory at LEMC. There are also no traditional military landscapes (New South Associates, Inc. 2013).

3.9.2 Environmental Consequences

3.9.2.1 Proposed Action

The Proposed Action could have long-term minor to moderate impacts on the cultural resources in the project area. Several of the proposed construction projects would likely impact cultural and archeological resources; however, cultural surveys and Section 106 consultation would need to be conducted for each individual project. Any renovations or upgrades to existing buildings would likely occur within previously disturbed building or construction footprints; therefore, the renovation and upgrade projects are unlikely to result in impacts on cultural resources. Since many of the World War II era buildings and other resources have been delisted, LEMC may be able to design the projects to avoid impacts on NRHP-eligible resources. Regardless, the State Historic Preservation Officer would be consulted as required and impacts would be appropriately mitigated for.

3.9.2.2 No Action Alternative

Under the No Action Alternative, the ADP and proposed projects would not be implemented. There would be no changes or impacts to cultural resources. However, it is anticipated that future development would still occur, as the need for modernization and expansion will not cease; and, those future development projects would be analyzed through the preparation of project specific NEPA documentation, as appropriate.

3.10 Socioeconomics

3.10.1 Affected Environment

Most of LEMC lies within the Letterkenny Township, with small portions in Hamilton Township to the south. According to the 2013-2017 American Community Survey (5-Year Estimates) the estimated population of Letterkenny Township is around 2,406 and the median household income is $53,523 (American FactFinder, 2019). According to the same survey, the median household income in Franklin

County is $52,637; and, the median household income for Pennsylvania is $53,046. Letterkenny Township is above the national median household income by about $500/year.

LEAD employs 2,480 people, including 1,484 Department of the Army civilians and 996 contractors. LEAD is one of the largest employers in the area and contributes over 300 million dollars to the regional economy (LEAD, 2015).

Table 3.10-1 provides a summary of selected demographic and socioeconomic statistics and illustrates the range of population densities in the potentially affected county, state and city in the vicinity of the project area.

Table 3.10-1
Existing population and Demographic Conditions

Demographic	Pennsylvania	Chambersburg, PA	Franklin County, PA
2018 Population Estimate	12,807,060	21,029	154,835
2010 Population Density (persons per square mile)	283.9	2,926.8	193.7
Population Change Since 2010 (percent)	0.8	4.1	3.5
Persons per household, 2017 Estimate	2.47	2.37	2.51
2018 Estimate White Individuals (percent)	81.8	82.2	92.4
2018 Estimate Black, or African American Individuals (percent)	12.0	10.7	4.1
2018 Estimate: American Indian and Alaska Native Individuals (percent)	0.4	0.4	0.3
2018 Estimate: Asian Individuals (percent)	3.7	1.5	1.1
2018 Estimate: Individuals of Hispanic or Latino Origin (percent)	7.6	17.6	5.9

Source: U.S. Census Bureau, 2019

Table 3.10-2 provides the amount of vacant housing units as well as the rental vacancy rate in the Project vicinity.

Table 3.10-2
Temporary Housing Units Available in the Project Vicinity

Demographic	Pennsylvania	Chambersburg, PA	Franklin County, PA
2017 Estimate: Number of Vacant Housing Units	646,157	701	4,782
2017 Estimate: Rental Vacancy Rate (percent)	5.9	3.1	2.5

Sources: U.S. Census Bureau, 2019 (vacant housing units and vacancy rate).

Table 3.10-3 provides information on the economy and employment in the project area.

Table 3.10-3
Existing Income and Employment conditions in the Project Area

Income Characteristic	Pennsylvania	Chambersburg, PA	Franklin County, PA
2017 Estimate: Per Capita Income (dollars)	31,476	24,297	28,985
2017 Estimate: Population Below Poverty Level (percent)	12.5	19.1	9.7
2017 Estimate: Civilian Labor Force (percent)	62.8	62.6	62.8
2019 Estimate: Unemployment Rate[1] (percent)	3.8	3.2	3.2
Major Industry	H&SS[1]	H&SS[1]	MH&SS[2]

Source: U.S. Census Bureau, 2019.
[1] U.S. Department of Healthcare and Social Assistance (H&SS)
[2] Manufacturing, Health care and Social Assistance (MH&SS)

Table 3.10-4 provides a summary of the local community services in the project area. Local communities typically have community services such as police, fire, medical, and schools to accommodate the state and county populations.

Table 3.10-4
Public Service Data for the Project Vicinity

Parish/County/City, State	Number of Public Schools	Number of Police Departments	Number of Fire Departments (by type)	Number of Hospitals[1]	Number of Hospital Beds
Pennsylvania	2,597	1,117	22 (Career) / 72 (Combination) / 2128 (Volunteer)	178	35,843
Chambersburg, PA	15	3	5 (Career) / 1 (Volunteer)	1	273
Franklin County, PA	28	11	12 (Career) / 6 (Volunteer)	3	441
Totals	**2640**	**10**	**39 (Career) / 72 (Combination) / 2135 (Volunteer)**	**182**	**36,557**

Sources:
(1) Public School Review, 2019.
(2) USACops, 2019.
(3) Fire Department Directory, 2019.
(4) American Hospital Directory: Texas, 2019.

[1] Hospitals do not include rehabilitation, long-term and psychiatric hospitals.

Table 3.10-5 shows minority and income information for the state, counties, and census blockgroups within a 2-mile radius of the Project.

Table 3.10-5
Minority Populations and Low-Income Population Information for the Census Blockgroups Within 2 Miles of the Project

State / County / Census Tract	Percent Minority[1]	Percent Low Income	Population
State of Pennsylvania	23.9	12.5	12,807,060
Franklin County	12.3	9.7	154,835
Blockgroup ID 420550104002	13%	48%	2,379
Blockgroup ID 420550103001	1%	33%	1,935
Blockgroup ID 420550103004	9%	47%	2,386
Blockgroup ID 420550104001	17%	28%	2,551
Blockgroup ID 420550113022	13%	19%	3,862
Blockgroup ID 420550113021	20%	17%	936
Blockgroup ID 420550102002	5%	20%	2,479

Sources:
(1) U.S. Census Bureau, 2019. Estimates; total minority calculated by subtracting the percentage of the population identified as “Not Hispanic or Latino – white alone” from the total.
(2) USEPA, EJSCREEN Mapping Tool, 2019.

3.10.2 Environmental Consequences

3.10.2.1 Proposed Action

The Proposed Action would have less than significant impacts on socioeconomics. There would be some beneficial direct and indirect impacts on the local economy resulting from construction, renovation, and infrastructure upgrade activities. These impacts would be moderate and short-term. Local business could experience an increase in employment and sales volume, and an increase in construction workers could increase payroll taxes and purchase of goods and services.

All projects would occur entirely within the existing LEMC property boundary, which is fenced with secured access. Potential adverse impacts on the surrounding populations could include increased noise and traffic levels and decreased air quality associated with construction activities. These impacts would be short-term, intermittent, and minimal. No impacts to minorities, low-income families, or children would be expected.

3.10.2.2 No Action Alternative

Under the No Action Alternative, the ADP and proposed projects would not be implemented. There would be no changes or impacts to socioeconomics. However, it is anticipated that future development would still occur, as the need for modernization and expansion will not cease; and, those future development projects would be analyzed through the preparation of project-specific NEPA documentation, as appropriate.

3.11 Traffic and Transportation

3.11.1 Affected Environment

The area around LEMC is served by U.S. Highway No. 11, U.S. Highway No. 30, Interstate 81, and the Pennsylvania Turnpike is 14 miles north of the facility via State Route 997 (TetraTech 2013). Direct access to LEMC is provided by State Route 433 and 997 (TetraTech 2013). The primary entrance to LEMC is via the access point on Coffey Avenue (TetraTech 2013). LEMC includes 123 miles of paved roadways and additional unpaved roadways. The unpaved roadway network includes direct connections between storage areas.

Many of the existing roadways and gate systems within LEMC have not been adequately maintained and are failing. The Voelz Gate, which is heavily utilized, lacks adequate space for overnight, queuing, and exiting truck traffic. Trucks are frequently required to queue in non-designated space, creating security issues. Virginia Avenue from Massachusetts Avenue to Pennsylvania Avenue, Wyoming Avenue, part of Massachusetts Avenue along the K-area, Georgia Avenue from Massachusetts Avenue to Bazooka Road,

the southeast perimeter section of the C-area, and two areas within the A-area are in poor condition and present immediate problems to the mission viability. Currently, each of these are paved roadways but are insufficient in condition and need repair.

The current railroad infrastructure within LEMC is in poor condition and in need of repair. Most of the existing railroads are rated as 80-pound rail.

3.11.2 Environmental Consequences

3.11.2.1 Proposed Action

The Proposed Action would result in moderate temporary adverse impacts on the existing traffic conditions within LEMC as the area experiences an increase in construction vehicle traffic and road work along many of the paved and unpaved roadways. As improvements to the existing roadway and railroad networks progress, traffic flow would improve, resulting in a long-term improvement on traffic and transportation. Ultimately the permanent impacts on traffic and transportation would significantly improve as a result of the Proposed Action because the roadways would undergo modernization and the rail improvements would allow for additional deliveries to be received via rail networks rather than by truck deliveries, freeing up the LEMC roadways for local commuter traffic.

3.11.2.2 No Action Alternative

Under the No Action Alternative, the ADP and proposed projects would not be implemented. There would be no long-term improvements to traffic and transportation. The existing road and railroad infrastructure would continue to degrade, resulting in worsening conditions for local commuters and truck deliveries. However, it is anticipated that future development would still occur, as the need for modernization and expansion will not cease; and, those future development projects would be analyzed through the preparation of project-specific NEPA documentation, as appropriate.

3.12 Utilities

3.12.1 Affected Environment

This section assesses the water supply, wastewater systems, stormwater systems, energy sources, communications, and solid waste service at LEAD. The water, sewer, and electric utilities have been privatized and services have been purchased from the Franklin County General Authority/Letterkenny Industrial Development Authority (LIDA), (LEAD, 2015).

Potable Water Supply

LEAD and LEMC receive potable water from the Letterkenny Reservoir. This reservoir is a 330-million-gallon reservoir located 10 miles north of the Installation. The portable storage area that serves LEMC is a 300,000-gallon tower (LEAD, 2015).

Wastewater System

LEAD uses a privatized wastewater system, operated and maintained by Suez Water Pennsylvania Inc. through the FCGA. Wastewater is collected throughout LEMC in holding tanks and is pumped out. An existing wastewater treatment plant operates to the south of the complex but is not currently used for existing facilities in LEMC. Due to the topography of the area, a connected sanitary sewer system would require multiple combinations of lift stations, force mains, and gravity flow pipes.

Storm Water System

There is no municipal separate storm sewer system for Letterkenny.

Energy Sources

The electrical power at LEAD is provided by Allegheny Power's (AP) Letterkenny substation, which also provides power for LEMC. The substation is served from a single 138-kV feeder that approaches from the east, where it ties to the AP distribution grid. Power is then distributed from the adjacent switch station, which is operated by AP, but is owned by the LIDA. LEMC is sub-fed at 7,200 volts on a single aerial circuit by means of step-down transformers. The existing electrical distribution system is currently insufficient for mission needs. Several facilities operate on generators and are not connected to the system.

Natural Gas

LEMC is currently in the process of converting the facility from propane to natural gas. Gas service only exists in certain areas of LEAD and LEMC. UGI Utilities, Inc. Gas Division supplies the natural gas on LEMC (JG&A 2019).

Communications

Aerial mounted copper (voice) and fiber optic (data) cabling exists along the existing utility pole lines and direct bury lines throughout LEMC (LEAD, 2015).

Solid Waste

Solid waste in collected and disposed through Waste Management, Inc. who transports the waste to Upton, Pennsylvania and places it in a landfill owned by Waste Management of Central Pennsylvania (LEAD, 2015).

3.12.2 Environmental Consequences

3.12.2.1 Proposed Action

Potable Water Supply

The current potable water supply is inadequate for the current mission and fire protection needs. The Proposed Action includes a project to increase the 6-inch potable water lines to 12-inch lines. Therefore, the project would have long-term beneficial impacts on the water supply at LEMC. However, there would be short-term interruptions that could occur when new facilities are disconnected from or connected to the water supply system (JG&A 2019).

Wastewater System

The Proposed Action would result in short-term negligible direct adverse impacts when facilities are disconnected from and connected to the wastewater system. However, the system interruptions would be temporary and coordinated with area users prior to disconnection (JG&A 2019).

Storm Water System

There is no municipal separate storm sewer system for Letterkenny. Therefore, there would not be any impacts from the Proposed Action (JG&A 2019).

Energy Sources

The Proposed Action would result in short-term negligible direct adverse impacts when facilities are disconnected from and connected to the electrical system. However, the system interruptions would be temporary and coordinated with area users prior to disconnection. The proposed upgraded electrical system would have long-term positive benefits by providing more efficient and reliable power to LEMC.

Currently, projects are underway to convert the Installation over to natural gas from propane. The overall condition is unknown, and a full evaluation would occur prior to additional facilities being connected.

Communications

The Proposed Action includes a project to upgrade the communication system with a line between the east and west ends of LEMC along Virginia Avenue for future development demands. With the upgrades, the system would adequately serve the needs of the current mission. Therefore, the project would have long-term beneficial impacts on the communications system (JG&A 2019).

3.12.2.2 No Action Alternative

Under the No Action Alternative, the ADP and proposed projects would not be implemented. There would be no changes or impacts to utilities.

3.13 Recreation

3.13.1 Affected Environment

Recreation activities (hunting and fishing) occur in the ammunition storage area and buffer zone of LEMC (TetraTech 2013).

The Ammunition Storage area is a 12,335-acre restricted area that is split into 11 hunting areas. A 4,570-acre Buffer Area is reserved for public use. Big game species that are hunted on LEMC include white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus Americana*), and eastern wild turkey (*Meleagris gallopavo*). Small game species that are hunted on LEMC include ring-necked pheasant (*Phasianus colchius*), ruffed grouse (*Bonasa umbellus*), gray squirrel (*Sciurus carolinensis*), red squirrel (*Tamiasciurus hudsonicus*), eastern cottontail (*Sylvilagus floridanus*), American crow (*Corvus brachyrhynchos*), fish crow (*Corvus ossifragus*), coyote (*Canis latrans*), Virginia opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), woodchuck (*Marmota monax*), and long-tailed weasel (*Mustela frenata*). Species that are trapped on LEMC include coyote, Virginia opossum, striped skunk, long-tailed weasel, raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), gray fox (*V. cinereoargenteus*), beaver (*Castor canadensis*), mink (*Mustela vison*), and muskrat (*Ondatra zibethicus*) (TetraTech 2013).

The waterbodies on LEMC that are primarily used for fishing include Shirley's Pond, Coles Pond, Henry's Pond, Bud's Lake, Lake Letterkenny, Rocky Spring's Lake, Muddy Run, and Keasey Run. A PCB-related fish advisory is in place for Rock Spring's Lake (TetraTech 2013).

3.13.2 Environmental Consequences

3.13.2.1 Proposed Action

The Proposed Action would have a short-term negligible direct adverse impact on recreation during construction. Based on the locations identified as "potential development areas" in the June 2019, IDP, most of the new construction would be in areas that are previously disturbed or developed. The largest area of forest/vegetation, where most hunting occurs, is in the northwestern section of LEMC; which would likely remain unchanged. The additional noise from general construction operations may startle off local wildlife temporarily. Once construction is complete, wildlife would be expected to return to the immediate area. No long-term impacts from operation activities are expected.

Further, impacts on streams, ponds, and lakes would be short term and would be minimized through implementation and maintenance of erosion and sediment controls during construction.

3.13.2.2 No Action Alternative

Under the No Action Alternative, the ADP and proposed projects would not be implemented. There would be no changes or impacts to recreation. However, it is anticipated that future development would still occur, as the need for modernization and expansion will not cease; and, those future development projects would be analyzed through the preparation of project specific NEPA documentation, as appropriate.

3.14 Human Health and Safety

3.14.1 Affected Environment

The nearest hospital to the Installation is the WellSpan Chambersburg Hospital in Chambersburg, approximately 6 miles to the south. The Chambersburg Fire Department, in Chambersburg, provides emergency response and fire protection services. The Chambersburg Fire Department is located approximately 6 miles to the south of the Installation. The Army Depot Fire Department within LEAD also serves as a first responder.

3.14.2 Environmental Consequences

3.14.2.1 Proposed Action

The Proposed Action would have a short-term minor direct adverse impact on human health and safety. To address any health and safety hazards that could potentially arise during construction, LEMC would develop a Health and Safety Plan to address worker safety during the construction and operation of the proposed projects. The Health and Safety Plan would include provisions for worker protection as is required by the Occupational Safety and Health Administration (OSHA) with emphasis on CFR 1926 – *Safety and Health Regulations for Construction.* During construction, all employees, contractors, and sub-contractors would be required to conform to OSHA safety procedures. Adequate training would be mandatory for all construction workers on site. Personal safety equipment such as hard hats, ear and eye protection, and safety boots would be required for all workers on site. Accidents and injuries would be reported to the designated safety officer at each site.

The proposed projects would comply with all relevant federal, state, and local requirements, including all requirements concerning public health and safety, including but not limited to requirements addressing land use, noise, and traffic.

The proposed projects would minimize any potential human health and safety impacts through prohibiting site access except for the purposes of constructing the proposed projects, and for providing access for emergency equipment, and for police and fire protection. Coffey Avenue and Georgia Avenue are adequate (width, grade, construction, overall safety, and design capacity) to carry all prospective traffic and entrance to the Installation is not open to public access.

Risk of accidental fire during construction could occur from human activities such as refueling and cigarette smoking. The Health and Safety plan would reduce fire-related risks to acceptable levels by imposing restrictions or procedures regarding these activities. In addition, implementation of industry-approved design measures for all proposed project components would ensure that fire-related risks would remain acceptably low.

The Proposed Action would have a minor long-term impact from the increased use and storage of regulated hazardous materials and generated hazardous waste at LEMC as a result of increased operations and production. During construction and operation, diesel fuel, gasoline, and lubricating oils from heavy equipment and vehicles could be accidentally leaked or spilled. Hydraulic fluid, paints, and solvents would likely be used during construction and operation as well. All used oil generated at the proposed project sites and other potentially hazardous materials (automotive fluids, spray paint cans, etc.) at the site would be collected by a licensed/permitted recycler.

If ACM or LBP are present at the site, abatement of said materials would be done in conformance with applicable local, state, and federal regulations by a licensed abatement contractor with appropriate Personal Protective Equipment (PPE).

3.14.2.2 No-Action Alternatives

Under the No Action Alternative, the ADP and proposed projects would not be implemented. There would be no changes or impacts to human health or safety. However, it is anticipated that future development would still occur, as the need for modernization and expansion will not cease; and, those future development projects would be analyzed through the preparation of project specific NEPA documentation, as appropriate.

3.15 Cumulative Effects

According to the Council on Environmental Quality (CEQ) regulations, a cumulative impact is defined as an impact on the natural and human environment, which results from the incremental impact of the proposed action when combined with impacts from other past, present, and reasonably foreseeable future actions. This Project and all associated actions must be evaluated with and in addition to the effects from other

projects in the area to determine if and where cumulative impacts on specific environmental resources are likely to occur.

In order to understand the contribution of past actions to the cumulative impacts of the proposed action, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. In this analysis, we generally consider the impacts of past projects within the resource-specific geographic scopes as part of the affected environment (environmental baseline), which was described under the specific resources discussed throughout section 3.0. However, this analysis does include the present effects of past actions that are relevant and useful.

This cumulative impact analysis includes other actions meeting the following three criteria:

- the action impacts a resource that is also potentially affected by the Project;
- the action causes the impacts within all or part of the same geographic scope as the Project; and
- the action causes this impact within all or part of the temporal scope for the potential impacts from the Project.

As described in previous sections of this EA, construction and operation of the projects under the Proposed Action would temporarily and permanently affect the environment, with most (but not all) impacts generally localized and minimal. The Project would result in impacts on geological resources, soils, wetlands, water resources, vegetation, wildlife habitat, special status species, some land uses, recreational and visual resources, socioeconomics, air quality, and noise. Nevertheless, throughout the individual resource discussions in this EA, we have determined that the Project would have only minimal, generally localized, and temporary impacts on these resources, except for the Project's long-term impacts where areas that are currently vegetated, natural forests would be permanently cleared.

Table 3.15-1 summarizes the resource-specific geographic boundaries that were considered in this analysis and justification for each. Actions located outside these boundaries are generally not evaluated because their potential to contribute to a cumulative impact diminishes with increasing distance from the project area. The geographic scope for analyzing some of the resources listed below is defined by the hydrologic unit code (HUC)-12 subwatershed(s) where the projects are proposed. A watershed is an area of streams, channels, and rivers that all drain into a common outlet. Based on the minimal disturbances proposed to land use and aquatic resources, the natural, ecological boundaries of a HUC-12 subwatershed is the appropriate geographic scope for this analysis.

Table 3.15-1
Resource-Specific Geographic Regions for Determining Cumulative Impacts of the Project

Resource(s)	Cumulative Impact Geographic Scope	Justification for Geographic Scope
Geological resources and soils	For geological resources, the area of disturbance of the Project and other projects would be overlapping or immediately abutting one another and involve excavation. Potential soils impact would be limited to within 0.25 mile of the Project workspaces.	Impacts on geological resources and soils would be highly localized and primarily limited to the respective project footprints during active construction. Cumulative impacts would only occur if other geographically overlapping or abutting projects were constructed at the same time as the Project
Surface water, groundwater and aquatic resources	HUC-12 subwatershed boundary.	Impacts on surface waters can result in downstream contamination or turbidity; therefore, the geographic scope used to assess cumulative impacts on water and aquatic resources includes the HUC-12 subwatersheds within LEMC.
Wetlands		
Vegetation and wildlife	2 miles from the LEMC. For less-transient species, such as reptiles and amphibians, the geographic scope will be the area immediately within and abutting the project's construction areas.	Due to the transient nature of wildlife, cumulative impacts on vegetation and wildlife have been considered within a 2-mile buffer of the LEMC.
Cultural resources	The area of potential effect of the Project and other projects would be overlapping or immediately abutting one another and involve excavation, or within the viewshed.	Project impacts on cultural resources would be restricted to the existing confines of the LEMC, therefore, the geographic scope for cumulative impacts is also confined to the LEMC.
Land use and special interest areas	0.5 mile from the project areas.	Project impacts on general land uses would be restricted to the existing confines of the LEMC, therefore, the geographic scope for land use and recreation is 0.5 mile from the centerline of the LEMC boundary.
Visual resources	Viewshed varies based on topography and vegetation.	The geographic scope for assessing cumulative impacts on a viewshed includes the surrounding area from where a new facility would be visible. Therefore, the geographic scope would be limited to areas where clearing of mature trees or installation of new aboveground facilities would occur. 500 feet has been considered for most areas; however, that distance could be greater depending on surrounding topography.
Socioeconomics	Affected county.	Due to the Project's limited regional scope, the geographic area for assessing contributions to cumulative impact on socioeconomics, including traffic-related impacts, was evaluated on a county-wide basis.
Air quality – construction	0.25 mile from the project.	Due to the limited amount of emissions generated by construction equipment, the geographic scope used to assess potential cumulative impacts on air from construction activities was set at 0.25 mile from the LEMC.
Air quality – operation	Affected county, distance up to 25 kilometers from site	The area immediately surrounding the property will have the largest impacts from the LEMC's operational emission. However, other nearby emissions sources could impact air quality in the area.
Noise	Noise receptors that could be affected during construction and operation; up to 0.25 mile during construction and up to 1 mile during operation.	The geographic scope for assessing potential cumulative impacts on noise was determined to be up to 1 mile due to the nearby residents and municipalities within 1 mile from the Installation.

Table 3.15-2 provides a preliminary list of the LEMC proposed projects as grouped by schedule.

Table 3.15-2
Letterkenny Munitions Center Proposed Projects List

Project Description	Project Category	Project Number
Short-Range (0-5 years)		
PAC 3 Facility	New Construction	85904
Shipping and Receiving Facility (56,000 SF)	New Construction	59700
Fire Station	New Construction	85904
Realign Test Track	Infrastructure Upgrade	TBD
ACP & Visitors Center	New Construction	66632
Renovation of Building 370	Renovation	93919
Renovation of Building 350	Renovation	90162
Renovation of Building 320	Renovation	93918
Industrial Waste Water Treatment Plant	New Construction	TBD
Mid-Range (6-15 years)		
Electrical Distribution Center	New Construction	TBD
Consolidated POV Parking Lots	New Construction	TBD
TPY-2 Radar Site	New Construction	TBD
Ground Support Equipment Maintenance Facility (120,000 SF)	New Construction	68976
Force Provider Facility (240,000 SF)	New Construction	69808
Perimeter Realignment and Land Swap	Infrastructure Upgrade	TBD
Long-Range (16-20 years)		
DISA HQ and Administrative Campus (135,000 SF)	New Construction	69878
LEAD HQ and Administrative Campus (95,000 SF)	New Construction	69849
Electric Repair Facility	New Construction	69864
Expansion of Building 320	Renovation	TBD
Walking Trails and Open Space	New Construction/Renovation	TBD
Realigned Road and New LEMC Gate	New Construction/ Infrastructure Upgrade	TBD
Capacity Plan		
Capacity Administrative Facilities (Total of 336,000 SF)	New Construction	TBD
Capacity Storage Facilities (Total of 467,000 SF)	New Construction	TBD
Capacity Production Facility (240,000 SF)	New Construction	TBD
Capacity Community Facilities	New Construction	TBD
Source: JG&A, 2019		

Table 3.15-3 provides a list of past, present, and reasonably foreseeable future projects that have been identified, using publicly available information, within the geographic scope of the LEMC projects.

Table 3.15-3
Past, Present, and Reasonably Foreseeable Future Project within the same Geographic Scope as the LEMC Projects.

Project Description	Project Category	Location
Past Project		
Utility Addition and expansion on City Hall (December 2018)	Renovation	Chambersburg
Aquatic Center at Memorial Park (2018)	New Construction	Chambersburg
J. Hase Mowrey Regional Wastewater Treatment Plant (2018)	New Construction	Chambersburg
Current Ongoing Project		
Bridge Replacements, Repairs, and Road Improvements (U.S.. 30 and U.S.. 11)	Infrastructure Upgrade/Renovation	Franklin County
Franklin County Courthouse (Construction over the next 20 years)	New Construction	Franklin County
Historical Courthouse and Courthouse Annex	Renovation	Franklin County
Administrative Annex	Renovation	Franklin County
Archive Building	New Construction	Franklin County
Greenway and Open Space Plan	New Construction/Renovation	Franklin County
Franklin County Forward: The Comprehensive Plan for Franklin County, PA	New Construction/Renovation	Franklin County
Fire Station and New Schools	New Construction	Franklin County, Southampton Township
Commercial Projects Planned Off I-81	New Construction	Chambersburg
Twentieth Century Judicial Center on Memorial Square in Downtown Chambersburg (2019)	New Construction	Franklin County, Chambersburg
The North Chambersburg Transportation Improvements Project	Infrastructure Upgrade	Franklin County, Chambersburg
Future Projects		
Police Department Project (2020)	New Construction	Chambersburg

Source: Franklin County Commissioners, 2012 and Franklin County Pennsylvania, 2019, Borough of Chambersburg, 2019.

3.15.1 Environmental Resources with Potential Cumulative Impacts

Table 3.15-4 summarizes the potential cumulative impacts for each resource area. This section summarizes the potential cumulative impacts for the resource areas identified in the table as having the potential for cumulative impacts; those with no potential for cumulative impacts are not discussed further.

The Proposed Action includes numerous construction, demolition, and infrastructure projects that would have the potential to contribute to cumulative impacts on soils, biological and aquatic resources, air emissions, hazardous and toxic substances, noise, socioeconomics, traffic and transportation, and safety.

Table 3.15-4
Summary of Cumulative Effects

Resource Area	Potential Cumulative Impact
Land Use	None. The designation of land for military uses would not change
Geology, Topography, and Soils	Potential short-term incremental impacts to soils from grading and other soil disturbances during construction and demolition. Negligible localized changes to topography from site grading. No changes to geology.
Biological Resources	Negligible cumulative impacts from incremental loss of terrestrial vegetation and wildlife habitat on a highly regional scale. No significant long-term loss of habitat types used by local populations of species would occur.
Water Resources	Potential for minor incremental cumulative impacts to water resources from increases in impervious surfaces and resulting stormwater runoff/erosion in nearby waterways. Potential long-term/permanent loss of wetlands in new construction areas (will be mitigated for).
Air Quality, GHGs, and Climate Change	Potential for negligible localized incremental short-term contributions to combustion emissions and dust generation from construction and demolition activities. Potential for long-term reduction in fossil fuel consumption and corresponding reduction in air emissions from increased energy efficiency in new buildings.
Hazardous and Toxic Substances	Potential for minor incremental impact from generation of hazardous wastes during construction or demolition.
Noise	Potential for short-term localized cumulative impacts from operation of equipment for construction and demolition activities. No potential for long-term noise impacts or modifications to noise contours.
Cultural Resources	None. Cultural resources may be impacted by the Proposed Action; however, no other projects (outside the boundaries of LEMC) would also contribute to impacts on the same resources; therefore, no cumulative impact would occur.
Socioeconomics	Potential for minor beneficial cumulative impacts from short-term hiring associated with construction, demolition, and infrastructure projects should other projects occur simultaneously.
Traffic and Transportation	Potential localized short-term cumulative transportation delays from increased traffic. Long-term minor benefit from improved infrastructure.
Human Health and Safety	Potential localized short-term cumulative negligible safety risk from increased traffic. Long-term minor benefit from improved infrastructure.

3.15.1.1 Geology, Topography, and Soils

Although the proposed projects under the ADP involve demolition and earth work that would result in moderate short- and long-term impacts on soils, none of the other projects identified in table 3.15-3 would be constructed at the same time, nor do they geographically overlap or abut the LEMC. Therefore, no cumulative impact is expected on geology, topography, or soils.

3.15.1.2 Biological Resources

Minor cumulative impacts to terrestrial biological habitat would occur as the result of the new construction projects under the Proposed Action. Some of the proposed projects would result in the permanent loss of forested land and of maintained/mowed landscape. This loss would be additive with the conversion of land from other past and reasonably foreseeable future activities. Because all impacts to vegetation resulting from the proposed projects would be confined within the boundary of LEMC and would comply with the requirements of local, state, and federal permits associated with land disturbing impacts and protected species, it is not expected that vegetation impacts of the proposed projects would interact with other projects occurring outside of LEMC. Thus, the Proposed Action's contribution towards a cumulative effect on regional vegetation and/or wildlife would be negligible.

3.15.1.3 Water Resources

Indirect cumulative impacts to water resources could occur during construction and demolition and following construction projects associated with the Proposed Action. The amount of impervious surface at LEMC would increase following implementation of all the proposed projects and could be additive with unrelated projects planned or potentially occurring within the same timeframe and same watershed. Construction and post-construction stormwater BMPs would limit impacts, although minor cumulative impacts could occur through incremental increases in scour and sedimentation.

Potential effects to water resources would be confined within the boundaries of LEMC. BMPs and design features would minimize the potential for indirect impacts to offsite waters. Planned improvements in 2020 for a number of bridges along U.S.-Hwy-30 and U.S.-Hwy-11 could coincide with some of the short-range (0-5 years) projects proposed under the Proposed Action. There is little potential for interaction of all the proposed projects with other past, present, and reasonably foreseeable projects outside LEMC boundaries.

Projects within the boundaries of LEMC and unrelated off-post projects may incrementally contribute to impacts to wetland resources. The Proposed Action would likely result in temporary and permanent impacts on wetlands, which would require mitigation either through the purchase of mitigation credits, payment to an in-lieu fee program, or through the development of a permittee-responsible mitigation site.

3.15.1.4 Air Quality, GHGs, and Climate Change

Construction of projects under the Proposed Action (as well as most of the projects and activities listed in table 3.15-3) would involve the use of heavy equipment that would generate temporary emissions of air contaminants and fugitive dust. The majority of criteria emissions generated during construction would be PM_{10} and $PM_{2.5}$ in the form of fugitive dust that would result from clearing, grading, excavation, and vehicle traffic on unpaved roadways. Typically, PM_{10} settles quickly near the construction sites. The cumulative air impacts would be additive emissions of pollutants due to the use of equipment powered by diesel or gasoline engines and further generation of fugitive dust from land clearing and grading. Emissions could be reduced by various abatement measures including using properly maintained vehicles, and storage pile and pavement watering. The impacts would be localized to the vicinity of the construction areas during active construction. For projects under the Proposed Action to contribute to a cumulative impact from construction air emissions, other projects/actions listed in Table 3.15-3 would need to also involve concurrent construction (temporal scope) in an area within 0.25 mile of the active construction footprint at the Installation (geographic scope). None of the other projects are located within 0.25 mile of the Installation; therefore, the Proposed Action in not expected to contribute to cumulative impacts on air quality during construction.

The projects listed in Table 2.2-1 are not expected to create large emissions increases of criteria pollutants. Since the project list contains new buildings, building expansions, building updates, increased and updated storage operations, and infrastructure updates, there are not expected to be many new emission sources as a part of the project list. Some buildings may require emergency equipment, but operation of these sources would be limited to maintenance and testing operations (approximately 200 hours per year of operation). Similarly, the new/replacement buildings and upgrades to existing buildings would increase the building efficiency, reducing the energy needed to operate said buildings. Similarly, only the wastewater treatment plant from the list provided in Table 3.15-3 is expected to have operational emissions that would affect the air quality. All other buildings are not expected to have any emission sources, or are expected to have emergency equipment only, as a part of construction.

Table 3.15-5 shows the 2017 Emissions Inventory for Franklin County, Pennsylvania (PDEQ), the 2017 Emissions Inventory for LEMC, and the emissions estimate for the construction of the projects.

Table 3.15-5
Franklin County Emissions (2017) Compared to Facility Emissions (2017) and Project Emissions

Pollutant	Franklin County Emissions (tons)	LEMC Operational Emissions (tons)	Short-Range Project Emissions (tons)	Mid-Range Project Emissions (tons)	Long-Range Project Emissions (tons)
NO_x	223.49	25.60	93.74	19.79	1,596.79
CO	433.95	16.00	528.10	83.06	9,417.24
VOC	293.35	33.30	31.93	6.11	581.35
SO_2	18.35	5.30	7.61	1.97	157.71
PM_{10}	196.29	79.90	5.27	1.06	97.70
$PM_{2.5}$	106.85	79.90	5.22	1.06	97.25
CO_2	262,211.90	15,419.80	23,406.01	2,398.58	232,981.19
CH_4	6,522.61	0.30	0.35	0.10	9.86
N_2O	1.11	0.00	0.10	0.66	2.04
CO_2e	425,608.89	15,427.30	23,444.67	2,596.78	233,836.32

GHGs were calculated for each of the Projects during construction and are reported in Table 3.6-2. GHG emissions from construction equipment are temporary and operational emissions from the project would not drastically change from the current condition. Additionally, increased efficiency of the new, replaced, and updated buildings would reduce the energy needed to power the facility. Since the GHG emissions from the projects are expected to largely be from the construction and the updates and renovations are expected to reduce energy consumption from the facility, the Projects are not expected to contribute to climate change.

3.15.1.5 Hazardous and Toxic Substances

Construction and demolition projects could have the potential for incremental increased generation of hazardous wastes, which would require proper handling and disposal.

3.15.1.6 Noise

Section 3.8 describes the existing noise environment at LEMC and identifies several residences located just north of the LEMC boundary. Construction of the Proposed Action would result in minor increases of noise levels, as compared to current ambient levels, due to the presence and operation of construction equipment and general construction-related activities. However, once all projects defined under the Proposed Action are complete, no permanent increases in noise are anticipated. Further, none of the other projects identified in table 3.15-3 are located within close enough proximity to those same 6 residences for there to be a cumulative impact when combined with the Proposed Action. Therefore, the Proposed Action would not

contribute towards a cumulative increase in noise at nearby noise sensitive receptors, when combined with the other past, present, and reasonably foreseeable future projects.

3.15.1.7 Socioeconomics

The Proposed Action would result in some beneficial direct and indirect impacts on the local economy resulting from construction, renovation, and infrastructure upgrade activities. These impacts would be moderate and short-term. Local business could experience increases in employment and sales volume, and an increase in construction workers could increase payroll taxes and purchase of goods and services. The same type of net positive impact is anticipated from most of the other projects. Therefore, a beneficial cumulative impact is expected for any projects overlapping in schedule within the Franklin County area.

3.15.1.8 Traffic and Transportation

Since the LEMC is surrounded by U.S.-Hwy-30 and U.S.-Hwy-11, construction of the Proposed Action is expected to result in a minor but noticeable increase in traffic from workers and the transportation of materials and equipment. This increase is expected across the life of the projects, until all active construction is complete. There were two other projects identified that would directly affect traffic and transportation within the same general area. The Pennsylvania DOT is planning infrastructure improvement projects along U.S.-Hwy-30 and U.S.- Hwy-11. Cumulatively, these highway improvement projects would result in a cumulative increase in traffic thus directly impacting transportation in the area. However, when the highway improvements are complete, increased congestion is expected to subside due to the improvements being complete.

3.15.1.9 Human Health and Safety

To quantify cumulative impacts on human health and safety, other projects would need to overlap both in schedule and geographically. None of the other projects identified in table 3.15-3 would share the same geographic and temporal scope as the proposed projects. Therefore, no cumulative impact on human health and safety is expected.

3.16 Mitigation Measures

LEMC would acquire the appropriate permits and clearances for the proposed projects, and mitigation measures would be implemented based on each permit requirements. Mitigation measures could include buying mitigation credits for impacts to wetlands and streams, implementing appropriate BMPs during construction, and limiting construction windows to avoid impacts to species. However, additional mitigation measures may be required on a project by project basis.

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APPENDIX A – AGENCY CONSULTATIONS

Insert any previously submitted/received consultation letters here.

APPENDIX B – AIR QUALITY CALCULATIONS

Letterkenny Ammunitions Center (LEMC)
Estimated On-Road Tailpipe Emissions

Project List	Worker Vehicle Miles Travelled	Delivery Vehicle Miles Travelled
Table 1: 10,000 Square foot NEW Building (BMCD ID: 8, 13, 15, 21, 24, 27, 29, 31, 33, and 36)	2,322	730
Table 2: 4,000 square foot NEW building (BMCD ID: 14)	2,322	0
Table 3: 2,700 sqft NEW Building (BMcD ID: 26)	2,322	0
Table 4: 2,400 sqft NEW Building (BMCD ID: 19)	2,322	0
Table 5: 100 Space PARKING LOT (BMCD ID: 7)	1,242	0
Table 6: 1,750 sqft NEW Building (BMCD ID: 10, 12)	5,562	0
Table 7: 5,000 sqft NEW Building (BMCD ID: 40)	2,322	0
Table 8: 35,000 sqft NEW Building (BMCD ID: 2)	17,604	4,380
Table 9: 45,000 sqft NEW Building (x2 BMCD ID: 1)	43,394	10,220
Table 10: 82,000 sqft NEW Building (x4) (BMCD ID: 5)	76,118	18,980
Table 11: 1,125,000 sqft NEW Building (BMCD ID: 50)	2,302,884	591,008
Table 12: 2,700 to 22,000 Square foot REPLACEMENT Building (BMCD ID: 39, 41 through 46, 48, 7 total)	18,684	730
Table 13: 0.9 Acre PARKING LOT (BMCD ID: 11)	2,484	0
Table 14: Expand Roadway at Voelz Gate PARKING LOT (BMCD ID: 4)	17,496	0
Table 15:250 square foot New Building (BMCD ID: 16)	1,242	0
Table 16: 750 square foot UPGRADED Building (BMCD ID: 17)	22,302	0
Table 17: 2050 square foot Upgraded Building (x 1004 BMCD ID: 38)	22,302	0
Table 18: 4400 square foot Upgraded Building (BMCD ID: 28)	22,302	0
Table 19: 5878 square foot Upgraded Building (BMCD ID: 34 and 37)	4,212	730
Table 20: 12,000 square foot Upgraded Building (BMCD ID: 30 and 35)	7,506	1,460
Table 21: 35,000 square foot REPLACEMENT Building (BMCD ID: 47)	18,684	4,380
Table 22: 10 Acre New Security Post Parking lot (BMCD ID: 25a)	6,869	0
Table 23: 100,000 square foot PARKING LOT (BMCD ID: 22)	7,992	0
Table 24: 3 miles of electric upgrades (BMCD ID: 20)	1,512	0
Table 25: 22 miles of RAIL network (BMCD ID: 3)	2,337,444	610,280
Table 26: 10 acre RAIL classification yard (BMCD ID: 6)	472,068	119,209
Table 27: Restoration of 4 miles of RAIL (BMCD ID: 18)	226,584	2,044
Table 28: Repair 11 miles of asphalt ROADS (BMCD ID: 23)	58,644	0
Table 29: Repair 1560000 sqft of asphalt ROADS (BMCD ID: 32)	69,120	0
Table 30: New Security Post Buildings (x2) (BMCD ID: 25b)	5,562	0
Table 31: Upgrade Utility Infrastructure Overall (BMcD ID 9)	1,650,456	0

Passenger Vehicles

Type	Fuel	Percentage[a]	Worker VMT (miles/project)	Emission Factor (g/mile)[b]									Emissions (tons)									
				NOx	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2[c]	CH_4	N_2O	NOx	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e[d]
Table 1: 10,000 Square foot NEW Building (BMCD ID: 8, 13, 15, 21, 24, 27, 29, 31, 33, and 36)																						
Passenger Car	Gasoline	63%	1462.86	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	2.22E-04	4.86E-03	2.88E-04	9.30E-06	4.13E-05	1.88E-05	0.56	1.83E-05	9.00E-06	0.56
	Diesel	7%	162.54	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	9.07E-05	3.14E-04	1.24E-05	8.50E-07	4.20E-06	1.77E-06	0.06	1.13E-05	1.25E-07	0.06
Passenger Truck	Gasoline	27%	626.94	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	2.41E-04	3.63E-03	2.07E-04	5.29E-06	2.71E-05	1.32E-05	0.33	1.78E-05	7.62E-06	0.33
	Diesel	3%	69.66	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	1.37E-04	9.59E-05	1.16E-05	6.55E-07	5.48E-06	3.88E-06	0.04	5.81E-06	2.16E-07	0.04
										Total Emissions Per Project (tpy)			**6.90E-04**	**8.91E-03**	**5.19E-04**	**1.61E-05**	**7.81E-05**	**3.76E-05**	**0.99**	**5.33E-05**	**1.70E-05**	**1.00**
Table 2: 4,000 square foot NEW building (BMCD ID: 14)																						
Passenger Car	Gasoline	63%	1462.86	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	2.22E-04	4.86E-03	2.88E-04	9.30E-06	4.13E-05	1.88E-05	0.56	1.83E-05	9.00E-06	0.56
	Diesel	7%	162.54	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	9.07E-05	3.14E-04	1.24E-05	8.50E-07	4.20E-06	1.77E-06	0.06	1.13E-05	1.25E-07	0.06
Passenger Truck	Gasoline	27%	626.94	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	2.41E-04	3.63E-03	2.07E-04	5.29E-06	2.71E-05	1.32E-05	0.33	1.78E-05	7.62E-06	0.33
	Diesel	3%	69.66	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	1.37E-04	9.59E-05	1.16E-05	6.55E-07	5.48E-06	3.88E-06	0.04	5.81E-06	2.16E-07	0.04
										Total Emissions Per Project (tpy)			**6.90E-04**	**8.91E-03**	**5.19E-04**	**1.61E-05**	**7.81E-05**	**3.76E-05**	**0.99**	**5.33E-05**	**1.70E-05**	**1.00**
Table 3: 2,700 sqft NEW Building (BMcD ID: 26)																						
Passenger Car	Gasoline	63%	1462.86	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	2.22E-04	4.86E-03	2.88E-04	9.30E-06	4.13E-05	1.88E-05	0.56	1.83E-05	9.00E-06	0.56
	Diesel	7%	162.54	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	9.07E-05	3.14E-04	1.24E-05	8.50E-07	4.20E-06	1.77E-06	0.06	1.13E-05	1.25E-07	0.06
Passenger Truck	Gasoline	27%	626.94	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	2.41E-04	3.63E-03	2.07E-04	5.29E-06	2.71E-05	1.32E-05	0.33	1.78E-05	7.62E-06	0.33
	Diesel	3%	69.66	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	1.37E-04	9.59E-05	1.16E-05	6.55E-07	5.48E-06	3.88E-06	0.04	5.81E-06	2.16E-07	0.04
										Total Emissions Per Project (tpy)			**6.90E-04**	**8.91E-03**	**5.19E-04**	**1.61E-05**	**7.81E-05**	**3.76E-05**	**0.99**	**5.33E-05**	**1.70E-05**	**1.00**
Table 4: 2,400 sqft NEW Building (BMCD ID: 19)																						
Passenger Car	Gasoline	63%	1462.86	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	2.22E-04	4.86E-03	2.88E-04	9.30E-06	4.13E-05	1.88E-05	0.56	1.83E-05	9.00E-06	0.56
	Diesel	7%	162.54	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	9.07E-05	3.14E-04	1.24E-05	8.50E-07	4.20E-06	1.77E-06	0.06	1.13E-05	1.25E-07	0.06
Passenger Truck	Gasoline	27%	626.94	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	2.41E-04	3.63E-03	2.07E-04	5.29E-06	2.71E-05	1.32E-05	0.33	1.78E-05	7.62E-06	0.33
	Diesel	3%	69.66	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	1.37E-04	9.59E-05	1.16E-05	6.55E-07	5.48E-06	3.88E-06	0.04	5.81E-06	2.16E-07	0.04
										Total Emissions Per Project (tpy)			**6.90E-04**	**8.91E-03**	**5.19E-04**	**1.61E-05**	**7.81E-05**	**3.76E-05**	**0.99**	**5.33E-05**	**1.70E-05**	**1.00**
Table 5: 100 Space PARKING LOT (BMCD ID: 7)																						
Passenger Car	Gasoline	63%	782.46	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	1.19E-04	2.60E-03	1.54E-04	4.97E-06	2.21E-05	1.00E-05	0.30	9.79E-06	4.82E-06	0.30
	Diesel	7%	86.94	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	4.85E-05	1.68E-04	6.64E-06	4.54E-07	2.24E-06	9.46E-07	0.03	6.07E-06	6.71E-08	0.03
Passenger Truck	Gasoline	27%	335.34	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	1.29E-04	1.94E-03	1.10E-04	2.83E-06	1.45E-05	7.04E-06	0.18	9.54E-06	4.08E-06	0.18
	Diesel	3%	37.26	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	7.33E-05	5.13E-05	6.23E-06	3.50E-07	2.93E-06	2.08E-06	0.02	3.11E-06	1.15E-07	0.02
										Total Emissions Per Project (tpy)			**3.69E-04**	**4.76E-03**	**2.78E-04**	**8.61E-06**	**4.18E-05**	**2.01E-05**	**0.53**	**2.85E-05**	**9.07E-06**	**0.53**
Table 6: 1,750 sqft NEW Building (BMCD ID: 10, 12)																						
Passenger Car	Gasoline	63%	3504.06	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	5.31E-04	1.17E-02	6.91E-04	2.23E-05	9.89E-05	4.50E-05	1.34	4.38E-05	2.16E-05	1.35
	Diesel	7%	389.34	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	2.17E-04	7.51E-04	2.97E-05	2.04E-06	1.00E-05	4.23E-06	0.15	2.72E-05	3.00E-07	0.15
Passenger Truck	Gasoline	27%	1501.74	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	5.77E-04	8.70E-03	4.95E-04	1.27E-05	6.49E-05	3.15E-05	0.79	4.27E-05	1.83E-05	0.79
	Diesel	3%	166.86	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	3.28E-04	2.30E-04	2.79E-05	1.57E-06	1.31E-05	9.30E-06	0.09	1.39E-05	5.17E-07	0.09
										Total Emissions Per Project (tpy)			**1.65E-03**	**2.13E-02**	**1.24E-03**	**3.85E-05**	**1.87E-04**	**9.00E-05**	**2.37**	**1.28E-04**	**4.06E-05**	**2.39**
Table 7: 5,000 sqft NEW Building (BMCD ID: 40)																						
Passenger Car	Gasoline	63%	1462.86	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	2.22E-04	4.86E-03	2.88E-04	9.30E-06	4.13E-05	1.88E-05	0.56	1.83E-05	9.00E-06	0.56
	Diesel	7%	162.54	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	9.07E-05	3.14E-04	1.24E-05	8.50E-07	4.20E-06	1.77E-06	0.06	1.13E-05	1.25E-07	0.06
Passenger Truck	Gasoline	27%	626.94	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	2.41E-04	3.63E-03	2.07E-04	5.29E-06	2.71E-05	1.32E-05	0.33	1.78E-05	7.62E-06	0.33
	Diesel	3%	69.66	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	1.37E-04	9.59E-05	1.16E-05	6.55E-07	5.48E-06	3.88E-06	0.04	5.81E-06	2.16E-07	0.04
										Total Emissions Per Project (tpy)			**6.90E-04**	**8.91E-03**	**5.19E-04**	**1.61E-05**	**7.81E-05**	**3.76E-05**	**0.99**	**5.33E-05**	**1.70E-05**	**1.00**
Table 8: 35,000 sqft NEW Building (BMCD ID: 2)																						
Passenger Car	Gasoline	63%	11090.52	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	1.68E-03	3.69E-02	2.19E-03	7.05E-05	3.13E-04	1.42E-04	4.26	1.39E-04	6.83E-05	4.28
	Diesel	7%	1232.28	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	6.88E-04	2.38E-03	9.41E-05	6.44E-06	3.18E-05	1.34E-05	0.47	8.60E-05	9.51E-07	0.48
Passenger Truck	Gasoline	27%	4753.08	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	1.83E-03	2.75E-02	1.57E-03	4.01E-05	2.05E-04	9.97E-05	2.49	1.35E-04	5.78E-05	2.51
	Diesel	3%	528.12	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	1.04E-03	7.27E-04	8.83E-05	4.96E-06	4.16E-05	2.94E-05	0.28	4.40E-05	1.63E-06	0.28
										Total Emissions Per Project (tpy)			**5.23E-03**	**6.75E-02**	**3.93E-03**	**1.22E-04**	**5.92E-04**	**2.85E-04**	**7.50**	**4.04E-04**	**1.29E-04**	**7.55**
Table 9: 45,000 sqft NEW Building (x2 BMCD ID: 1)																						
Passenger Car	Gasoline	63%	27338.47	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	4.14E-03	9.09E-02	5.39E-03	1.74E-04	7.72E-04	3.51E-04	10.49	3.42E-04	1.68E-04	10.55
	Diesel	7%	3037.61	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	1.70E-03	5.86E-03	2.32E-04	1.59E-05	7.84E-05	3.30E-05	1.17	2.12E-04	2.34E-06	1.17
Passenger Truck	Gasoline	27%	11716.49	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	4.50E-03	6.79E-02	3.86E-03	9.88E-05	5.06E-04	2.46E-04	6.15	3.33E-04	1.42E-04	6.20
	Diesel	3%	1301.83	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	2.56E-03	1.79E-03	2.18E-04	1.22E-05	1.02E-04	7.25E-05	0.68	1.09E-04	4.03E-06	0.69
										Total Emissions Per Project (tpy)			**1.29E-02**	**1.66E-01**	**9.70E-03**	**3.01E-04**	**1.46E-03**	**7.02E-04**	**18.49**	**9.96E-04**	**3.17E-04**	**18.61**
Table 10: 82,000 sqft NEW Building (x4) (BMCD ID: 5)																						
Passenger Car	Gasoline	63%	47954.59	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	7.27E-03	1.59E-01	9.45E-03	3.05E-04	1.35E-03	6.16E-04	18.40	6.00E-04	2.95E-04	18.51
	Diesel	7%	5328.29	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	2.97E-03	1.03E-02	4.07E-04	2.78E-05	1.38E-04	5.80E-05	2.04	3.72E-04	4.11E-06	2.06
Passenger Truck	Gasoline	27%	20551.97	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	7.90E-03	1.19E-01	6.77E-03	1.73E-04	8.88E-04	4.31E-04	10.78	5.85E-04	2.50E-04	10.87
	Diesel	3%	2283.55	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	4.49E-03	3.15E-03	3.82E-04	2.15E-05	1.80E-04	1.27E-04	1.20	1.90E-04	7.07E-06	1.21
										Total Emissions Per Project (tpy)			**2.26E-02**	**2.92E-01**	**1.70E-02**	**5.27E-04**	**2.56E-03**	**1.23E-03**	**32.43**	**1.75E-03**	**5.56E-04**	**32.64**

Letterkenny Ammunitions Center (LEMC)
Estimated On-Road Tailpipe Emissions

Passenger Vehicles

Type	Fuel	Percentage[a]	Worker VMT (miles/project)	Emission Factor (g/mile)[b] NOx	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2[c]	CH_4	N_2O	Emissions (tons) NOx	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e[d]
Table 11: 1,125,000 sqft NEW Building (BMCD ID: 50)																						
Passenger Car	Gasoline	63%	1450816.92	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	2.20E-01	4.82	2.86E-01	9.22E-03	4.10E-02	1.86E-02	556.81	1.82E-02	8.93E-03	559.92
	Diesel	7%	161201.88	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	9.00E-02	3.11E-01	1.23E-02	8.43E-04	4.16E-03	1.75E-03	61.87	1.13E-02	1.24E-04	62.19
Passenger Truck	Gasoline	27%	621778.68	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	2.39E-01	3.60	2.05E-01	5.24E-03	2.69E-02	1.30E-02	326.25	1.77E-02	7.56E-03	328.94
	Diesel	3%	69086.52	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	1.36E-01	9.52E-02	1.16E-02	6.49E-04	5.44E-03	3.85E-03	36.25	5.76E-03	2.14E-04	36.46
										Total Emissions Per Project (tpy)			**6.85E-01**	**8.83**	**5.15E-01**	**1.60E-02**	**7.74E-02**	**3.73E-02**	**981.17**	**5.29E-02**	**1.68E-02**	**987.51**
Table 12: 2,700 to 22,000 Square foot REPLACEMENT Building (BMCD ID: 39, 41 through 46, 48, 7 total)																						
Passenger Car	Gasoline	63%	11770.92	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	1.78E-03	3.91E-02	2.32E-03	7.48E-05	3.32E-04	1.51E-04	4.52	1.47E-04	7.24E-05	4.54
	Diesel	7%	1307.88	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	7.30E-04	2.52E-03	9.99E-05	6.84E-06	3.38E-05	1.42E-05	0.50	9.13E-05	1.01E-06	0.50
Passenger Truck	Gasoline	27%	5044.68	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	1.94E-03	2.92E-02	1.66E-03	4.25E-05	2.18E-04	1.06E-04	2.65	1.44E-04	6.13E-05	2.67
	Diesel	3%	560.52	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	1.10E-03	7.72E-04	9.37E-05	5.27E-06	4.41E-05	3.12E-05	0.29	4.67E-05	1.74E-06	0.30
										Total Emissions Per Project (tpy)			**5.56E-03**	**7.17E-02**	**4.18E-03**	**1.29E-04**	**6.28E-04**	**3.02E-04**	**7.96**	**4.29E-04**	**1.36E-04**	**8.01**
Table 13: 0.9 Acre PARKING LOT (BMCD ID: 11)																						
Passenger Car	Gasoline	63%	1564.92	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	2.37E-04	5.20E-03	3.09E-04	9.95E-06	4.42E-05	2.01E-05	0.60	1.96E-05	9.63E-06	0.60
	Diesel	7%	173.88	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	9.71E-05	3.36E-04	1.33E-05	9.09E-07	4.49E-06	1.89E-06	0.07	1.21E-05	1.34E-07	0.07
Passenger Truck	Gasoline	27%	670.68	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	2.58E-04	3.89E-03	2.21E-04	5.66E-06	2.90E-05	1.41E-05	0.35	1.91E-05	8.15E-06	0.35
	Diesel	3%	74.52	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	1.47E-04	1.03E-04	1.25E-05	7.00E-07	5.87E-06	4.15E-06	0.04	6.21E-06	2.31E-07	0.04
										Total Emissions Per Project (tpy)			**7.39E-04**	**9.53E-03**	**5.55E-04**	**1.72E-05**	**8.35E-05**	**4.02E-05**	**1.06**	**5.70E-05**	**1.81E-05**	**1.07**
Table 14: Expand Roadway at Voelz Gate PARKING LOT (BMCD ID: 4)																						
Passenger Car	Gasoline	63%	11022.48	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	1.67E-03	3.67E-02	2.17E-03	7.01E-05	3.11E-04	1.42E-04	4.23	1.38E-04	6.78E-05	4.25
	Diesel	7%	1224.72	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	6.84E-04	2.36E-03	9.35E-05	6.40E-06	3.16E-05	1.33E-05	0.47	8.55E-05	9.45E-07	0.47
Passenger Truck	Gasoline	27%	4723.92	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	1.82E-03	2.74E-02	1.56E-03	3.98E-05	2.04E-04	9.91E-05	2.48	1.34E-04	5.74E-05	2.50
	Diesel	3%	524.88	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	1.03E-03	7.23E-04	8.78E-05	4.93E-06	4.13E-05	2.92E-05	0.28	4.38E-05	1.62E-06	0.28
										Total Emissions Per Project (tpy)			**5.20E-03**	**6.71E-02**	**3.91E-03**	**1.21E-04**	**5.88E-04**	**2.83E-04**	**7.45**	**4.02E-04**	**1.28E-04**	**7.50**
Table 15:250 square foot New Building (BMCD ID: 16)																						
Passenger Car	Gasoline	63%	782.46	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	1.19E-04	2.60E-03	1.54E-04	4.97E-06	2.21E-05	1.00E-05	0.30	9.79E-06	4.82E-06	0.30
	Diesel	7%	86.94	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	4.85E-05	1.68E-04	6.64E-06	4.54E-07	2.24E-06	9.46E-07	0.03	6.07E-06	6.71E-08	0.03
Passenger Truck	Gasoline	27%	335.34	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	1.29E-04	1.94E-03	1.10E-04	2.83E-06	1.45E-05	7.04E-06	0.18	9.54E-06	4.08E-06	0.18
	Diesel	3%	37.26	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	7.33E-05	5.13E-05	6.23E-06	3.50E-07	2.93E-06	2.08E-06	0.02	3.11E-06	1.15E-07	0.02
										Total Emissions Per Project (tpy)			**3.69E-04**	**4.76E-03**	**2.78E-04**	**8.61E-06**	**4.18E-05**	**2.01E-05**	**0.53**	**2.85E-05**	**9.07E-06**	**0.53**
Table 16: 750 square foot UPGRADED Building (BMCD ID: 17)																						
Passenger Car	Gasoline	63%	14050.26	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	2.13E-03	4.67E-02	2.77E-03	8.93E-05	3.97E-04	1.80E-04	5.39	1.76E-04	8.65E-05	5.42
	Diesel	7%	1561.14	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	8.72E-04	3.01E-03	1.19E-04	8.16E-06	4.03E-05	1.70E-05	0.60	1.09E-04	1.20E-06	0.60
Passenger Truck	Gasoline	27%	6021.54	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	2.31E-03	3.49E-02	1.98E-03	5.08E-05	2.60E-04	1.26E-04	3.16	1.71E-04	7.32E-05	3.19
	Diesel	3%	669.06	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	1.32E-03	9.22E-04	1.12E-04	6.29E-06	5.27E-05	3.73E-05	0.35	5.58E-05	2.07E-06	0.35
										Total Emissions Per Project (tpy)			**6.63E-03**	**8.55E-02**	**4.99E-03**	**1.55E-04**	**7.50E-04**	**3.61E-04**	**9.50**	**5.12E-04**	**1.63E-04**	**9.56**
Table 17: 2050 square foot Upgraded Building (x 1004 BMCD ID: 38)																						
Passenger Car	Gasoline	63%	14050.26	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	2.13E-03	4.67E-02	2.77E-03	8.93E-05	3.97E-04	1.80E-04	5.39	1.76E-04	8.65E-05	5.42
	Diesel	7%	1561.14	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	8.72E-04	3.01E-03	1.19E-04	8.16E-06	4.03E-05	1.70E-05	0.60	1.09E-04	1.20E-06	0.60
Passenger Truck	Gasoline	27%	6021.54	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	2.31E-03	3.49E-02	1.98E-03	5.08E-05	2.60E-04	1.26E-04	3.16	1.71E-04	7.32E-05	3.19
	Diesel	3%	669.06	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	1.32E-03	9.22E-04	1.12E-04	6.29E-06	5.27E-05	3.73E-05	0.35	5.58E-05	2.07E-06	0.35
										Total Emissions Per Project (tpy)			**6.63E-03**	**8.55E-02**	**4.99E-03**	**1.55E-04**	**7.50E-04**	**3.61E-04**	**9.50**	**5.12E-04**	**1.63E-04**	**9.56**
Table 18: 4400 square foot Upgraded Building (BMCD ID: 28)																						
Passenger Car	Gasoline	63%	14050.26	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	2.13E-03	4.67E-02	2.77E-03	8.93E-05	3.97E-04	1.80E-04	5.39	1.76E-04	8.65E-05	5.42
	Diesel	7%	1561.14	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	8.72E-04	3.01E-03	1.19E-04	8.16E-06	4.03E-05	1.70E-05	0.60	1.09E-04	1.20E-06	0.60
Passenger Truck	Gasoline	27%	6021.54	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	2.31E-03	3.49E-02	1.98E-03	5.08E-05	2.60E-04	1.26E-04	3.16	1.71E-04	7.32E-05	3.19
	Diesel	3%	669.06	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	1.32E-03	9.22E-04	1.12E-04	6.29E-06	5.27E-05	3.73E-05	0.35	5.58E-05	2.07E-06	0.35
										Total Emissions Per Project (tpy)			**6.63E-03**	**8.55E-02**	**4.99E-03**	**1.55E-04**	**7.50E-04**	**3.61E-04**	**9.50**	**5.12E-04**	**1.63E-04**	**9.56**
Table 19: 5878 square foot Upgraded Building (BMCD ID: 34 and 37)																						
Passenger Car	Gasoline	63%	2653.56	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	4.02E-04	8.82E-03	5.23E-04	1.69E-05	7.49E-05	3.41E-05	1.02	3.32E-05	1.63E-05	1.02
	Diesel	7%	294.84	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	1.65E-04	5.69E-04	2.25E-05	1.54E-06	7.61E-06	3.21E-06	0.11	2.06E-05	2.28E-07	0.11
Passenger Truck	Gasoline	27%	1137.24	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	4.37E-04	6.59E-03	3.75E-04	9.59E-06	4.91E-05	2.39E-05	0.60	3.24E-05	1.38E-05	0.60
	Diesel	3%	126.36	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	2.49E-04	1.74E-04	2.11E-05	1.19E-06	9.95E-06	7.04E-06	0.07	1.05E-05	3.91E-07	0.07
										Total Emissions Per Project (tpy)			**1.25E-03**	**1.62E-02**	**9.41E-04**	**2.92E-05**	**1.42E-04**	**6.82E-05**	**1.79**	**9.67E-05**	**3.08E-05**	**1.81**
Table 20: 12,000 square foot Upgraded Building (BMCD ID: 30 and 35)																						
Passenger Car	Gasoline	63%	4728.78	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	7.17E-04	1.57E-02	9.32E-04	3.01E-05	1.34E-04	6.07E-05	1.81	5.92E-05	2.91E-05	1.83
	Diesel	7%	525.42	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	2.93E-04	1.01E-03	4.01E-05	2.75E-06	1.36E-05	5.71E-06	0.20	3.67E-05	4.05E-07	0.20
Passenger Truck	Gasoline	27%	2026.62	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	7.79E-04	1.17E-02	6.68E-04	1.71E-05	8.75E-05	4.25E-05	1.06	5.77E-05	2.46E-05	1.07
	Diesel	3%	225.18	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	4.43E-04	3.10E-04	3.76E-05	2.12E-06	1.77E-05	1.25E-05	0.12	1.88E-05	6.97E-07	0.12
										Total Emissions Per Project (tpy)			**2.23E-03**	**2.88E-02**	**1.68E-03**	**5.20E-05**	**2.52E-04**	**1.22E-04**	**3.20**	**1.72E-04**	**5.48E-05**	**3.22**
Table 21: 35,000 square foot REPLACEMENT Building (BMCD ID: 47)																						
Passenger Car	Gasoline	63%	11770.92	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	1.78E-03	3.91E-02	2.32E-03	7.48E-05	3.32E-04	1.51E-04	4.52	1.47E-04	7.24E-05	4.54
	Diesel	7%	1307.88	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	7.30E-04	2.52E-03	9.99E-05	6.84E-06	3.38E-05	1.42E-05	0.50	9.13E-05	1.01E-06	0.50
Passenger Truck	Gasoline	27%	5044.68	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	1.94E-03	2.92E-02	1.66E-03	4.25E-05	2.18E-04	1.06E-04	2.65	1.44E-04	6.13E-05	2.67
	Diesel	3%	560.52	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	1.10E-03	7.72E-04	9.37E-05	5.27E-06	4.41E-05	3.12E-05	0.29	4.67E-05	1.74E-06	0.30
										Total Emissions Per Project (tpy)			**5.56E-03**	**7.17E-02**	**4.18E-03**	**1.29E-04**	**6.28E-04**	**3.02E-04**	**7.96**	**4.29E-04**	**1.36E-04**	**8.01**
Table 22: 10 Acre New Security Post Parking lot (BMCD ID: 25a)																						
Passenger Car	Gasoline	63%	4327.34	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	6.56E-04	1.44E-02	8.53E-04	2.75E-05	1.22E-04	5.56E-05	1.66	5.41E-05	2.66E-05	1.67
	Diesel	7%	480.82	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	2.68E-04	9.28E-04	3.67E-05	2.51E-06	1.24E-05	5.23E-06	0.18	3.36E-05	3.71E-07	0.19
Passenger Truck	Gasoline	27%	1854.58	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	7.13E-04	1.07E-02	6.11E-04	1.56E-05	8.01E-05	3.89E-05	0.97	5.28E-05	2.25E-05	0.98
	Diesel	3%	206.06	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	4.05E-04	2.84E-04	3.45E-05	1.94E-06	1.62E-05	1.15E-05	0.11	1.72E-05	6.38E-07	0.11
										Total Emissions Per Project (tpy)			**2.04E-03**	**2.63E-02**	**1.54E-03**	**4.76E-05**	**2.31E-04**	**1.11E-04**	**2.93**	**1.58E-04**	**5.02E-05**	**2.95**
Table 23: 100,000 square foot PARKING LOT (BMCD ID: 22)																						
Passenger Car	Gasoline	63%	5034.96	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	7.63E-04	1.67E-02	9.93E-04	3.20E-05	1.42E-04	6.47E-05	1.93	6.30E-05	3.10E-05	1.94
	Diesel	7%	559.44	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	3.12E-04	1.08E-03	4.27E-05	2.92E-06	1.44E-05	6.08E-06	0.21	3.91E-05	4.32E-07	0.22
Passenger Truck	Gasoline	27%	2157.84	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	8.29E-04	1.25E-02	7.11E-04	1.82E-05	9.32E-05	4.53E-05	1.13	6.14E-05	2.62E-05	1.14
	Diesel	3%	239.76	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	4.72E-04	3.30E-04	4.01E-05	2.25E-06	1.89E-05	1.34E-05	0.13	2.00E-05	7.42E-07	0.13
										Total Emissions Per Project (tpy)			**2.38E-03**	**3.07E-02**	**1.79E-03**	**5.54E-05**	**2.69E-04**	**1.29E-04**	**3.41**	**1.83E-04**	**5.84E-05**	**3.43**
Table 24: 3 miles of electric upgrades (BMCD ID: 20)																						
Passenger Car	Gasoline	63%	952.56	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	1.44E-04	3.17E-03	1.88E-04	6.06E-06	2.69E-05	1.22E-05	0.37	1.19E-05	5.86E-06	0.37
	Diesel	7%	105.84	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	5.91E-05	2.04E-04	8.08E-06	5.53E-07	2.73E-06	1.15E-06	0.04	7.39E-06	8.17E-08	0.04
Passenger Truck	Gasoline	27%	408.24	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	1.57E-04	2.37E-03	1.35E-04	3.44E-06	1.76E-05	8.57E-06	0.21	1.16E-05	4.96E-06	0.22
	Diesel	3%	45.36	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	8.92E-05	6.25E-05	7.58E-06	4.26E-07	3.57E-06	2.53E-06	0.02	3.78E-06	1.40E-07	0.02
										Total Emissions Per Project (tpy)			**4.50E-04**	**5.80E-03**	**3.38E-04**	**1.05E-05**	**5.08E-05**	**2.45E-05**	**0.64**	**3.47E-05**	**1.10E-05**	**0.65**

Letterkenny Ammunitions Center (LEMC)
Estimated On-Road Tailpipe Emissions

Passenger Vehicles

Type	Fuel	Percentage[a]	Worker VMT (miles/project)	Emission Factor (g/mile)[b] NOx	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2[c]	CH_4	N_2O	Emissions (tons) NOx	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e[d]
Table 25: 22 miles of RAIL network (BMCD ID: 3)																						
Passenger Car	Gasoline	63%	1472589.72	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	2.23E-01	4.90	2.90E-01	9.36E-03	4.16E-02	1.89E-02	565.16	1.84E-02	9.06E-03	568.32
	Diesel	7%	163621.08	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	9.13E-02	3.16E-01	1.25E-02	8.55E-04	4.22E-03	1.78E-03	62.80	1.14E-02	1.26E-04	63.12
Passenger Truck	Gasoline	27%	631109.88	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	2.43E-01	3.66	2.08E-01	5.32E-03	2.73E-02	1.32E-02	331.14	1.80E-02	7.67E-03	333.88
	Diesel	3%	70123.32	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	1.38E-01	9.66E-02	1.17E-02	6.59E-04	5.52E-03	3.91E-03	36.79	5.85E-03	2.17E-04	37.00
										Total Emissions Per Project (tpy)			**6.95E-01**	**8.97**	**5.22E-01**	**1.62E-02**	**7.86E-02**	**3.78E-02**	**995.90**	**5.36E-02**	**1.71E-02**	**1002.33**
Table 26: 10 acre RAIL classification yard (BMCD ID: 6)																						
Passenger Car	Gasoline	63%	297402.84	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	4.51E-02	9.89E-01	5.86E-02	1.89E-03	8.40E-03	3.82E-03	114.14	3.72E-03	1.83E-03	114.78
	Diesel	7%	33044.76	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	1.84E-02	6.38E-02	2.52E-03	1.73E-04	8.53E-04	3.59E-04	12.68	2.31E-03	2.55E-05	12.75
Passenger Truck	Gasoline	27%	127458.36	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	4.90E-02	7.38E-01	4.20E-02	1.07E-03	5.51E-03	2.67E-03	66.88	3.63E-03	1.55E-03	67.43
	Diesel	3%	14162.04	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	2.79E-02	1.95E-02	2.37E-03	1.33E-04	1.11E-03	7.89E-04	7.43	1.18E-03	4.38E-05	7.47
										Total Emissions Per Project (tpy)			**1.40E-01**	**1.81**	**1.06E-01**	**3.27E-03**	**1.59E-02**	**7.64E-03**	**201.13**	**1.08E-02**	**3.45E-03**	**202.43**
Table 27: Restoration of 4 miles of RAIL (BMCD ID: 18)																						
Passenger Car	Gasoline	63%	142747.92	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	2.16E-02	4.75E-01	2.81E-02	9.07E-04	4.03E-03	1.83E-03	54.78	1.79E-03	8.79E-04	55.09
	Diesel	7%	15860.88	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	8.85E-03	3.06E-02	1.21E-03	8.29E-05	4.09E-04	1.73E-04	6.09	1.11E-03	1.22E-05	6.12
Passenger Truck	Gasoline	27%	61177.68	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	2.35E-02	3.54E-01	2.02E-02	5.16E-04	2.64E-03	1.28E-03	32.10	1.74E-03	7.43E-04	32.37
	Diesel	3%	6797.52	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	1.34E-02	9.36E-03	1.14E-03	6.39E-05	5.35E-04	3.79E-04	3.57	5.67E-04	2.10E-05	3.59
										Total Emissions Per Project (tpy)			**6.74E-02**	**8.69E-01**	**5.06E-02**	**1.57E-03**	**7.62E-03**	**3.67E-03**	**96.54**	**5.20E-03**	**1.66E-03**	**97.16**
Table 28: Repair 11 miles of asphalt ROADS (BMCD ID: 23)																						
Passenger Car	Gasoline	63%	36945.72	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	5.60E-03	1.23E-01	7.28E-03	2.35E-04	1.04E-03	4.74E-04	14.18	4.62E-04	2.27E-04	14.26
	Diesel	7%	4105.08	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	2.29E-03	7.92E-03	3.13E-04	2.15E-05	1.06E-04	4.46E-05	1.58	2.87E-04	3.17E-06	1.58
Passenger Truck	Gasoline	27%	15833.88	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	6.09E-03	9.17E-02	5.22E-03	1.34E-04	6.84E-04	3.32E-04	8.31	4.50E-04	1.92E-04	8.38
	Diesel	3%	1759.32	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	3.46E-03	2.42E-03	2.94E-04	1.65E-05	1.38E-04	9.80E-05	0.92	1.47E-04	5.45E-06	0.93
										Total Emissions Per Project (tpy)			**1.74E-02**	**2.25E-01**	**1.31E-02**	**4.06E-04**	**1.97E-03**	**9.49E-04**	**24.99**	**1.35E-03**	**4.28E-04**	**25.15**
Table 29: Repair 1560000 sqft of asphalt ROADS (BMCD ID: 32)																						
Passenger Car	Gasoline	63%	43545.60	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	6.60E-03	1.45E-01	8.58E-03	2.77E-04	1.23E-03	5.59E-04	16.71	5.45E-04	2.68E-04	16.81
	Diesel	7%	4838.40	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	2.70E-03	9.34E-03	3.69E-04	2.53E-05	1.25E-04	5.26E-05	1.86	3.38E-04	3.73E-06	1.87
Passenger Truck	Gasoline	27%	18662.40	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	7.17E-03	1.08E-01	6.15E-03	1.57E-04	8.06E-04	3.92E-04	9.79	5.31E-04	2.27E-04	9.87
	Diesel	3%	2073.60	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	4.08E-03	2.86E-03	3.47E-04	1.95E-05	1.63E-04	1.16E-04	1.09	1.73E-04	6.42E-06	1.09
										Total Emissions Per Project (tpy)			**2.06E-02**	**2.65E-01**	**1.55E-02**	**4.79E-04**	**2.32E-03**	**1.12E-03**	**29.45**	**1.59E-03**	**5.05E-04**	**29.64**
Table 30: New Security Post Buildings (x2) (BMCD ID: 25b)																						
Passenger Car	Gasoline	63%	3504.06	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	5.31E-04	1.17E-02	6.91E-04	2.23E-05	9.89E-05	4.50E-05	1.34	4.38E-05	2.16E-05	1.35
	Diesel	7%	389.34	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	2.17E-04	7.51E-04	2.97E-05	2.04E-06	1.00E-05	4.23E-06	0.15	2.72E-05	3.00E-07	0.15
Passenger Truck	Gasoline	27%	1501.74	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	5.77E-04	8.70E-03	4.95E-04	1.27E-05	6.49E-05	3.15E-05	0.79	4.27E-05	1.83E-05	0.79
	Diesel	3%	166.86	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	3.28E-04	2.30E-04	2.79E-05	1.57E-06	1.31E-05	9.30E-06	0.09	1.39E-05	5.17E-07	0.09
										Total Emissions Per Project (tpy)			**1.65E-03**	**2.13E-02**	**1.24E-03**	**3.85E-05**	**1.87E-04**	**9.00E-05**	**2.37**	**1.28E-04**	**4.06E-05**	**2.39**
Table 31: Upgrade Utility Infrastructure Overall (BMcD ID 9)																						
Passenger Car	Gasoline	63%	1039787.28	0.14	3.02	0.18	5.77E-03	0.03	1.17E-02	348.17	1.14E-02	5.58E-03	1.58E-01	3.46	2.05E-01	6.61E-03	2.94E-02	1.34E-02	399.06	1.30E-02	6.40E-03	401.29
	Diesel	7%	115531.92	0.51	1.75	0.07	4.74E-03	0.02	9.87E-03	348.17	6.33E-02	7.00E-04	6.45E-02	2.23E-01	8.82E-03	6.04E-04	2.98E-03	1.26E-03	44.34	8.07E-03	8.91E-05	44.57
Passenger Truck	Gasoline	27%	445623.12	0.35	5.26	0.30	7.65E-03	0.04	1.90E-02	476.00	2.58E-02	1.10E-02	1.71E-01	2.58	1.47E-01	3.76E-03	1.92E-02	9.35E-03	233.82	1.27E-02	5.42E-03	235.75
	Diesel	3%	49513.68	1.78	1.25	0.15	8.53E-03	0.07	5.06E-02	476.00	7.57E-02	2.81E-03	9.74E-02	6.82E-02	8.28E-03	4.65E-04	3.90E-03	2.76E-03	25.98	4.13E-03	1.53E-04	26.13

(a) Vehicle breakdown based on U.S. fleet trends in US EPA Report "Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 through 2014"

Percent passenger cars	70%
Percent passenger trucks	30%
Percent gasoline vehicles	90%
Percent diesel vehicles	10%

(b) Emission factors from MOVES2010b, average of vehicle years 1990-2020. PM_{10} and $PM_{2.5}$ emissions include exhaust emissions plus tire and brake wear emissions.

(c) CO2 emission factors from the US EPA Report "Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 through 2014"

(d) Global Warming Potentials Table A-1 to Subpart A of 40 CFR Part 98

CO2	1
CH4	25
N2O	298

Letterkenny Ammunitions Center (LEMC)
Estimated On-Road Tailpipe Emissions

Delivery Vehicles

Equipment	Fuel	Quantity[a]	Vendor VMT Distribution by Vehicle Type	Emission Factors (g/mi)[b]									Emissions (tons per year)									
				NOx	CO	VOC	SO2	PM10	PM2.5	CO2 (g/gal)	CH4	N2O	NOx	CO	VOC	SO2	PM10	PM2.5	CO2[d]	CH4	N2O	CO2e[e]
Table 1: 10,000 Square foot NEW Building (BMCD ID: 8, 13, 15, 21, 24, 27, 29, 31, 33, and 36)																						
1/2 Ton Trucks	Gasoline	12%	90.12	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	1.20E-04	0.00	2.75E-04	1.13E-06	1.36E-05	1.22E-05	0.87	1.33E-06	3.31E-06	0.87
1 Ton Trucks	Gasoline	37%	270.37	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	3.60E-04	0.01	8.26E-04	3.40E-06	4.08E-05	3.67E-05	2.62	3.99E-06	9.92E-06	2.62
2 1/2 Ton Trucks	Diesel	12%	90.12	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-04	1.72E-04	3.77E-05	3.76E-06	3.03E-05	2.61E-05	1.01	7.75E-07	4.77E-07	1.01
Tractor Trailers	Diesel	25%	180.25	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	3.45E-04	7.53E-05	7.51E-06	6.07E-05	5.22E-05	2.03	1.55E-06	9.54E-07	2.03
Dump Trucks	Diesel	12%	90.12	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-04	1.72E-04	3.77E-05	3.76E-06	3.03E-05	2.61E-05	1.01	7.75E-07	4.77E-07	1.01
Concrete Trucks	Diesel	1%	9.01	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-05	1.72E-05	3.77E-06	3.76E-07	3.03E-06	2.61E-06	0.10	7.75E-08	4.77E-08	0.10
										Total Emissions Per Project (tpy)			**0.00**	**0.01**	**0.00**	**1.99E-05**	**1.79E-04**	**1.56E-04**	**7.65**	**8.50E-06**	**1.52E-05**	**7.65**
Table 2: 4,000 square foot NEW building (BMCD ID: 14)																						
1/2 Ton Trucks	Gasoline	12%	90.12	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	1.20E-04	0.00	2.75E-04	1.13E-06	1.36E-05	1.22E-05	0.87	1.33E-06	3.31E-06	0.87
1 Ton Trucks	Gasoline	37%	270.37	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	3.60E-04	0.01	8.26E-04	3.40E-06	4.08E-05	3.67E-05	2.62	3.99E-06	9.92E-06	2.62
2 1/2 Ton Trucks	Diesel	12%	90.12	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-04	1.72E-04	3.77E-05	3.76E-06	3.03E-05	2.61E-05	1.01	7.75E-07	4.77E-07	1.01
Tractor Trailers	Diesel	25%	180.25	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	3.45E-04	7.53E-05	7.51E-06	6.07E-05	5.22E-05	2.03	1.55E-06	9.54E-07	2.03
Dump Trucks	Diesel	12%	90.12	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-04	1.72E-04	3.77E-05	3.76E-06	3.03E-05	2.61E-05	1.01	7.75E-07	4.77E-07	1.01
Concrete Trucks	Diesel	1%	9.01	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-05	1.72E-05	3.77E-06	3.76E-07	3.03E-06	2.61E-06	0.10	7.75E-08	4.77E-08	0.10
										Total Emissions Per Project (tpy)			**0.00**	**0.01**	**0.00**	**1.99E-05**	**1.79E-04**	**1.56E-04**	**7.65**	**8.50E-06**	**1.52E-05**	**7.65**
Table 3: 2,700 sqft NEW Building (BMcD ID: 26)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Table 4: 2,400 sqft NEW Building (BMCD ID: 19)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Table 5: 100 Space PARKING LOT (BMCD ID: 7)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Table 6: 1,750 sqft NEW Building (BMCD ID: 10, 12)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Table 7: 5,000 sqft NEW Building (BMCD ID: 40)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Table 8: 35,000 sqft NEW Building (BMCD ID: 2)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Table 9: 45,000 sqft NEW Building (x2 BMCD ID: 1)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Table 10: 82,000 sqft NEW Building (x4) (BMCD ID: 5)																						
1/2 Ton Trucks	Gasoline	12%	90.12	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	1.20E-04	0.00	2.75E-04	1.13E-06	1.36E-05	1.22E-05	0.87	1.33E-06	3.31E-06	0.87
1 Ton Trucks	Gasoline	37%	270.37	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	3.60E-04	0.01	8.26E-04	3.40E-06	4.08E-05	3.67E-05	2.62	3.99E-06	9.92E-06	2.62
2 1/2 Ton Trucks	Diesel	12%	90.12	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-04	1.72E-04	3.77E-05	3.76E-06	3.03E-05	2.61E-05	1.01	7.75E-07	4.77E-07	1.01
Tractor Trailers	Diesel	25%	180.25	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	3.45E-04	7.53E-05	7.51E-06	6.07E-05	5.22E-05	2.03	1.55E-06	9.54E-07	2.03
Dump Trucks	Diesel	12%	90.12	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-04	1.72E-04	3.77E-05	3.76E-06	3.03E-05	2.61E-05	1.01	7.75E-07	4.77E-07	1.01
Concrete Trucks	Diesel	1%	9.01	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-05	1.72E-05	3.77E-06	3.76E-07	3.03E-06	2.61E-06	0.10	7.75E-08	4.77E-08	0.10
										Total Emissions Per Project (tpy)			**0.00**	**0.01**	**0.00**	**1.99E-05**	**1.79E-04**	**1.56E-04**	**7.65**	**8.50E-06**	**1.52E-05**	**7.65**
Table 11: 1,125,000 sqft NEW Building (BMCD ID: 50)																						
1/2 Ton Trucks	Gasoline	12%	90.12	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	1.20E-04	0.00	2.75E-04	1.13E-06	1.36E-05	1.22E-05	0.87	1.33E-06	3.31E-06	0.87
1 Ton Trucks	Gasoline	37%	270.37	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	3.60E-04	0.01	8.26E-04	3.40E-06	4.08E-05	3.67E-05	2.62	3.99E-06	9.92E-06	2.62
2 1/2 Ton Trucks	Diesel	12%	90.12	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-04	1.72E-04	3.77E-05	3.76E-06	3.03E-05	2.61E-05	1.01	7.75E-07	4.77E-07	1.01
Tractor Trailers	Diesel	25%	180.25	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	3.45E-04	7.53E-05	7.51E-06	6.07E-05	5.22E-05	2.03	1.55E-06	9.54E-07	2.03
Dump Trucks	Diesel	12%	90.12	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-04	1.72E-04	3.77E-05	3.76E-06	3.03E-05	2.61E-05	1.01	7.75E-07	4.77E-07	1.01
Concrete Trucks	Diesel	1%	9.01	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-05	1.72E-05	3.77E-06	3.76E-07	3.03E-06	2.61E-06	0.10	7.75E-08	4.77E-08	0.10
										Total Emissions Per Project (tpy)			**0.00**	**0.01**	**0.00**	**1.99E-05**	**1.79E-04**	**1.56E-04**	**7.65**	**8.50E-06**	**1.52E-05**	**7.65**
Table 12: 2,700 to 22,000 Square foot REPLACEMENT Building (BMCD ID: 39, 41 through 46, 48, 7 total)																						
1/2 Ton Trucks	Gasoline	12%	90.12	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	1.20E-04	0.00	2.75E-04	1.13E-06	1.36E-05	1.22E-05	0.87	1.33E-06	3.31E-06	0.87
1 Ton Trucks	Gasoline	37%	270.37	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	3.60E-04	0.01	8.26E-04	3.40E-06	4.08E-05	3.67E-05	2.62	3.99E-06	9.92E-06	2.62
2 1/2 Ton Trucks	Diesel	12%	90.12	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-04	1.72E-04	3.77E-05	3.76E-06	3.03E-05	2.61E-05	1.01	7.75E-07	4.77E-07	1.01
Tractor Trailers	Diesel	25%	180.25	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	3.45E-04	7.53E-05	7.51E-06	6.07E-05	5.22E-05	2.03	1.55E-06	9.54E-07	2.03
Dump Trucks	Diesel	12%	90.12	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-04	1.72E-04	3.77E-05	3.76E-06	3.03E-05	2.61E-05	1.01	7.75E-07	4.77E-07	1.01
Concrete Trucks	Diesel	1%	9.01	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-05	1.72E-05	3.77E-06	3.76E-07	3.03E-06	2.61E-06	0.10	7.75E-08	4.77E-08	0.10
										Total Emissions Per Project (tpy)			**0.00**	**0.01**	**0.00**	**1.99E-05**	**1.79E-04**	**1.56E-04**	**7.65**	**8.50E-06**	**1.52E-05**	**7.65**

Letterkenny Ammunitions Center (LEMC)
Estimated On-Road Tailpipe Emissions

Delivery Vehicles

Equipment	Fuel	Quantity[a]	Vendor VMT Distribution by Vehicle Type	Emission Factors (g/mi)[b]									Emissions (tons per year)									
				NOx	CO	VOC	SO2	PM10	PM2.5	CO2 (g/gal)	CH4	N2O	NOx	CO	VOC	SO2	PM10	PM2.5	CO2[d]	CH4	N2O	CO2e[e]
Table 13: 0.9 Acre PARKING LOT (BMCD ID: 11)																						
1/2 Ton Trucks	Gasoline	12%	90.12	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	1.20E-04	0.00	2.75E-04	1.13E-06	1.36E-05	1.22E-05	0.87	1.33E-06	3.31E-06	0.87
1 Ton Trucks	Gasoline	37%	270.37	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	3.60E-04	0.01	8.26E-04	3.40E-06	4.08E-05	3.67E-05	2.62	3.99E-06	9.92E-06	2.62
2 1/2 Ton Trucks	Diesel	12%	90.12	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-04	1.72E-04	3.77E-05	3.76E-06	3.03E-05	2.61E-05	1.01	7.75E-07	4.77E-07	1.01
Tractor Trailers	Diesel	25%	180.25	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	3.45E-04	7.53E-05	7.51E-06	6.07E-05	5.22E-05	2.03	1.55E-06	9.54E-07	2.03
Dump Trucks	Diesel	12%	90.12	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-04	1.72E-04	3.77E-05	3.76E-06	3.03E-05	2.61E-05	1.01	7.75E-07	4.77E-07	1.01
Concrete Trucks	Diesel	1%	9.01	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-05	1.72E-05	3.77E-06	3.76E-07	3.03E-06	2.61E-06	0.10	7.75E-08	4.77E-08	0.10
										Total Emissions Per Project (tpy)			**0.00**	**0.01**	**0.00**	**1.99E-05**	**1.79E-04**	**1.56E-04**	**7.65**	**8.50E-06**	**1.52E-05**	**7.65**
Table 14: Expand Roadway at Voelz Gate PARKING LOT (BMCD ID: 4)																						
1/2 Ton Trucks	Gasoline	12%	90.12	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	1.20E-04	0.00	2.75E-04	1.13E-06	1.36E-05	1.22E-05	0.87	1.33E-06	3.31E-06	0.87
1 Ton Trucks	Gasoline	37%	270.37	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	3.60E-04	0.01	8.26E-04	3.40E-06	4.08E-05	3.67E-05	2.62	3.99E-06	9.92E-06	2.62
2 1/2 Ton Trucks	Diesel	12%	90.12	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-04	1.72E-04	3.77E-05	3.76E-06	3.03E-05	2.61E-05	1.01	7.75E-07	4.77E-07	1.01
Tractor Trailers	Diesel	25%	180.25	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	3.45E-04	7.53E-05	7.51E-06	6.07E-05	5.22E-05	2.03	1.55E-06	9.54E-07	2.03
Dump Trucks	Diesel	12%	90.12	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-04	1.72E-04	3.77E-05	3.76E-06	3.03E-05	2.61E-05	1.01	7.75E-07	4.77E-07	1.01
Concrete Trucks	Diesel	1%	9.01	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-05	1.72E-05	3.77E-06	3.76E-07	3.03E-06	2.61E-06	0.10	7.75E-08	4.77E-08	0.10
										Total Emissions Per Project (tpy)			**0.00**	**0.01**	**0.00**	**1.99E-05**	**1.79E-04**	**1.56E-04**	**7.65**	**8.50E-06**	**1.52E-05**	**7.65**
Table 15:250 square foot New Building (BMCD ID: 16)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Table 16: 750 square foot UPGRADED Building (BMCD ID: 17)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Table 17: 2050 square foot Upgraded Building (x 1004 BMCD ID: 38)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Table 18: 4400 square foot Upgraded Building (BMCD ID: 28)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Table 19: 5878 square foot Upgraded Building (BMCD ID: 34 and 37)																						
1/2 Ton Trucks	Gasoline	12%	90.12	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	1.20E-04	0.00	2.75E-04	1.13E-06	1.36E-05	1.22E-05	0.87	1.33E-06	3.31E-06	0.87
1 Ton Trucks	Gasoline	37%	270.37	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	3.60E-04	0.01	8.26E-04	3.40E-06	4.08E-05	3.67E-05	2.62	3.99E-06	9.92E-06	2.62
2 1/2 Ton Trucks	Diesel	12%	90.12	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-04	1.72E-04	3.77E-05	3.76E-06	3.03E-05	2.61E-05	1.01	7.75E-07	4.77E-07	1.01
Tractor Trailers	Diesel	25%	180.25	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	3.45E-04	7.53E-05	7.51E-06	6.07E-05	5.22E-05	2.03	1.55E-06	9.54E-07	2.03
Dump Trucks	Diesel	12%	90.12	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-04	1.72E-04	3.77E-05	3.76E-06	3.03E-05	2.61E-05	1.01	7.75E-07	4.77E-07	1.01
Concrete Trucks	Diesel	1%	9.01	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	6.74E-05	1.72E-05	3.77E-06	3.76E-07	3.03E-06	2.61E-06	0.10	7.75E-08	4.77E-08	0.10
										Total Emissions Per Project (tpy)			**0.00**	**0.01**	**0.00**	**1.99E-05**	**1.79E-04**	**1.56E-04**	**7.65**	**8.50E-06**	**1.52E-05**	**7.65**
Table 20: 12,000 square foot Upgraded Building (BMCD ID: 30 and 35)																						
1/2 Ton Trucks	Gasoline	12%	180.25	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	2.40E-04	0.00	5.51E-04	2.27E-06	2.72E-05	2.45E-05	1.74	2.66E-06	6.62E-06	1.75
1 Ton Trucks	Gasoline	37%	540.74	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	7.20E-04	0.01	0.00	6.80E-06	8.15E-05	7.34E-05	5.23	7.99E-06	1.98E-05	5.24
2 1/2 Ton Trucks	Diesel	12%	180.25	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	3.45E-04	7.53E-05	7.51E-06	6.07E-05	5.22E-05	2.03	1.55E-06	9.54E-07	2.03
Tractor Trailers	Diesel	25%	360.49	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	6.90E-04	1.51E-04	1.50E-05	1.21E-04	1.04E-04	4.06	3.10E-06	1.91E-06	4.06
Dump Trucks	Diesel	12%	180.25	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	3.45E-04	7.53E-05	7.51E-06	6.07E-05	5.22E-05	2.03	1.55E-06	9.54E-07	2.03
Concrete Trucks	Diesel	1%	18.02	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	1.35E-04	3.45E-05	7.53E-06	7.51E-07	6.07E-06	5.22E-06	0.20	1.55E-07	9.54E-08	0.20
										Total Emissions Per Project (tpy)			**0.01**	**0.02**	**0.00**	**3.99E-05**	**3.57E-04**	**3.12E-04**	**15.29**	**1.70E-05**	**3.04E-05**	**15.30**
Table 21: 35,000 square foot REPLACEMENT Building (BMCD ID: 47)																						
1/2 Ton Trucks	Gasoline	12%	540.74	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	7.20E-04	0.01	0.00	6.80E-06	8.15E-05	7.34E-05	5.23	7.99E-06	1.98E-05	5.24
1 Ton Trucks	Gasoline	37%	1622.22	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.04	0.00	2.04E-05	2.45E-04	2.20E-04	15.70	2.40E-05	5.95E-05	15.72
2 1/2 Ton Trucks	Diesel	12%	540.74	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	2.26E-04	2.25E-05	1.82E-04	1.57E-04	6.09	4.65E-06	2.86E-06	6.09
Tractor Trailers	Diesel	25%	1081.48	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.01	0.00	4.52E-04	4.51E-05	3.64E-04	3.13E-04	12.17	9.30E-06	5.72E-06	12.17
Dump Trucks	Diesel	12%	540.74	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	2.26E-04	2.25E-05	1.82E-04	1.57E-04	6.09	4.65E-06	2.86E-06	6.09
Concrete Trucks	Diesel	1%	54.07	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	4.04E-04	1.03E-04	2.26E-05	2.25E-06	1.82E-05	1.57E-05	0.61	4.65E-07	2.86E-07	0.61
										Total Emissions Per Project (tpy)			**0.02**	**0.06**	**0.01**	**1.20E-04**	**0.00**	**9.35E-04**	**45.88**	**5.10E-05**	**9.11E-05**	**45.91**
Table 22: 10 Acre New Security Post Parking lot (BMCD ID: 25a)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Table 23: 100,000 square foot PARKING LOT (BMCD ID: 22)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Table 24: 3 miles of electric upgrades (BMCD ID: 20)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Letterkenny Ammunitions Center (LEMC)
Estimated On-Road Tailpipe Emissions

Delivery Vehicles

Equipment	Fuel	Quantity[a]	Vendor VMT Distribution by Vehicle Type	Emission Factors (g/mi)[b]									Emissions (tons per year)									
				NOx	CO	VOC	SO2	PM10	PM2.5	CO2 (g/gal)	CH4	N2O	NOx	CO	VOC	SO2	PM10	PM2.5	CO2[d]	CH4	N2O	CO2e[e]
Table 25: 22 miles of RAIL network (BMCD ID: 3)																						
1/2 Ton Trucks	Gasoline	12%	75343.21	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.10	1.95	0.23	9.47E-04	0.01	0.01	729.18	0.00	0.00	730.03
1 Ton Trucks	Gasoline	37%	226029.63	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.30	5.85	0.69	0.00	0.03	0.03	2187.54	0.00	0.01	2190.10
2 1/2 Ton Trucks	Diesel	12%	75343.21	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.56	0.14	0.03	0.00	0.03	0.02	847.94	6.48E-04	3.99E-04	848.08
Tractor Trailers	Diesel	25%	150686.42	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	1.13	0.29	0.06	0.01	0.05	0.04	1695.89	0.00	7.97E-04	1696.16
Dump Trucks	Diesel	12%	75343.21	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.56	0.14	0.03	0.00	0.03	0.02	847.94	6.48E-04	3.99E-04	848.08
Concrete Trucks	Diesel	1%	7534.32	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.06	0.01	0.00	3.14E-04	0.00	0.00	84.79	6.48E-05	3.99E-05	84.81
										Total Emissions Per Project (tpy)			**2.71**	**8.39**	**1.05**	**0.02**	**0.15**	**0.13**	**6393.29**	**0.01**	**0.01**	**6397.25**
Table 26: 10 acre RAIL classification yard (BMCD ID: 6)																						
1/2 Ton Trucks	Gasoline	12%	14717.16	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.02	0.38	0.04	1.85E-04	0.00	0.00	142.43	2.17E-04	5.40E-04	142.60
1 Ton Trucks	Gasoline	37%	44151.48	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.06	1.14	0.13	5.55E-04	0.01	0.01	427.30	6.52E-04	0.00	427.80
2 1/2 Ton Trucks	Diesel	12%	14717.16	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.11	0.03	0.01	6.13E-04	0.00	0.00	165.63	1.27E-04	7.79E-05	165.66
Tractor Trailers	Diesel	25%	29434.32	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.22	0.06	0.01	0.00	0.01	0.01	331.27	2.53E-04	1.56E-04	331.32
Dump Trucks	Diesel	12%	14717.16	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.11	0.03	0.01	6.13E-04	0.00	0.00	165.63	1.27E-04	7.79E-05	165.66
Concrete Trucks	Diesel	1%	1471.72	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.01	0.00	6.15E-04	6.13E-05	4.95E-04	4.26E-04	16.56	1.27E-05	7.79E-06	16.57
										Total Emissions Per Project (tpy)			**0.53**	**1.64**	**0.21**	**0.00**	**0.03**	**0.03**	**1248.83**	**0.00**	**0.00**	**1249.61**
Table 27: Restoration of 4 miles of RAIL (BMCD ID: 18)																						
1/2 Ton Trucks	Gasoline	12%	252.35	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	3.36E-04	0.01	7.71E-04	3.17E-06	3.81E-05	3.43E-05	2.44	3.73E-06	9.26E-06	2.45
1 Ton Trucks	Gasoline	37%	757.04	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.02	0.00	9.51E-06	1.14E-04	1.03E-04	7.33	1.12E-05	2.78E-05	7.34
2 1/2 Ton Trucks	Diesel	12%	252.35	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	4.83E-04	1.05E-04	1.05E-05	8.49E-05	7.30E-05	2.84	2.17E-06	1.34E-06	2.84
Tractor Trailers	Diesel	25%	504.69	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	9.66E-04	2.11E-04	2.10E-05	1.70E-04	1.46E-04	5.68	4.34E-06	2.67E-06	5.68
Dump Trucks	Diesel	12%	252.35	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	4.83E-04	1.05E-04	1.05E-05	8.49E-05	7.30E-05	2.84	2.17E-06	1.34E-06	2.84
Concrete Trucks	Diesel	1%	25.23	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	1.89E-04	4.83E-05	1.05E-05	1.05E-06	8.49E-06	7.30E-06	0.28	2.17E-07	1.34E-07	0.28
										Total Emissions Per Project (tpy)			**0.01**	**0.03**	**0.00**	**5.58E-05**	**5.00E-04**	**4.37E-04**	**21.41**	**2.38E-05**	**4.25E-05**	**21.43**
Table 28: Repair 11 miles of asphalt ROADS (BMCD ID: 23)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00E+00**
Table 29: Repair 1560000 sqft of asphalt ROADS (BMCD ID: 32)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Table 30: New Security Post Buildings (x2) (BMCD ID: 25b)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Table 31: Upgrade Utility Infrastructure Overall (BMcD ID 9)																						
1/2 Ton Trucks	Gasoline	12%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Ton Trucks	Gasoline	37%	0.00	1.21	23.49	2.77	0.01	0.14	0.12	8780	1.34E-02	3.33E-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 1/2 Ton Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tractor Trailers	Diesel	25%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Trucks	Diesel	12%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete Trucks	Diesel	1%	0.00	6.78	1.74	0.38	0.04	0.31	0.26	10210	7.80E-03	4.80E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
										Total Emissions Per Project (tpy)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

(a) Vehicle breakdown based on U.S. fleet trends in US EPA Report "Light-Duty Automotive Technology, Carbon Dioxide Emissions, and Fuel Economy Trends: 1975 through 2014"

Percent passenger cars	70%
Percent passenger trucks	30%
Percent gasoline vehicles	90%
Percent diesel vehicles	10%

(b) Criteria Pollutant Emission Factors from U.S. EPA MOBILE6.2. Summer 2008 LGT12 emission factors used for project component emissions; Greenhouse gas emissions from EPA (2014) Inventory of US Greenhouse Gas Emissions and Sinks
(c) Global Warming Potentials Table A-1 to Subpart A of 40 CFR Part 98

CO2	1
CH4	25
N2O	298

Letterkenny Ammunitions Center (LEMC)
Fugitive Dust Emissions from Vehicle Travel to Construction Site on Paved Roads

Unpaved Roads emission factor from AP-42, Section 13.2.2: *Unpaved Roads* (11/06); Equations a1 and 2

Paved Roads emission factor from AP-42, Section 13.2.1: *Paved Roads* (01/11)

$$E = k(sL)^{0.91}(W)^{1.02}(1-P/(4*365))$$

where:

sL =	0.6	road surface silt loading silt loading (g/m2) [Table 13.2.1-2, for Ubiquitous Baseline, <500]
W =	varies	tons [Average vehicle weight]
k =	0.0022	lb/VMT [Table 13.2.1-1, for PM_{10}]
k =	0.00054	lb/VMT [Table 13.2.1-1, for $PM_{2.5}$]
P =	120	days [Average number of days with > 0.01 inches of precipitation for southeast Texas, Figure 13.2.1-2]

Equipment	Construction Duration (days)	Trip Length-Workers	Trips per day-Workers	Total Vehicle Miles Traveled[a] (VMT)-Workers	W: Mean Vehicle Weight (tons)[b]	Emission Factors (lb/VMT)[c]		Emissions Per Facility (tons)		Trip Length-Vendors	Trips per day-Vendors	Total Vehicle Miles Traveled[a] (VMT)-Vendors	W: Mean Vehicle Weight (tons)[c]	Emission Factors (lb/VMT)[d]		Emissions Per Facility (tons)	
						PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$					PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Table 1: 10,000 Square foot NEW Building (BMCD ID: 8, 13, 15, 21, 24, 27, 29, 31, 33, and 36)																	
Site Prep	1	10.8	5	54	3	0.004	0.001	1.05E-04	2.58E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	2	10.8	10	216	3	0.004	0.001	4.20E-04	1.03E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	100	10.8	1	1,080	3	0.004	0.001	2.10E-03	5.16E-04	7.30	1	730	15	0.02	4.93E-03	7.33E-03	1.80E-03
Paving	5	10.8	18	972	3	0.004	0.001	1.89E-03	4.64E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	0	0	3	0.004	0.001	0.00	0.00	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**4.52E-03**	**1.11E-03**					**Total Emissions (tpy)**		**7.33E-03**	**1.80E-03**
Table 2: 4,000 square foot NEW building (BMCD ID: 14)																	
Site Prep	1	10.8	5	54	3	0.004	0.001	1.05E-04	2.58E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	2	10.8	10	216	3	0.004	0.001	4.20E-04	1.03E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	100	10.8	1	1,080	3	0.004	0.001	2.10E-03	5.16E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	5	10.8	18	972	3	0.004	0.001	1.89E-03	4.64E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	0	0	3	0.004	0.001	0.00	0.00	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**4.52E-03**	**1.11E-03**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 3: 2,700 sqft NEW Building (BMcD ID: 26)																	
Site Prep	1	10.8	5	54	3	0.004	0.001	1.05E-04	2.58E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	2	10.8	10	216	3	0.004	0.001	4.20E-04	1.03E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	100	10.8	1	1,080	3	0.004	0.001	2.10E-03	5.16E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	5	10.8	18	972	3	0.004	0.001	1.89E-03	4.64E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	0	0	3	0.004	0.001	0.00	0.00	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**4.52E-03**	**1.11E-03**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 4: 2,400 sqft NEW Building (BMCD ID: 19)																	
Site Preparation	1	10.8	5	54	3	0.004	0.001	1.05E-04	2.58E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	2	10.8	10	216	3	0.004	0.001	4.20E-04	1.03E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	100	10.8	1	1,080	3	0.004	0.001	2.10E-03	5.16E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	5	10.8	18	972	3	0.004	0.001	1.89E-03	4.64E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	0	0	3	0.004	0.001	0.00	0.00	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**4.52E-03**	**1.11E-03**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 5: 100 Space PARKING LOT (BMCD ID: 7)																	
Site Preparation	1	10.8	5	54	3	0.004	0.001	1.05E-04	2.58E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	2	10.8	10	216	3	0.004	0.001	4.20E-04	1.03E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	5	10.8	18	972	3	0.004	0.001	1.89E-03	4.64E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	0	0	3	0.004	0.001	0.00	0.00	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**2.42E-03**	**5.93E-04**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 6: 1,750 sqft NEW Building (BMCD ID: 10, 12)																	
Site Prep	1	10.8	5	54	3	0.004	0.001	1.05E-04	2.58E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	2	10.8	10	216	3	0.004	0.001	4.20E-04	1.03E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	100	10.8	4	4,320	3	0.004	0.001	8.40E-03	2.06E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	5	10.8	18	972	3	0.004	0.001	1.89E-03	4.64E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	0	0	3	0.004	0.001	0.00	0.00	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.01**	**2.66E-03**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 7: 5,000 sqft NEW Building (BMCD ID: 40)																	
Site Prep	1	10.8	5	54	3	0.004	0.001	1.05E-04	2.58E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	2	10.8	10	216	3	0.004	0.001	4.20E-04	1.03E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	100	10.8	1	1,080	3	0.004	0.001	2.10E-03	5.16E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	5	10.8	18	972	3	0.004	0.001	1.89E-03	4.64E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	0	0	3	0.004	0.001	0.00	0.00	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**4.52E-03**	**1.11E-03**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 8: 35,000 sqft NEW Building (BMCD ID: 2)																	
Site Preparation	1	10.8	5	54	3	0.004	0.001	1.05E-04	2.58E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	2	10.8	10	216	3	0.004	0.001	4.20E-04	1.03E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	100	10.8	15	16,200	3	0.004	0.001	0.03	7.73E-03	7.30	6	4,380	15	0.02	4.93E-03	0.04	0.01
Paving	5	10.8	18	972	3	0.004	0.001	1.89E-03	4.64E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	3	162	3	0.004	0.001	3.15E-04	7.73E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.03**	**8.40E-03**					**Total Emissions (tpy)**		**0.04**	**0.01**
Table 9: 45,000 sqft NEW Building (x2 BMCD ID: 1)																	
Site Preparation	2	10.8	8	173	3	0.004	0.001	3.36E-04	8.25E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	4	10.8	8	346	3	0.004	0.001	6.72E-04	1.65E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	200	10.8	19	41,040	3	0.004	0.001	0.08	0.02	7.30	7	10,220	15	0.02	4.93E-03	0.10	0.03
Paving	10	10.8	13	1,404	3	0.004	0.001	2.73E-03	6.70E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	10	10.8	4	432	3	0.004	0.001	8.40E-04	2.06E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.08**	**0.02**					**Total Emissions (tpy)**		**0.10**	**0.03**
Table 10: 82,000 sqft NEW Building (x4) (BMCD ID: 5)																	
Site Preparation	2	10.8	8	173	3	0.004	0.001	3.36E-04	8.25E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	4	10.8	8	346	3	0.004	0.001	6.72E-04	1.65E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	200	10.8	34	73,440	3	0.004	0.001	0.14	0.04	7.30	13	18,980	15	0.02	4.93E-03	0.19	0.05
Paving	10	10.8	13	1,404	3	0.004	0.001	2.73E-03	6.70E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	10	10.8	7	756	3	0.004	0.001	1.47E-03	3.61E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.15**	**0.04**					**Total Emissions (tpy)**		**0.19**	**0.05**

Letterkenny Ammunitions Center (LEMC)
Fugitive Dust Emissions from Vehicle Travel to Construction Site on Paved Roads

Unpaved Roads emission factor from AP-42, Section 13.2.2: *Unpaved Roads* (11/06); Equations a1 and 2

Paved Roads emission factor from AP-42, Section 13.2.1: *Paved Roads* (01/11)

$$E = k(sL)^{0.91}(W)^{1.02}(1-P/(4*365))$$

where:

sL =	0.6	road surface silt loading silt loading (g/m2) [Table 13.2.1-2, for Ubiquitous Baseline, <500]
W =	varies	tons [Average vehicle weight]
k =	0.0022	lb/VMT [Table 13.2.1-1, for PM_{10}]
k =	0.00054	lb/VMT [Table 13.2.1-1, for $PM_{2.5}$]
P =	120	days [Average number of days with > 0.01 inches of precipitation for southeast Texas, Figure 13.2.1-2]

Equipment	Construction Duration (days)	Trip Length-Workers	Trips per day-Workers	Total Vehicle Miles Traveled[a] (VMT)-Workers	W: Mean Vehicle Weight (tons)[b]	Emission Factors (lb/VMT)[c]		Emissions Per Facility (tons)		Trip Length-Vendors	Trips per day-Vendors	Total Vehicle Miles Traveled[a] (VMT)-Vendors	W: Mean Vehicle Weight (tons)[c]	Emission Factors (lb/VMT)[d]		Emissions Per Facility (tons)	
						PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$					PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Table 11: 1,125,000 sqft NEW Building (BMCD ID: 50)																	
Site Preparation	20	10.8	18	3,888	3	0.004	0.001	7.56E-03	1.86E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	45	10.8	20	9,720	3	0.004	0.001	0.02	4.64E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	440	10.8	473	2,247,696	3	0.004	0.001	4.37	1.07	7.30	184	591,008	15	0.02	4.93E-03	5.94	1.46
Paving	35	10.8	15	5,670	3	0.004	0.001	0.01	2.71E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	35	10.8	95	35,910	3	0.004	0.001	0.07	0.02	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**4.48**	**1.10**					**Total Emissions (tpy)**		**5.94**	**1.46**
Table 12: 2,700 to 22,000 Square foot REPLACEMENT Building (BMCD ID: 39, 41 through 46, 48, 7 total)																	
Demolition	10	10.8	10	1,080	3	0.004	0.001	2.10E-03	5.16E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Site Preparation	1	10.8	5	54	3	0.004	0.001	1.05E-04	2.58E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	2	10.8	10	216	3	0.004	0.001	4.20E-04	1.03E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	100	10.8	15	16,200	3	0.004	0.001	0.03	7.73E-03	7.30	1	730	15	0.02	4.93E-03	7.33E-03	1.80E-03
Paving	5	10.8	18	972	3	0.004	0.001	1.89E-03	4.64E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	3	162	3	0.004	0.001	3.15E-04	7.73E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.04**	**8.92E-03**					**Total Emissions (tpy)**		**7.33E-03**	**1.80E-03**
Table 13: 0.9 Acre PARKING LOT (BMCD ID: 11)																	
Demolition	10	10.8	10	1,080	3	0.004	0.001	2.10E-03	5.16E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Site Preparation	1	10.8	5	54	3	0.004	0.001	1.05E-04	2.58E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	2	10.8	10	216	3	0.004	0.001	4.20E-04	1.03E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	5	10.8	18	972	3	0.004	0.001	1.89E-03	4.64E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	3	162	3	0.004	0.001	3.15E-04	7.73E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**4.83E-03**	**1.19E-03**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 14: Expand Roadway at Voelz Gate PARKING LOT (BMCD ID: 4)																	
Site Preparation	10	10.8	18	1,944	3	0.004	0.001	3.78E-03	9.28E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	20	10.8	20	4,320	3	0.004	0.001	8.40E-03	2.06E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	20	10.8	15	3,240	3	0.004	0.001	6.30E-03	1.55E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	20	10.8	37	7,992	3	0.004	0.001	0.02	3.82E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.03**	**8.35E-03**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 15:250 square foot New Building (BMCD ID: 16)																	
Site Preparation	1	10.8	5	54	3	0.004	0.001	1.05E-04	2.58E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	2	10.8	10	216	3	0.004	0.001	4.20E-04	1.03E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	100	10.8	0	0	3	0.004	0.001	0.00	0.00	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	5	10.8	18	972	3	0.004	0.001	1.89E-03	4.64E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	0	0	3	0.004	0.001	0.00	0.00	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**2.42E-03**	**5.93E-04**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 16: 750 square foot UPGRADED Building (BMCD ID: 17)																	
Demolition	10	10.8	8	864	3	0.004	0.001	1.68E-03	4.12E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	100	10.8	19	20,520	3	0.004	0.001	0.04	9.80E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	5	10.8	13	702	3	0.004	0.001	1.37E-03	3.35E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	4	216	3	0.004	0.001	4.20E-04	1.03E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.04**	**0.01**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 17: 2050 square foot Upgraded Building (x 1004 BMCD ID: 38)																	
Demolition	10	10.8	8	864	3	0.004	0.001	1.68E-03	4.12E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	100	10.8	19	20,520	3	0.004	0.001	0.04	9.80E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	5	10.8	13	702	3	0.004	0.001	1.37E-03	3.35E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	4	216	3	0.004	0.001	4.20E-04	1.03E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.04**	**0.01**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 18: 4400 square foot Upgraded Building (BMCD ID: 28)																	
Demolition	10	10.8	8	864	3	0.004	0.001	1.68E-03	4.12E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	100	10.8	19	20,520	3	0.004	0.001	0.04	9.80E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	5	10.8	13	702	3	0.004	0.001	1.37E-03	3.35E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	4	216	3	0.004	0.001	4.20E-04	1.03E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.04**	**0.01**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 19: 5878 square foot Upgraded Building (BMCD ID: 34 and 37)																	
Demolition	10	10.8	10	1,080	3	0.004	0.001	2.10E-03	5.16E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	100	10.8	2	2,160	3	0.004	0.001	4.20E-03	1.03E-03	7.30	1	730	15	0.02	4.93E-03	7.33E-03	1.80E-03
Paving	5	10.8	18	972	3	0.004	0.001	1.89E-03	4.64E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	0	0	3	0.004	0.001	0.00	0.00	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**8.19E-03**	**2.01E-03**					**Total Emissions (tpy)**		**7.33E-03**	**1.80E-03**
Table 20: 12,000 square foot Upgraded Building (BMCD ID: 30 and 35)																	
Demolition	10	10.8	10	1,080	3	0.004	0.001	2.10E-03	5.16E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	100	10.8	5	5,400	3	0.004	0.001	0.01	2.58E-03	7.30	2	1,460	15	0.02	4.93E-03	0.01	3.60E-03
Paving	5	10.8	18	972	3	0.004	0.001	1.89E-03	4.64E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	1	54	3	0.004	0.001	1.05E-04	2.58E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.01**	**3.58E-03**					**Total Emissions (tpy)**		**0.01**	**3.60E-03**

Letterkenny Ammunitions Center (LEMC)
Fugitive Dust Emissions from Vehicle Travel to Construction Site on Paved Roads

Unpaved Roads emission factor from AP-42, Section 13.2.2: *Unpaved Roads* (11/06); Equations a1 and 2

Paved Roads emission factor from AP-42, Section 13.2.1: *Paved Roads* (01/11)

$$E = k(sL)^{0.91}(W)^{1.02}(1-P/(4*365))$$

where:

sL =	0.6	road surface silt loading silt loading (g/m2) [Table 13.2.1-2, for Ubiquitous Baseline, <500]
W =	varies	tons [Average vehicle weight]
k =	0.0022	lb/VMT [Table 13.2.1-1, for PM_{10}]
k =	0.00054	lb/VMT [Table 13.2.1-1, for $PM_{2.5}$]
P =	120	days [Average number of days with > 0.01 inches of precipitation for southeast Texas, Figure 13.2.1-2]

Equipment	Construction Duration (days)	Trip Length-Workers	Trips per day-Workers	Total Vehicle Miles Traveled[a] (VMT)-Workers	W: Mean Vehicle Weight (tons)[b]	Emission Factors (lb/VMT)[c]		Emissions Per Facility (tons)		Trip Length-Vendors	Trips per day-Vendors	Total Vehicle Miles Traveled[a] (VMT)-Vendors	W: Mean Vehicle Weight (tons)[c]	Emission Factors (lb/VMT)[d]		Emissions Per Facility (tons)	
						PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$					PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Table 21: 35,000 square foot REPLACEMENT Building (BMCD ID: 47)																	
Demolition	10	10.8	10	1,080	3	0.004	0.001	2.10E-03	5.16E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Site Preparation	1	10.8	5	54	3	0.004	0.001	1.05E-04	2.58E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	2	10.8	10	216	3	0.004	0.001	4.20E-04	1.03E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	100	10.8	15	16,200	3	0.004	0.001	0.03	7.73E-03	7.30	6	4,380	15	0.02	4.93E-03	0.04	0.01
Paving	5	10.8	18	972	3	0.004	0.001	1.89E-03	4.64E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	3	162	3	0.004	0.001	3.15E-04	7.73E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.04**	**8.92E-03**					**Total Emissions (tpy)**		**0.04**	**0.01**
Table 22: 10 Acre New Security Post Parking lot (BMCD ID: 25a)																	
Site Preparation	2	10.8	18	389	3	0.004	0.001	7.56E-04	1.86E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	4	10.8	20	864	3	0.004	0.001	1.68E-03	4.12E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	10	10.8	15	1,620	3	0.004	0.001	3.15E-03	7.73E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	10	10.8	37	3,996	3	0.004	0.001	7.77E-03	1.91E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.01**	**3.28E-03**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 23: 100,000 square foot PARKING LOT (BMCD ID: 22)																	
Site Preparation	10	10.8	8	864	3	0.004	0.001	1.68E-03	4.12E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	20	10.8	10	2,160	3	0.004	0.001	4.20E-03	1.03E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	20	10.8	15	3,240	3	0.004	0.001	6.30E-03	1.55E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	20	10.8	8	1,728	3	0.004	0.001	3.36E-03	8.25E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.02**	**3.82E-03**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 24: 3 miles of electric upgrades (BMCD ID: 20)																	
Upgrades	14	10.8	10	1,512	3	0.004	0.001	2.94E-03	7.22E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**2.94E-03**	**7.22E-04**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 25: 22 miles of RAIL network (BMCD ID: 3)																	
Demolition	30	10.8	15	4,860	3	0.004	0.001	9.45E-03	2.32E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Site Preparation	20	10.8	18	3,888	3	0.004	0.001	7.56E-03	1.86E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	45	10.8	20	9,720	3	0.004	0.001	0.02	4.64E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	440	10.8	488	2,318,976	3	0.004	0.001	4.51	1.11	7.30	190	610,280	15	0.02	4.93E-03	6.13	1.50
						Total Emissions (tpy)		**4.55**	**1.12**					**Total Emissions (tpy)**		**6.13**	**1.50**
Table 26: 10 acre RAIL classification yard (BMCD ID: 6)																	
Site Preparation	10	10.8	18	1,944	3	0.004	0.001	3.78E-03	9.28E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	20	10.8	20	4,320	3	0.004	0.001	8.40E-03	2.06E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	230	10.8	183	454,572	3	0.004	0.001	0.88	0.22	7.30	71	119,209	15	0.02	4.93E-03	1.20	0.29
Paving	20	10.8	15	3,240	3	0.004	0.001	6.30E-03	1.55E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	20	10.8	37	7,992	3	0.004	0.001	0.02	3.82E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.92**	**0.23**					**Total Emissions (tpy)**		**1.20**	**0.29**
Table 27: Restoration of 4 miles of RAIL (BMCD ID: 18)																	
Demolition	20	10.8	15	3,240	3	0.004	0.001	6.30E-03	1.55E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Site Preparation	5	10.8	18	972	3	0.004	0.001	1.89E-03	4.64E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	8	10.8	15	1,296	3	0.004	0.001	2.52E-03	6.19E-04	7.30	35	2,044	15	0.02	4.93E-03	0.02	5.04E-03
Building Construction	230	10.8	89	221,076	3	0.004	0.001	0.43	0.11	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.44**	**0.11**					**Total Emissions (tpy)**		**0.02**	**5.04E-03**
Table 28: Repair 11 miles of asphalt ROADS (BMCD ID: 23)																	
Demolition	30	10.8	15	4,860	3	0.004	0.001	9.45E-03	2.32E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Site Preparation	20	10.8	18	3,888	3	0.004	0.001	7.56E-03	1.86E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	35	10.8	15	5,670	3	0.004	0.001	0.01	2.71E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	35	10.8	117	44,226	3	0.004	0.001	0.09	0.02	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.11**	**0.03**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 29: Repair 1560000 sqft of asphalt ROADS (BMCD ID: 32)																	
Demolition	50	10.8	15	8,100	3	0.004	0.001	0.02	3.87E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Site Preparation	30	10.8	18	5,832	3	0.004	0.001	0.01	2.78E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	35	10.8	15	5,670	3	0.004	0.001	0.01	2.71E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	35	10.8	131	49,518	3	0.004	0.001	0.10	0.02	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.13**	**0.03**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 30: New Security Post Buildings (x2) (BMCD ID: 25b)																	
Site Preparation	1	10.8	5	54	3	0.004	0.001	1.05E-04	2.58E-05	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	2	10.8	10	216	3	0.004	0.001	4.20E-04	1.03E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	100	10.8	4	4,320	3	0.004	0.001	8.40E-03	2.06E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Paving	5	10.8	18	972	3	0.004	0.001	1.89E-03	4.64E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Architectural Coating	5	10.8	0	0	3	0.004	0.001	0.00	0.00	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
						Total Emissions (tpy)		**0.01**	**2.66E-03**					**Total Emissions (tpy)**		**0.00**	**0.00**
Table 31: Upgrade Utility Infrastructure Overall (BMcD ID 9)																	
Demolition	50	10.8	25	13,500	3	0.004	0.001	0.03	6.45E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Site Preparation	15	10.8	8	1,296	3	0.004	0.001	2.52E-03	6.19E-04	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Grading	20	10.8	10	2,160	3	0.004	0.001	4.20E-03	1.03E-03	7.30	0	0	15	0.02	4.93E-03	0.00	0.00
Building Construction	550	10.8	275	1,633,500	3	0.004	0.001	3.18	0.78	7.30	50	200,750	15	0.02	4.93E-03	2.02	0.49
Total (tons)						**Total Emissions (tpy)**		**3.21**	**0.79**					**Total Emissions (tpy)**		**2.02**	**0.49**

(a) VMT per day are projected based on experience from previous construction projects

(b) Weighted average of worker vehicle wt (tons)

(c) Weighted average of vendor and delivery vehicles (tons), based on research of typical vehicle weights and hauling capacity.

(c) AP 42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2

Letterkenny Ammunitions Center (LEMC)
Off-Road Construction Equipment List

Table 1: 10,000 Square foot NEW Building (BMCD ID: 8, 13, 15, 21, 24, 27, 29, 31, 33, and 36)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	113	9	1017	250	0.8
Graders	Site Preparation	Diesel	1	1	8	8	187	0.41
Tractors/Loaders/Backhoes	Site Preparation	Diesel	1	1	8	8	97	0.37
Concrete/Industrial Saws	Grading	Diesel	1	2	8	16	81	0.73
Rubber Tired Dozers	Grading	Diesel	1	2	1	2	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	2	2	6	24	97	0.37
Cranes	Building Construction	Diesel	1	100	4	400	231	0.29
Forklifts	Building Construction	Diesel	2	100	6	1200	89	0.2
Tractors/Loaders/Backhoes	Building Construction	Diesel	2	100	8	1600	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	120	9	0.56
Pavers	Paving	Diesel	1	5	7	35	130	0.42
Rollers	Paving	Diesel	1	5	7	35	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	35	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	30	78	0.48

(a) Assumes usage of 10 hours per day

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

Table 2: 4,000 square foot NEW building (BMCD ID: 14)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	113	9	1130	250	0.8
Graders	Site Preparation	Diesel	1	1	8	8	187	0.41
Tractors/Loaders/Backhoes	Site Preparation	Diesel	1	1	8	8	97	0.37
Concrete/Industrial Saws	Grading	Diesel	1	2	8	16	81	0.73
Rubber Tired Dozers	Grading	Diesel	1	2	1	2	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	2	2	6	24	97	0.37
Cranes	Building Construction	Diesel	1	100	4	400	231	0.29
Forklifts	Building Construction	Diesel	2	100	6	1200	89	0.2
Tractors/Loaders/Backhoes	Building Construction	Diesel	2	100	8	1600	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	120	9	0.56
Pavers	Paving	Diesel	1	5	7	35	130	0.42
Rollers	Paving	Diesel	1	5	7	35	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	35	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	30	78	0.48

(a) Assumes usage of 10 hours per day

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

Table 3: 2,700 sqft NEW Building (BMcD ID: 26)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	113	9	1130	250	0.8
Graders	Site Preparation	Diesel	1	1	8	10	187	0.41
Tractors/Loaders/Backhoes	Site Preparation	Diesel	1	1	8	10	97	0.37
Concrete/Industrial Saws	Grading	Diesel	1	2	8	20	81	0.73
Rubber Tired Dozers	Grading	Diesel	1	2	1	20	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	2	2	6	40	97	0.37
Cranes	Building Construction	Diesel	1	100	4	1000	231	0.29
Forklifts	Building Construction	Diesel	2	100	6	2000	89	0.2
Tractors/Loaders/Backhoes	Building Construction	Diesel	2	100	8	2000	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	200	9	0.56
Pavers	Paving	Diesel	1	5	7	50	130	0.42
Rollers	Paving	Diesel	1	5	7	50	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	50	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	50	78	0.48

(a) Assumes usage of 10 hours per day

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

Table 4: 2,400 sqft NEW Building (BMCD ID: 19)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	113	9	1130	250	0.8
Graders	Site Preparation	Diesel	1	1	8	10	187	0.41
Tractors/Loaders/Backhoes	Site Preparation	Diesel	1	1	8	10	97	0.37
Concrete/Industrial Saws	Grading	Diesel	1	2	8	20	81	0.73
Rubber Tired Dozers	Grading	Diesel	1	2	1	20	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	2	2	6	40	97	0.37
Cranes	Building Construction	Diesel	1	100	4	1000	231	0.29
Forklifts	Building Construction	Diesel	2	100	6	2000	89	0.2
Tractors/Loaders/Backhoes	Building Construction	Diesel	2	100	8	2000	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	200	9	0.56
Pavers	Paving	Diesel	1	5	7	50	130	0.42
Rollers	Paving	Diesel	1	5	7	50	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	50	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	50	78	0.48

(a) Assumes usage of 10 hours per day

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

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Table 5: 100 Space PARKING LOT (BMCD ID: 7)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	13	9	130	250	0.8
Graders	Site Preparation	Diesel	1	1	8	10	187	0.41
Tractors/Loaders/Backhoes	Site Preparation	Diesel	1	1	8	10	97	0.37
Concrete/Industrial Saws	Grading	Diesel	1	2	8	20	81	0.73
Rubber Tired Dozers	Grading	Diesel	1	2	1	20	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	2	2	6	40	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	200	9	0.56
Pavers	Paving	Diesel	1	5	7	50	130	0.42
Rollers	Paving	Diesel	1	5	7	50	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	50	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	50	78	0.48

(a) Assumes usage of 10 hours per day
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

Table 6: 1,750 sqft NEW Building (BMCD ID: 10, 12)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	113	9	1130	250	0.8
Graders	Site Preparation	Diesel	1	1	8	10	187	0.41
Tractors/Loaders/Backhoes	Site Preparation	Diesel	1	1	8	10	97	0.37
Concrete/Industrial Saws	Grading	Diesel	1	2	8	20	81	0.73
Rubber Tired Dozers	Grading	Diesel	1	2	1	20	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	2	2	6	40	97	0.37
Cranes	Building Construction	Diesel	1	100	4	1000	231	0.29
Forklifts	Building Construction	Diesel	2	100	6	2000	89	0.2
Tractors/Loaders/Backhoes	Building Construction	Diesel	2	100	8	2000	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	200	9	0.56
Pavers	Paving	Diesel	1	5	7	50	130	0.42
Rollers	Paving	Diesel	1	5	7	50	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	50	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	50	78	0.48

(a) Assumes usage of 10 hours per day
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

Table 7: 5,000 sqft NEW Building (BMCD ID: 40)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	113	9	1130	250	0.8
Graders	Site Preparation	Diesel	1	1	8	10	187	0.41
Tractors/Loaders/Backhoes	Site Preparation	Diesel	1	1	8	10	97	0.37
Concrete/Industrial Saws	Grading	Diesel	1	2	8	20	81	0.73
Rubber Tired Dozers	Grading	Diesel	1	2	1	20	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	2	2	6	40	97	0.37
Cranes	Building Construction	Diesel	1	100	4	1000	231	0.29
Forklifts	Building Construction	Diesel	2	100	6	2000	89	0.2
Tractors/Loaders/Backhoes	Building Construction	Diesel	2	100	8	2000	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	200	9	0.56
Pavers	Paving	Diesel	1	5	7	50	130	0.42
Rollers	Paving	Diesel	1	5	7	50	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	50	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	50	78	0.48

(a) Assumes usage of 10 hours per day
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

Table 8: 35,000 sqft NEW Building (BMCD ID: 2)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	113	9	1130	250	0.8
Graders	Site Preparation	Diesel	1	1	8	10	187	0.41
Tractors/Loaders/Backhoes	Site Preparation	Diesel	1	1	8	10	97	0.37
Concrete/Industrial Saws	Grading	Diesel	1	2	8	20	81	0.73
Rubber Tired Dozers	Grading	Diesel	1	2	1	20	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	2	2	6	40	97	0.37
Cranes	Building Construction	Diesel	1	100	4	1000	231	0.29
Forklifts	Building Construction	Diesel	2	100	6	2000	89	0.2
Tractors/Loaders/Backhoes	Building Construction	Diesel	2	100	8	2000	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	200	9	0.56
Pavers	Paving	Diesel	1	5	7	50	130	0.42
Rollers	Paving	Diesel	1	5	7	50	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	50	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	50	78	0.48

(a) Assumes usage of 10 hours per day
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

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Table 9: 45,000 sqft NEW Building (x2 BMCD ID: 1)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	226	9	2260	250	0.8
Graders	Site Preparation	Diesel	1	2	8	20	187	0.41
Scrapers	Site Preparation	Diesel	1	2	8	20	367	0.48
Tractors/Loaders/Backhoes	Site Preparation	Diesel	1	2	7	20	97	0.37
Graders	Grading	Diesel	1	4	8	40	187	0.41
Rubber Tired Dozers	Grading	Diesel	1	4	8	40	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	2	4	7	80	97	0.37
Cranes	Building Construction	Diesel	1	200	8	2000	231	0.29
Forklifts	Building Construction	Diesel	2	200	7	4000	89	0.2
Generator Sets	Building Construction	Diesel	1	200	8	2000	84	0.74
Tractors/Loaders/Backhoes	Building Construction	Diesel	1	200	6	2000	97	0.37
Welders	Building Construction	Diesel	3	200	8	6000	46	0.45
Cement and Mortar Mixers	Paving	Diesel	1	10	8	100	9	0.56
Pavers	Paving	Diesel	1	10	8	100	130	0.42
Paving Equipment	Paving	Diesel	1	10	8	100	132	0.36
Rollers	Paving	Diesel	2	10	8	200	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	10	8	100	97	0.37
Air Compressors	Architectural Coating	Diesel	1	10	6	100	78	0.48

(a) Assumes usage of 10 hours per day

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

Table 10: 82,000 sqft NEW Building (x4) (BMCD ID: 5)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	226	9	2260	250	0.8
Graders	Site Preparation	Diesel	1	2	8	16	187	0.41
Rubber Tired Dozers	Site Preparation	Diesel	1	2	7	14	247	0.4
Tractors/Loaders/Backhoes	Site Preparation	Diesel	1	2	8	16	97	0.37
Graders	Grading	Diesel	1	4	6	24	187	0.41
Rubber Tired Dozers	Grading	Diesel	1	4	6	24	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	1	4	7	28	97	0.37
Cranes	Building Construction	Diesel	1	200	6	1200	231	0.29
Forklifts	Building Construction	Diesel	1	200	6	1200	89	0.2
Generator Sets	Building Construction	Diesel	1	200	8	1600	84	0.74
Tractors/Loaders/Backhoes	Building Construction	Diesel	1	200	6	1200	97	0.37
Welders	Building Construction	Diesel	3	200	8	4800	46	0.45
Cement and Mortar Mixers	Paving	Diesel	1	10	6	60	9	0.56
Pavers	Paving	Diesel	1	10	6	60	130	0.42
Paving Equipment	Paving	Diesel	1	10	8	80	132	0.36
Rollers	Paving	Diesel	1	10	7	70	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	10	8	80	97	0.37
Air Compressors	Architectural Coating	Diesel	1	10	6	60	78	0.48

(a) Assumes usage of 10 hours per day

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

Table 11: 1,125,000 sqft NEW Building (BMCD ID: 50)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	575	9	5750	250	0.8
Rubber Tired Dozers	Site Preparation	Diesel	3	20	8	600	247	0.4
Tractors/Loaders/Backhoes	Site Preparation	Diesel	4	20	8	800	97	0.37
Excavators	Grading	Diesel	2	45	8	900	158	0.38
Graders	Grading	Diesel	1	45	8	450	187	0.41
Rubber Tired Dozers	Grading	Diesel	1	45	8	450	247	0.4
Scrapers	Grading	Diesel	2	45	8	900	367	0.48
Tractors/Loaders/Backhoes	Grading	Diesel	2	45	8	900	97	0.37
Cranes	Building Construction	Diesel	1	440	7	4400	231	0.29
Forklifts	Building Construction	Diesel	3	440	8	13200	89	0.2
Generator Sets	Building Construction	Diesel	1	440	8	4400	84	0.74
Tractors/Loaders/Backhoes	Building Construction	Diesel	3	440	7	13200	97	0.37
Welders	Building Construction	Diesel	1	440	8	4400	46	0.45
Pavers	Paving	Diesel	2	35	8	700	130	0.42
Paving Equipment	Paving	Diesel	2	35	8	700	132	0.36
Rollers	Paving	Diesel	2	35	8	700	80	0.38
Air Compressors	Architectural Coating	Diesel	1	35	6	350	78	0.48

(a) Assumes usage of 10 hours per day

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

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Table 12: 2,700 to 22,000 Square foot REPLACEMENT Building (BMCD ID: 39, 41 through 46, 48, 7 total)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	113	9	1130	250	0.8
Concrete/Industrial Saws	Demolition	Diesel	1	10	8	100	81	0.73
Rubber Tired Dozers	Demolition	Diesel	1	10	1	100	247	0.4
Tractors/Loaders/Backhoes	Demolition	Diesel	2	10	6	200	97	0.37
Graders	Site Preparation	Diesel	1	1	8	10	187	0.41
Tractors/Loaders/Backhoes	Site Preparation	Diesel	1	1	8	10	97	0.37
Concrete/Industrial Saws	Grading	Diesel	1	2	8	20	81	0.73
Rubber Tired Dozers	Grading	Diesel	1	2	1	20	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	2	2	6	40	97	0.37
Cranes	Building Construction	Diesel	1	100	4	1000	231	0.29
Forklifts	Building Construction	Diesel	2	100	6	2000	89	0.2
Tractors/Loaders/Backhoes	Building Construction	Diesel	2	100	8	2000	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	200	9	0.56
Pavers	Paving	Diesel	1	5	7	50	130	0.42
Rollers	Paving	Diesel	1	5	7	50	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	50	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	50	78	0.48

(a) Assumes usage of 10 hours per day
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(c) It was determined the CalEEMod generates the same construction equipment list for buidlings ranging from at least 2,700 to 22,000 square feet. As such, one set of outputs will be multiplied by 8.

Table 13: 0.9 Acre PARKING LOT (BMCD ID: 11)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	13	9	130	250	0.8
Graders	Site Preparation	Diesel	1	1	8	10	187	0.41
Tractors/Loaders/Backhoes	Site Preparation	Diesel	1	1	8	10	97	0.37
Concrete/Industrial Saws	Grading	Diesel	1	2	8	20	81	0.73
Rubber Tired Dozers	Grading	Diesel	1	2	1	20	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	2	2	6	40	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	200	9	0.56
Pavers	Paving	Diesel	1	5	7	50	130	0.42
Rollers	Paving	Diesel	1	5	7	50	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	50	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	50	78	0.48

(a) Assumes usage of 10 hours per day
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

Table 14: Expand Roadway at Voelz Gate PARKING LOT (BMCD ID: 4)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	70	9	700	250	0.8
Rubber Tired Dozers	Site Preparation	Diesel	3	10	8	300	247	0.4
Tractors/Loaders/Backhoes	Site Preparation	Diesel	4	10	8	400	97	0.37
Excavators	Grading	Diesel	2	20	8	400	158	0.38
Graders	Grading	Diesel	1	20	8	200	187	0.41
Rubber Tired Dozers	Grading	Diesel	1	20	8	200	247	0.4
Scrapers	Grading	Diesel	2	20	8	400	367	0.48
Tractors/Loaders/Backhoes	Grading	Diesel	2	20	8	400	97	0.37
Pavers	Paving	Diesel	2	20	8	400	130	0.42
Paving Equipment	Paving	Diesel	2	20	8	400	132	0.36
Rollers	Paving	Diesel	2	20	8	400	80	0.38
Air Compressors	Architectural Coating	Diesel	1	20	6	200	78	0.48

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

Table 15:250 square foot New Building (BMCD ID: 16)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	113	9	1017	250	0.8
Graders	Site Preparation	Diesel	1	1	8	8	187	0.41
Tractors/Loaders/Backhoes	Site Preparation	Diesel	1	1	8	8	97	0.37
Concrete/Industrial Saws	Grading	Diesel	1	2	8	16	81	0.73
Rubber Tired Dozers	Grading	Diesel	1	2	1	2	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	2	2	6	24	97	0.37
Cranes	Building Construction	Diesel	1	100	4	400	231	0.29
Forklifts	Building Construction	Diesel	2	100	6	1200	89	0.2
Tractors/Loaders/Backhoes	Building Construction	Diesel	2	100	8	1600	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	120	9	0.56
Pavers	Paving	Diesel	1	5	7	35	130	0.42
Rollers	Paving	Diesel	1	5	7	35	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	35	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	30	78	0.48

(a) Assumes usage of 10 hours per day
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

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Table 16: 750 square foot UPGRADED Building (BMCD ID: 17)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	120	9	1080	250	0.8
Concrete/Industrial Saws	Demolition	Diesel	1	10	8	80	81	0.73
Rubber Tired Dozers	Demolition	Diesel	1	10	1	10	247	0.4
Tractors/Loaders/Backhoes	Demolition	Diesel	2	10	6	120	97	0.37
Cranes	Building Construction	Diesel	1	100	4	400	231	0.29
Forklifts	Building Construction	Diesel	2	100	6	1200	89	0.2
Tractors/Loaders/Backhoes	Building Construction	Diesel	2	100	8	1600	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	120	9	0.56
Pavers	Paving	Diesel	1	5	7	35	130	0.42
Rollers	Paving	Diesel	1	5	7	35	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	35	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	30	78	0.48

(a) Assumes usage of 10 hours per day
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

Table 17: 2050 square foot Upgraded Building (x 902 BMCD ID: 38)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	120	9	1080	250	0.8
Graders	Demolition	Diesel	1	10	8	80	81	0.73
Tractors/Loaders/Backhoes	Demolition	Diesel	1	10	1	10	247	0.4
Tractors/Loaders/Backhoes	Demolition	Diesel	2	10	6	120	97	0.37
Cranes	Building Construction	Diesel	1	100	4	400	231	0.29
Forklifts	Building Construction	Diesel	2	100	6	1200	89	0.2
Tractors/Loaders/Backhoes	Building Construction	Diesel	2	100	8	1600	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	120	9	0.56
Pavers	Paving	Diesel	1	5	7	35	130	0.42
Rollers	Paving	Diesel	1	5	7	35	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	35	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	30	78	0.48

(a) Assumes usage of 10 hours per day
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

Table 18: 4400 square foot Upgraded Building (BMCD ID: 28)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	120	9	1080	250	0.8
Graders	Demolition	Diesel	1	10	8	80	81	0.73
Tractors/Loaders/Backhoes	Demolition	Diesel	1	10	1	10	247	0.4
Tractors/Loaders/Backhoes	Demolition	Diesel	2	10	6	120	97	0.37
Cranes	Building Construction	Diesel	1	100	4	400	231	0.29
Forklifts	Building Construction	Diesel	2	100	6	1200	89	0.2
Tractors/Loaders/Backhoes	Building Construction	Diesel	2	100	8	1600	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	120	9	0.56
Pavers	Paving	Diesel	1	5	7	35	130	0.42
Rollers	Paving	Diesel	1	5	7	35	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	35	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	30	78	0.48

(a) Assumes usage of 10 hours per day
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

Table 19: 5878 square foot Upgraded Building (BMCD ID: 34 and 37)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	120	9	1080	250	0.8
Graders	Demolition	Diesel	1	10	8	80	81	0.73
Tractors/Loaders/Backhoes	Demolition	Diesel	1	10	1	10	247	0.4
Tractors/Loaders/Backhoes	Demolition	Diesel	2	10	6	120	97	0.37
Cranes	Building Construction	Diesel	1	100	4	400	231	0.29
Forklifts	Building Construction	Diesel	2	100	6	1200	89	0.2
Tractors/Loaders/Backhoes	Building Construction	Diesel	2	100	8	1600	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	120	9	0.56
Pavers	Paving	Diesel	1	5	7	35	130	0.42
Rollers	Paving	Diesel	1	5	7	35	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	35	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	30	78	0.48

(a) Assumes usage of 10 hours per day
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

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Table 20: 12,000 square foot Upgraded Building (BMCD ID: 30 and 35)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	120	9	1080	250	0.8
Graders	Demolition	Diesel	1	10	8	80	81	0.73
Tractors/Loaders/Backhoes	Demolition	Diesel	1	10	1	10	247	0.4
Tractors/Loaders/Backhoes	Demolition	Diesel	2	10	6	120	97	0.37
Cranes	Building Construction	Diesel	1	100	4	400	231	0.29
Forklifts	Building Construction	Diesel	2	100	6	1200	89	0.2
Tractors/Loaders/Backhoes	Building Construction	Diesel	2	100	8	1600	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	120	9	0.56
Pavers	Paving	Diesel	1	5	7	35	130	0.42
Rollers	Paving	Diesel	1	5	7	35	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	35	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	30	78	0.48

(a) Assumes usage of 10 hours per day

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

Table 21: 35,000 square foot REPLACEMENT Building (BMCD ID: 47)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	113	9	1130	250	0.8
Demolition	Concrete/Industrial Saws	Diesel	1	10	8	100	81	0.73
Demolition	Rubber Tired Dozers	Diesel	1	10	1	100	247	0.4
Demolition	Tractors/Loaders/Backhoes	Diesel	2	10	6	200	97	0.37
Site Preparation	Graders	Diesel	1	1	8	10	187	0.41
Site Preparation	Tractors/Loaders/Backhoes	Diesel	1	1	8	10	97	0.37
Grading	Concrete/Industrial Saws	Diesel	1	2	8	20	81	0.73
Grading	Rubber Tired Dozers	Diesel	1	2	1	20	247	0.4
Grading	Tractors/Loaders/Backhoes	Diesel	2	2	6	40	97	0.37
Building Construction	Cranes	Diesel	1	100	4	1000	231	0.29
Building Construction	Forklifts	Diesel	2	100	6	2000	89	0.2
Building Construction	Tractors/Loaders/Backhoes	Diesel	2	100	8	2000	97	0.37
Paving	Cement and Mortar Mixers	Diesel	4	5	6	200	9	0.56
Paving	Pavers	Diesel	1	5	7	50	130	0.42
Paving	Rollers	Diesel	1	5	7	50	80	0.38
Paving	Tractors/Loaders/Backhoes	Diesel	1	5	7	50	97	0.37
Architectural Coating	Air Compressors	Diesel	1	5	6	50	78	0.48

Table 22: 10 Acre New Security Post Parking lot (BMCD ID: 25a)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	26	9	234	250	0.8
Graders	Site Preparation	Diesel	1	2	8	16	187	0.41
Rubber Tired Dozers	Site Preparation	Diesel	1	2	7	14	247	0.4
Tractors/Loaders/Backhoes	Site Preparation	Diesel	1	2	8	16	97	0.37
Concrete/Industrial Saws	Grading	Diesel	1	4	6	24	187	0.41
Rubber Tired Dozers	Grading	Diesel	1	4	6	24	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	1	4	7	28	97	0.37
Cement and Mortar Mixers	Paving	Diesel	1	10	6	60	9	0.56
Pavers	Paving	Diesel	1	10	6	60	130	0.42
Paving Equipment	Paving	Diesel	1	10	8	80	132	0.36
Rollers	Paving	Diesel	1	10	7	70	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	10	8	80	97	0.37
Air Compressors	Architectural Coating	Diesel	1	10	6	60	78	0.48

(a) Assumes usage of 10 hours per day

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

Table 23: 100,000 square foot PARKING LOT (BMCD ID: 22)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	70	9	700	250	0.8
Rubber Tired Dozers	Site Preparation	Diesel	3	10	8	240	247	0.4
Tractors/Loaders/Backhoes	Site Preparation	Diesel	4	10	8	320	97	0.37
Excavators	Grading	Diesel	2	20	8	320	158	0.38
Graders	Grading	Diesel	1	20	8	160	187	0.41
Rubber Tired Dozers	Grading	Diesel	1	20	8	160	247	0.4
Scrapers	Grading	Diesel	2	20	8	320	367	0.48
Tractors/Loaders/Backhoes	Grading	Diesel	2	20	8	320	97	0.37
Pavers	Paving	Diesel	2	20	8	320	130	0.42
Paving Equipment	Paving	Diesel	2	20	8	320	132	0.36
Rollers	Paving	Diesel	2	20	8	320	80	0.38
Air Compressors	Architectural Coating	Diesel	1	20	6	120	78	0.48

(a) Assumes usage of 10 hours per day

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

Table 24: 3 miles of electric upgrades (BMCD ID: 20)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	14	9	140	250	0.8
55' Bucket 4x4	Upgrades	Diesel	1	14	8	112	187	0.41
Digger	Upgrades	Diesel	1	14	8	112	367	0.48

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004

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Table 25: 22 miles of RAIL network (BMCD ID: 3)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	505	9	5050	250	0.8
Concrete/Industrial Saws	Demolition	Diesel	1	30	8	240	81	0.73
Excavators	Demolition	Diesel	3	30	8	720	158	0.38
Rubber Tired Dozers	Demolition	Diesel	2	30	8	480	247	0.4
Rubber Tired Dozers	Site Preparation	Diesel	3	20	8	480	247	0.4
Tractors/Loaders/Backhoes	Site Preparation	Diesel	4	20	8	640	97	0.37
Excavators	Grading	Diesel	2	45	8	720	158	0.38
Graders	Grading	Diesel	1	45	8	360	187	0.41
Rubber Tired Dozers	Grading	Diesel	1	45	8	360	247	0.4
Scrapers	Grading	Diesel	2	45	8	720	367	0.48
Tractors/Loaders/Backhoes	Grading	Diesel	2	45	8	720	97	0.37
Cranes	Building Construction	Diesel	1	440	7	3080	231	0.29
Forklifts	Building Construction	Diesel	3	440	8	10560	89	0.2
Generator Sets	Building Construction	Diesel	1	440	8	3520	84	0.74
Tractors/Loaders/Backhoes	Building Construction	Diesel	3	440	7	9240	97	0.37
Welders	Building Construction	Diesel	1	440	8	3520	46	0.45

Table 26: 10 acre RAIL classification yard (BMCD ID: 6)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	300	9	3000	250	0.8
Rubber Tired Dozers	Site Preparation	Diesel	3	10	8	240	247	0.4
Tractors/Loaders/Backhoes	Site Preparation	Diesel	4	10	8	320	97	0.37
Excavators	Grading	Diesel	2	20	8	320	158	0.38
Graders	Grading	Diesel	1	20	8	160	187	0.41
Rubber Tired Dozers	Grading	Diesel	1	20	8	160	247	0.4
Scrapers	Grading	Diesel	2	20	8	320	367	0.48
Tractors/Loaders/Backhoes	Grading	Diesel	2	20	8	320	97	0.37
Cranes	Building Construction	Diesel	1	230	7	1610	231	0.29
Forklifts	Building Construction	Diesel	3	230	8	5520	89	0.2
Generator Sets	Building Construction	Diesel	1	230	8	1840	84	0.74
Tractors/Loaders/Backhoes	Building Construction	Diesel	3	230	7	4830	97	0.37
Welders	Building Construction	Diesel	1	230	8	1840	46	0.45
Pavers	Paving	Diesel	2	20	8	320	130	0.42
Paving Equipment	Paving	Diesel	2	20	8	320	132	0.36
Rollers	Paving	Diesel	2	20	8	320	80	0.38
Air Compressors	Architectural Coating	Diesel	1	20	6	120	78	0.48

Table 27: Restoration of 4 miles of RAIL (BMCD ID: 18)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	278	9	2780	250	0.8
Concrete/Industrial Saws	Demolition	Diesel	1	20	8	160	81	0.73
Excavators	Demolition	Diesel	3	20	8	480	158	0.38
Rubber Tired Dozers	Demolition	Diesel	2	20	8	320	247	0.4
Rubber Tired Dozers	Site Preparation	Diesel	3	5	8	120	247	0.4
Tractors/Loaders/Backhoes	Site Preparation	Diesel	4	5	8	160	97	0.37
Excavators	Grading	Diesel	1	8	8	64	158	0.38
Graders	Grading	Diesel	1	8	8	64	187	0.41
Rubber Tired Dozers	Grading	Diesel	1	8	8	64	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	3	8	8	192	97	0.37
Cranes	Building Construction	Diesel	1	230	7	1610	231	0.29
Forklifts	Building Construction	Diesel	3	230	8	5520	89	0.2
Generator Sets	Building Construction	Diesel	1	230	8	1840	84	0.74
Tractors/Loaders/Backhoes	Building Construction	Diesel	3	230	7	4830	97	0.37
Welders	Building Construction	Diesel	1	230	8	1840	46	0.45

Table 28: Repair 11 miles of asphalt ROADS (BMCD ID: 23)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	120	9	1200	250	0.8
Concrete/Industrial Saws	Demolition	Diesel	1	30	8	240	81	0.73
Excavators	Demolition	Diesel	3	30	8	720	158	0.38
Rubber Tired Dozers	Demolition	Diesel	2	30	8	480	247	0.4
Rubber Tired Dozers	Site Preparation	Diesel	3	20	8	480	247	0.4
Tractors/Loaders/Backhoes	Site Preparation	Diesel	4	20	8	640	97	0.37
Pavers	Paving	Diesel	2	35	8	560	130	0.42
Paving Equipment	Paving	Diesel	2	35	8	560	132	0.36
Rollers	Paving	Diesel	2	35	8	560	80	0.38
Air Compressors	Architectural Coating	Diesel	1	35	6	210	78	0.48

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Table 29: Repair 1560000 sqft of asphalt ROADS (BMCD ID: 32)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	150	9	1500	250	0.8
Concrete/Industrial Saws	Demolition	Diesel	1	50	8	400	81	0.73
Excavators	Demolition	Diesel	3	50	8	1200	158	0.38
Rubber Tired Dozers	Demolition	Diesel	2	50	8	800	247	0.4
Rubber Tired Dozers	Site Preparation	Diesel	3	30	8	720	247	0.4
Tractors/Loaders/Backhoes	Site Preparation	Diesel	4	30	8	960	97	0.37
Pavers	Paving	Diesel	2	35	8	560	130	0.42
Paving Equipment	Paving	Diesel	2	35	8	560	132	0.36
Rollers	Paving	Diesel	2	35	8	560	80	0.38
Air Compressors	Architectural Coating	Diesel	1	35	6	210	78	0.48

Table 30: New Security Post Buildings (x2) (BMCD ID: 25b)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	113	9	1130	250	0.8
Graders	Site Preparation	Diesel	1	1	8	10	187	0.41
Tractors/Loaders/Backhoes	Site Preparation	Diesel	1	1	8	10	97	0.37
Concrete/Industrial Saws	Grading	Diesel	1	2	8	20	81	0.73
Rubber Tired Dozers	Grading	Diesel	1	2	1	20	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	2	2	6	40	97	0.37
Cranes	Building Construction	Diesel	1	100	4	1000	231	0.29
Forklifts	Building Construction	Diesel	2	100	6	2000	89	0.2
Tractors/Loaders/Backhoes	Building Construction	Diesel	2	100	8	2000	97	0.37
Cement and Mortar Mixers	Paving	Diesel	4	5	6	200	9	0.56
Pavers	Paving	Diesel	1	5	7	50	130	0.42
Rollers	Paving	Diesel	1	5	7	50	80	0.38
Tractors/Loaders/Backhoes	Paving	Diesel	1	5	7	50	97	0.37
Air Compressors	Architectural Coating	Diesel	1	5	6	50	78	0.48

Table 31: Upgrade Utility Infrastructure Overall (BMcD ID 9)

Equipment	Phase	Fuel Type	Quantity	Days Used	Hours of Use/day	Total hours used[a]	Engine Rating (hp)	Load Factor[b]
Foreman / Supervisor Truck	All	Gasoline	1	635	9	6350	250	0.8
Concrete/Industrial Saws	Demolition	Diesel	1	50	8	400	81	0.73
Excavators	Demolition	Diesel	3	50	8	1200	158	0.38
Rubber Tired Dozers	Demolition	Diesel	2	50	8	800	247	0.4
Rubber Tired Dozers	Site Preparation	Diesel	3	15	8	360	247	0.4
Tractors/Loaders/Backhoes	Site Preparation	Diesel	4	15	8	480	97	0.37
Excavators	Grading	Diesel	1	20	8	160	158	0.38
Graders	Grading	Diesel	1	20	8	160	187	0.41
Rubber Tired Dozers	Grading	Diesel	1	20	8	160	247	0.4
Tractors/Loaders/Backhoes	Grading	Diesel	3	20	8	480	97	0.37
Cranes	Building Construction	Diesel	1	550	7	3850	231	0.29
Forklifts	Building Construction	Diesel	3	550	8	13200	89	0.2
Generator Sets	Building Construction	Diesel	1	550	8	4400	84	0.74
Tractors/Loaders/Backhoes	Building Construction	Diesel	3	550	7	11550	97	0.37
Welders	Building Construction	Diesel	1	550	8	4400	46	0.45

Letterkenny Ammunitions Center (LEMC)
Criteria & GHG Pollutant Emissions - Construction Equipment

Table 1: 10,000 Square foot NEW Building (BMCD ID: 8, 13, 15, 21, 24, 27, 29, 31, 33, and 36)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors[c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1,017	Gasoline	250	200.00	1130.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.39	6.24	0.20	0.01	0.02	0.02	110.21	4.71E-03	9.42E-04	110.61
Graders	8	Diesel	187	76.67	*	D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	1.20E-03	6.29E-04	1.81E-04	1.81E-04	0.35	1.42E-05	2.84E-06	0.35
Tractors/Loaders/Backhoes	8	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	6.37E-04	2.94E-04	1.70E-04	1.70E-04	0.16	6.65E-06	1.33E-06	0.16
Concrete/Industrial Saws	16	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.10E-03	9.70E-04	5.59E-04	5.59E-04	0.54	2.19E-05	4.38E-06	0.54
Rubber Tired Dozers	2	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	3.86E-04	2.03E-04	5.84E-05	5.84E-05	0.11	4.57E-06	9.15E-07	0.11
Tractors/Loaders/Backhoes	24	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	1.91E-03	8.83E-04	5.09E-04	5.09E-04	0.49	1.99E-05	3.99E-06	0.49
Cranes	400	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.20	0.14	5.07E-02	2.75E-02	7.92E-03	7.92E-03	15.29	6.20E-04	1.24E-04	15.34
Forklifts	1,200	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.19	0.16	4.74E-02	2.19E-02	1.26E-02	1.26E-02	12.19	4.94E-04	9.89E-05	12.23
Tractors/Loaders/Backhoes	1,600	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.51	0.42	1.27E-01	5.89E-02	3.40E-02	3.40E-02	32.77	1.33E-03	2.66E-04	32.88
Cement and Mortar Mixers	120	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	1.34E-03	6.20E-04	7.15E-04	7.15E-04	0.35	1.40E-05	2.80E-06	0.35
Pavers	35	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.73E-03	1.96E-03	8.47E-04	8.47E-04	1.09	4.42E-05	8.85E-06	1.09
Rollers	35	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.36E-03	1.09E-03	6.29E-04	6.29E-04	0.61	2.46E-05	4.93E-06	0.61
Tractors/Loaders/Backhoes	35	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.79E-03	1.29E-03	7.43E-04	7.43E-04	0.72	2.91E-05	5.82E-06	0.72
Air Compressors	30	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.49E-03	1.15E-03	6.64E-04	6.64E-04	0.64	2.60E-05	5.20E-06	0.64
																				Total	**1.37**	**7.03**	**0.44**	**0.12**	**0.08**	**0.08**	**175.52**	**7.36E-03**	**1.47E-03**	**176.14**

(a) Equipment usage based on construction schedule

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 2: 4,000 square foot NEW building (BMCD ID: 14)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors[c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1,130	Gasoline	250	200	1130.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.44	6.93	0.22	0.01	0.02	0.02	122.45	5.23E-03	1.05E-03	122.90
Graders	8	Diesel	187	77		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	1.20E-03	6.29E-04	1.81E-04	1.81E-04	0.35	1.42E-05	2.84E-06	0.35
Tractors/Loaders/Backhoes	8	Diesel	97	36		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	6.37E-04	2.94E-04	1.70E-04	1.70E-04	0.16	6.65E-06	1.33E-06	0.16
Concrete/Industrial Saws	16	Diesel	81	59		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.10E-03	9.70E-04	5.59E-04	5.59E-04	0.54	2.19E-05	4.38E-06	0.54
Rubber Tired Dozers	2	Diesel	247	99		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	3.86E-04	2.03E-04	5.84E-05	5.84E-05	0.11	4.57E-06	9.15E-07	0.11
Tractors/Loaders/Backhoes	24	Diesel	97	36		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	1.91E-03	8.83E-04	5.09E-04	5.09E-04	0.49	1.99E-05	3.99E-06	0.49
Cranes	400	Diesel	231	67		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.20	0.14	5.07E-02	2.75E-02	7.92E-03	7.92E-03	15.29	6.20E-04	1.24E-04	15.34
Forklifts	1,200	Diesel	89	18		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.19	0.16	4.74E-02	2.19E-02	1.26E-02	1.26E-02	12.19	4.94E-04	9.89E-05	12.23
Tractors/Loaders/Backhoes	1,600	Diesel	97	36		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.51	0.42	1.27E-01	5.89E-02	3.40E-02	3.40E-02	32.77	1.33E-03	2.66E-04	32.88
Cement and Mortar Mixers	120	Diesel	9	5		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	1.34E-03	6.20E-04	7.15E-04	7.15E-04	0.35	1.40E-05	2.80E-06	0.35
Pavers	35	Diesel	130	55		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.73E-03	1.96E-03	8.47E-04	8.47E-04	1.09	4.42E-05	8.85E-06	1.09
Rollers	35	Diesel	80	30		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.36E-03	1.09E-03	6.29E-04	6.29E-04	0.61	2.46E-05	4.93E-06	0.61
Tractors/Loaders/Backhoes	35	Diesel	97	36		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.79E-03	1.29E-03	7.43E-04	7.43E-04	0.72	2.91E-05	5.82E-06	0.72
Air Compressors	30	Diesel	78	37		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.49E-03	1.15E-03	6.64E-04	6.64E-04	0.64	2.60E-05	5.20E-06	0.64
																				Total	**1.41**	**7.72**	**0.47**	**0.12**	**0.08**	**0.08**	**187.77**	**7.88E-03**	**1.58E-03**	**188.43**

(a) Equipment usage based on construction schedule

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 3: 2,700 sqft NEW Building (BMcD ID: 26)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors[c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1,130	Gasoline	250	200.00	1130.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.44	6.93	0.22	0.01	0.02	0.02	122.45	5.23E-03	1.05E-03	122.90
Graders	10	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.00	1.50E-03	7.86E-04	2.27E-04	2.27E-04	0.44	1.77E-05	3.55E-06	0.44
Tractors/Loaders/Backhoes	10	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	7.96E-04	3.68E-04	2.12E-04	2.12E-04	0.20	8.31E-06	1.66E-06	0.21
Concrete/Industrial Saws	20	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.62E-03	1.21E-03	6.99E-04	6.99E-04	0.67	2.74E-05	5.48E-06	0.68
Rubber Tired Dozers	20	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.86E-03	2.03E-03	5.84E-04	5.84E-04	1.13	4.57E-05	9.15E-06	1.13
Tractors/Loaders/Backhoes	40	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.18E-03	1.47E-03	8.49E-04	8.49E-04	0.82	3.32E-05	6.65E-06	0.82
Cranes	1,000	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.51	0.35	1.27E-01	6.87E-02	1.98E-02	1.98E-02	38.23	1.55E-03	3.10E-04	38.36
Forklifts	2,000	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.32	0.26	7.89E-02	3.65E-02	2.10E-02	2.10E-02	20.32	8.24E-04	1.65E-04	20.39
Tractors/Loaders/Backhoes	2,000	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.64	0.53	1.59E-01	7.36E-02	4.24E-02	4.24E-02	40.96	1.66E-03	3.32E-04	41.10
Cement and Mortar Mixers	200	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.24E-03	1.03E-03	1.19E-03	1.19E-03	0.58	2.33E-05	4.67E-06	0.58
Pavers	50	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	5.33E-03	2.80E-03	1.21E-03	1.21E-03	1.56	6.32E-05	1.26E-05	1.56
Rollers	50	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.37E-03	1.56E-03	8.99E-04	8.99E-04	0.87	3.52E-05	7.04E-06	0.87
Tractors/Loaders/Backhoes	50	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.98E-03	1.84E-03	1.06E-03	1.06E-03	1.02	4.15E-05	8.31E-06	1.03
Air Compressors	50	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	4.15E-03	1.92E-03	1.11E-03	1.11E-03	1.07	4.33E-05	8.67E-06	1.07
																				Total	**2.02**	**8.18**	**0.62**	**0.20**	**0.11**	**0.11**	**230.32**	**9.61E-03**	**1.92E-03**	**231.13**

(a) Equipment usage based on construction schedule

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Letterkenny Ammunitions Center (LEMC)
Criteria & GHG Pollutant Emissions - Construction Equipment

Table 4: 2,400 sqft NEW Building (BMCD ID: 19)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors [c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1,130	Gasoline	250	200.00	1130.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.44	6.93	0.22	0.01	0.02	0.02	122.45	5.23E-03	1.05E-03	122.90
Graders	10	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.00	1.50E-03	7.86E-04	2.27E-04	2.27E-04	0.44	1.77E-05	3.55E-06	0.44
Tractors/Loaders/Backhoes	10	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	7.96E-04	3.68E-04	2.12E-04	2.12E-04	0.20	8.31E-06	1.66E-06	0.21
Concrete/Industrial Saws	20	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.62E-03	1.21E-03	6.99E-04	6.99E-04	0.67	2.74E-05	5.48E-06	0.68
Rubber Tired Dozers	20	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.86E-03	2.03E-03	5.84E-04	5.84E-04	1.13	4.57E-05	9.15E-06	1.13
Tractors/Loaders/Backhoes	40	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.18E-03	1.47E-03	8.49E-04	8.49E-04	0.82	3.32E-05	6.65E-06	0.82
Cranes	1,000	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.51	0.35	1.27E-01	6.87E-02	1.98E-02	1.98E-02	38.23	1.55E-03	3.10E-04	38.36
Forklifts	2,000	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.32	0.26	7.89E-02	3.65E-02	2.10E-02	2.10E-02	20.32	8.24E-04	1.65E-04	20.39
Tractors/Loaders/Backhoes	2,000	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.64	0.53	1.59E-01	7.36E-02	4.24E-02	4.24E-02	40.96	1.66E-03	3.32E-04	41.10
Cement and Mortar Mixers	200	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.24E-03	1.03E-03	1.19E-03	1.19E-03	0.58	2.33E-05	4.67E-06	0.58
Pavers	50	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	5.33E-03	2.80E-03	1.21E-03	1.21E-03	1.56	6.32E-05	1.26E-05	1.56
Rollers	50	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.37E-03	1.56E-03	8.99E-04	8.99E-04	0.87	3.52E-05	7.04E-06	0.87
Tractors/Loaders/Backhoes	50	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.98E-03	1.84E-03	1.06E-03	1.06E-03	1.02	4.15E-05	8.31E-06	1.03
Air Compressors	50	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	4.15E-03	1.92E-03	1.11E-03	1.11E-03	1.07	4.33E-05	8.67E-06	1.07
																				Total	**2.02**	**8.18**	**0.62**	**0.20**	**0.11**	**0.11**	**230.32**	**9.61E-03**	**1.92E-03**	**231.13**

(a) Equipment usage based on construction schedule

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 5: 100 Space PARKING LOT (BMCD ID: 7)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors [c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	130	Gasoline	250	200.00	130.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.01	0.09	0.00	0.00	0.00	0.00	14.09	6.02E-04	1.20E-04	14.14
Graders	10	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.00	1.50E-03	7.86E-04	2.27E-04	2.27E-04	0.44	1.77E-05	3.55E-06	0.44
Tractors/Loaders/Backhoes	10	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	7.96E-04	3.68E-04	2.12E-04	2.12E-04	0.20	8.31E-06	1.66E-06	0.21
Concrete/Industrial Saws	20	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.62E-03	1.21E-03	6.99E-04	6.99E-04	0.67	2.74E-05	5.48E-06	0.68
Rubber Tired Dozers	20	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.86E-03	2.03E-03	5.84E-04	5.84E-04	1.13	4.57E-05	9.15E-06	1.13
Tractors/Loaders/Backhoes	40	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.18E-03	1.47E-03	8.49E-04	8.49E-04	0.82	3.32E-05	6.65E-06	0.82
Cement and Mortar Mixers	200	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.24E-03	1.03E-03	1.19E-03	1.19E-03	0.58	2.33E-05	4.67E-06	0.58
Pavers	50	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	5.33E-03	2.80E-03	1.21E-03	1.21E-03	1.56	6.32E-05	1.26E-05	1.56
Rollers	50	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.37E-03	1.56E-03	8.99E-04	8.99E-04	0.87	3.52E-05	7.04E-06	0.87
Tractors/Loaders/Backhoes	50	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.98E-03	1.84E-03	1.06E-03	1.06E-03	1.02	4.15E-05	8.31E-06	1.03
Air Compressors	50	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	4.15E-03	1.92E-03	1.11E-03	1.11E-03	1.07	4.33E-05	8.67E-06	1.07
																				Total	**0.13**	**0.20**	**0.03**	**0.02**	**0.01**	**0.01**	**22.44**	**9.41E-04**	**1.88E-04**	**22.52**

(a) Equipment usage based on construction schedule

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 6: 1,750 sqft NEW Building (BMCD ID: 10, 12)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors [c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1,130	Gasoline	250	200.00	1130.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.44	6.93	0.22	0.01	0.02	0.02	122.45	5.23E-03	1.05E-03	122.90
Graders	10	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.00	1.50E-03	7.86E-04	2.27E-04	2.27E-04	0.44	1.77E-05	3.55E-06	0.44
Tractors/Loaders/Backhoes	10	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	7.96E-04	3.68E-04	2.12E-04	2.12E-04	0.20	8.31E-06	1.66E-06	0.21
Concrete/Industrial Saws	20	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.62E-03	1.21E-03	6.99E-04	6.99E-04	0.67	2.74E-05	5.48E-06	0.68
Rubber Tired Dozers	20	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.86E-03	2.03E-03	5.84E-04	5.84E-04	1.13	4.57E-05	9.15E-06	1.13
Tractors/Loaders/Backhoes	40	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.18E-03	1.47E-03	8.49E-04	8.49E-04	0.82	3.32E-05	6.65E-06	0.82
Cranes	1,000	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.51	0.35	1.27E-01	6.87E-02	1.98E-02	1.98E-02	38.23	1.55E-03	3.10E-04	38.36
Forklifts	2,000	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.32	0.26	7.89E-02	3.65E-02	2.10E-02	2.10E-02	20.32	8.24E-04	1.65E-04	20.39
Tractors/Loaders/Backhoes	2,000	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.64	0.53	1.59E-01	7.36E-02	4.24E-02	4.24E-02	40.96	1.66E-03	3.32E-04	41.10
Cement and Mortar Mixers	200	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.24E-03	1.03E-03	1.19E-03	1.19E-03	0.58	2.33E-05	4.67E-06	0.58
Pavers	50	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	5.33E-03	2.80E-03	1.21E-03	1.21E-03	1.56	6.32E-05	1.26E-05	1.56
Rollers	50	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.37E-03	1.56E-03	8.99E-04	8.99E-04	0.87	3.52E-05	7.04E-06	0.87
Tractors/Loaders/Backhoes	50	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.98E-03	1.84E-03	1.06E-03	1.06E-03	1.02	4.15E-05	8.31E-06	1.03
Air Compressors	50	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	4.15E-03	1.92E-03	1.11E-03	1.11E-03	1.07	4.33E-05	8.67E-06	1.07
																				Total	**2.02**	**8.18**	**0.62**	**0.20**	**0.11**	**0.11**	**230.32**	**9.61E-03**	**1.92E-03**	**231.13**

(a) Equipment usage based on construction schedule

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 7: 5,000 sqft NEW Building (BMCD ID: 40)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors [c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1,130	Gasoline	250	200.00	1130.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.44	6.93	0.22	0.01	0.02	0.02	122.45	5.23E-03	1.05E-03	122.90
Graders	10	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.00	1.50E-03	7.86E-04	2.27E-04	2.27E-04	0.44	1.77E-05	3.55E-06	0.44
Tractors/Loaders/Backhoes	10	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	7.96E-04	3.68E-04	2.12E-04	2.12E-04	0.20	8.31E-06	1.66E-06	0.21
Concrete/Industrial Saws	20	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.62E-03	1.21E-03	6.99E-04	6.99E-04	0.67	2.74E-05	5.48E-06	0.68
Rubber Tired Dozers	20	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.86E-03	2.03E-03	5.84E-04	5.84E-04	1.13	4.57E-05	9.15E-06	1.13
Tractors/Loaders/Backhoes	40	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.18E-03	1.47E-03	8.49E-04	8.49E-04	0.82	3.32E-05	6.65E-06	0.82
Cranes	1,000	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.51	0.35	1.27E-01	6.87E-02	1.98E-02	1.98E-02	38.23	1.55E-03	3.10E-04	38.36
Forklifts	2,000	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.32	0.26	7.89E-02	3.65E-02	2.10E-02	2.10E-02	20.32	8.24E-04	1.65E-04	20.39
Tractors/Loaders/Backhoes	2,000	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.64	0.53	1.59E-01	7.36E-02	4.24E-02	4.24E-02	40.96	1.66E-03	3.32E-04	41.10
Cement and Mortar Mixers	200	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.24E-03	1.03E-03	1.19E-03	1.19E-03	0.58	2.33E-05	4.67E-06	0.58
Pavers	50	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	5.33E-03	2.80E-03	1.21E-03	1.21E-03	1.56	6.32E-05	1.26E-05	1.56
Rollers	50	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.37E-03	1.56E-03	8.99E-04	8.99E-04	0.87	3.52E-05	7.04E-06	0.87
Tractors/Loaders/Backhoes	50	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.98E-03	1.84E-03	1.06E-03	1.06E-03	1.02	4.15E-05	8.31E-06	1.03
Air Compressors	50	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	4.15E-03	1.92E-03	1.11E-03	1.11E-03	1.07	4.33E-05	8.67E-06	1.07
																				Total	**2.02**	**8.18**	**0.62**	**0.20**	**0.11**	**0.11**	**230.32**	**9.61E-03**	**1.92E-03**	**231.13**

(a) Equipment usage based on construction schedule

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Letterkenny Ammunitions Center (LEMC)
Criteria & GHG Pollutant Emissions - Construction Equipment

Table 8: 35,000 sqft NEW Building (BMCD ID: 2)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors [c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1,130	Gasoline	250	200.00	1130.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.44	6.93	0.22	0.01	0.02	0.02	122.45	5.23E-03	1.05E-03	122.90
Graders	10	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.00	1.50E-03	7.86E-04	2.27E-04	2.27E-04	0.44	1.77E-05	3.55E-06	0.44
Tractors/Loaders/Backhoes	10	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	7.96E-04	3.68E-04	2.12E-04	2.12E-04	0.20	8.31E-06	1.66E-06	0.21
Concrete/Industrial Saws	20	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.62E-03	1.21E-03	6.99E-04	6.99E-04	0.67	2.74E-05	5.48E-06	0.68
Rubber Tired Dozers	20	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.86E-03	2.03E-03	5.84E-04	5.84E-04	1.13	4.57E-05	9.15E-06	1.13
Tractors/Loaders/Backhoes	40	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.18E-03	1.47E-03	8.49E-04	8.49E-04	0.82	3.32E-05	6.65E-06	0.82
Cranes	1,000	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.51	0.35	1.27E-01	6.87E-02	1.98E-02	1.98E-02	38.23	1.55E-03	3.10E-04	38.36
Forklifts	2,000	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.32	0.26	7.89E-02	3.65E-02	2.10E-02	2.10E-02	20.32	8.24E-04	1.65E-04	20.39
Tractors/Loaders/Backhoes	2,000	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.64	0.53	1.59E-01	7.36E-02	4.24E-02	4.24E-02	40.96	1.66E-03	3.32E-04	41.10
Cement and Mortar Mixers	200	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.24E-03	1.03E-03	1.19E-03	1.19E-03	0.58	2.33E-05	4.67E-06	0.58
Pavers	50	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	5.33E-03	2.80E-03	1.21E-03	1.21E-03	1.56	6.32E-05	1.26E-05	1.56
Rollers	50	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.37E-03	1.56E-03	8.99E-04	8.99E-04	0.87	3.52E-05	7.04E-06	0.87
Tractors/Loaders/Backhoes	50	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.98E-03	1.84E-03	1.06E-03	1.06E-03	1.02	4.15E-05	8.31E-06	1.03
Air Compressors	50	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	4.15E-03	1.92E-03	1.11E-03	1.11E-03	1.07	4.33E-05	8.67E-06	1.07
																				Total	**2.02**	**8.18**	**0.62**	**0.20**	**0.11**	**0.11**	**230.32**	**9.61E-03**	**1.92E-03**	**231.13**

(a) Equipment usage based on construction schedule

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 9: 45,000 sqft NEW Building (x2 BMCD ID: 1)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors [c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	2,260	Gasoline	250	200.00	2260.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	1.74	27.73	0.89	0.03	0.07	0.07	244.91	1.05E-02	2.09E-03	245.79
Graders	20	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.99E-03	1.57E-03	4.53E-04	4.53E-04	0.88	3.55E-05	7.10E-06	0.88
Scrapers	20	Diesel	367	176.16		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.03	0.02	6.67E-03	3.61E-03	1.04E-03	1.04E-03	2.01	8.16E-05	1.63E-05	2.02
Tractors/Loaders/Backhoes	20	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	1.59E-03	7.36E-04	4.24E-04	4.24E-04	0.41	1.66E-05	3.32E-06	0.41
Graders	40	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	5.98E-03	3.14E-03	9.07E-04	9.07E-04	1.75	7.10E-05	1.42E-05	1.76
Rubber Tired Dozers	40	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.03	0.02	7.71E-03	4.05E-03	1.17E-03	1.17E-03	2.26	9.15E-05	1.83E-05	2.26
Tractors/Loaders/Backhoes	80	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.03	0.02	6.37E-03	2.94E-03	1.70E-03	1.70E-03	1.64	6.65E-05	1.33E-05	1.64
Cranes	2,000	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	1.01	0.69	2.54E-01	1.37E-01	3.96E-02	3.96E-02	76.46	3.10E-03	6.20E-04	76.72
Forklifts	4,000	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.63	0.53	1.58E-01	7.30E-02	4.21E-02	4.21E-02	40.63	1.65E-03	3.30E-04	40.77
Generator Sets	2,000	Diesel	84	62.16		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	1.10	0.92	2.76E-01	1.27E-01	7.35E-02	7.35E-02	70.95	2.88E-03	5.76E-04	71.19
Tractors/Loaders/Backhoes	2,000	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.64	0.53	1.59E-01	7.36E-02	4.24E-02	4.24E-02	40.96	1.66E-03	3.32E-04	41.10
Welders	6,000	Diesel	46	20.70		D50	8.05	7.38	2.01	0.93	0.80	0.80	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	1.10	1.01	2.75E-01	1.27E-01	1.10E-01	1.10E-01	70.88	2.88E-03	5.75E-04	71.12
Cement and Mortar Mixers	100	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.01	1.12E-03	5.17E-04	5.96E-04	5.96E-04	0.29	1.17E-05	2.33E-06	0.29
Pavers	100	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.04	0.04	1.07E-02	5.60E-03	2.42E-03	2.42E-03	3.12	1.26E-04	2.53E-05	3.13
Paving Equipment	100	Diesel	132	47.52		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.04	0.04	9.27E-03	4.87E-03	2.11E-03	2.11E-03	2.71	1.10E-04	2.20E-05	2.72
Rollers	200	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.05	0.04	1.35E-02	6.23E-03	3.60E-03	3.60E-03	3.47	1.41E-04	2.81E-05	3.48
Tractors/Loaders/Backhoes	100	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.03	0.03	7.96E-03	3.68E-03	2.12E-03	2.12E-03	2.05	8.31E-05	1.66E-05	2.06
Air Compressors	100	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.03	0.03	8.30E-03	3.84E-03	2.21E-03	2.21E-03	2.14	8.67E-05	1.73E-05	2.14
																				Total	**6.56**	**31.68**	**2.09**	**0.61**	**0.40**	**0.40**	**567.50**	**2.35E-02**	**4.71E-03**	**569.49**

(a) Equipment usage based on construction schedule

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 10: 82,000 sqft NEW Building (x4) (BMCD ID: 5)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors [c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	2,260	Gasoline	250	200.00	2260.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	1.74	27.73	0.89	0.03	0.07	0.07	244.91	1.05E-02	2.09E-03	245.79
Graders	16	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.39E-03	1.26E-03	3.63E-04	3.63E-04	0.70	2.84E-05	5.68E-06	0.70
Rubber Tired Dozers	14	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.70E-03	1.42E-03	4.09E-04	4.09E-04	0.79	3.20E-05	6.40E-06	0.79
Tractors/Loaders/Backhoes	16	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.00	1.27E-03	5.89E-04	3.40E-04	3.40E-04	0.33	1.33E-05	2.66E-06	0.33
Graders	24	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.59E-03	1.89E-03	5.44E-04	5.44E-04	1.05	4.26E-05	8.52E-06	1.05
Rubber Tired Dozers	24	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	4.63E-03	2.43E-03	7.01E-04	7.01E-04	1.35	5.49E-05	1.10E-05	1.36
Tractors/Loaders/Backhoes	28	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.23E-03	1.03E-03	5.94E-04	5.94E-04	0.57	2.33E-05	4.65E-06	0.58
Cranes	1,200	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.61	0.42	1.52E-01	8.24E-02	2.38E-02	2.38E-02	45.88	1.86E-03	3.72E-04	46.03
Forklifts	1,200	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.19	0.16	4.74E-02	2.19E-02	1.26E-02	1.26E-02	12.19	4.94E-04	9.89E-05	12.23
Generator Sets	1,600	Diesel	84	62.16		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.88	0.74	2.21E-01	1.02E-01	5.88E-02	5.88E-02	56.76	2.30E-03	4.60E-04	56.95
Tractors/Loaders/Backhoes	1,200	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.38	0.32	9.55E-02	4.41E-02	2.55E-02	2.55E-02	24.58	9.97E-04	1.99E-04	24.66
Welders	4,800	Diesel	46	20.70		D50	8.05	7.38	2.01	0.93	0.80	0.80	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.88	0.81	2.20E-01	1.02E-01	8.81E-02	8.81E-02	56.70	2.30E-03	4.60E-04	56.90
Cement and Mortar Mixers	60	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	6.71E-04	3.10E-04	3.58E-04	3.58E-04	0.17	7.00E-06	1.40E-06	0.17
Pavers	60	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.03	0.02	6.39E-03	3.36E-03	1.45E-03	1.45E-03	1.87	7.58E-05	1.52E-05	1.88
Paving Equipment	80	Diesel	132	47.52		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.03	0.03	7.42E-03	3.90E-03	1.69E-03	1.69E-03	2.17	8.80E-05	1.76E-05	2.18
Rollers	70	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	4.72E-03	2.18E-03	1.26E-03	1.26E-03	1.21	4.93E-05	9.85E-06	1.22
Tractors/Loaders/Backhoes	80	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.03	0.02	6.37E-03	2.94E-03	1.70E-03	1.70E-03	1.64	6.65E-05	1.33E-05	1.64
Air Compressors	60	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	4.98E-03	2.30E-03	1.33E-03	1.33E-03	1.28	5.20E-05	1.04E-05	1.29
																				Total	**4.87**	**30.32**	**1.67**	**0.41**	**0.29**	**0.29**	**454.15**	**1.90E-02**	**3.79E-03**	**455.76**

(a) Equipment usage based on construction schedule

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Letterkenny Ammunitions Center (LEMC)
Criteria & GHG Pollutant Emissions - Construction Equipment

Table 11: 1,125,000 sqft NEW Building (BMCD ID: 50)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors[c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	5.750	Gasoline	250	200.00	5750.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	11.27	179.49	5.75	0.20	0.48	0.48	623.10	2.66E-02	5.32E-03	625.36
Rubber Tired Dozers	600	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.46	0.31	1.16E-01	6.08E-02	1.75E-02	1.75E-02	33.83	1.37E-03	2.74E-04	33.95
Tractors/Loaders/Backhoes	800	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.25	0.21	6.37E-02	2.94E-02	1.70E-02	1.70E-02	16.39	6.65E-04	1.33E-04	16.44
Excavators	900	Diesel	158	60.04		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.42	0.40	1.05E-01	5.54E-02	2.40E-02	2.40E-02	30.84	1.25E-03	2.50E-04	30.94
Graders	450	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.27	0.18	6.73E-02	3.54E-02	1.02E-02	1.02E-02	19.69	7.99E-04	1.60E-04	19.76
Rubber Tired Dozers	450	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.35	0.23	8.68E-02	4.56E-02	1.31E-02	1.31E-02	25.37	1.03E-03	2.06E-04	25.46
Scrapers	900	Diesel	367	176.16		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	1.20	0.82	3.00E-01	1.63E-01	4.69E-02	4.69E-02	90.48	3.67E-03	7.34E-04	90.79
Tractors/Loaders/Backhoes	900	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.29	0.24	7.16E-02	3.31E-02	1.91E-02	1.91E-02	18.43	7.48E-04	1.50E-04	18.50
Cranes	4,400	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	2.23	1.53	5.58E-01	3.02E-01	8.71E-02	8.71E-02	168.21	6.82E-03	1.36E-03	168.79
Forklifts	13,200	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	2.08	1.74	5.21E-01	2.41E-01	1.39E-01	1.39E-01	134.09	5.44E-03	1.09E-03	134.55
Generator Sets	4,400	Diesel	84	62.16		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	2.43	2.02	6.06E-01	2.80E-01	1.62E-01	1.62E-01	156.09	6.33E-03	1.27E-03	156.62
Tractors/Loaders/Backhoes	13,200	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	4.20	3.50	1.05E+00	4.86E-01	2.80E-01	2.80E-01	270.36	1.10E-02	2.19E-03	271.29
Welders	4,400	Diesel	46	20.70		D50	8.05	7.38	2.01	0.93	0.80	0.80	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.81	0.74	2.02E-01	9.34E-02	8.08E-02	8.08E-02	51.98	2.11E-03	4.22E-04	52.16
Pavers	700	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.30	0.28	7.46E-02	3.92E-02	1.69E-02	1.69E-02	21.81	8.85E-04	1.77E-04	21.89
Paving Equipment	700	Diesel	132	47.52		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.26	0.25	6.49E-02	3.41E-02	1.48E-02	1.48E-02	18.98	7.70E-04	1.54E-04	19.05
Rollers	700	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.19	0.16	4.72E-02	2.18E-02	1.26E-02	1.26E-02	12.14	4.93E-04	9.85E-05	12.19
Air Compressors	350	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.12	0.10	2.91E-02	1.34E-02	7.75E-03	7.75E-03	7.48	3.03E-04	6.07E-05	7.50
																				Total	**27.12**	**192.19**	**9.72**	**2.13**	**1.43**	**1.43**	**1699.28**	**7.03E-02**	**1.41E-02**	**1705.23**

(a) Equipment usage based on construction schedule

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 12: 2,700 to 22,000 Square foot REPLACEMENT Building (BMCD ID: 39, 41 through 46, 48, 7 total)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors[c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1,130	Gasoline	250	200.00	1130.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.44	6.93	0.22	0.01	0.02	0.02	122.45	5.23E-03	1.05E-03	122.90
Concrete/Industrial Saws	20	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.62E-03	1.21E-03	6.99E-04	6.99E-04	0.67	2.74E-05	5.48E-06	0.68
Rubber Tired Dozers	20	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.86E-03	2.03E-03	5.84E-04	5.84E-04	1.13	4.57E-05	9.15E-06	1.13
Tractors/Loaders/Backhoes	40	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.18E-03	1.47E-03	8.49E-04	8.49E-04	0.82	3.32E-05	6.65E-06	0.82
Graders	1,000	Diesel	231	66.99		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.52	0.35	1.31E-01	6.87E-02	1.98E-02	1.98E-02	38.23	1.55E-03	3.10E-04	38.36
Tractors/Loaders/Backhoes	2,000	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.32	0.26	7.89E-02	3.65E-02	2.10E-02	2.10E-02	20.32	8.24E-04	1.65E-04	20.39
Concrete/Industrial Saws	2,000	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.64	0.53	1.59E-01	7.36E-02	4.24E-02	4.24E-02	40.96	1.66E-03	3.32E-04	41.10
Rubber Tired Dozers	200	Diesel	9	5.04		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	1.97E-03	1.03E-03	2.98E-04	2.98E-04	0.58	2.33E-05	4.67E-06	0.58
Tractors/Loaders/Backhoes	50	Diesel	130	54.60		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	6.05E-03	2.80E-03	1.61E-03	1.61E-03	1.56	6.32E-05	1.26E-05	1.56
Cranes	50	Diesel	80	30.40		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.88E-03	1.56E-03	4.49E-04	4.49E-04	0.87	3.52E-05	7.04E-06	0.87
Forklifts	50	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.98E-03	1.84E-03	1.06E-03	1.06E-03	1.02	4.15E-05	8.31E-06	1.03
Tractors/Loaders/Backhoes	50	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	4.15E-03	1.92E-03	1.11E-03	1.11E-03	1.07	4.33E-05	8.67E-06	1.07
Cement and Mortar Mixers	0	0	0	0.00		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00	0.00
Pavers	0	0	0	0.00		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00	0.00
Rollers	0	0	0	0.00		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00	0.00
Tractors/Loaders/Backhoes	0	0	0	0.00		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00	0.00
Air Compressors	0	0	0	0.00		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00	0.00E+00	0.00E+00	0.00
																				Total	**2.03**	**8.16**	**0.62**	**0.20**	**0.11**	**0.11**	**229.68**	**9.58E-03**	**1.92E-03**	**230.49**

(a) Equipment usage based on construction schedule

(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 13: 0.9 Acre PARKING LOT (BMCD ID: 11)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors[c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	130	Gasoline	250	200.00	130.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.01	0.09	0.00	0.00	0.00	0.00	14.09	6.02E-04	1.20E-04	14.14
Graders	10	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.00	1.50E-03	7.86E-04	2.27E-04	2.27E-04	0.44	1.77E-05	3.55E-06	0.44
Tractors/Loaders/Backhoes	10	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	7.96E-04	3.68E-04	2.12E-04	2.12E-04	0.20	8.31E-06	1.66E-06	0.21
Concrete/Industrial Saws	20	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.62E-03	1.21E-03	6.99E-04	6.99E-04	0.67	2.74E-05	5.48E-06	0.68
Rubber Tired Dozers	20	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.86E-03	2.03E-03	5.84E-04	5.84E-04	1.13	4.57E-05	9.15E-06	1.13
Tractors/Loaders/Backhoes	40	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.18E-03	1.47E-03	8.49E-04	8.49E-04	0.82	3.32E-05	6.65E-06	0.82
Cement and Mortar Mixers	200	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.24E-03	1.03E-03	1.19E-03	1.19E-03	0.58	2.33E-05	4.67E-06	0.58
Pavers	50	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	5.33E-03	2.80E-03	1.21E-03	1.21E-03	1.56	6.32E-05	1.26E-05	1.56
Rollers	50	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.37E-03	1.56E-03	8.99E-04	8.99E-04	0.87	3.52E-05	7.04E-06	0.87
Tractors/Loaders/Backhoes	50	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.98E-03	1.84E-03	1.06E-03	1.06E-03	1.02	4.15E-05	8.31E-06	1.03
Air Compressors	50	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	4.15E-03	1.92E-03	1.11E-03	1.11E-03	1.07	4.33E-05	8.67E-06	1.07
																				Total	**0.13**	**0.20**	**0.03**	**0.02**	**0.01**	**0.01**	**22.44**	**9.41E-04**	**1.88E-04**	**22.52**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Letterkenny Ammunitions Center (LEMC)
Criteria & GHG Pollutant Emissions - Construction Equipment

Table 14: Expand Roadway at Voelz Gate PARKING LOT (BMCD ID: 4)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors [c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	700	Gasoline	250	200.00	700.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.17	2.66	0.09	0.00	0.01	0.01	75.86	3.24E-03	6.48E-04	76.13
Rubber Tired Dozers	300	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.23	0.15	5.78E-02	3.04E-02	8.76E-03	8.76E-03	16.92	6.86E-04	1.37E-04	16.97
Tractors/Loaders/Backhoes	400	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.13	0.11	3.18E-02	1.47E-02	8.49E-03	8.49E-03	8.19	3.32E-04	6.65E-05	8.22
Excavators	400	Diesel	158	60.04		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.19	0.18	4.69E-02	2.46E-02	1.07E-02	1.07E-02	13.71	5.56E-04	1.11E-04	13.75
Graders	200	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.12	0.08	2.99E-02	1.57E-02	4.53E-03	4.53E-03	8.75	3.55E-04	7.10E-05	8.78
Rubber Tired Dozers	200	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/ho-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.15	0.10	3.86E-02	2.03E-02	5.84E-03	5.84E-03	11.28	4.57E-04	9.15E-05	11.32
Scrapers	400	Diesel	367	176.16		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.53	0.36	1.33E-01	7.22E-02	2.08E-02	2.08E-02	40.21	1.63E-03	3.26E-04	40.35
Tractors/Loaders/Backhoes	400	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.13	0.11	3.18E-02	1.47E-02	8.49E-03	8.49E-03	8.19	3.32E-04	6.65E-05	8.22
Pavers	400	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.17	0.16	4.26E-02	2.24E-02	9.69E-03	9.69E-03	12.46	5.06E-04	1.01E-04	12.51
Paving Equipment	400	Diesel	132	47.52		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.15	0.14	3.71E-02	1.95E-02	8.43E-03	8.43E-03	10.85	4.40E-04	8.80E-05	10.88
Rollers	400	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.11	0.09	2.70E-02	1.25E-02	7.19E-03	7.19E-03	6.94	2.81E-04	5.63E-05	6.96
Air Compressors	200	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.07	0.06	1.66E-02	7.68E-03	4.43E-03	4.43E-03	4.27	1.73E-04	3.47E-05	4.29
																				Total	**2.14**	**4.20**	**0.58**	**0.26**	**0.10**	**0.10**	**217.63**	**8.99E-03**	**1.80E-03**	**218.39**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 15:250 square foot New Building (BMCD ID: 16)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors [c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1,017	Gasoline	250	200.00	1130.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.39	6.24	0.20	0.01	0.02	0.02	110.21	4.71E-03	9.42E-04	110.61
Graders	8	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	1.20E-03	6.29E-04	1.81E-04	1.81E-04	0.35	1.42E-05	2.84E-06	0.35
Tractors/Loaders/Backhoes	8	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	6.37E-04	2.94E-04	1.70E-04	1.70E-04	0.16	6.65E-06	1.33E-06	0.16
Concrete/Industrial Saws	16	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.10E-03	9.70E-04	5.59E-04	5.59E-04	0.54	2.19E-05	4.38E-06	0.54
Rubber Tired Dozers	2	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	3.86E-04	2.03E-04	5.84E-05	5.84E-05	0.11	4.57E-06	9.15E-07	0.11
Tractors/Loaders/Backhoes	24	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	1.91E-03	8.83E-04	5.09E-04	5.09E-04	0.49	1.99E-05	3.99E-06	0.49
Cranes	400	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.20	0.14	5.07E-02	2.75E-02	7.92E-03	7.92E-03	15.29	6.20E-04	1.24E-04	15.34
Forklifts	1,200	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.19	0.16	4.74E-02	2.19E-02	1.26E-02	1.26E-02	12.19	4.94E-04	9.89E-05	12.23
Tractors/Loaders/Backhoes	1,600	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.51	0.42	1.27E-01	5.89E-02	3.40E-02	3.40E-02	32.77	1.33E-03	2.66E-04	32.88
Cement and Mortar Mixers	120	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	1.34E-03	6.20E-04	7.15E-04	7.15E-04	0.35	1.40E-05	2.80E-06	0.35
Pavers	35	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/ho-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.73E-03	1.96E-03	8.47E-04	8.47E-04	1.09	4.42E-05	8.85E-06	1.09
Rollers	35	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.36E-03	1.09E-03	6.29E-04	6.29E-04	0.61	2.46E-05	4.93E-06	0.61
Tractors/Loaders/Backhoes	35	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.79E-03	1.29E-03	7.43E-04	7.43E-04	0.72	2.91E-05	5.82E-06	0.72
Air Compressors	30	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.49E-03	1.15E-03	6.64E-04	6.64E-04	0.64	2.60E-05	5.20E-06	0.64
																				Total	**1.37**	**7.03**	**0.44**	**0.12**	**0.08**	**0.08**	**175.52**	**7.36E-03**	**1.47E-03**	**176.14**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 16: 750 square foot UPGRADED Building (BMCD ID: 17)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors [c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1,080	Gasoline	250	200.00	1200.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.44	7.04	0.23	0.01	0.02	0.02	117.04	5.00E-03	1.00E-03	117.46
Concrete/Industrial Saws	80	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.04	0.03	1.05E-02	4.85E-03	2.80E-03	2.80E-03	2.70	1.10E-04	2.19E-05	2.71
Rubber Tired Dozers	10	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	1.93E-03	1.01E-03	2.92E-04	2.92E-04	0.56	2.29E-05	4.57E-06	0.57
Tractors/Loaders/Backhoes	120	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.04	0.03	9.55E-03	4.41E-03	2.55E-03	2.55E-03	2.46	9.97E-05	1.99E-05	2.47
Cranes	400	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.20	0.14	5.07E-02	2.75E-02	7.92E-03	7.92E-03	15.29	6.20E-04	1.24E-04	15.34
Forklifts	1,200	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.19	0.16	4.74E-02	2.19E-02	1.26E-02	1.26E-02	12.19	4.94E-04	9.89E-05	12.23
Tractors/Loaders/Backhoes	1,600	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.51	0.42	1.27E-01	5.89E-02	3.40E-02	3.40E-02	32.77	1.33E-03	2.66E-04	32.88
Cement and Mortar Mixers	120	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	1.34E-03	6.20E-04	7.15E-04	7.15E-04	0.35	1.40E-05	2.80E-06	0.35
Pavers	35	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.73E-03	1.96E-03	8.47E-04	8.47E-04	1.09	4.42E-05	8.85E-06	1.09
Rollers	35	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.36E-03	1.09E-03	6.29E-04	6.29E-04	0.61	2.46E-05	4.93E-06	0.61
Tractors/Loaders/Backhoes	35	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.79E-03	1.29E-03	7.43E-04	7.43E-04	0.72	2.91E-05	5.82E-06	0.72
Air Compressors	30	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.49E-03	1.15E-03	6.64E-04	6.64E-04	0.64	2.60E-05	5.20E-06	0.64
																				Total	**1.48**	**7.88**	**0.49**	**0.13**	**0.08**	**0.08**	**186.41**	**7.81E-03**	**1.56E-03**	**187.07**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 17: 2050 square foot Upgraded Building (x 1004 BMCD ID: 38)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors [c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1,080	Gasoline	250	200.00	1200.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.44	7.04	0.23	0.01	0.02	0.02	117.04	5.00E-03	1.00E-03	117.46
Graders	80	Diesel	81	59.13		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.04	0.02	9.23E-03	4.85E-03	1.40E-03	1.40E-03	2.70	1.10E-04	2.19E-05	2.71
Tractors/Loaders/Backhoes	10	Diesel	247	98.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.19E-03	1.01E-03	5.84E-04	5.84E-04	0.56	2.29E-05	4.57E-06	0.57
Tractors/Loaders/Backhoes	120	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.04	0.03	9.55E-03	4.41E-03	2.55E-03	2.55E-03	2.46	9.97E-05	1.99E-05	2.47
Cranes	400	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.20	0.14	5.07E-02	2.75E-02	7.92E-03	7.92E-03	15.29	6.20E-04	1.24E-04	15.34
Forklifts	1,200	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.19	0.16	4.74E-02	2.19E-02	1.26E-02	1.26E-02	12.19	4.94E-04	9.89E-05	12.23
Tractors/Loaders/Backhoes	1,600	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.51	0.42	1.27E-01	5.89E-02	3.40E-02	3.40E-02	32.77	1.33E-03	2.66E-04	32.88
Cement and Mortar Mixers	120	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	1.34E-03	6.20E-04	7.15E-04	7.15E-04	0.35	1.40E-05	2.80E-06	0.35
Pavers	35	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.73E-03	1.96E-03	8.47E-04	8.47E-04	1.09	4.42E-05	8.85E-06	1.09
Rollers	35	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.36E-03	1.09E-03	6.29E-04	6.29E-04	0.61	2.46E-05	4.93E-06	0.61
Tractors/Loaders/Backhoes	35	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.79E-03	1.29E-03	7.43E-04	7.43E-04	0.72	2.91E-05	5.82E-06	0.72
Air Compressors	30	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.49E-03	1.15E-03	6.64E-04	6.64E-04	0.64	2.60E-05	5.20E-06	0.64
																				Total	**1.48**	**7.87**	**0.48**	**0.13**	**0.08**	**0.08**	**186.41**	**7.81E-03**	**1.56E-03**	**187.07**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Letterkenny Ammunitions Center (LEMC)
Criteria & GHG Pollutant Emissions - Construction Equipment

Table 18: 4400 square foot Upgraded Building (BMCD ID: 28)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors[c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1,080	Gasoline	250	200.00	1200.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.44	7.04	0.23	0.01	0.02	0.02	117.04	5.00E-03	1.00E-03	117.46
Graders	80	Diesel	81	59.13		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.04	0.02	9.23E-03	4.85E-03	1.40E-03	1.40E-03	2.70	1.10E-04	2.19E-05	2.71
Tractors/Loaders/Backhoes	10	Diesel	247	98.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.19E-03	1.01E-03	5.84E-04	5.84E-04	0.56	2.29E-05	4.57E-06	0.57
Tractors/Loaders/Backhoes	120	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.04	0.03	9.55E-03	4.41E-03	2.55E-03	2.55E-03	2.46	9.97E-05	1.99E-05	2.47
Cranes	400	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.20	0.14	5.07E-02	2.75E-02	7.92E-03	7.92E-03	15.29	6.20E-04	1.24E-04	15.34
Forklifts	1,200	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/ho-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.19	0.16	4.74E-02	2.19E-02	1.26E-02	1.26E-02	12.19	4.94E-04	9.89E-05	12.23
Tractors/Loaders/Backhoes	1,600	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.51	0.42	1.27E-01	5.89E-02	3.40E-02	3.40E-02	32.77	1.33E-03	2.66E-04	32.88
Cement and Mortar Mixers	120	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	1.34E-03	6.20E-04	7.15E-04	7.15E-04	0.35	1.40E-05	2.80E-06	0.35
Pavers	35	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.73E-03	1.96E-03	8.47E-04	8.47E-04	1.09	4.42E-05	8.85E-06	1.09
Rollers	35	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.36E-03	1.09E-03	6.29E-04	6.29E-04	0.61	2.46E-05	4.93E-06	0.61
Tractors/Loaders/Backhoes	35	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.79E-03	1.29E-03	7.43E-04	7.43E-04	0.72	2.91E-05	5.82E-06	0.72
Air Compressors	30	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.49E-03	1.15E-03	6.64E-04	6.64E-04	0.64	2.60E-05	5.20E-06	0.64
																				Total	**1.48**	**7.87**	**0.48**	**0.13**	**0.08**	**0.08**	**186.41**	**7.81E-03**	**1.56E-03**	**187.07**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 19: 5878 square foot Upgraded Building (BMCD ID: 34 and 37)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors[c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1,080	Gasoline	250	200.00	1200.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.44	7.04	0.23	0.01	0.02	0.02	117.04	5.00E-03	1.00E-03	117.46
Graders	80	Diesel	81	59.13		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.04	0.02	9.23E-03	4.85E-03	1.40E-03	1.40E-03	2.70	1.10E-04	2.19E-05	2.71
Tractors/Loaders/Backhoes	10	Diesel	247	98.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/ho-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.19E-03	1.01E-03	5.84E-04	5.84E-04	0.56	2.29E-05	4.57E-06	0.57
Tractors/Loaders/Backhoes	120	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.04	0.03	9.55E-03	4.41E-03	2.55E-03	2.55E-03	2.46	9.97E-05	1.99E-05	2.47
Cranes	400	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.20	0.14	5.07E-02	2.75E-02	7.92E-03	7.92E-03	15.29	6.20E-04	1.24E-04	15.34
Forklifts	1,200	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/ho-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.19	0.16	4.74E-02	2.19E-02	1.26E-02	1.26E-02	12.19	4.94E-04	9.89E-05	12.23
Tractors/Loaders/Backhoes	1,600	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/ho-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.51	0.42	1.27E-01	5.89E-02	3.40E-02	3.40E-02	32.77	1.33E-03	2.66E-04	32.88
Cement and Mortar Mixers	120	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/ho-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	1.34E-03	6.20E-04	7.15E-04	7.15E-04	0.35	1.40E-05	2.80E-06	0.35
Pavers	35	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.73E-03	1.96E-03	8.47E-04	8.47E-04	1.09	4.42E-05	8.85E-06	1.09
Rollers	35	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.36E-03	1.09E-03	6.29E-04	6.29E-04	0.61	2.46E-05	4.93E-06	0.61
Tractors/Loaders/Backhoes	35	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.79E-03	1.29E-03	7.43E-04	7.43E-04	0.72	2.91E-05	5.82E-06	0.72
Air Compressors	30	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.49E-03	1.15E-03	6.64E-04	6.64E-04	0.64	2.60E-05	5.20E-06	0.64
																				Total	**1.48**	**7.87**	**0.48**	**0.13**	**0.08**	**0.08**	**186.41**	**7.81E-03**	**1.56E-03**	**187.07**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 20: 12,000 square foot Upgraded Building (BMCD ID: 30 and 35)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors[c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1,080	Gasoline	250	200.00	1200.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.44	7.04	0.23	0.01	0.02	0.02	117.04	5.00E-03	1.00E-03	117.46
Graders	80	Diesel	81	59.13		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.04	0.02	9.23E-03	4.85E-03	1.40E-03	1.40E-03	2.70	1.10E-04	2.19E-05	2.71
Tractors/Loaders/Backhoes	10	Diesel	247	98.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/ho-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.19E-03	1.01E-03	5.84E-04	5.84E-04	0.56	2.29E-05	4.57E-06	0.57
Tractors/Loaders/Backhoes	120	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.04	0.03	9.55E-03	4.41E-03	2.55E-03	2.55E-03	2.46	9.97E-05	1.99E-05	2.47
Cranes	400	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.20	0.14	5.07E-02	2.75E-02	7.92E-03	7.92E-03	15.29	6.20E-04	1.24E-04	15.34
Forklifts	1,200	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/ho-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.19	0.16	4.74E-02	2.19E-02	1.26E-02	1.26E-02	12.19	4.94E-04	9.89E-05	12.23
Tractors/Loaders/Backhoes	1,600	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/ho-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.51	0.42	1.27E-01	5.89E-02	3.40E-02	3.40E-02	32.77	1.33E-03	2.66E-04	32.88
Cement and Mortar Mixers	120	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/ho-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	1.34E-03	6.20E-04	7.15E-04	7.15E-04	0.35	1.40E-05	2.80E-06	0.35
Pavers	35	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.73E-03	1.96E-03	8.47E-04	8.47E-04	1.09	4.42E-05	8.85E-06	1.09
Rollers	35	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.36E-03	1.09E-03	6.29E-04	6.29E-04	0.61	2.46E-05	4.93E-06	0.61
Tractors/Loaders/Backhoes	35	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.79E-03	1.29E-03	7.43E-04	7.43E-04	0.72	2.91E-05	5.82E-06	0.72
Air Compressors	30	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.49E-03	1.15E-03	6.64E-04	6.64E-04	0.64	2.60E-05	5.20E-06	0.64
																				Total	**1.48**	**7.87**	**0.48**	**0.13**	**0.08**	**0.08**	**186.41**	**7.81E-03**	**1.56E-03**	**187.07**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 21: 35,000 square foot REPLACEMENT Building (BMCD ID: 47)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors[c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1,130	Gasoline	250	200.00	1130.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.44	6.93	0.22	0.01	0.02	0.02	122.45	5.23E-03	1.05E-03	122.90
Concrete/Industrial Saws	100	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.05	0.04	1.31E-02	6.06E-03	3.50E-03	3.50E-03	3.37	1.37E-04	2.74E-05	3.39
Rubber Tired Dozers	100	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.08	0.05	1.93E-02	1.01E-02	2.92E-03	2.92E-03	5.64	2.29E-04	4.57E-05	5.66
Tractors/Loaders/Backhoes	200	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.06	0.05	1.59E-02	7.36E-03	4.24E-03	4.24E-03	4.10	1.66E-04	3.32E-05	4.11
Graders	10	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.00	1.50E-03	7.86E-04	2.27E-04	2.27E-04	0.44	1.77E-05	3.55E-06	0.44
Tractors/Loaders/Backhoes	10	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	7.96E-04	3.68E-04	2.12E-04	2.12E-04	0.20	8.31E-06	1.66E-06	0.21
Concrete/Industrial Saws	20	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.62E-03	1.21E-03	6.99E-04	6.99E-04	0.67	2.74E-05	5.48E-06	0.68
Rubber Tired Dozers	20	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.86E-03	2.03E-03	5.84E-04	5.84E-04	1.13	4.57E-05	9.15E-06	1.13
Tractors/Loaders/Backhoes	40	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.18E-03	1.47E-03	8.49E-04	8.49E-04	0.82	3.32E-05	6.65E-06	0.82
Cranes	1,000	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.51	0.35	1.27E-01	6.87E-02	1.98E-02	1.98E-02	38.23	1.55E-03	3.10E-04	38.36
Forklifts	2,000	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.32	0.26	7.89E-02	3.65E-02	2.10E-02	2.10E-02	20.32	8.24E-04	1.65E-04	20.39
Tractors/Loaders/Backhoes	2,000	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.64	0.53	1.59E-01	7.36E-02	4.24E-02	4.24E-02	40.96	1.66E-03	3.32E-04	41.10
Cement and Mortar Mixers	200	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.24E-03	1.03E-03	1.19E-03	1.19E-03	0.58	2.33E-05	4.67E-06	0.58
Pavers	50	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	5.33E-03	2.80E-03	1.21E-03	1.21E-03	1.56	6.32E-05	1.26E-05	1.56
Rollers	50	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.37E-03	1.56E-03	8.99E-04	8.99E-04	0.87	3.52E-05	7.04E-06	0.87
Tractors/Loaders/Backhoes	50	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.98E-03	1.84E-03	1.06E-03	1.06E-03	1.02	4.15E-05	8.31E-06	1.03
Air Compressors	50	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	4.15E-03	1.92E-03	1.11E-03	1.11E-03	1.07	4.33E-05	8.67E-06	1.07
																				Total	**2.21**	**8.33**	**0.67**	**0.22**	**0.12**	**0.12**	**243.43**	**1.01E-02**	**2.03E-03**	**244.29**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Letterkenny Ammunitions Center (LEMC)
Criteria & GHG Pollutant Emissions - Construction Equipment

Table 22: 10 Acre New Security Post Parking lot (BMCD ID: 25a)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors [c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	234	Gasoline	250	200.00	260.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.02	0.33	0.01	0.00	0.00	0.00	25.36	1.08E-03	2.17E-04	25.45
Graders	16	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.39E-03	1.26E-03	3.63E-04	3.63E-04	0.70	2.84E-05	5.68E-06	0.70
Rubber Tired Dozers	14	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.70E-03	1.42E-03	4.09E-04	4.09E-04	0.79	3.20E-05	6.40E-06	0.79
Tractors/Loaders/Backhoes	16	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.00	1.27E-03	5.89E-04	3.40E-04	3.40E-04	0.33	1.33E-05	2.66E-06	0.33
Concrete/Industrial Saws	24	Diesel	187	76.67		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	4.08E-03	1.89E-03	1.09E-03	1.09E-03	1.05	4.26E-05	8.52E-06	1.05
Rubber Tired Dozers	24	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	4.63E-03	2.43E-03	7.01E-04	7.01E-04	1.35	5.49E-05	1.10E-05	1.36
Tractors/Loaders/Backhoes	28	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.23E-03	1.03E-03	5.94E-04	5.94E-04	0.57	2.33E-05	4.65E-06	0.58
Cement and Mortar Mixers	60	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	6.71E-04	3.10E-04	3.58E-04	3.58E-04	0.17	7.00E-06	1.40E-06	0.17
Pavers	60	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.03	0.02	6.39E-03	3.36E-03	1.45E-03	1.45E-03	1.87	7.58E-05	1.52E-05	1.88
Paving Equipment	80	Diesel	132	47.52		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.03	0.03	7.42E-03	3.90E-03	1.69E-03	1.69E-03	2.17	8.80E-05	1.76E-05	2.18
Rollers	70	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	4.72E-03	2.18E-03	1.26E-03	1.26E-03	1.21	4.93E-05	9.85E-06	1.22
Tractors/Loaders/Backhoes	80	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.03	0.02	6.37E-03	2.94E-03	1.70E-03	1.70E-03	1.64	6.65E-05	1.33E-05	1.64
Air Compressors	60	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	4.98E-03	2.30E-03	1.33E-03	1.33E-03	1.28	5.20E-05	1.04E-05	1.29
																				Total	**0.21**	**0.49**	**0.06**	**0.02**	**0.01**	**0.01**	**38.50**	**1.62E-03**	**3.23E-04**	**38.64**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 23: 100,000 square foot PARKING LOT (BMCD ID: 22)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors [c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	700	Gasoline	250	200.00	700.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.17	2.66	0.09	0.00	0.01	0.01	75.86	3.24E-03	6.48E-04	76.13
Rubber Tired Dozers	240	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.19	0.12	4.63E-02	2.43E-02	7.01E-03	7.01E-03	13.53	5.49E-04	1.10E-04	13.58
Tractors/Loaders/Backhoes	320	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.10	0.08	2.55E-02	1.18E-02	6.79E-03	6.79E-03	6.55	2.66E-04	5.32E-05	6.58
Excavators	320	Diesel	158	60.04		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.15	0.14	3.75E-02	1.97E-02	8.52E-03	8.52E-03	10.96	4.45E-04	8.89E-05	11.00
Graders	160	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.10	0.06	2.39E-02	1.26E-02	3.63E-03	3.63E-03	7.00	2.84E-04	5.68E-05	7.02
Rubber Tired Dozers	160	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.12	0.08	3.08E-02	1.62E-02	4.67E-03	4.67E-03	9.02	3.66E-04	7.32E-05	9.05
Scrapers	320	Diesel	367	176.16		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.43	0.29	1.07E-01	5.78E-02	1.67E-02	1.67E-02	32.17	1.30E-03	2.61E-04	32.28
Tractors/Loaders/Backhoes	320	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.10	0.08	2.55E-02	1.18E-02	6.79E-03	6.79E-03	6.55	2.66E-04	5.32E-05	6.58
Pavers	320	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.14	0.13	3.41E-02	1.79E-02	7.75E-03	7.75E-03	9.97	4.04E-04	8.09E-05	10.01
Paving Equipment	320	Diesel	132	47.52		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.12	0.11	2.97E-02	1.56E-02	6.74E-03	6.74E-03	8.68	3.52E-04	7.04E-05	8.71
Rollers	320	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.09	0.07	2.16E-02	9.97E-03	5.75E-03	5.75E-03	5.55	2.25E-04	4.50E-05	5.57
Air Compressors	120	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.04	0.03	9.96E-03	4.61E-03	2.66E-03	2.66E-03	2.56	1.04E-04	2.08E-05	2.57
																				Total	**1.73**	**3.88**	**0.48**	**0.21**	**0.08**	**0.08**	**188.42**	**7.81E-03**	**1.56E-03**	**189.08**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 24: 3 miles of electric upgrades (BMCD ID: 20)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors [c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	140	Gasoline	250	200.00	140.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.01	0.11	0.00	0.00	0.00	0.00	15.17	6.48E-04	1.30E-04	15.23
55' Bucket 4x4	112	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.07	0.04	1.68E-02	8.80E-03	2.54E-03	2.54E-03	4.90	1.99E-04	3.98E-05	4.92
Dinger	112	Diesel	367	176.16		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.15	0.10	3.73E-02	2.02E-02	5.83E-03	5.83E-03	11.26	4.57E-04	9.13E-05	11.30
																				Total	**0.22**	**0.25**	**0.06**	**0.03**	**0.01**	**0.01**	**31.33**	**1.30E-03**	**2.61E-04**	**31.44**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 25: 22 miles of RAIL network (BMCD ID: 3)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors [c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	5,050	Gasoline	250	200.00	5050.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	8.69	138.45	4.44	0.15	0.37	0.37	547.25	2.34E-02	4.68E-03	549.23
Demolition	240	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.13	0.10	3.15E-02	1.45E-02	8.39E-03	8.39E-03	8.10	3.29E-04	6.57E-05	8.13
Demolition	720	Diesel	158	60.04		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.34	0.32	8.44E-02	4.43E-02	1.92E-02	1.92E-02	24.67	1.00E-03	2.00E-04	24.75
Demolition	480	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.37	0.25	9.25E-02	4.86E-02	1.40E-02	1.40E-02	27.06	1.10E-03	2.20E-04	27.16
Rubber Tired Dozers	480	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.37	0.25	9.25E-02	4.86E-02	1.40E-02	1.40E-02	27.06	1.10E-03	2.20E-04	27.16
Tractors/Loaders/Backhoes	640	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.20	0.17	5.09E-02	2.35E-02	1.36E-02	1.36E-02	13.11	5.32E-04	1.06E-04	13.15
Excavators	720	Diesel	158	60.04		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.34	0.32	8.44E-02	4.43E-02	1.92E-02	1.92E-02	24.67	1.00E-03	2.00E-04	24.75
Graders	360	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.22	0.14	5.39E-02	2.83E-02	8.16E-03	8.16E-03	15.75	6.39E-04	1.28E-04	15.81
Rubber Tired Dozers	360	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.28	0.18	6.94E-02	3.65E-02	1.05E-02	1.05E-02	20.30	8.23E-04	1.65E-04	20.37
Scrapers	720	Diesel	367	176.16		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.96	0.66	2.40E-01	1.30E-01	3.75E-02	3.75E-02	72.38	2.94E-03	5.87E-04	72.63
Tractors/Loaders/Backhoes	720	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.23	0.19	5.73E-02	2.65E-02	1.53E-02	1.53E-02	14.75	5.98E-04	1.20E-04	14.80
Cranes	3,080	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	1.56	1.07	3.90E-01	2.11E-01	6.10E-02	6.10E-02	117.75	4.78E-03	9.55E-04	118.15
Forklifts	10,560	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	1.67	1.39	4.17E-01	1.93E-01	1.11E-01	1.11E-01	107.27	4.35E-03	8.70E-04	107.64
Generator Sets	3,520	Diesel	84	62.16		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	1.94	1.62	4.85E-01	2.24E-01	1.29E-01	1.29E-01	124.87	5.06E-03	1.01E-03	125.30
Tractors/Loaders/Backhoes	9,240	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	2.94	2.45	7.35E-01	3.40E-01	1.96E-01	1.96E-01	189.25	7.68E-03	1.54E-03	189.90
Welders	3,520	Diesel	46	20.70		D50	8.05	7.38	2.01	0.93	0.80	0.80	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.65	0.59	1.62E-01	7.47E-02	6.46E-02	6.46E-02	41.58	1.69E-03	3.37E-04	41.73
																				Total	**20.87**	**148.15**	**7.48**	**1.64**	**1.09**	**1.09**	**1375.83**	**5.70E-02**	**1.14E-02**	**1380.65**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Letterkenny Ammunitions Center (LEMC)
Criteria & GHG Pollutant Emissions - Construction Equipment

Table 26: 10 acre RAIL classification yard (BMCD ID: 6)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors[c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	3.000	Gasoline	250	200.00	3000.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	3.07	48.86	1.57	0.05	0.13	0.13	325.10	1.39E-02	2.78E-03	326.27
Rubber Tired Dozers	240	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.19	0.12	4.63E-02	2.43E-02	7.01E-03	7.01E-03	13.53	5.49E-04	1.10E-04	13.58
Tractors/Loaders/Backhoes	320	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.10	0.08	2.55E-02	1.18E-02	6.79E-03	6.79E-03	6.55	2.66E-04	5.32E-05	6.58
Excavators	320	Diesel	158	60.04		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.15	0.14	3.75E-02	1.97E-02	8.52E-03	8.52E-03	10.96	4.45E-04	8.89E-05	11.00
Graders	160	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.10	0.06	2.39E-02	1.26E-02	3.63E-03	3.63E-03	7.00	2.84E-04	5.68E-05	7.02
Rubber Tired Dozers	160	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.12	0.08	3.08E-02	1.62E-02	4.67E-03	4.67E-03	9.02	3.66E-04	7.32E-05	9.05
Scrapers	320	Diesel	367	176.16		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.43	0.29	1.07E-01	5.78E-02	1.67E-02	1.67E-02	32.17	1.30E-03	2.61E-04	32.28
Tractors/Loaders/Backhoes	320	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.10	0.08	2.55E-02	1.18E-02	6.79E-03	6.79E-03	6.55	2.66E-04	5.32E-05	6.58
Cranes	1,610	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.82	0.56	2.04E-01	1.11E-01	3.19E-02	3.19E-02	61.55	2.50E-03	4.99E-04	61.76
Forklifts	5,520	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.87	0.73	2.18E-01	1.01E-01	5.81E-02	5.81E-02	56.07	2.27E-03	4.55E-04	56.27
Generator Sets	1,840	Diesel	84	62.16		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	1.01	0.85	2.54E-01	1.17E-01	6.76E-02	6.76E-02	65.27	2.65E-03	5.30E-04	65.50
Tractors/Loaders/Backhoes	4,830	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	1.54	1.28	3.84E-01	1.78E-01	1.02E-01	1.02E-01	98.93	4.01E-03	8.03E-04	99.27
Welders	1,840	Diesel	46	20.70		D50	8.05	7.38	2.01	0.93	0.80	0.80	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.34	0.31	8.45E-02	3.90E-02	3.38E-02	3.38E-02	21.74	8.82E-04	1.76E-04	21.81
Pavers	320	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.14	0.13	3.41E-02	1.79E-02	7.75E-03	7.75E-03	9.97	4.04E-04	8.09E-05	10.01
Paving Equipment	320	Diesel	132	47.52		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.12	0.11	2.97E-02	1.56E-02	6.74E-03	6.74E-03	8.68	3.52E-04	7.04E-05	8.71
Rollers	320	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.09	0.07	2.16E-02	9.97E-03	5.75E-03	5.75E-03	5.55	2.25E-04	4.50E-05	5.57
Air Compressors	120	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.04	0.03	9.96E-03	4.61E-03	2.66E-03	2.66E-03	2.56	1.04E-04	2.08E-05	2.57
																				Total	**9.21**	**53.80**	**3.10**	**0.80**	**0.50**	**0.50**	**741.22**	**3.08E-02**	**6.15E-03**	**743.82**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 27: Restoration of 4 miles of RAIL (BMCD ID: 18)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors[c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	2,780	Gasoline	250	200.00	2780.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	2.63	41.96	1.35	0.05	0.11	0.11	301.26	1.29E-02	2.57E-03	302.35
Concrete/Industrial Saws	160	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.08	0.07	2.10E-02	9.70E-03	5.59E-03	5.59E-03	5.40	2.19E-04	4.38E-05	5.42
Excavators	480	Diesel	158	60.04		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.22	0.21	5.62E-02	2.95E-02	1.28E-02	1.28E-02	16.45	6.67E-04	1.33E-04	16.50
Rubber Tired Dozers	320	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.25	0.16	6.17E-02	3.24E-02	9.35E-03	9.35E-03	18.04	7.32E-04	1.46E-04	18.10
Rubber Tired Dozers	120	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.09	0.06	2.31E-02	1.22E-02	3.51E-03	3.51E-03	6.77	2.74E-04	5.49E-05	6.79
Tractors/Loaders/Backhoes	160	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.05	0.04	1.27E-02	5.89E-03	3.40E-03	3.40E-03	3.28	1.33E-04	2.66E-05	3.29
Excavators	64	Diesel	158	60.04		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.03	0.03	7.50E-03	3.94E-03	1.70E-03	1.70E-03	2.19	8.89E-05	1.78E-05	2.20
Graders	64	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.04	0.03	9.57E-03	5.03E-03	1.45E-03	1.45E-03	2.80	1.14E-04	2.27E-05	2.81
Rubber Tired Dozers	64	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.05	0.03	1.23E-02	6.48E-03	1.87E-03	1.87E-03	3.61	1.46E-04	2.93E-05	3.62
Tractors/Loaders/Backhoes	192	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.06	0.05	1.53E-02	7.06E-03	4.07E-03	4.07E-03	3.93	1.60E-04	3.19E-05	3.95
Cranes	1,610	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.82	0.56	2.04E-01	1.11E-01	3.19E-02	3.19E-02	61.55	2.50E-03	4.99E-04	61.76
Forklifts	5,520	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.87	0.73	2.18E-01	1.01E-01	5.81E-02	5.81E-02	56.07	2.27E-03	4.55E-04	56.27
Generator Sets	1,840	Diesel	84	62.16		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	1.01	0.85	2.54E-01	1.17E-01	6.76E-02	6.76E-02	65.27	2.65E-03	5.30E-04	65.50
Tractors/Loaders/Backhoes	4,830	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	1.54	1.28	3.84E-01	1.78E-01	1.02E-01	1.02E-01	98.93	4.01E-03	8.03E-04	99.27
Welders	1,840	Diesel	46	20.70		D50	8.05	7.38	2.01	0.93	0.80	0.80	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.34	0.31	8.45E-02	3.90E-02	3.38E-02	3.38E-02	21.74	8.82E-04	1.76E-04	21.81
																				Total	**8.09**	**46.36**	**2.71**	**0.70**	**0.45**	**0.45**	**667.29**	**2.77E-02**	**5.54E-03**	**669.63**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 28: Repair 11 miles of asphalt ROADS (BMCD ID: 23)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors[c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1.200	Gasoline	250	200.00	1200.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.49	7.82	0.25	0.01	0.02	0.02	130.04	5.56E-03	1.11E-03	130.51
Concrete/Industrial Saws	240	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.13	0.10	3.15E-02	1.45E-02	8.39E-03	8.39E-03	8.10	3.29E-04	6.57E-05	8.13
Excavators	720	Diesel	158	60.04		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.34	0.32	8.44E-02	4.43E-02	1.92E-02	1.92E-02	24.67	1.00E-03	2.00E-04	24.75
Rubber Tired Dozers	480	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.37	0.25	9.25E-02	4.86E-02	1.40E-02	1.40E-02	27.06	1.10E-03	2.20E-04	27.16
Rubber Tired Dozers	480	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.37	0.25	9.25E-02	4.86E-02	1.40E-02	1.40E-02	27.06	1.10E-03	2.20E-04	27.16
Tractors/Loaders/Backhoes	640	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.20	0.17	5.09E-02	2.35E-02	1.36E-02	1.36E-02	13.11	5.32E-04	1.06E-04	13.15
Pavers	560	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.24	0.23	5.97E-02	3.13E-02	1.36E-02	1.36E-02	17.45	7.08E-04	1.42E-04	17.51
Paving Equipment	560	Diesel	132	47.52		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.21	0.20	5.19E-02	2.73E-02	1.18E-02	1.18E-02	15.19	6.16E-04	1.23E-04	15.24
Rollers	560	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		76.96	3.00E-03	3.00E+00	538.72	2.10E-02	2.10E+01	0.15	0.13	3.77E-02	1.74E-02	1.01E-02	1.01E-02	10.11	3.94E-04	3.94E-01	127.58
Air Compressors	210	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		77.96	3.00E-03	4.00E+00	545.72	2.10E-02	2.80E+01	0.07	0.06	1.74E-02	8.06E-03	4.65E-03	4.65E-03	4.73	1.82E-04	2.43E-01	77.06
																				Total	**2.56**	**9.51**	**0.77**	**0.27**	**0.13**	**0.13**	**277.52**	**1.15E-02**	**0.64**	**468.25**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 29: Repair 1560000 sqft of asphalt ROADS (BMCD ID: 32)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors[c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1.500	Gasoline	250	200.00	1500.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.77	12.21	0.39	0.01	0.03	0.03	162.55	6.94E-03	1.39E-03	163.14
Concrete/Industrial Saws	400	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.21	0.17	5.24E-02	2.42E-02	1.40E-02	1.40E-02	13.50	5.48E-04	1.10E-04	13.54
Excavators	1,200	Diesel	158	60.04		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.56	0.53	1.41E-01	7.38E-02	3.20E-02	3.20E-02	41.12	1.67E-03	3.34E-04	41.26
Rubber Tired Dozers	800	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.62	0.41	1.54E-01	8.10E-02	2.34E-02	2.34E-02	45.11	1.83E-03	3.66E-04	45.26
Rubber Tired Dozers	720	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.56	0.37	1.39E-01	7.29E-02	2.10E-02	2.10E-02	40.60	1.65E-03	3.29E-04	40.74
Tractors/Loaders/Backhoes	960	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.31	0.25	7.64E-02	3.53E-02	2.04E-02	2.04E-02	19.66	7.98E-04	1.60E-04	19.73
Pavers	560	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.24	0.23	5.97E-02	3.13E-02	1.36E-02	1.36E-02	17.45	7.08E-04	1.42E-04	17.51
Paving Equipment	560	Diesel	132	47.52		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.21	0.20	5.19E-02	2.73E-02	1.18E-02	1.18E-02	15.19	6.16E-04	1.23E-04	15.24
Rollers	560	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.15	0.13	3.77E-02	1.74E-02	1.01E-02	1.01E-02	9.72	3.94E-04	7.88E-05	9.75
Air Compressors	210	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.07	0.06	1.74E-02	8.06E-03	4.65E-03	4.65E-03	4.49	1.82E-04	3.64E-05	4.50
																				Total	**3.68**	**14.56**	**1.12**	**0.38**	**0.18**	**0.18**	**369.37**	**1.53E-02**	**3.07E-03**	**370.67**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Letterkenny Ammunitions Center (LEMC)
Criteria & GHG Pollutant Emissions - Construction Equipment

Table 30: New Security Post Buildings (x2) (BMCD ID: 25b)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors[c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	1,130	Gasoline	250	200.00	1130.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	0.44	6.93	0.22	0.01	0.02	0.02	122.45	5.23E-03	1.05E-03	122.90
Graders	10	Diesel	187	76.67		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.00	1.50E-03	7.86E-04	2.27E-04	2.27E-04	0.44	1.77E-05	3.55E-06	0.44
Tractors/Loaders/Backhoes	10	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	7.96E-04	3.68E-04	2.12E-04	2.12E-04	0.20	8.31E-06	1.66E-06	0.21
Concrete/Industrial Saws	20	Diesel	81	59.13		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.62E-03	1.21E-03	6.99E-04	6.99E-04	0.67	2.74E-05	5.48E-06	0.68
Rubber Tired Dozers	20	Diesel	247	98.80		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.86E-03	2.03E-03	5.84E-04	5.84E-04	1.13	4.57E-05	9.15E-06	1.13
Tractors/Loaders/Backhoes	40	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/ho-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.18E-03	1.47E-03	8.49E-04	8.49E-04	0.82	3.32E-05	6.65E-06	0.82
Cranes	1,000	Diesel	231	66.99		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.51	0.35	1.27E-01	6.87E-02	1.98E-02	1.98E-02	38.23	1.55E-03	3.10E-04	38.36
Forklifts	2,000	Diesel	89	17.80		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.32	0.26	7.89E-02	3.65E-02	2.10E-02	2.10E-02	20.32	8.24E-04	1.65E-04	20.39
Tractors/Loaders/Backhoes	2,000	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.64	0.53	1.59E-01	7.36E-02	4.24E-02	4.24E-02	40.96	1.66E-03	3.32E-04	41.10
Cement and Mortar Mixers	200	Diesel	9	5.04		D11	8.05	10.73	2.01	0.93	1.07	1.07	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.24E-03	1.03E-03	1.19E-03	1.19E-03	0.58	2.33E-05	4.67E-06	0.58
Pavers	50	Diesel	130	54.60		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	5.33E-03	2.80E-03	1.21E-03	1.21E-03	1.56	6.32E-05	1.26E-05	1.56
Rollers	50	Diesel	80	30.40		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	3.37E-03	1.56E-03	8.99E-04	8.99E-04	0.87	3.52E-05	7.04E-06	0.87
Tractors/Loaders/Backhoes	50	Diesel	97	35.89		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	3.98E-03	1.84E-03	1.06E-03	1.06E-03	1.02	4.15E-05	8.31E-06	1.03
Air Compressors	50	Diesel	78	37.44		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.01	4.15E-03	1.92E-03	1.11E-03	1.11E-03	1.07	4.33E-05	8.67E-06	1.07
																				Total	**2.02**	**8.18**	**0.62**	**0.20**	**0.11**	**0.11**	**230.32**	**9.61E-03**	**1.92E-03**	**231.13**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Table 31: Upgrade Utility Infrastructure Overall (BMcD ID 9)

Equipment	Equipment Usage (Hours)[a]	Fuel Type	HP each	Effective Loaded Power[b]	Miles/year	Emission Factor Category	Criteria Emission Factors[c]						Units	Criteria Emission Factor Basis	GHG Emission Factors (kg/MMBtu)[d]			GHG Emission Factors (g/hp-hr)[d]			Criteria Emissions (tons per year)						GHG Emissions (tons per year)[e]			
							NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Foreman / Supervisor Truck	6350	Gasoline	250	0.8	6350.00		0.309	4.925	0.158	0.005	0.013	0.013	g/mile	Updated Emission Factors of Air Pollutants from Vehicle Operations in GREET Using MOVES - Table A4 - Model year 2017	70.22	3.00E-03	6.00E-04	491.54	2.10E-02	4.20E-03	13.74	218.91	7.02	0.24	0.59	0.59	2.75	1.18E-04	2.35E-05	2.76
Concrete/Industrial Saws	400	Diesel	81	0.73		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr	40 CFR 89.112, Tier 2	73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	6.47E-04	2.99E-04	1.73E-04	1.73E-04	0.17	6.76E-06	1.35E-06	0.17
Excavators	1200	Diesel	158	0.38		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	8.90E-04	4.67E-04	2.02E-04	2.02E-04	0.26	1.06E-05	2.11E-06	0.26
Rubber Tired Dozers	800	Diesel	247	0.4		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	6.24E-04	3.28E-04	9.46E-05	9.46E-05	0.18	7.41E-06	1.48E-06	0.18
Rubber Tired Dozers	360	Diesel	247	0.4		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	2.81E-04	1.48E-04	4.26E-05	4.26E-05	0.08	3.33E-06	6.67E-07	0.08
Tractors/Loaders/Backhoes	480	Diesel	97	0.37		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	3.94E-04	1.82E-04	1.05E-04	1.05E-04	0.10	4.11E-06	8.22E-07	0.10
Excavators	160	Diesel	158	0.38		D174	7.08	6.71	1.77	0.93	0.40	0.40	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	1.19E-04	6.23E-05	2.70E-05	2.70E-05	0.03	1.41E-06	2.81E-07	0.03
Graders	160	Diesel	187	0.41		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	1.28E-04	6.72E-05	1.94E-05	1.94E-05	0.04	1.52E-06	3.04E-07	0.04
Rubber Tired Dozers	160	Diesel	247	0.4		D302	7.08	4.69	1.77	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	1.25E-04	6.56E-05	1.89E-05	1.89E-05	0.04	1.48E-06	2.96E-07	0.04
Tractors/Loaders/Backhoes	480	Diesel	97	0.37		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.00	0.00	3.94E-04	1.82E-04	1.05E-04	1.05E-04	0.10	4.11E-06	8.22E-07	0.10
Cranes	3850	Diesel	231	0.29		D603	6.87	4.69	1.72	0.93	0.27	0.27	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.01	0.01	2.11E-03	1.14E-03	3.30E-04	3.30E-04	0.64	2.58E-05	5.17E-06	0.64
Forklifts	13200	Diesel	89	0.2		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	5.85E-03	2.71E-03	1.56E-03	1.56E-03	1.51	6.11E-05	1.22E-05	1.51
Generator Sets	4400	Diesel	84	0.74		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.03	0.02	7.22E-03	3.34E-03	1.93E-03	1.93E-03	1.86	7.54E-05	1.51E-05	1.86
Tractors/Loaders/Backhoes	11550	Diesel	97	0.37		D101	8.05	6.71	2.01	0.93	0.54	0.54	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.04	0.03	9.48E-03	4.38E-03	2.53E-03	2.53E-03	2.44	9.89E-05	1.98E-05	2.45
Welders	4400	Diesel	46	0.45		D50	8.05	7.38	2.01	0.93	0.80	0.80	g/hp-hr		73.96	3.00E-03	6.00E-04	517.72	2.10E-02	4.20E-03	0.02	0.02	4.39E-03	2.03E-03	1.76E-03	1.76E-03	1.13	4.58E-05	9.17E-06	1.13
																				Total	**13.87**	**219.02**	**7.05**	**0.26**	**0.60**	**0.60**	**11.33**	**4.65E-04**	**9.31E-05**	**11.37**

(a) Equipment usage based on construction schedule
(b) Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, EPA 2004
(d) Greenhouse gas emissions from 40 CFR 98; conversion of 7000 Btu/hp-hr is assumed
(e) Global warming potentials: CO_2 = 1; CH_4 = 25; N_2O = 298 (Table A-1 to Subpart A of 40 CFR 98)

Letterkenny Ammunitions Center (LEMC)
Emissions from Construction Equipment Travel on Construction Site

Unpaved Roads emission factor from AP-42, Section 13.2.2: *Unpaved Roads* (11/06)

$$E = [k(s/12)^a(W/3)^b]*[(365-P)/365]$$

where:

s =	8.5	surface material silt content (%) [Table 13.2.2-1, Construction sites mean silt content %]
W =	15	tons [Average vehicle weight][a]
k =	1.5	lb/VMT [Table 13.2.2-2, for PM_{10}]
k =	0.15	lb/VMT [Table 13.2.2-2, for $PM_{2.5}$]
a =	0.9	constant [Table 13.2.2-2, for PM_{10} and $PM_{2.5}$]
b =	0.45	constant [Table 13.2.2-2, for PM_{10} and $PM_{2.5}$]
P =	120	days [Average number of days with > 0.01 inches of precipitation for southern Pennsylvania, Figure 13.2.2-1
$E_{(PM10)}$=	1.52	lb/VMT
$E_{(PM2.5)}$=	0.15	lb/VMT

Project	VMT per day[b]	Equipment Days	Total VMT	PM_{10} (tons)	$PM_{2.5}$ (tons)
Table 1: 10,000 Square foot NEW Building (BMCD ID: 8, 13, 15, 21, 24, 27, 29, 31, 33, and 36)	2.00	550	1100.00	0.84	0.08
Table 2: 4,000 square foot NEW building (BMCD ID: 14)	2.00	550	1100.00	0.84	0.08
Table 3: 2,700 sqft NEW Building (BMcD ID: 26)	2.00	550	1100.00	0.84	0.08
Table 4: 2,400 sqft NEW Building (BMCD ID: 19)	2.00	550	1100.00	0.84	0.08
Table 5: 100 Space PARKING LOT (BMCD ID: 7)	2.00	50	100.00	0.08	0.01
Table 6: 1,750 sqft NEW Building (BMCD ID: 10, 12)	2.00	550	1100.00	0.84	0.08
Table 7: 5,000 sqft NEW Building (BMCD ID: 40)	2.00	550	1100.00	0.84	0.08
Table 8: 35,000 sqft NEW Building (BMCD ID: 2)	2.00	550	1100.00	0.84	0.08
Table 9: 45,000 sqft NEW Building (x2 BMCD ID: 1)	2.00	1,692	3384.00	2.58	0.26
Table 10: 82,000 sqft NEW Building (x4) (BMCD ID: 5)	2.00	1,478	2956.00	2.25	0.23
Table 11: 1,125,000 sqft NEW Building (BMCD ID: 50)	2.00	4,705	9410.00	7.17	0.72
Table 12: 2,700 to 22,000 Square foot REPLACEMENT Building (BMCD ID: 39, 41 through 46, 48, 7 total)	2.00	590	1180.00	0.90	0.09
Table 13: 0.9 Acre PARKING LOT (BMCD ID: 11)	2.00	50	100.00	0.08	0.01
Table 14: Expand Roadway at Voelz Gate PARKING LOT (BMCD ID: 4)	2.00	370	740.00	0.56	0.06
Table 15:250 square foot New Building (BMCD ID: 16)	2.00	550	1100.00	0.84	0.08
Table 16: 750 square foot UPGRADED Building (BMCD ID: 17)	2.00	580	1160.00	0.88	0.09
Table 17: 2050 square foot Upgraded Building (x 1004 BMCD ID: 38)	2.00	580	1160.00	0.88	0.09
Table 18: 4400 square foot Upgraded Building (BMCD ID: 28)	2.00	580	1160.00	0.88	0.09
Table 19: 5878 square foot Upgraded Building (BMCD ID: 34 and 37)	2.00	580	1160.00	0.88	0.09
Table 20: 12,000 square foot Upgraded Building (BMCD ID: 30 and 35)	2.00	580	1160.00	0.88	0.09
Table 21: 35,000 square foot REPLACEMENT Building (BMCD ID: 47)	2.00	590	1180.00	0.90	0.09
Table 22: 10 Acre New Security Post Parking lot (BMCD ID: 25a)	2.00	104	208.00	0.16	0.02
Table 23: 100,000 square foot PARKING LOT (BMCD ID: 22)	2.00	370	740.00	0.56	0.06
Table 24: 3 miles of electric upgrades (BMCD ID: 20)	2.00	28	56.00	0.04	0.00
Table 25: 22 miles of RAIL network (BMCD ID: 3)	2.00	4,640	9280.00	7.07	0.71
Table 26: 10 acre RAIL classification yard (BMCD ID: 6)	2.00	2,440	4880.00	3.72	0.37
Table 27: Restoration of 4 miles of RAIL (BMCD ID: 18)	2.00	2,273	4546.00	3.46	0.35
Table 28: Repair 11 miles of asphalt ROADS (BMCD ID: 23)	2.00	565	1130.00	0.86	0.09
Table 29: Repair 1560000 sqft of asphalt ROADS (BMCD ID: 32)	2.00	755	1510.00	1.15	0.11
Table 30: New Security Post Buildings (x2) (BMCD ID: 25b)	2.00	550	1100.00	0.84	0.08
Table 31: Upgrade Utility Infrastructure Overall (BMcD ID 9)	2.00	5,475	10950.00	4.17	0.42
			Total	**41.50**	**4.15**

(a) Average construction equipment weights for the grouping of all construction equipment is projected to be 15 tons.

(b) Vehicle Miles Traveled (VMT) per day is projected to be 2 miles and used as a conservative estimate for construction of each Project

Letterkenny Ammunitions Center (LEMC)
Fugitive Dust Emissions from Earthmoving Activities

Construction Activity	Building Footprint Area[a] (ft2)	Excavation Depth (ft)	Temporary Workspace for Construction (acres)
Table 1: 10,000 Square foot NEW Building (BMCD ID: 8, 13, 15, 21, 24, 27, 29, 31, 33, and 36)	10,000	10	0.46
Table 2: 4,000 square foot NEW building (BMCD ID: 14)	4,000	10	0.18
Table 3: 2,700 sqft NEW Building (BMcD ID: 26)	2,700	10	0.12
Table 4: 2,400 sqft NEW Building (BMCD ID: 19)	2,400	10	0.11
Table 5: 100 Space PARKING LOT (BMCD ID: 7)	43,560	10	2.00
Table 6: 1,750 sqft NEW Building (BMCD ID: 10, 12)	1,750	10	0.08
Table 7: 5,000 sqft NEW Building (BMCD ID: 40)	5,000	10	0.23
Table 8: 35,000 sqft NEW Building (BMCD ID: 2)	35,000	10	1.61
Table 9: 45,000 sqft NEW Building (x2 BMCD ID: 1)	45,000	10	2.07
Table 10: 82,000 sqft NEW Building (x4) (BMCD ID: 5)	82,000	10	3.76
Table 11: 1,125,000 sqft NEW Building (BMCD ID: 50)	1,125,000	10	51.65
Table 13: 0.9 Acre PARKING LOT (BMCD ID: 11)	39,204	10	1.80
Table 14: Expand Roadway at Voelz Gate PARKING LOT (BMCD ID: 4)	43,560	10	2.00
Table 15:250 square foot New Building (BMCD ID: 16)	250	10	0.01
Table 16: 750 square foot UPGRADED Building (BMCD ID: 17)	750	10	0.03
Table 17: 2050 square foot Upgraded Building (x 1004 BMCD ID: 38)	2,050	10	0.09
Table 18: 4400 square foot Upgraded Building (BMCD ID: 28)	4,400	10	0.20
Table 19: 5878 square foot Upgraded Building (BMCD ID: 34 and 37)	5,878	10	0.27
Table 20: 12,000 square foot Upgraded Building (BMCD ID: 30 and 35)	12,000	10	0.55
Table 21: 35,000 square foot REPLACEMENT Building (BMCD ID: 47)	35,000	10	1.61
Table 22: 10 Acre New Security Post Parking lot (BMCD ID: 25a)	43,560	10	2.00
Table 23: 100,000 square foot PARKING LOT (BMCD ID: 22)	10,000	10	0.46
Table 24: 3 miles of electric upgrades (BMCD ID: 20)	60	10	0.00
Table 25: 22 miles of RAIL network (BMCD ID: 3)	1,161,600	2	53.33
Table 26: 10 acre RAIL classification yard (BMCD ID: 6)	211,200	2	9.70
Table 27: Restoration of 4 miles of RAIL (BMCD ID: 18)	1,161,600	2	53.33
Table 28: Repair 11 miles of asphalt ROADS (BMCD ID: 23)	435,600	2	20.00
Table 29: Repair 1560000 sqft of asphalt ROADS (BMCD ID: 32)	1,560,000	2	71.63
Table 30: New Security Post Buildings (x2) (BMCD ID: 25b)	250	10	0.01
Table 31: Upgrade Utility Infrastructure Overall (BMcD ID 9)	1,270,000	6	58.31

Project Construction Activity Particulate Matter Emissions

Construction Activity	Excavation[a] (tons)	Excavation PM_{10} Emission Factor[b] (lb/ton)	Excavation PM_{10} Emissions (tons)	Backfilling[a] (tons)	Backfilling PM_{10} Emission Factor[b] (lb/ton)	Backfilling PM10 Emissions (tpy)	Windblown Dust (ft^2)	PM_{10} Windblown Dust Emission Factor[c,d] (lb/ft^2)	Windblown Dust PM_{10} Emissions - Controlled (tons)	Total Construction Activity PM_{10} emissions (tons)	Total Construction Activity $PM_{2.5}$ emissions[e] (tons)
Table 1: 10,000 Square foot NEW Building (BMCD ID: 8, 13, 15, 21, 24, 27, 29, 31, 33, and 36)	5,000	0.058	0.145	5,000	0.012	0.030	20,000	2.52E-05	2.52E-04	0.175	0.036
Table 2: 4,000 square foot NEW building (BMCD ID: 14)	2,000	0.058	0.058	2,000	0.012	0.012	8,000	2.52E-05	1.01E-04	0.070	0.015
Table 3: 2,700 sqft NEW Building (BMcD ID: 26)	1,350	0.058	0.039	1,350	0.012	0.008	5,400	2.52E-05	6.80E-05	0.047	0.010
Table 4: 2,400 sqft NEW Building (BMCD ID: 19)	1,200	0.058	0.035	1,200	0.012	0.007	4,800	2.52E-05	6.05E-05	0.042	0.009
Table 5: 100 Space PARKING LOT (BMCD ID: 7)	21,780	0.058	0.632	21,780	0.012	0.131	87,120	2.52E-05	1.10E-03	0.763	0.159
Table 6: 1,750 sqft NEW Building (BMCD ID: 10, 12)	875	0.058	0.025	875	0.012	0.005	3,500	2.52E-05	4.41E-05	0.031	0.006
Table 7: 5,000 sqft NEW Building (BMCD ID: 40)	2,500	0.058	0.073	2,500	0.012	0.015	10,000	2.52E-05	1.26E-04	0.088	0.018
Table 8: 35,000 sqft NEW Building (BMCD ID: 2)	17,500	0.058	0.508	17,500	0.012	0.105	70,000	2.52E-05	8.82E-04	0.613	0.128
Table 9: 45,000 sqft NEW Building (x2 BMCD ID: 1)	22,500	0.058	0.653	22,500	0.012	0.135	90,000	2.52E-05	1.13E-03	0.789	0.164
Table 10: 82,000 sqft NEW Building (x4) (BMCD ID: 5)	41,000	0.058	1.189	41,000	0.012	0.246	164,000	2.52E-05	2.07E-03	1.437	0.299
Table 11: 1,125,000 sqft NEW Building (BMCD ID: 50)	562,500	0.058	16.313	562,500	0.012	3.375	2,250,000	2.52E-05	2.84E-02	19.716	4.101
Table 13: 0.9 Acre PARKING LOT (BMCD ID: 11)	19,602	0.058	0.568	19,602	0.012	0.118	78,408	2.52E-05	9.88E-04	0.687	0.143
Table 14: Expand Roadway at Voelz Gate PARKING LOT (BMCD ID: 4)	21,780	0.058	0.632	21,780	0.012	0.131	87,120	2.52E-05	1.10E-03	0.763	0.159
Table 15:250 square foot New Building (BMCD ID: 16)	125	0.058	0.004	125	0.012	0.001	500	2.52E-05	6.30E-06	0.004	0.001
Table 16: 750 square foot UPGRADED Building (BMCD ID: 17)	375	0.058	0.011	375	0.012	0.002	1,500	2.52E-05	1.89E-05	0.013	0.003
Table 17: 2050 square foot Upgraded Building (x 1004 BMCD ID: 38)	1,025	0.058	0.030	1,025	0.012	0.006	4,100	2.52E-05	5.17E-05	0.036	0.007
Table 18: 4400 square foot Upgraded Building (BMCD ID: 28)	2,200	0.058	0.064	2,200	0.012	0.013	8,800	2.52E-05	1.11E-04	0.077	0.016
Table 19: 5878 square foot Upgraded Building (BMCD ID: 34 and 37)	2,939	0.058	0.085	2,939	0.012	0.018	11,756	2.52E-05	1.48E-04	0.103	0.021
Table 20: 12,000 square foot Upgraded Building (BMCD ID: 30 and 35)	6,000	0.058	0.174	6,000	0.012	0.036	24,000	2.52E-05	3.02E-04	0.210	0.044
Table 21: 35,000 square foot REPLACEMENT Building (BMCD ID: 47)	17,500	0.058	0.508	17,500	0.012	0.105	70,000	2.52E-05	8.82E-04	0.613	0.128
Table 22: 10 Acre New Security Post Parking lot (BMCD ID: 25a)	21,780	0.058	0.632	21,780	0.012	0.131	87,120	2.52E-05	1.10E-03	0.763	0.159
Table 23: 100,000 square foot PARKING LOT (BMCD ID: 22)	5,000	0.058	0.145	5,000	0.012	0.030	20,000	2.52E-05	2.52E-04	0.175	0.036
Table 24: 3 miles of electric upgrades (BMCD ID: 20)	30	0.058	0.001	30	0.012	0.000	120	2.52E-05	1.51E-06	0.001	0.000
Table 25: 22 miles of RAIL network (BMCD ID: 3)	116,160	0.058	3.369	116,160	0.012	0.697	2,323,200	2.52E-05	2.93E-02	4.095	0.852
Table 26: 10 acre RAIL classification yard (BMCD ID: 6)	21,120	0.058	0.612	21,120	0.012	0.127	422,400	2.52E-05	5.32E-03	0.745	0.155
Table 27: Restoration of 4 miles of RAIL (BMCD ID: 18)	116,160	0.058	3.369	116,160	0.012	0.697	2,323,200	2.52E-05	2.93E-02	4.095	0.852
Table 28: Repair 11 miles of asphalt ROADS (BMCD ID: 23)	43,560	0.058	1.263	43,560	0.012	0.261	871,200	2.52E-05	1.10E-02	1.536	0.319
Table 29: Repair 1560000 sqft of asphalt ROADS (BMCD ID: 32)	21,120	0.058	0.612	21,120	0.012	0.127	3,120,000	2.52E-05	3.93E-02	0.779	0.162
Table 30: New Security Post Buildings (x2) (BMCD ID: 25b)	125	0.058	0.004	125	0.012	0.001	500	2.52E-05	6.30E-06	0.004	0.001
Table 31: Upgrade Utility Infrastructure Overall (BMcD ID 9)	381,000	0.058	11.049	381,000	0.012	2.286	2,540,000	2.52E-05	3.20E-02	13.367	2.780
									Total	**51.84**	**10.78**

(a) Excavation of M&R Stations assumed to be 3 feet deep. Soil density is assumed to be 100 lb/ft^3

(b) Excavation and backfilling factors from AP-42, Table 11.9-4 (dated 7/98), assuming 100% of TSP is PM_{10}

(c) Windblown dust factor from "Improvement of Specific Emission Factors" prepared for South Coast AQMD by Midwest Research Institute (1996) assuming 100% of TSP is PM_{10}.

(d) PM_{10} emissions are conservatively assumed to be 100% of TSP.

(e) $PM_{2.5}$ emissions were calculated following the SCAQMD Particulate Matter $PM_{2.5}$ Significance Thresholds and Calculation Methodology (2006). For construction and demolition fugitive dust sources, 20.8% of the PM_{10} would be $PM_{2.5}$

Letterkenny Ammunitions Center (LEMC)
Summary of Construction Emissions Calculations for Projects at LEMC

Project	Project Number	Illustrative Reference	Emissions Estimates (tons per year)									
			NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
SHORT-RANGE (0 – 5 YEARS)												
Guided Missile Maintenance Facility	66632	1	13.14	63.69	4.20	1.22	8.05E-01	8.03E-01	1,171.98	4.91E-02	1.01E-02	1,176.21
Precision Strike Missile System (PrSM)	94216	2	2.02	8.25	6.22E-01	2.01E-01	1.11E-01	1.10E-01	237.82	1.00E-02	2.05E-03	238.68
Rail Modernization	91782	N/A	26.30	164.94	9.58	1.67	1.39	1.35	14,162.42	7.12E-02	3.68E-02	14,175.16
Expand Roadway at Voelz Gate	LEAD 532415	3	2.15	4.27	5.84E-01	2.58E-01	1.05E-01	1.05E-01	232.73	9.40E-03	1.94E-03	233.54
Consolidated Munition Distribution Facility	86433	4	19.60	122.49	6.76	1.63	1.19	1.18	1,976.93	8.28E-02	1.74E-02	1,984.20
Rail Classification Yard	86433	5	10.27	57.08	3.51	8.07E-01	5.60E-01	5.53E-01	3,238.89	3.35E-02	1.11E-02	3,243.04
LEMC POV Parking Expansion	TBD	6	1.30E-01	2.03E-01	3.42E-02	1.51E-02	8.33E-03	8.31E-03	22.97	9.69E-04	1.97E-04	23.06
Inert Storage	CAAA15-18MC-64	7	1.37	7.05	4.46E-01	1.24E-01	7.66E-02	7.65E-02	184.16	7.42E-03	1.50E-03	184.79
Upgrade Utility Infrastructure – Overall	TBD	N/A	14.36	225.35	7.42	2.67E-01	6.51E-01	6.22E-01	714.52	3.83E-02	1.22E-02	719.10
Paint Shop Addition	CAAA15-18MC-68	8	2.02	8.20	6.19E-01	2.01E-01	1.10E-01	1.10E-01	232.69	9.73E-03	1.96E-03	233.52
Secure Holding Area for Loaded Trailers	TBD	9	1.34E-01	2.18E-01	3.58E-02	1.51E-02	8.55E-03	8.48E-03	31.15	1.01E-03	2.22E-04	31.24
Blast Booth Addition	TBD	8	2.02	8.20	6.19E-01	2.01E-01	1.10E-01	1.10E-01	232.69	9.73E-03	1.96E-03	233.52
Inert Storage – Wood Storage	TBD	10	1.37	7.05	4.46E-01	1.24E-01	7.66E-02	7.65E-02	184.16	7.42E-03	1.50E-03	184.79
Ready Magazine	CAAA15-18MC-65	11	1.42	7.74	4.68E-01	1.25E-01	7.84E-02	7.84E-02	196.40	7.94E-03	1.61E-03	197.08
Inert Storage	TBD	12	1.37	7.05	4.46E-01	1.24E-01	7.66E-02	7.65E-02	184.16	7.42E-03	1.50E-03	184.79
Breakroom for Building 5321	TBD	13	1.37	7.03	4.45E-01	1.24E-01	7.63E-02	7.63E-02	176.05	7.39E-03	1.48E-03	176.68
Facility for SDO at X-11-G	TBD	N/A	1.49	7.96	4.91E-01	1.32E-01	8.33E-02	8.30E-02	195.91	8.33E-03	1.73E-03	196.64
Restoration of Transportation Infrastructure (Rail)	TBD	N/A	8.17	47.26	2.76	7.05E-01	4.58E-01	4.54E-01	785.24	3.29E-02	7.24E-03	788.22
MID-RANGE (6 – 10 YEARS)												
Rocket Motor Destruction (ARMD) Facility Addition	89246	N/A	2.02	8.19	6.19E-01	2.01E-01	1.10E-01	1.10E-01	231.31	9.66E-03	1.94E-03	232.13
Repair Electrical Distribution System, Ammunition Area	91417	N/A	2.23E-01	2.59E-01	5.78E-02	2.92E-02	8.71E-03	8.68E-03	31.98	1.34E-03	2.72E-04	32.09
Inert Storage	TBD	12	1.37	7.05	4.46E-01	1.24E-01	7.66E-02	7.65E-02	184.16	7.42E-03	1.50E-03	184.79
Upgrade Existing 20-foot Equivalent Units (TEU) Storage Lots	TBD	N/A	1.74	3.91	4.79E-01	2.05E-01	8.44E-02	8.42E-02	191.82	7.99E-03	1.62E-03	192.51
Restoration of Transportation Infrastructure (Roads)	87046	N/A	2.58	9.73	7.82E-01	2.73E-01	1.32E-01	1.31E-01	302.51	1.29E-02	6.39E-01	493.39
Inert Storage	TBD	12	1.37	7.05	4.46E-01	1.24E-01	7.66E-02	7.65E-02	184.16	7.42E-03	1.50E-03	184.79
Security Upgrades (New Post #2)	TBD	N/A	4.25	16.92	1.30	4.27E-01	2.33E-01	2.32E-01	506.81	2.12E-02	4.30E-03	508.62
Building 5321 Addition	TBD	N/A	2.02	8.19	6.19E-01	2.01E-01	1.10E-01	1.10E-01	231.31	9.66E-03	1.94E-03	232.13
Inert Storage	TBD	N/A	1.37	7.05	4.46E-01	1.24E-01	7.66E-02	7.65E-02	184.16	7.42E-03	1.50E-03	184.79
Project for Modernization of Building 3700	94432	N/A	1.48	7.95	4.90E-01	1.32E-01	8.22E-02	8.19E-02	195.91	8.33E-03	1.73E-03	196.64
Inert Storage	TBD	N/A	1.37	7.05	4.46E-01	1.24E-01	7.66E-02	7.65E-02	184.16	7.42E-03	1.50E-03	184.79
LONG-RANGE (10+ YEARS)												
Igloo Modernization – Overall	90406	N/A	72.84	387.88	23.95	6.49	4.02	4.01	10,040.28	3.92E-01	8.08E-02	10,074.15
Inert Storage	TBD	N/A	1.37	7.05	4.46E-01	1.24E-01	7.66E-02	7.65E-02	184.16	7.42E-03	1.50E-03	184.79
Igloo Road Repairs – Overall	90407	N/A	3.70	14.83	1.14	3.85E-01	1.86E-01	1.85E-01	398.82	1.69E-02	3.57E-03	400.31
Inert Storage	TBD	N/A	1.37	7.05	4.46E-01	1.24E-01	7.66E-02	7.65E-02	184.16	7.42E-03	1.50E-03	184.79
Modernization of Building 3701	TBD	N/A	1.48	7.89	4.87E-01	1.32E-01	8.18E-02	8.17E-02	195.85	7.92E-03	1.61E-03	196.53
Aboveground Magazine Repair	86673	N/A	1.49	7.92	4.89E-01	1.32E-01	8.21E-02	8.19E-02	204.90	8.00E-03	1.65E-03	205.59
Inert Storage	TBD	N/A	1.37	7.05	4.46E-01	1.24E-01	7.66E-02	7.65E-02	184.16	7.42E-03	1.50E-03	184.79
Modernization of Building 3702	TBD	N/A	1.48	7.88	4.86E-01	1.32E-01	8.16E-02	8.16E-02	188.21	7.91E-03	1.59E-03	188.88
Earth-covered Magazine Repair	86671 / 86672	N/A	1,490.42	7,984.47	491.59	133.00	82.57	82.18	196,696.38	8.36	1.73	197,421.69
Building 4755 Replacement (Ammunition Demilitarization Facility)	TBD	14	2.03	8.24	6.25E-01	2.00E-01	1.09E-01	1.09E-01	245.29	1.00E-02	2.07E-03	246.15
Satellite Fire Station	TBD	15	2.02	8.19	6.19E-01	2.01E-01	1.10E-01	1.10E-01	231.31	9.66E-03	1.94E-03	232.13
Building 3626 Replacement (Receipt Classification)	TBD	16	2.03	8.24	6.25E-01	2.00E-01	1.09E-01	1.09E-01	245.29	1.00E-02	2.07E-03	246.15
Conventional Ammunition Workshop	TBD	17	2.03	8.24	6.25E-01	2.00E-01	1.09E-01	1.09E-01	245.29	1.00E-02	2.07E-03	246.15
Building 3810 Replacement (MFOM)	TBD	18	2.03	8.24	6.25E-01	2.00E-01	1.09E-01	1.09E-01	245.29	1.00E-02	2.07E-03	246.15
Building 3750 Replacement (MFOM)	TBD	19	2.03	8.24	6.25E-01	2.00E-01	1.09E-01	1.09E-01	245.29	1.00E-02	2.07E-03	246.15
Building 8001 Replacement (MFOM)	TBD	20	2.03	8.24	6.25E-01	2.00E-01	1.09E-01	1.09E-01	245.29	1.00E-02	2.07E-03	246.15
Building 5647 Replacement (ARMD)	TBD	21	2.03	8.24	6.25E-01	2.00E-01	1.09E-01	1.09E-01	245.29	1.00E-02	2.07E-03	246.15
Building 2755 Replacement (Surveillance)	TBD	22	2.24	8.46	6.78E-01	2.25E-01	1.22E-01	1.22E-01	297.28	1.06E-02	2.26E-03	298.21
Building 2383 Replacement (MUTT)	TBD	N/A	2.03	8.24	6.25E-01	2.00E-01	1.09E-01	1.09E-01	245.29	1.00E-02	2.07E-03	246.15
D-Area Igloos Replacement	TBD	18	168.54	902.90	55.59	15.04	9.34	9.29	22,242.83	9.45E-01	1.96E-01	22,324.85
CAPACITY												
Future Munitions Operations Support	TBD	24	27.81	201.03	10.23	2.15	1.51	1.47	2,688.10	1.23E-01	3.09E-02	2,700.38