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ENVIRONMENTAL ASSESSMENT

FOR

CONSTRUCTION AND OPERATION OF BARRACKS, DINING HALLS, AND ADMINISTRATION BUILDINGS FOR THE TENNESSEE ARMY NATIONAL GUARD AT ARNOLD AIR FORCE BASE, TENNESSEE

PREPARED JOINTLY BY:

Tennessee Army National Guard
and
Department of the Air Force

August 2022

FORMAT PAGE

PRIVACY ADVISORY

This Environmental Assessment (EA) is provided for public comment in accordance with the National Environmental Policy Act (NEPA), the President's Council on Environmental Quality (CEQ) NEPA Regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508), and 32 CFR Part 989, Environmental Impact Analysis Process (EIAP).

The EIAP provides an opportunity for public input on the Department of the Air Force (DAF) decision making, allows the public to offer input on alternative ways for the DAF to accomplish what it is proposing, and solicits comments on the DAF's analysis of environmental effects.

Public commenting allows the DAF to make better, informed decisions. Letters or other written or oral comments provided may be published in the EA. As required by law, comments provided will be addressed in the EA and made available to the public. Providing personal information is voluntary. Any personal information provided will be used only to identify your desire to make a statement during the public comment portion of any public meetings or hearings or to fulfill requests for copies of the EA or associated documents. Private addresses will be compiled to develop a mailing list for those requesting copies of EA; however, only the names of the individuals making comments and specific comments will be disclosed. Personal home addresses and phone numbers will not be published in the EA.

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This document has been verified not to exceed the 75 pages, not including appendices, as defined in 40 CFR § 1501.5(f). As defined in 40 CFR § 1508.1(v) a "page" means 500 words and does not include maps, diagrams, graphs, tables, and other means of graphically displaying quantitation or geospatial information.

FORMAT PAGE

Environmental Assessment Organization

This Environmental Assessment (EA) evaluates the potential environmental, socioeconomical, and cultural effects for the Tennessee Army National Guard's (TNARNG's) proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Arnold Air Force Base (AFB) in Tullahoma, Tennessee. The TNARNG currently lacks bed space, dining, administrative, and storage facilities for TNARNG units training at the Installation. The existing barracks space is too small for the number of TNARNG troops assigned to train at Arnold AFB.

The potential effects of the Proposed Action and considered alternatives are analyzed in this EA pursuant to the National Environmental Policy Act of 1969 (NEPA), the Council on Environmental Quality *Regulations Implementing the Procedural Provisions of NEPA*, 32 Code of Federal Regulations Part 651, *Environmental Analysis of Army Actions*, and 32 Code of Federal Regulation Part 989, *Air Force Environmental Impact Analysis Process*. This EA will facilitate the decision-making process by the TNARNG and the National Guard Bureau regarding the Proposed Action and its considered alternatives, and is organized as follows:

- **ENVIRONMENTAL ASSESSMENT SIGNATURE PAGE:** Describes the Proposed Action and its considered alternatives; summarizes environmental, cultural, and socioeconomic consequences and compares potential effects associated with the considered alternatives, including the No Action Alternative.
- **SECTION 1.0 PURPOSE AND NEED:** Summarizes the purpose of and need for the Proposed Action, provides relevant background information, and describes the scope of the EA.
- **SECTION 2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES:** Describes the Proposed Action and presents alternatives for implementing the Proposed Action.
- **SECTION 3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES:** Describes the existing environmental, cultural, and socioeconomic conditions that may be affected by the Proposed Action and alternatives. Identifies individual and potential cumulative environmental, cultural, and socioeconomic effects of implementing the Proposed Action and alternatives and identifies proposed mitigation measures (if any).
- **SECTION 4.0 LIST OF PREPARERS:** Identifies document preparers and their areas of expertise.
- **SECTION 5.0 REFERENCES:** Provides bibliographical information for cited sources.
- **APPENDIX A:** Agency Correspondence
- **APPENDIX B:** Reasonably Foreseeable Future Actions
- **APPENDIX C:** National Environmental Policy Act Supporting Documentation

FORMAT PAGE

ENVIRONMENTAL ASSESSMENT SIGNATURE PAGE

Lead Agencies:	National Guard Bureau (NGB), Tennessee Army National Guard (TNARNG) and Department of the Air Force (DAF), Arnold Air Force Base (AFB), Tennessee
Title of Proposed Action:	Construction and Operation of Barracks, Dining Halls, and Administrative Buildings for the TNARNG at Arnold AFB, Tennessee
Affected Jurisdiction:	TNARNG Volunteer Training Site – Tullahoma (VTS-T) Arnold AFB, Tennessee
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Reviewed By:

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TNARNG

Document Designation: Draft Environmental Assessment (EA)

Abstract: TNARNG proposes to construct and operate up to 20 new one-story, 5,000-square-foot open-bay barracks with latrines; showers; laundry; exterior paving; stairs, ramps, and walkways; and grading and drainage; and all related work for a new functional and energy-efficient barracks for the TNARNG at VTS-T on Arnold AFB. The purpose of the action is to enhance the ability of the TNARNG to fulfill its military training mission by fully supporting all units assigned to training at Arnold AFB. The Proposed Action is needed to rectify bed space, dining, administrative, and storage facilities deficits for TNARNG units training at the Installation. The existing barracks space is does not have adequate bed space to support the number of TNARNG troops assigned to train at Arnold AFB.

This EA evaluates direct and indirect effects of the Proposed Action and the No Action Alternative with respect to the following criteria: noise, air quality, earth resources, water resources, biological resources, cultural resources, hazardous materials and wastes, infrastructure and transportation, and health and safety. Two additional alternative locations at VTS-T were considered and were eliminated from further consideration.

The evaluation performed in this EA concludes that no significant adverse impacts, either individually or cumulatively when combined with other reasonably foreseeable projects, would occur on environmental resources resulting from the Proposed Action. The analysis presented indicates that an Environmental Impact Statement is unnecessary for this Proposed Action and issuance of a Finding of No Significant Impacts is appropriate.

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FINDING OF NO SIGNIGICANT IMPACT FOR
CONSTRUCTION AND OPERATION OF BARRACKS,
DINING HALLS, AND ADMINISTRATION BUILDINGS FOR
THE TENNESSEE ARMY NATIONAL GUARD
AT ARNOLD AIR FORCE BASE, TENNESSEE

Pursuant to the National Environmental Policy Act of 1969 (NEPA) (Title 42 United States Code § 4321 et seq.), and in accordance with Council on Environmental Quality (CEQ) *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA)* (Title 40 Code of Federal Regulations [CFR] Parts 1500–1508), *Environmental Analysis of Army Actions*, Army Regulation 200-2, as well as the Department of the Air Force (DAF) *Environmental Impact Analysis Process* implementing regulation at 32 CFR Part 989, this Environmental Assessment (EA) has been prepared jointly by the Tennessee Army National Guard (TNARNG) and the DAF to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Arnold Air Force Base (AFB), Tennessee (TN).

A Joint Agency Assistance Memorandum was exchanged on 4 October 2021 between the Air Force Materiel Command and Army National Guard (ARNG) G9 Installation and Environment Directorate (ARNG-G9) in accordance with the President's CEQ NEPA regulations, 40 CFR §1501.7, *Lead Agencies*. For this EA, the TNARNG is the proponent for the Proposed Action while the DAF, as the federal landowner, is the primary lead agency. This EA is a joint agency effort between the TNARNG and DAF since ultimately this EA must contain sufficient information for each agency's signatory authority to fulfill their respective NEPA responsibilities and make independent decisions on resources and issues under their purview as they relate to the Proposed Action.

This EA considered all potential environmental impacts of implementing the Proposed Action and the No Action Alternative, in addition to cumulative impacts of other reasonably foreseeable projects, and identified measures to avoid, minimize, or compensate for environmental impacts. This EA is attached and incorporated by reference.

BACKGROUND AND PURPOSE AND NEED FOR THE PROPOSED ACTION (EA §§ 1.2 and 1.5, pages 1-1 to 1-5): The TNARNG is composed of four major units: the 278th Armored Cavalry Regiment in Knoxville; the 230th Sustainment Brigade based in Chattanooga; the 194th Engineer Brigade out of Jackson; and the 30th Troop Command headquartered in Tullahoma. Altogether, the TNARNG has a strength of approximately 10,700 soldiers, consisting of 15 infantry units, 9 aviation units, 8 engineering units, 6 artillery units, 2 signal units, 1 Army liaison team, 21 support units (maintenance, personnel, logistics, etc.), and 7 military police units. There are individual sites and training installations that support this mission by providing training locales, maintaining and storing equipment and weapons, and housing TNARNG staff. The TNARNG maintains four Volunteer Training Sites. The Tennessee Military Department has operated VTS-Tullahoma (VTS-T) at Arnold AFB for the TNARNG since the early 1970s through a real estate agreement with the DAF.

VTS-T is located at the eastern edge of the Arnold AFB boundary in Coffee County, TN, and covers approximately 7,998 acres**.** VTS-T is headquarters for the 30th Troop Command, the TNARNG's 1-107th Air Operations Battalion, and the 1175th Transportation Company. This is the only site that has a firing range to qualify soldiers for their required annual small-arms weapons qualification. All TNARNG units that train at VTS-T must have adequate housing while at the site. The maximum number of soldiers on the ground training during a given drill weekend is 670. In fiscal year 2021, annual throughput to complete small-arms weapons qualification was 30,862 soldiers, which exceeded current bed capacity of 375.

The existing barracks at VTS-T are in good condition, but there is a bed space deficit. Additional bunk beds were added, but this resulted in less space per soldier and per latrine than the authorized allowances. Based on these deficiencies, the purpose of the Proposed Action is to enhance the ability of the TNARNG to fulfill its military training mission by fully supporting all units assigned to training at VTS-T on Arnold AFB. The Proposed Action is needed to rectify bed space, dining, administrative, and storage facilities deficits for TNARNG units training at the Installation.

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

DESCRIPTION OF THE PROPOSED ACTION (EA § 2.2, page 2-1): The Proposed Action would construct and operate up to 20 new one-story, 5,000-square-foot (SF) open-bay barracks with latrines; showers; laundry; exterior paving; stairs, ramps, and walkways; and grading and drainage; and all related work for a new functional and energy-efficient barracks for the TNARNG at VTS-T on Arnold AFB. This would increase bed capacity by 640. Five new dining facilities servicing 200 people (each approximately 4,500 SF) and five new administrative/storage facilities (totaling approximately 5,960 SF) would be built in accordance with National Guard Pamphlet 415-12. TNARNG would construct each new barracks in the coming years as funding becomes available. Currently, TNARNG has only secured funding for one 1-story 5,000-SF open-bay barracks building. If TNARNG obtains funds for additional barracks buildings and the proposed dining halls and administration/storage buildings, then TNARNG would review the EA to determine if language regarding site conditions and potential environmental consequences need to be revised and updated. TNARNG would coordinate its EA review findings with ARNG-G9 and Arnold AFB NEPA staff. Construction of one new 5,000 SF barracks would take no more than 12 months. The additional required bed, dining, and administrative spaces would be programmed and constructed in the future, as funding becomes available.

TNARNG has sought National Guard Bureau (NGB) approval and programming for the construction of new barracks for several years, with a two- to three-story barracks as the design type, which would reduce the facility footprint, save land, decrease walking distances, and make VTS-T more compliant with a sustainable planning strategy that promotes compact development. While a two-story or three-story barracks alternative could be desired for completing more bed spaces at once, it causes multiple units to occupy the same space. Construction of separate one-story buildings allows better command and control within unit elements using the barracks and is the preferred solution of the NGB Ground Forces Commander to remedy current bed space deficiencies. As the need for additional bed space to accommodate the annual throughput of soldiers training at VTS-T has continued to grow, and consistent with the Army's Sustainable Design and Development policy and facility designs included within the NGB's prioritized plan

for military construction (MILCON) projects, TNARNG proposes construction of multiple one-story, open-bay barracks. Therefore, the construction of multiple barracks of only one specific type, one story open bay, is being considered as part of the Proposed Action in this EA.

ALTERNATIVES CONSIDERED (EA § 2.4, pages 2-2 to 2-12): TNARNG initially considered siting the new barracks, dining, administrative, and storage facilities adjacent to the existing barracks on the same parcel at VTS-T on Arnold AFB; however, the required land area is not available; and the site is not developable due to stormwater runoff and the geothermal field. This initial consideration was dismissed and not assessed relative to selection standards.
TNARNG and DAF evaluated three action alternatives for the new VTS-T barracks, dining, administrative, and storage facilities: Alternative 1—an undeveloped forested parcel near the current obstacle course; Alternative 2—the current site support/motor pool area, and Alternative 3—the existing Landing Zone (LZ). TNARNG also considered the construction of the new barracks, dining, administrative, and storage facilities in areas outside the current TNARNG-licensed areas on Arnold AFB (Alternative 4). TNARNG and DAF compared the four alternatives against the selection standards (EA § 2.3, pages 2-1 to 2-12) and, based on the outcome of the comparison, identified Alternative 1 as the Preferred Alternative. Alternatives 2, 3, and 4 did not meet one or more of the selection standards.

NO ACTION ALTERNATIVE (EA § 2.4.5, page 2-12 and 2-14): Under the No Action Alternative, TNARNG would not construct any new barracks, dining, administrative, or storage facilities on Arnold AFB; bed space at VTS-T would not be expanded; programmed funding would go unexecuted; and overall mission training readiness would suffer. The No Action Alternative assumes the Proposed Action would not occur. Although the No Action Alternative does not meet the purpose and need to rectify bed space, dining, administrative, and storage facilities deficits for TNARNG units, it is carried forward for detailed analysis in this EA as required under NEPA. The No Action Alternative represents a baseline to assess any consequences that might occur if the Proposed Action is not implemented.

ENVIRONMENTAL CONSEQUENCES

Based on the findings within this EA, resource areas that are anticipated to experience no impacts under implementation of the Preferred Alternative are land use; prime, unique, and important farmlands; floodplains and wetlands; socioeconomics; environmental justice and protection of children; airspace management; and Air Installation Compatible Use Zones (EA §3.0, pages 3-1 to 3-3). The Preferred Alternative is compatible with all nearby land uses, and land use designation change is not required. There are no unique farmlands present at VTS-T or on Arnold AFB that are suitable for the production of specific high-value food and fiber crops. The Preferred Alternative would not take place within a floodplain; the site is located approximately 2.7 miles from the nearest floodplain area. The Preferred Alternative would not take place within any portion of a designated wetland; the nearest wetland to the Preferred Alternative site is approximately 0.31 mile away. No personnel relocation would be required to implement the Preferred Alternative. It is anticipated construction labor would be performed by the local work force; therefore, the Preferred Alternative would not impact housing or population in the region, nor would there be any impact on community resources such as emergency services, schools, or jobs in the region. The Preferred Alternative is located on DAF property, and the nearest low-income or minority

population is approximately 25 miles away. Children are not typically located within the project area; however, Waggoner Park, a multiuse park, is located adjacent to VTS-T. The Preferred Alternative would have no effect on children or families using the park, as TNARNG currently trains at VTS-T with no significant impact to the park or its users. There would be no interactions between airspace and the Preferred Alternative at Arnold AFB. The airfield at Arnold AFB is located more than 4.5 miles away from the Preferred Alternative. No airspace modification would occur, and no additional air operations from the Arnold AFB airfield are proposed. The Preferred Alternative would not have any effect on airfield usage or aircraft operations; therefore, the Air Installation Compatible Use Zone program is not applicable. In addition, no significant direct or indirect cumulative impacts caused by implementation of the Preferred Alternative when combined with other reasonably foreseeable actions occurring on or near Arnold AFB were identified (EA, § 3.0, pages 3-1 to 3-48). Overall, environmental analyses did not identify any significant impact on any of the remaining analyzed resources as discussed below.

Noise (EA §3.1, pages 3-3 to 3-5): The Preferred Alternative would have short- and long-term, minor, adverse effects on the noise environment. Short-term increases in noise would be caused by construction activities. No appreciable long-term noise increases in areas of incompatible land use and no violation of any federal, state, or local noise regulation are expected. Individual pieces of construction equipment typically generate noise levels of 80 to 90 A-weighted decibel at a distance of 50 feet (EA Table 3-3, page 3-5). With multiple pieces of equipment operating concurrently, the zone of relatively high construction noise typically extends to distances of 400 to 800 feet from the site of major equipment operations. There are no noise-sensitive areas within 800 feet of the proposed site that would experience appreciable construction noise. Limited truck and worker traffic might be audible at locations beyond 800 feet. Given the temporary nature of proposed construction activities and the limited amount of noise generated by heavy equipment, these effects would be minor. Following the completion of construction, noise levels proximate to the barracks would be similar to the noise levels at the existing barracks at VTS-T. Noise would primarily be generated from vehicle movement went the barracks are being used to support training activities. There are no sensitive noise receptors proximate to the Preferred Alternative locations. Based on this analysis, the Preferred Alternative will have no significant impacts on noise.

Air Quality (EA §3.2, pages 3-5 to 3-11): Coffee County, where the Preferred Alternative is located, has been designated as full attainment for the National Ambient Air Quality Standards (NAAQS). The DAF used the Air Conformity Applicability Model to estimate emissions (EA Table 3-6, page 3-9). Estimated annual emissions from construction and operations were determined to be less than significant for all criteria pollutants. The Preferred Alternative would have short- and long-term minor adverse effects on air quality. There would be short-term effects due to the use of heavy equipment and generation of fugitive dust during site preparation and construction activities. Long-term effects would be due to the potential use of backup generators and HVAC systems at the proposed barracks. New stationary sources of air emissions could be subject to federal and state air permitting regulations for which TNARNG would be responsible. Permitting scenarios would vary based on the types and sizes of new stationary sources, timing of the projects, and the types of controls ultimately selected. These can differ in specific features from the ones described in this EA. It is not anticipated that the stationary sources of air emissions at VTS-T would exceed the prevention of significant deterioration (PSD) major source thresholds; however, during the final design stage and the permitting process either (1) the actual equipment,

controls, or operating limitations would be selected to reduce the potential to emit less than the PSD major source threshold; or (2) the PSD permitting process would require detailed dispersion modeling to ensure any new emission sources at Arnold AFB would not allow for concentrations above the National Ambient Air Quality Standards (NAAQS). The Preferred Alternative would not (1) exceed the prevention of significant deterioration major source thresholds or (2) contribute to a violation of any local, state, or federal air quality regulation.

In addition to permitting of new stationary sources of air emissions, the Tennessee Department of Environmental Conservation outlines requirements with which the TNARNG must comply when constructing the new facilities, such as controlling fugitive dust and open burning. Changes in greenhouse gas (GHG) emissions from the Preferred Alternative would primarily come from the use of backup generators and heating, ventilation, and cooling systems. The US Environmental Protection Agency and other federal agencies use estimates of the social cost of carbon (SC-CO_2) to determine a value of the climate impacts of rulemakings. The SC-CO_2 is a measure, in dollars, of the long-term damage done by a ton of carbon dioxide (CO_2) emissions in a given year. Using carbon dioxide equivalents (CO_2e) as a surrogate for CO_2 emissions, the SC-O_2 for implementing construction of all 20 barracks proposed under the Preferred Alternative was estimated to be $158,814.12 per year. Overall, the Preferred Alternative will have no significant impacts on air quality.

Earth Resources (EA § 3.3, pages 3-12 to 3-15): The Preferred Alternative would result in minor impacts on geological resources at Arnold AFB. Potential impacts on geological resources associated with the Preferred Alternative would be limited to ground-disturbing activities occurring during site preparation and construction. Minor impacts would result from the proposed new construction; however, the ground-disturbing activities associated with the Preferred Alternative would be localized and would not impact sensitive or regionally significant geologic or physiographic features. The Preferred Alternative would result in negligible impacts associated with seismicity or geologic hazards. Seismic hazards in Middle TN are relatively low. There are no known active faults underlying Arnold AFB, and consequently there is no known potential for fault rupture. The Preferred Alternative would include proper construction techniques, soil erosion/siltation control measures, and structural engineering designs which would minimize potential impacts. Topography across Arnold AFB is gently sloping, and there are no excessive slopes (i.e., greater than 8 percent) at the Preferred Alternative site. Further, the proposed project has been sited away from slopes toward water features, and the Preferred Alternative location is generally level. The Preferred Alternative would result in short-term, minor, site-specific impacts and negligible long-term impacts on soils. The Preferred Alternative would include excavation and site preparation activities associated with construction. Most soils at the proposed project location are in the Mountview silt loam, eroded, gently sloping phase (Mu) series. Soils in the Mu series have features that are moderately favorable for construction. Any construction limitations can be overcome or minimized by planning, design, or installation, and implementation of the Preferred Alternative would include proper construction techniques, soil erosion/siltation control measures, and structural engineering designs that would minimize potential soil limitations related to construction. The Preferred Alternative would therefore not pose a substantial erosion hazard.
Based on this analysis, the Preferred Alternative will have no significant impacts on earth resources.

Water Resources (EA § 3.4, pages 3-15 to 3-19): The site is located approximately 2.7 miles from the nearest floodplain area. The nearest wetland is approximately 0.31 mile away and is located outside Arnold AFB boundaries. Groundwater can be found at depths of 10 to 40 feet below the surface. The closest surface waters to the Preferred Alternative are Bobo Creek, located approximately 0.75 mile to the east, and Poorhouse Creek, located approximately 1 mile to the south (EA Figure 3-2, page 3-17). The Preferred Alternative would temporarily increase turbidity of surface waters from site preparation and earth-disturbing activities. The TNARNG will be required to develop a grading plan and stormwater management system to manage drainage as part of the Preferred Alternative. Berms, diversions, and other stormwater practices will be incorporated into the grading plan. Since the Preferred Alternative results in the disturbance of more than 1 acre, TNARNG will apply for a National Pollutant Discharge Elimination System (NPDES) Construction General Permit from the TN Department of Environmental Conservation along with a stormwater pollution prevention plan (SWPPP). The SWPPP will identify the protection measures and best management practices to prevent sediment and contaminants from entering nearby Bobo Creek. The existing stormwater infrastructure for handling runoff, in combination with the proposed drainage improvements under the Preferred Alternative would accommodate the slight increase in stormwater runoff. The TNARNG will also comply with Section 438 of the Energy Independence and Security Act (EISA) of 2007. EISA requires federal agencies to establish stormwater design requirements for construction projects that disturb a footprint greater than 5,000 SF of land in order to maintain or restore the property to its predevelopment hydrology state. Overall, there will be no impacts on water quality with adherence to NPDES and SWPPP permitting requirements.

Biological Resources (EA §3.5, pages 3-19 to 3-28): The Preferred Alternative would have minor impacts on vegetation and local wildlife from construction activities. Impacts on wildlife would be short term and would affect only animals in the immediate project area. A list of federally protected species to be evaluated for potential effects of the Proposed Action was generated using the US Fish and Wildlife Service (USFWS) Information for Planning and Consultation tool and the USFWS 2022 Listing Workplan. Species that have been documented within the vicinity of Arnold AFB include:

- Indiana bat – federally endangered
- Northern long-eared bat (NLEB) – federally threatened
- Gray bat – federally endangered
- Tricolored bat – under review for federal listing
- Little brown bat – under review for federal listing
- Monarch butterfly – federal candidate species
- Pale lilliput (mollusk) – federally endangered
- Slabside pearlymussel (mollusk) – federally endangered
- Snuffbox mussel (mollusk) – federally endangered
- Turgid blossom (mollusk) – federally endangered

The gray bat, NLEB, and Indiana bat have the potential to occur within the proposed project area. No Indiana bat roosts or maternity colonies have been identified on Arnold AFB. However, there are known NLEB roosts and maternity colonies on Arnold AFB. Nearly annual bat surveys conducted by Arnold AFB since 2000 have documented the presence of the NLEB on the

Installation. Bat surveys have captured the NLEB at 30 locations on Arnold AFB and detected it acoustically at 14 locations. The nearest capture and acoustic detection sites to the proposed Preferred Alternative location are approximately 2.94 miles and 2.76 miles, respectively. Twelve NLEB roost trees have been documented on Arnold AFB, with the closest one approximately 2.82 miles away, and the closest known maternity colony is located approximately 3.44 miles from the proposed site. It is approximately 6 miles to the nearest known NLEB hibernacula. The Preferred Alternative is located in a Swarming 2 Area, which provides swarming habitat for NLEB and Indiana bats. Swarming habitat refers to suitable roosting, foraging, and travel habitat for the bats that is within a specific distance of a known hibernaculum. For the NLEB, this distance is 5 miles from a known hibernaculum. For the Indiana bat, this distance is 10 miles from a Priority 1 or Priority 2 hibernaculum, and 5 miles from a Priority 3 or Priority 4 hibernaculum.

The Elk River Dam, which impounds the Woods Reservoir, is the only known roost site for gray bats at Arnold AFB, is located over 6.5 miles south of the Preferred Alternative. Gray bat roosting caves or similar structures are not known to exist at the Preferred Alternative site. The Preferred Alternative may impact the Indiana bat. The project site is located approximately 2.75 miles from a site where Indiana bats have been acoustically detected. Therefore, there is the potential for use of the Preferred Alternative site for roosting by Indiana bats. Because limiting the clearing of trees to only take place during the winter hibernation season is not feasible under the Preferred Alternative, Indiana bats could be injured or killed if present at the site during site preparation for construction.

Nearly annual bat surveys conducted by Arnold AFB since 2000 have documented the presence of the tricolored bat. Bat surveys have captured the species at 27 locations on Base since 1998 and detected it acoustically at all five monitoring locations used since 2015. The nearest capture and acoustic detection sites to the Preferred Alternative are approximately 2.9 miles and 3.2 miles, respectively. It is approximately 6 miles to the nearest known hibernacula, which the tricolored bat shares with NLEB, gray, little brown, and Indiana bats. It is assumed that the tricolored bat, since present in the same hibernacula, could be using the area during swarming much like the listed bat species. Bat surveys have captured little brown bats at 13 locations on Base since 1998 and detected them acoustically at all five monitoring locations used since 2015. The nearest capture and acoustic detection sites to the Preferred Alternative are approximately 2.3 miles and 3.2 miles, respectively. It is approximately 6 miles to the nearest known hibernacula. It is assumed that the little brown bat, since present in the same hibernacula, could be using the area during swarming much like the listed bat species. Surveys indicate that while capture rates have been highly variable on Arnold AFB since 1998, they have been at or near zero since 2014.

Arnold AFB, TNARNG, and USFWS conducted a site visit and evaluation of habitat at the Preferred Alternative site on 2 February 2022. During evaluation of the habitat, it was determined that only 5 acres of mixed hardwood forest location in the southeastern portion of the Preferred Alternative site provide suitable roost habitat for listed bat species (EA Figure 2-5, page 2-9). The remaining mixed pine portions of the Preferred Alternative site do not contain suitable roost trees (EA Figure 2-5, page 2-9).

TNARNG prepared a Biological Assessment (BA) to facilitate consultation with the USFWS and is in formal consultation with the USFWS under the ESA for the gray bat, NLEB, Indiana bat, tricolored bat, and little brown bat. The Draft BA is provided in Appendix C of the EA. Considering the species' biology and habitat requirements, TNARNG has made the determination that the proposed timber clearing associated with the Proposed Action at VTS-T, as well as

operation and maintenance of the proposed barracks and associated facilities, *may affect, and is likely to adversely affect* the NLEB, Indiana bat, tricolored bat, and little brown bat through the permanent conversion of 5.19 acres of good-quality habitat to a developed land use and through potential timber harvest and construction noise effects (Table 3-10; Appendix C). TNARNG also determined that the Proposed Action *may affect, but is not likely to adversely affect* the gray bat. TNARNG determined that the Proposed Action would have no effect on the monarch butterfly, the four listed mollusks, or any designated critical habitat (Table 3-10; Appendix C). TNARNG proposes to contribute to the Tennessee Imperiled Bat Conservation Fund (TN IBCF) to compensate for potential impacts on the NLEB and Indiana bat. The current per-acre cost for bat habitat compensation is $4,260.00. TNARNG is proposing to contribute a total payment to the TN IBCF of $22,109.40 (5.19 acres x 1.0 multiplier x $4,260 per acre) for good-quality NLEB and Indiana bat habitat to adequately compensate for NLEB and Indiana bat habitat loss. TNARNG has determined that the Preferred Alternative would have no effect on all other ESA listed species and candidate species with the potential to occur at or near the site (EA Table 3-10, page 3-27).

TNARNG would make every effort to avoid and minimize the project's potential impacts on listed species. The project location and orientation of buildings have been chosen to leave only minimal space between developed areas, eliminate interspersed openings, and reduce parking area size. TNARNG also reduced the site footprint from the originally planned 27 acres to 14.9 acres in order to limit the need for additional forest clearing and potential impacts on listed bat species. The originally proposed site layout included small forest patches that would have remained on the site and been dispersed among the buildings. The smaller site layout removes the dispersed forest patches and allows a large block of bottomland forest west of the site along Bobo Creek to remain. Leaving this larger forested patch intact would provide better habitat for the NLEB and Indiana bat than smaller patches of trees interspersed among buildings. Additionally, leaving the larger forest patch intact increases the standoff distance from the creek, reducing potential for siltation and other water quality impacts to the creek. This benefits aquatic insects that may serve as bat forage species, and listed mollusks if present.

Tree clearing associated with initial barracks under the Preferred Alternative cannot be accomplished during the winter months due to harvest logistics, required initial barracks construction timelines, and winter soil moisture levels potentially causing extensive problems such as soil disturbance, erosion, siltation, soil compaction, etc. The tree harvests would therefore be conducted during the late summer/early fall (1 August to 14 November) timeframe, when bat pups will be volant and all bats will be capable of escaping disturbance from tree harvesting operations. TNARNG already conducts all its activities and training within compliance of state and federal law. The TDEC required a SWPPP containing water quality protection measures and BMPs to be implemented throughout the life of the project, preventing siltation and contamination of nearby Bobo Creek from impacting aquatic insects that could serve as bat forage species as well as listed mollusks if present.

Operation and maintenance of the proposed barracks and associated facilities have the potential to impact listed species over time. To prevent or minimize potential impacts, the outdoor lighting plan would include bat-friendly lighting that incorporates the use of building and security light fixtures that direct light downward and not sideways or up, in conjunction with light-emitting diodes (LEDs) designed to produce wavelengths less visible and less disturbing to listed bats (amber to red spectrum). These LED lights would prevent concentrating insects and therefore bats in open areas near occupied buildings, reducing impediments to commuting and foraging, and

reducing susceptibility to predation. Use of pesticides would be restricted to the minimum effective amount/concentration, using methods that minimize drift, and adhering to the application situation restrictions of the label. This would minimize potential effects to plants and insects, including the monarch butterfly, in surrounding areas, water bodies, bat insect forage species, and the potential for impacting nearby water sources. Further, TNARNG would make efforts to avoid and minimize the project's potential impacts on milkweed, the host plant for the monarch butterfly.

By incorporating these avoidance and minimization measures as part of design and with TNARNG's adherence to the forthcoming USFWS Biological Opinion (BO), impacts on biological resources from the Preferred Alternative would be reduced to insignificant.

Cultural Resources (EA §3.6, pages 3-28 to 3-33): The Camp Forrest Site is a very large archaeological site consisting of the remains of a World War II–era military training center. The site encompasses 2,451 acres in the western portion of the Arnold AFB and includes the Preferred Alternative. Subsequent archaeological investigations indicate the remains of an early twentieth-century farm are located well outside of the Preferred Alternative and not eligible for the National Register of Historic Places. No historic built resources are present within or adjacent to the Preferred Alternative; therefore, no effects on historic properties are anticipated. Arnold AFB is consulting with the Tennessee State Historic Preservation Office (TN SHPO) on behalf of TNARNG (14 December 2021) pursuant to 36 CFR §800.14. The TN SHPO has not yet responded to concur with the DAF findings; however, all Section 106 consultation will be completed before signature of the Final Finding of No Significant Impact (FONSI) and approval of the Final EA. In addition, letters were mailed on 17 January 2022 to 15 federally recognized tribes. The Thlopthlocco Tribal Town, Eastern Shawnee Tribe, Poarch Band of Creek Indians, and Cherokee Nation responded on (28 January, 1 February, 15 February, and 22 February 2022, respectively) stating the Preferred Alternative would have no adverse effect on tribal resources. No other tribal letters have been received. Records of correspondence with the TN SHPO and the Native American tribal governments are included in **Appendix A** of the EA. Overall, it is anticipated that the Preferred Alternative will have no significant impacts on cultural resources.

Hazardous Materials and Wastes (EA § 3.7, pages 3-34 to 3-38): The Preferred Alternative would not likely interfere with the long-term monitoring of Environmental Restoration Program (ERP) sites at Arnold AFB, and similarly no effects on human health or safety or the Preferred Alternative are expected from any existing ERP sites. Further, measures are in place that would reduce the likelihood of the Preferred Alternative affecting any ERP sites and any ERP sites affecting human health and safety or the Preferred Alternative. The Preferred Alternative is located within Solid Waste Management Unit 24 (SWMU 24) – Camp Forrest. Land use controls (LUC) areas are present within SWMU 24; however, the Preferred Alternative is not located within one of these areas. Several sites within SWMU 24 have required corrective action, including a former landfill, Landfill 1 (LF1) which is proximate to the Preferred Alternative. LF1 is fully fenced, and the existing fence would continue to be maintained and the access gates would continue to be secured. LUC measures are in place and are inspected annually in accordance with the Arnold AFB Hazardous and Solid Waste Amendments Permit, and any deficiencies are corrected in a timely manner. Construction and digging permits are also required on Arnold AFB property, which would limit any potential effects from soil disturbance proximate to LF1 during construction.

Short-term, construction-related impacts associated with hazardous materials and wastes would be negligible. TNARNG and Arnold AFB would comply with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) and all applicable state and federal regulations concerning the transport, storage, use, and disposal of hazardous substances, including all hazardous materials and wastes. The use and storage of minor amounts of hazardous materials related to the Preferred Alternative activities would increase temporarily during site preparation and construction activities. Any hazardous materials used or hazardous wastes generated as a result of implementation of the Preferred Alternative would be accumulated and removed in compliance with the procedures included in VTS-T's hazardous materials management guidance. Implementation of the Preferred Alternative would not be expected to result in any substantial changes in the use or storage of hazardous materials at Arnold AFB. No demolition or renovations of existing buildings are included in the Preferred Alternative, and asbestos is no longer used in new construction; therefore, there would be no impacts associated with asbestos with implementation of the Preferred Alternative. No demolition or renovations to existing buildings are included in the Preferred Alternative, and lead-based paint is no longer used in new construction; therefore, there would be no impacts associated with lead-based paint with implantation of the Preferred Alternative. Based on this analysis, the Preferred Alternative will have no significant impacts on hazardous materials and wastes.

Infrastructure and Transportation (EA § 3.8, pages 3-39 to 3-46): The Preferred Alternative would have short-term, minor, adverse effects on transportation and traffic. Short-term effects would result from construction vehicles and small changes in localized traffic patterns due to the Preferred Alternative. Effects on transportation and traffic would primarily be confined to on-Base areas but would have short-term, negligible, adverse effects on off-Base traffic. These effects would be from incremental increases in the number of vehicles accessing Arnold AFB in support of site preparation and construction activities. Site preparation and construction would require use of privately owned vehicles and delivery trucks to and from the sites. Construction traffic would comprise a small percentage of the total existing traffic both on and off the Installation and would occur for no longer than a 12-month period. Road closures or detours to accommodate utility system work could be necessary, creating short-term traffic delays. These effects would be primarily confined to on-Base areas, temporary in nature, and would end with the construction phase. There would be an incremental increase in off-Base traffic from worker commutes and delivery trucks in support of the on-Base demolition and construction activities. The local roadway infrastructure would be sufficient to support this limited increase in construction vehicle traffic, and there would be no perceptible change in off-Base traffic conditions when compared to existing conditions. No level-of-service change is expected as a result of the minor, short-term increase in traffic associated with construction. Although the effects would be minor, the following measures would be implemented: all site preparation and construction vehicles would be equipped with backing alarms, two-way radios, and slow-moving-vehicle signs, when appropriate; site preparation and construction traffic would be routed and scheduled to minimize conflicts with other traffic; and staging areas would be located to minimize traffic impacts. The Preferred Alternative would not introduce long-term increases in personnel or traffic at the Base.

The Preferred Alternative would result in no impacts associated with antiterrorism/force protection (AT/FP). Buildings associated with the Preferred Alternative would be constructed to the minimum Department of Defense antiterrorism standards for buildings, and the Preferred

Alternative location meets AT/FP requirements. All construction personnel associated with the project would be directed to enter at a designated access control point and would be required to complete all access requirements and badging prior to arriving on the site.

The Preferred Alternative would not result in any changes to the Tullahoma Utilities Authority's municipal water system. Under the Preferred Alternative, no additional TNARNG troops would be assigned to training at VTS-T. The existing barracks are connected to the existing Tullahoma Utilities Authority's municipal water system. While the proposed new TNARNG barracks would also be connected to the water system, no additional use of the system is anticipated. Implementation of the Preferred Alternative would not cause the municipal water system to exceed its 4-million-gallon capacity. The Preferred Alternative would not result in any changes to the Tullahoma Utilities Authority's wastewater system. Under the Preferred Alternative, no additional TNARNG troops would be assigned to training at VTS-T. The existing barracks are connected to the existing sanitary sewer system at VTS-T. While the proposed new TNARNG barracks would also be connected to the wastewater system at VTS-T, no additional use of the system is anticipated; therefore, no known impacts on the wastewater system would occur.

The capacity of the stormwater drainage system at VTS-T would not be exceeded with implementation of the Preferred Alternative, and no long-term changes would occur. As part of the Preferred Alternative, on-site stormwater management would be designed and installed to manage drainage. The areas surrounding the new foundations of buildings and equipment would be appropriately graded to direct stormwater away from the foundation to the appropriate stormwater ditch. During the design phase, a grading plan would be prepared to identify how the site would be graded, how drainage patterns would be directed, and how runoff velocities would affect receiving waters. The grading plan would also include information regarding when earthwork would start and stop, establish the degree and length of finished slopes, and specify where and how excess material would be disposed or where borrow materials would be obtained if needed. Berms, diversions, and other stormwater practices that require excavation and filling would be incorporated into the grading plan. The grading plan would be designed with erosion and sediment control and stormwater management goals in mind. Grading crews would be supervised to ensure that the plans are implemented as intended.

The TNARNG barracks would result in negligible increases in electrical distribution system demand. Minimal temporary outages, localized to VTS-T, could be required to connect the new barracks to the existing electrical supply. However, the Preferred Alternative would not introduce long-term major increases or disruptions in electricity use or availability at VTS-T or in Tullahoma. Therefore, no long-term changes in the electrical distribution system are anticipated.

The proposed site preparation and construction activities included in the Preferred Alternative would temporarily increase the volume of solid waste generated at VTS-T. However, construction and municipal waste is transported off site for disposal at landfills. The capacity of local landfills is more than sufficient for disposal of the debris that would be generated by implementation of the Preferred Alternative. Any wastes that may be unearthed during the Preferred Alternative would be subject to a hazardous waste determination and would be managed appropriately. Therefore, no negative long-term changes in the solid waste system would occur. Based on this analysis, the Preferred Alternative will have no significant impacts on infrastructure and transportation.

Health and Safety (EA § 3.9, pages 3-46 to 3-48): The Preferred Alternative would have short-term, minor, adverse impacts on health and safety during site preparation and construction activities. Although construction activities pose an increased risk of construction-related accidents, construction contractors would comply with all appropriate Army and DAF regulations and policies and wear appropriate personal protective equipment. Health and safety during construction for non-construction-related personnel or dependents who might be in the area would be maintained through administrative controls and engineering controls, such as construction barriers and warning posters and signs. Construction equipment would be used only as necessary during the daylight hours and would be maintained to the manufacturer's specifications to minimize noise impacts. These measures would minimize adverse effects associated with health and safety. Based on this analysis, the Preferred Alternative will have no significant impacts on health and safety.

AVOIDANCE AND MINIMIZATION TO BE IMPLEMENTED BY TNARNG

As the proponent for this action, the TNARNG is responsible for making every effort to avoid and minimize the project's potential impacts on listed species. Further, TNARNG is responsible for ensuring best management practices, permit requirements, and avoidance and minimization measures are fully funded, in place, and being carried out as described above and within §§ 3.1.2 through 3.9.2 of the EA. The TNARNG and its contractors will adhere to all applicable permitting, best management practices, avoidance and minimization measures, and all forthcoming BO requirements in accordance with federal, state, and/or local regulatory requirements during installation and operation of the Preferred Alternative at the VTS-T location.

PUBLIC REVIEW / INTERAGENCY COORDINATION

A Notice of Availability was published in *The Tullahoma News* and *The Manchester Times* on 17 August 2022 and in the *Herald Chronicle* on 18 August 2022, inviting the public to review the draft EA and draft Finding of No Significant Impact (FONSI) for a 30-day comment period. Copies were posted to the TNARNG and Arnold AFB public-facing websites for download and are available for review at the Coffee County, Manchester, Lannom, and Franklin county public libraries. The public comment period closes on 17 September 2022. In consideration of the effect that lengthy closures of local public libraries and other public meeting places, as well as challenges associated with an increasingly overburdened Internet due to the coronavirus (COVID-19) pandemic had on the traditional methods of releasing documents for public review, the TNARNG and DAF encouraged members of the public and all interested stakeholders to contact Arnold AFB directly by email or telephone to discuss and resolve issues involving access to the draft EA and draft FONSI or the ability to comment.

FINDING OF NO SIGNIFICANT IMPACT

Based on review of the facts and analysis summarized above and contained within the findings of the EA, the DAF and TNARNG find the proposed decision to construct and operate barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at VTS-T on Arnold AFB (the Proposed Action Alternative) will not have a significant impact on the natural or human environment. Therefore, an Environmental Impact Statement is not required. This analysis fulfills the NEPA, the President's Council on Environmental Quality 40 CFR §§ 1500 – 1508, the DAF Environmental Impact Analysis Process regulations at 32 CFR § 989, and Army Regulation 200-2.

_____ _____

ANTHONY HAMMETT Date
Colonel, GS
G-9, Army National Guard

_____ _____

RONALD J. ONDERKO, P.E. Date
Command Senior Civil Engineer
Logistics, Civil Engineering and Force Protection

FORMAT PAGE

TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

LIST OF APPENDICES

Page

FORMAT PAGE

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

ACAM	Air Conformity Applicability Model
ACM	asbestos-containing material
AEDC	Arnold Engineering Development Complex
AFB	Air Force Base
AFI	Air Force Instruction
AICUZ	Air Installation Compatible Use Zone
ANSI	American National Standards Institute
APE	Area of Potential Effect
AR	Army Regulation
ARNG	Army National Guard
ARNG I&E	Army National Guard G-9 Installation & Environment
AT/FP	antiterrorism/force protection
BA	Biological Assessment
BEQ	basic enlisted quarters
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
BO	Biological Opinion
BOQ	basic officer's quarters
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
DAF	Department of the Air Force
dB	decibel(s)
dBA	A-weighted decibel
DoD	Department of Defense
EA	Environmental Assessment
EHR	Eastern Highland Rim
EISA	Energy Independence and Security Act of 2007
EO	Executive Order
ERP	Environmental Restoration Program
ESA	Endangered Species Act
°F	degrees Fahrenheit
FONSI	Finding of No Significant Impact
GHG	greenhouse gas
HVAC	heating, ventilating, and air conditioning
I-24	Interstate 24
IBA	Important Bird Area
IDP	Installation Development Plan
INRMP	Integrated Natural Resources Management Plan
LED	light-emitting diode
L_{eq}	equivalent continuous sound level
LF1	Landfill 1
LOS	level of service
LTM	long-term monitoring
LUC	land use control
LUCAM	Land Use Control Assurance Manual
LUCIP	Land Use Control Implementation Plan
LZ	landing zone
m^3	cubic meter(s)
MBTA	Migratory Bird Treaty Act
MILCON	military construction
MMRP	Military Munitions Response Program
MMT	million metric tons
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NFA	no further action
NGB	National Guard Bureau
NHPA	National Historic Preservation Act
NLEB	northern long-eared bat
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
O_3	ozone
OSHA	Occupational Safety and Health Administration
PA	Programmatic Agreement
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PM_{10}	particulate matter less than 10 microns in diameter
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PSD	prevention of significant deterioration
PWS	public water system
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
SC-CO_2	social cost of carbon
SDD	Sustainable Design and Development
SDP	Site Development Plan
SF	square foot/feet
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO_2	sulfur dioxide

SO_X	sulfur oxides
SWMU	solid waste management unit
SWPPP	Stormwater Pollution Prevention Plan
TDEC	Tennessee Department of Environmental Conservation
TNARNG	Tennessee Army National Guard
TN IBCF	Tennessee Imperiled Bat Conservation Fund
tpy	tons per year
TSDC	AEDC Civil Engineering Branch
UFC	Unified Facilities Criteria
USC	United States Code
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
VOC	volatile organic compound
VTS-C	Volunteer Training Site Catoosa
VTS-M	Volunteer Training Site – Milan
VTS-S	Volunteer Training Site – Smyrna
VTS-T	Volunteer Training Site – Tullahoma

1.0 PURPOSE AND NEED

1.1 INTRODUCTION

This Environmental Assessment (EA) has been prepared jointly by the Tennessee Army National Guard (TNARNG) and the Department of the Air Force (DAF) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Arnold Air Force Base (AFB), Tennessee. A Joint Agency Assistance Memorandum was exchanged on 4 October 2021 between the DAF Air Force Materiel Command and Army National Guard (ARNG) G9 Installation and Environment Directorate (ARNG-G9) in accordance with the President's Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) regulations, 40 Code of Federal Regulations (CFR) §1501.7, *Lead Agencies*. For this EA, the TNARNG is the proponent for the Proposed Action while the DAF is the primary lead agency. This EA is a joint agency effort between the TNARNG and DAF since ultimately this EA must contain sufficient information for each agency's signatory authority to fulfill their respective NEPA responsibilities and make independent decisions on resources and issues under their purview as they relate to the Proposed Action.

In accordance with CEQ NEPA regulations (40 CFR Parts 1500-1508, § 1502.13), this section specifies the purpose of and need for the proposed project. Per 10 United States Code (USC) § 10501, the National Guard Bureau (NGB) is a joint activity of the Department of Defense (DoD). Pursuant to DoD Directive 5105.77, *NGB*, dated 30 October 2015, the NGB serves as the principal advisor to US Army on matters involving the ARNG and is responsible for implementing DoD guidance on the structure and strength authorizations of the ARNG. The NGB is responsible for ensuring that ARNG activities are performed in accordance with applicable policies and regulations. As such, the NGB is the lead federal agency responsible for preparation of NEPA-compliant documentation on projects for which the TNARNG is the proponent. In that capacity, the NGB is ultimately responsible for environmental analyses and documentation; however, the local responsibility for NEPA document preparation falls upon the TNARNG. If TNARNG is unable to execute construction of the Proposed Action as described in this EA, findings of this EA would be reviewed and a supplemental or additional NEPA analysis would be completed, if necessary, before implementing any additional new construction.

1.2 BACKGROUND

The TNARNG has a dual mission. During peacetime, the role of the TNARNG is to be a state military force under the direction of the Governor of Tennessee, as Commander-in-Chief of the state. The TNARNG may be called upon to maintain or restore order in emergency situations, to rescue civilians whose lives are in danger, or to assist during natural disasters. The state mission is to provide trained and disciplined forces for domestic emergencies or as otherwise required by state laws. The state mission provides for the protection of life and property and to preserve peace, order, and public safety under the competent orders of the state governor.

During national emergencies, the President of the United States has the authority to mobilize National Guard units or individuals, putting them in federal duty status. While federalized, TNARNG units or personnel report to the Combatant Commander of the theatre in which they

operate and, ultimately, to the President of the United States. Even when not on federal duty status, the TNARNG has a federal mission to maintain properly trained and equipped units, available for prompt mobilization for war, national emergency, or as otherwise needed. The Army also has an environmental mission to sustain the environment to enable the Army mission and secure the future.

The TNARNG is composed of four major units: the 278th Armored Cavalry Regiment in Knoxville; the 230th Sustainment Brigade based in Chattanooga; the 194th Engineer Brigade out of Jackson; and the 30th Troop Command headquartered in Tullahoma. Altogether, the TNARNG has a strength of approximately 10,700 soldiers, consisting of 15 infantry units, 9 aviation units, 8 engineering units, 6 artillery units, 2 signal units, 1 Army liaison team, 21 support units (maintenance, personnel, logistics, etc.), and 7 military police units. There are individual sites and training installations that support this mission by providing training locales, maintaining and storing equipment and weapons, and housing TNARNG staff. The TNARNG comprises the following facilities:

- 84 Readiness Centers (armories)
- 4 Volunteer Training Sites
- 18 Field Maintenance Shops
- 3 Combined Service Maintenance Shops
- 4 Army Aviation Support Facilities
- 2 Unit Training Equipment Sites

1.2.1 Volunteer Training Site – Catoosa

The TNARNG maintains the Volunteer Training Site – Catoosa (VTS-C) in Tunnel Hill, Catoosa County, Georgia. VTS-C encompasses 1,633 acres. The site is currently used as a test facility for the Army's multiple rocket system and for military reenactments. In addition, VTS-C supports actions for the TNARNG and Army reserve units, including the use of tanks, rocket launchers, and small arms; supports civilian law enforcement agencies; and provides limited active-duty aircraft training.

1.2.2 Volunteer Training Site – Smyrna

The TNARNG maintains the Volunteer Training Site – Smyrna (VTS-S) in Rutherford County, Tennessee. VTS-S is an 876-acre training site owned primarily by the US Army Corps of Engineers and licensed for use by the TNARNG. The training facility is adjacent to the Smyrna/Rutherford County Regional Airport. The site is primarily used by the TNARNG; however, it is also used by National Guard units from other states, the US Army Reserve, state and local law enforcement agencies, and other groups. Currently, VTS-S serves as the TNARNG's primary educational center for the Tennessee Military Academy, Army Aviation Support Facility, Combined Support Maintenance Shop, Troop Command, and Training Site Activities/Centers located at VTS-C, VTS-Milan (VTS-M), and VTS-Tullahoma (VTS-T). The mission of VTS-S is to develop, maintain, and operate training facilities in support of mission training requirements for TNARNG units. VTS-S oversees the other TNARNG training centers of VTS-C, VTS -M, and VTS T. The formal mission statement for VTS Smyrna.

1.2.3 Volunteer Training Site – Milan

VTS-M was established during World War II as Milan Arsenal on 2,466 acres, the bulk of which is located in the city of Lavinia in Carroll County, Tennessee, with three small parcels in Gibson County, Tennessee. VTS-M is utilized by the TNARNG as a combat readiness training facility for the TNARNG and Reserve Components of the armed forces. VTS-M includes several gunnery ranges but is primarily used for training with wheeled and towed artillery. The facility road network is used for practice with driving and maneuvering large trucks used in transporting such items. Areas of VTS-M are also used as field camps or bivouacs for troops in training. Certain restricted areas are also used by engineering troops carrying out training related to large-scale excavation and filling operations with heavy equipment.

1.2.4 Volunteer Training Site – Tullahoma

The Tennessee Military Department has operated VTS-T at Arnold AFB for the TNARNG since the early 1970s through a real estate agreement with the DAF. VTS-T is located off Industrial Boulevard at the eastern edge of the Arnold AFB boundary in Coffee County, Tennessee, and covers approximately 7,998 acres**.** VTS-T is headquarters for the 30th Troop Command, the TNARNG's 1-107th Air Operations Battalion, and the 1175th Transportation Company, which are committed to maintaining a stance of readiness to accomplish all parts of the TNARNG primary and additional missions. All units within the TNARNG utilize the ranges at VTS-T for small-arms training, light/heavy unit maneuvers, obstacle courses, helicopter drop zone training, and the use of the only automated record fire range in the state.

VTS-T is the only site that has a firing range to qualify soldiers for their required annual small-arms weapons qualification. Therefore, all TNARNG must use VTS-T for annual small-arms weapons qualification, and all units must have adequate housing while training at the site. In 2021, the maximum number of soldiers on the ground training during a given drill weekend was 670. These 670 soldiers belonged to a total of six units utilizing VTS-T for training during one drill weekend. Over multiple drill weekends in 2021, the number of soldiers on the ground for training exceeded the current bed capacity of 375. Overall, in fiscal year 2021, the annual throughput of soldiers utilizing VTS-T to complete annual small-arms weapons qualification was 30,862 soldiers.

1.2.4.1 Existing Barracks

The existing six barracks at VTS-T are in good condition, but there is a bed space deficit, with only 195 current bed spaces (**Table 1-1**; CH2MHILL 2016). Each of the four existing 40-bed barracks contains 80 beds and the existing 20-bed barracks contains 40 beds (**Table 1-2**). Bunk beds were added to the barracks to provide the needed bed spaces, which resulted in less space per soldier and per latrine than the authorized allowances (CH2MHILL 2016). VTS-T is authorized to have bed spaces to accommodate the habitual peak training unit requirement plus 10 percent without exceeding 1,000 bed spaces (CH2MHILL 2016). With the existing barracks, VTS-T has a billeting capacity of 375 personnel; therefore, VTS-T has a deficit of 625 beds (**Table 1-2**; CH2MHILL 2016). With the addition of 625 beds, VTS-T would be at the maximum authorized bed spaces of 1,000 beds (**Table 1-2**; CH2MHILL 2016). TNARNG proposes to construct additional barracks and move the excess beds from the existing barracks to the newly constructed barracks to properly house TNARNG soldiers while they are training at Arnold AFB.

Table 1-1. Current Billeting Space at VTS-T on Arnold AFB

Type	Buildings	Bed Spaces	Space (SF)	Authorized (SF)
Barracks	02831, 02832, 02834, 08235, 08236, 08237	195	23,903	163,000[a, b, c, d]

Source: CH2MHILL 2016
SF – square feet
[a] Based on 20 open bay, 9 basic enlisted quarters, and 2 basic officer's quarters.
[b] Based on 1,000 troops.
[c] Includes 7,200 SF for billeting laundry.
[d] National Guard Pamphlet 415-12 (NGB 2015) dictates space allowance for transient training spaces.

Table 1-2. Current Barracks Space and Proposed Facilities to Meet the Bed Space Deficit at VTS-T on Arnold AFB

Type	Buildings	Bed Spaces	Actual Beds	Barracks Type
Barracks	02831	15	15	BOQ
Barracks	02832	20	40	BOQ
Barracks	02834	40	80	BEQ open bay
Barracks	08235	40	80	Open bay
Barracks	08236	40	80	BEQ open bay
Barracks	08237	40	80	BEQ open bay
Total Barracks		195	375	
Allowance		1,000	1,000	30 = BOQ (2 buildings) 170 = BEQ (9 buildings) 800 = open bay (20 buildings)
Deficit		807	625	15 = BOQ (1 building) 152 = BEQ (8 buildings) 640 = open bay with bunks (16 buildings)

Source: CH2MHILL 2016
BOQ – basic officer's quarters; **BEQ** – basic enlisted quarters

1.3 DEVELOPMENT PLANNING AT VOLUNTEER TRAINING SITE – TULLAHOMA

TNARNG completed the VTS-T Site Development Plan (SDP) in 2016 (CH2MHILL 2016). The purposes of the SDP were to establish a vision and future direction for VTS-T in the context of site constraints and mission needs. Goals and objectives were identified and included an objective to develop opportunities with the Arnold Engineering Development Complex (AEDC) at Arnold AFB, in addition to objectives to construct new facilities and new ranges as needed. Two of the key findings in the 2016 SDP were that more billeting was required to meet demand at VTS-T and that the existing 40-bed barracks were housing 80 beds with no increase in latrine facilities (CH2MHILL 2016). Constructing new barracks space to relieve the bed deficit was one of the major projects in the SDP (CH2MHILL 2016).

Similarly, in the 2017 Installation Development Plan (IDP) for Arnold AFB, it was noted that the living quarters for TNARNG were crowded and that more space was needed (Arnold AFB 2017). Several TNARNG-identified specific project needs were included in the 2017 IDP (Arnold AFB 2017). In particular, a long-term renovation/expansion plan for the barracks that would increase occupancy to about 600 people was included in the IDP (Arnold AFB 2017).

1.4 LOCATION

Arnold AFB is located in south-central Tennessee, approximately 72 miles southeast of Nashville and 61 miles northwest of Chattanooga (**Figure 1-1**). The Installation straddles Coffee and Franklin counties; nearby cities include Tullahoma, Manchester, Winchester, Estill Springs, Decherd, and Sewanee (**Figure 1-2**). VTS-T is located entirely in Coffee County (**Figure 1-2**).

1.5 PURPOSE AND NEED

The purpose of the action is to enhance the ability of the TNARNG to fulfill its military training mission by fully supporting all units assigned to training at VTS-T on Arnold AFB. The Proposed Action is needed to rectify bed space, dining, administrative, and storage facilities deficits for TNARNG units training at the Installation. The existing barracks space is too small for the number of TNARNG troops assigned to train at Arnold AFB.

1.6 SUMMARY OF ENVIRONMENTAL STUDY REQUIREMENTS

The proposed activities addressed within this document constitute a major federal action and, therefore, must be assessed in accordance with NEPA, which requires federal agencies to consider the environmental consequences of proposed actions in the decision-making process (42 USC 4321, et seq.). The intent of NEPA is to protect, restore, or enhance the environment through well-informed decisions by the federal decision maker. The CEQ was established under NEPA, 42 USC 4342, et seq., to implement and oversee federal policy in this process. In 1978, the CEQ issued regulations implementing the NEPA process under Title 40 CFR 17 Parts 1500–1508. On 20 April 2022, CEQ issued *National Environmental Policy Act Implementing Regulations Revisions* for CFR Parts 1502, 1507, and 1508 *(*87 Federal Register 2345340). The Army's Environmental Analysis of Army Actions is set forth in 32 CFR 651 and Army Regulation (AR) 200-2. The DAF Environmental Impact Analysis Process for meeting CEQ requirements is set forth in 32 CFR 989. This EA has been prepared in accordance with all NEPA and CEQ guidance, 32 CFR 651 and 989, and AR 200-2.

1.7 APPLICABLE REGULATORY REQUIREMENTS

Applicable federal, state, and local regulations have been considered during analysis of the impacts on individual environmental and social resources evaluated as part of the EA. The following legislation has been given particular consideration:

- Clean Air Act (CAA) (42 USC 7401)
- Clean Water Act (33 USC 1251)
- Endangered Species Act (ESA) (16 USC 1531–1543)
- Migratory Bird Treaty Act (MBTA) (16 USC 703–712)
- Bald and Golden Eagle Protection Act (BGEPA) (16 USC 668-668d)
- National Historic Preservation Act (NHPA) (42 USC 300101 et seq.)
- Safe Drinking Water Act (42 USC 300f et seq.)
- Stormwater requirements under Section 438 of the Energy Independence and Security Act (EISA) (42 USC 17094)

Figure 1-1. Regional Location of Arnold Air Force Base

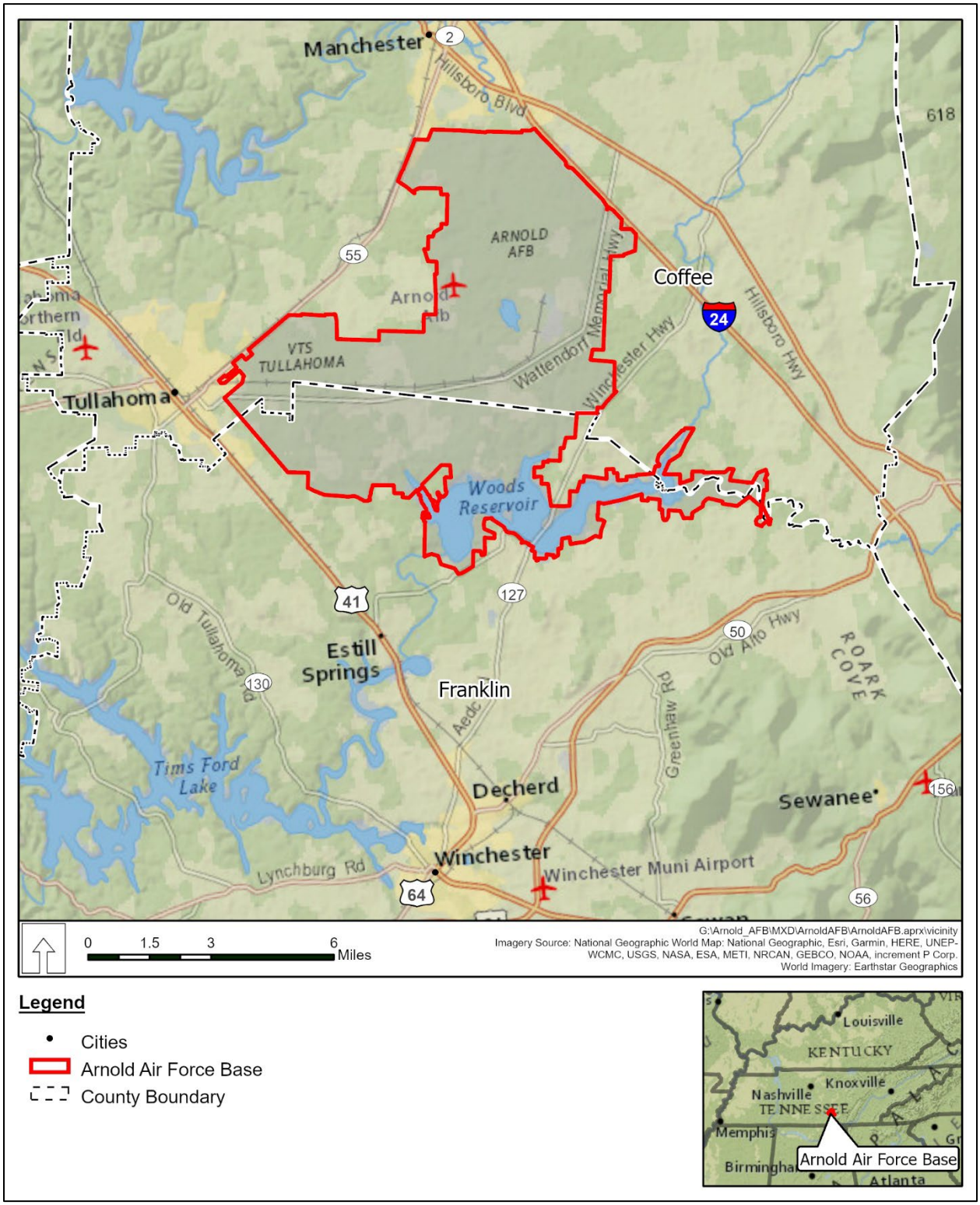

Figure 1-2. Location of Arnold Air Force Base and Surrounding Area

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC 9601–9675)
- Resource Conservation and Recovery Act (RCRA) (42 USC 6901)
- Toxic Substances Control Act of 1970 (15 USC §§ 2601-2671)
- Occupational Safety and Health Act (29 USC §§ 651)
- Executive Order (EO) 13045, *Protection of Children from Environmental Health Risks and Safety Risks*
- EO 12898*, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*
- EO 13175, *Consultation and Coordination with Indian Tribal Governments*
- EO 13990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis*
- EO 14008, *Tackling the Climate Crisis at Home and Abroad*
- EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*

Section 7 of the ESA, as amended, requires that, through consultation with the US Fish and Wildlife Service (USFWS), federal actions do not jeopardize the continued existence of threatened, endangered, or proposed species or result in the destruction or adverse modification of critical habitat. Section 7(a)(1) of the ESA directs federal agencies, in consultation with the USFWS, to use their authorities to further the purposes of the ESA by carrying out programs for the conservation of endangered and threatened species. Additionally, Section 7(a)(2) of the ESA requires federal agencies to ensure that any action they authorize, fund, or carry out (i.e., has a federal nexus) is not likely to jeopardize the continued existence of any federally listed threatened or endangered species or result in the destruction or adverse modification of designated critical habitat.

As the proponent, Army National Guard G-9 (Installation & Environment, ARNG I&E) is the lead federal action agency for consultation with the USFWS, and per 50 CFR 402.08, has designated TNARNG as its nonfederal representative for informal consultation. The ARNG I&E would participate in all aspects and any other formal consultations associated with the Proposed Action with the USFWS involving federally listed species, to include the review of draft Biological Opinions (BOs). Records of correspondence with the USFWS for the Proposed Action are included in **Appendix A**.

To comply with the NHPA and its implementing regulations at 36 CFR 800.3 et seq., federally recognized tribes affiliated historically within the Arnold AFB geographic region have invited to consult on all proposed undertakings that have a potential to affect properties of cultural, historical, or religious significance to the tribes. The tribal coordination process is distinct from NEPA coordination or the DAF's Interagency/Intergovernmental Coordination for Environmental Planning processes and requires separate notification of all relevant tribes. Timelines for tribal consultation are also distinct from those of intergovernmental consultations. On behalf of the TNARNG, Arnold AFB initiated consultation for the Proposed Action in accordance with Air Force Instruction (AFI) 90-2002, *Interactions with Federally Recognized Tribes* (24 August 2020). Once consultation is initiated by the Commander, the Arnold AFB point of contact for consultation with the Tribal Historic Preservation Officer and the Advisory Council on Historic Preservation is the Cultural Resources Manager. TNARNG participates in any meetings with the tribes and assists

the DAF in responding to any comments received from the tribes. Records of correspondence with the Native American tribal governments for the Proposed Action are included in **Appendix A**.

Arnold AFB is consulting with the Tennessee State Historic Preservation Office (SHPO) on behalf of TNARNG pursuant to 36 CFR 800.14 regarding the management of historic properties within the TNARNG-licensed land areas at the Installation (**Appendix A**). In 2014, Arnold AFB, the Tennessee SHPO, tribal representatives, local governmental jurisdictions, and other parties consulted on a *Programmatic Agreement (PA) between Arnold Engineering Development Complex, Arnold Air Force Base and the Tennessee State Historic Preservation Officer Regarding Management of Historic Properties at Arnold Air Force Base, Tennessee, Pursuant to 36 CFR Part 800.14* regarding the management of historic properties at the Installation. The Proposed Action in this EA would be covered under the PA. The PA is effective until 2024 and may be modified, terminated, or extended depending on review by the signatories. The PA establishes procedures to implement Section 106, standards and procedures for the treatment of historic properties, classes of undertakings exempt from further review, standardized treatments for project effects, and documentation, reporting, and monitoring requirements.

TNARNG would comply with CERCLA and RCRA and all applicable state and federal regulations concerning the transport, storage, use, and disposal of hazardous substances, including all hazardous materials and wastes. No hazardous substance use is anticipated during implementation of the Proposed Action. In addition to meeting the above requirements, TNARNG would obtain all necessary permits (e.g., National Pollutant Discharge Elimination System [NPDES] Construction General Permit, individual permits from the Tennessee Department of Environment and Conservation [TDEC]) prior to the initiation of construction activities.

The Proposed Action must also comply with Army and DAF planning and design manuals and design standards. These include:

- DoD installation master planning criteria, consistent with Unified Facilities Criteria (UFC) 2-100-01, *Installation Master Planning*
- Army Sustainable Design and Development (SDD) Policy (17 January 2017)
- AR 200-2, *Environmental Effects of Army Actions* (1 July 1999)
- Air Force Installation Force Protection Guide (September 2021)
- AFI 32-1015, *Integrated Installation Planning* (30 July 2019, Incorporating Change 1, 13 October 2020, and Corrective Action, 4 January 2021)
- DAF Manual 32-1084 (15 January 2020)
- DoD antiterrorism/force protection (AT/FP) criteria, consistent with UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*, and the Air Force *Installation Force Protection Guide* (1 October 2013)
- EO 13834 §§ 6,7, and 11, *Efficient Federal Operations* (20 January 2021)
- Air Force Manual 32-1084 (1 April 2018)

In particular, all planning, design, and construction activities associated with TNARNG's Proposed Action at Arnold AFB would comply with the Army's SDD policy. The goal of the SDD policy is to provide sustainable and adaptable facilities and installations that enhance mission effectiveness, reduce the Army's environmental footprint, and achieve levels of energy independence that enhance continuity of mission-essential operations. TNARNG would plan,

design, build, maintain, and operate the proposed facilities to achieve the highest-performing sustainable design that is life-cycle cost-effective within the program amount.

1.8 PUBLIC AND AGENCY REVIEW OF EA

Through the public involvement process, TNARNG and DAF will notify relevant federal, state, and local agencies and the public of the Proposed Action and request input on environmental concerns they might have regarding the Proposed Action. The public involvement process provides TNARNG and DAF with the opportunity to consider and address state and local views in its decision regarding implementing this federal proposal. **Table 1-3** presents the persons and agencies that will be contacted in the preparation of this EA.

Table 1-3. Persons and Agencies Consulted/Coordinated

Federal Agencies	
Mr. John Blevins US Environmental Protection Agency Region 4 Atlanta Federal Center 61 Forsyth Street, SW Atlanta, GA 30303-8960	Mr. Chase Coakley US Department of Agriculture Natural Resources Conservation Service Area 3 Cookeville Area Office 900 South Walnut Avenue, Room 3 Cookeville, TN 38501
Mr. Dan Elbert and Ms. Nicole Sikula Field Supervisor US Fish and Wildlife Service Tennessee Field Office 446 Neal Street Cookeville, TN 38501	Ms. Tammy Turley US Army Corps of Engineers Nashville District Estes Kefauver Federal Building & Courthouse Annex 801 Broadway Nashville, TN 37203
State Agencies	
Mr. Bryan Davidson Tennessee Department of Environment and Conservation Office of Policy and Sustainable Practices 312 Rosa L. Parks Avenue Nashville, TN 37243	Ms. Jennifer Greer Tennessee Department of Environment and Conservation Columbia Environmental Field Office 1421 Hampshire Pike Columbia, TN 38401
Mr. Roger McCoy and Mr. Dillion Blankenship Tennessee Department of Environment and Conservation Division of Natural Areas William R. Snodgrass TN Tower 312 Rosa L. Parks Avenue, 2nd Floor Nashville, TN 37243	Mr. Phil Hodge Tennessee Division of Archaeology Cole Building #3 1216 Foster Avenue Nashville, TN 37243
Mr. Patrick McIntyre Jr. Tennessee Historic Commission 2941 Lebanon Road Nashville TN 37243-0442	Mr. Wes Winton, Mr. Vincent Pontello, and Mr. Josh Campbell Tennessee Wildlife Resources Agency Region II Ellington Agricultural Center 5105 Edmonson Pike Nashville, TN 37211
Tribes	
Governor John Raymond Johnson Absentee Shawnee Tribe of Oklahoma 2025 S. Gordon Cooper Drive Shawnee, OK 74801	First Chief Herbert Johnson Sr. Alabama-Coushatta Tribe of Texas 571 State Park Road 56 Livingston, TX 77351
Chief Chuck Hoskin, Jr. Cherokee Nation P.O. Box 948 Tahlequah, OK 74465-0948	Chief Nelson Harjo Alabama-Quassarte Tribal Town Oklahoma P.O. Box 187 Wetumka, OK 74883

Governor Bill Anoatubby Chickasaw Nation P.O. Box 1548 Ada, OK 74821-1548	Chairman Jonathan Cernek Coushatta Tribe of Louisiana P.O. Box 10 Elton, LA 70532
Chief Tiger Hobia Kialegee Tribal Town P. O. Box 332 Wetumka, OK 74883	Chief Richard Sneed Eastern Band of Cherokee Indians P.O. Box 455 Cherokee, NC 28719
Chief Joe Bunch United Keetoowah Band of Cherokee P.O. Box 746 Tahlequah, OK 74464	Chief Glenna J. Wallace Eastern Shawnee Tribe of Oklahoma 12755 South 705 Road Wyandotte, OK 74370
Tribal Chair Stephanie Bryan Poarch Band of Creek Indians 5811 Jack Springs Road Atmore, AL 36502	Principal Chief David W. Hill Muscogee (Creek) Nation of Oklahoma P.O. Box 580 Okmulgee, OK 74447
Principal Chief Lewis J. Johnson Seminole Nation of Oklahoma P.O. Box 1498 Wewoka, OK 74884	Tribal Chairman Ben Barnes Shawnee Tribe of Oklahoma 29 South Hwy 69A Miami, OK 74355
Mekko (Chief) Ryan Morrow Thlopthlocco Tribal Town P.O. Box 188 Okemah, OK 74859	

A Notice of Availability of the Draft EA and proposed Finding of No Significant Impact (FONSI) was published in the newspapers of record (*The Manchester Times*, Manchester, Tennessee; *The Tullahoma News*, Tullahoma, Tennessee; and *Herald Chronicle*, Winchester, Tennessee) announcing the availability of this EA for a period of 30 days. Public and agency comments received on the Draft EA and proposed FONSI will be provided in **Appendix A** of the Final EA**.**

Copies of this Draft EA and proposed FONSI are available for review online at the TNARNG and Arnold AFB public websites, https://www.tn.gov/military/who-we-are/state-administration-military/environmental.html and https://www.arnold.af.mil/Units/Test-Support-Division, and at the following locations:

Coffee County Manchester Public Library
1005 Hillsboro Boulevard
Manchester, TN 37355

Lannom Public Library
312 North Collins Street
Tullahoma, TN 37388

Franklin County Library
105 South Porter Street
Winchester, TN 37398

FORMAT PAGE

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This section of the EA describes details of the Proposed Action and alternatives considered to meet the purpose and need of the Proposed Action, and how the alternatives were screened against selection standards.

2.2 DESCRIPTION OF THE PROPOSED ACTION

The Proposed Action would construct and operate up to 20 new one-story, 5,000-square-foot (SF) open-bay barracks with latrines; showers; laundry; exterior paving; stairs, ramps, and walkways; and grading and drainage; and all related work for a new functional and energy-efficient barracks for the TNARNG at VTS-T on Arnold AFB. The 20 new barracks would increase bed capacity by 640. The proposed five new 200-person dining facilities (each approximately 4,500 SF in accordance with National Guard Pamphlet 415-12 [NGB 2015]) and five new administrative and storage facilities totaling approximately 5,960 SF (NGB 2015) associated with the barracks would also be constructed at VTS-T. TNARNG would construct each new barracks in the coming years as funding becomes available. Currently, TNARNG has only secured funding for one one-story 5,000-SF open-bay barracks building. If TNARNG obtains funds for additional barracks buildings and the proposed dining halls and administration/storage buildings, then TNARNG would review this EA to determine if language regarding site conditions and potential environmental consequences need to be revised and updated. TNARNG would coordinate its EA review findings with ARNG-G9 NEPA staff. Construction of one new 5,000 SF barracks would take no more than 12 months. The additional required bed, dining, and administrative spaces would be programmed and constructed in the future, as funding becomes available.

TNARNG has sought NGB approval and programming for the construction of new barracks for several years, with a two- to three-story barracks as the design type, which would reduce the facility footprint, save land, decrease walking distances, and make VTS-T more compliant with a sustainable planning strategy that promotes compact development (CH2M Hill 2016). While a two-story or three-story barracks alternative could be desired for completing more bed spaces at once, it causes multiple units to occupy the same space. Construction of separate one-story buildings allows better command and control within unit elements using the barracks and is the preferred solution of the NGB Ground Forces Commander to remedy current bed space deficiencies. As the need for additional bed space to accommodate the annual throughput of soldiers training at VTS-T has continued to grow, and consistent with the Army's SDD policy and facility designs included within the NGB's prioritized plan for military construction (MILCON) projects, TNARNG proposes construction of multiple one-story, open-bay barracks. Therefore, the construction of multiple barracks of only one specific type, one story open bay, is being considered as part of the Proposed Action in this EA.

2.3 ALTERNATIVE SELECTION STANDARDS

NEPA and the CEQ regulations mandate the consideration of reasonable alternatives for the Proposed Action. "Reasonable alternatives" are those that could be utilized to meet the purpose and need of the Proposed Action. In accordance with 32 CFR 989.8(c), the development of

selection standards is an effective mechanism for the identification, comparison, and evaluation of reasonable alternatives.

Alternatives to the Proposed Action were evaluated based on four selection standards:

- **Standard 1**: The alternative(s) must be sited on existing TNARNG-licensed lands at Arnold AFB with available area (minimum of approximately 14.9 acres) for construction of up to 20 new 5,000 SF barracks to maximize operational security and be proximate to existing TNARNG VTS-T Training Areas (**Figure 2-1** and **Figure 2-2**).
- **Standard 2**: The alternative(s) must be sited proximate to existing utilities on Base and within walking distance to the current VTS-T cantonment area **(Figure 2-1**).
- **Standard 3**: The alternative(s) must comply with the VTS-T SDP and Arnold AFB IDP.
- **Standard 4**: The alternative(s) must ensure that construction does not disrupt current or planned training.

2.4 ALTERNATIVES CONSIDERED

This section presents all alternatives evaluated and assesses them relative to selection standards. TNARNG initially considered siting the new barracks, dining, administrative, and storage facilities adjacent to the existing barracks on the same parcel at VTS-T on Arnold AFB (**Figure 2-3**); however, the required land area is not available; and the site is not developable due to stormwater runoff considerations and the location of an existing geothermal field (CH2MHILL 2016). This initial consideration was dismissed and not assessed relative to selection standards.

Any location that is not proximate to the VTS-T would not meet the project's purpose and need, as all proposed barracks and associated facilities would need to be constructed proximate to VTS-T to accommodate training that is only available at VTS-T. This training includes annual small-arms weapons qualifications for all TNARNG units. Therefore, TNARNG and DAF focused on TNARNG-leased areas on Arnold AFB to identify alternative locations at or proximate to VTS-T for the Proposed Action (**Figure 2-3**). The four selection standards were used to screen alternative locations and to select alternatives that would be carried forward for further detailed analysis in the EA (**Table 2-1**). Alternatives that met all selection standards were considered reasonable and retained for consideration in this EA. Although the No Action Alternative was analyzed, under the No Action Alternative, no barracks would be constructed; therefore, the purpose and need would not be met.

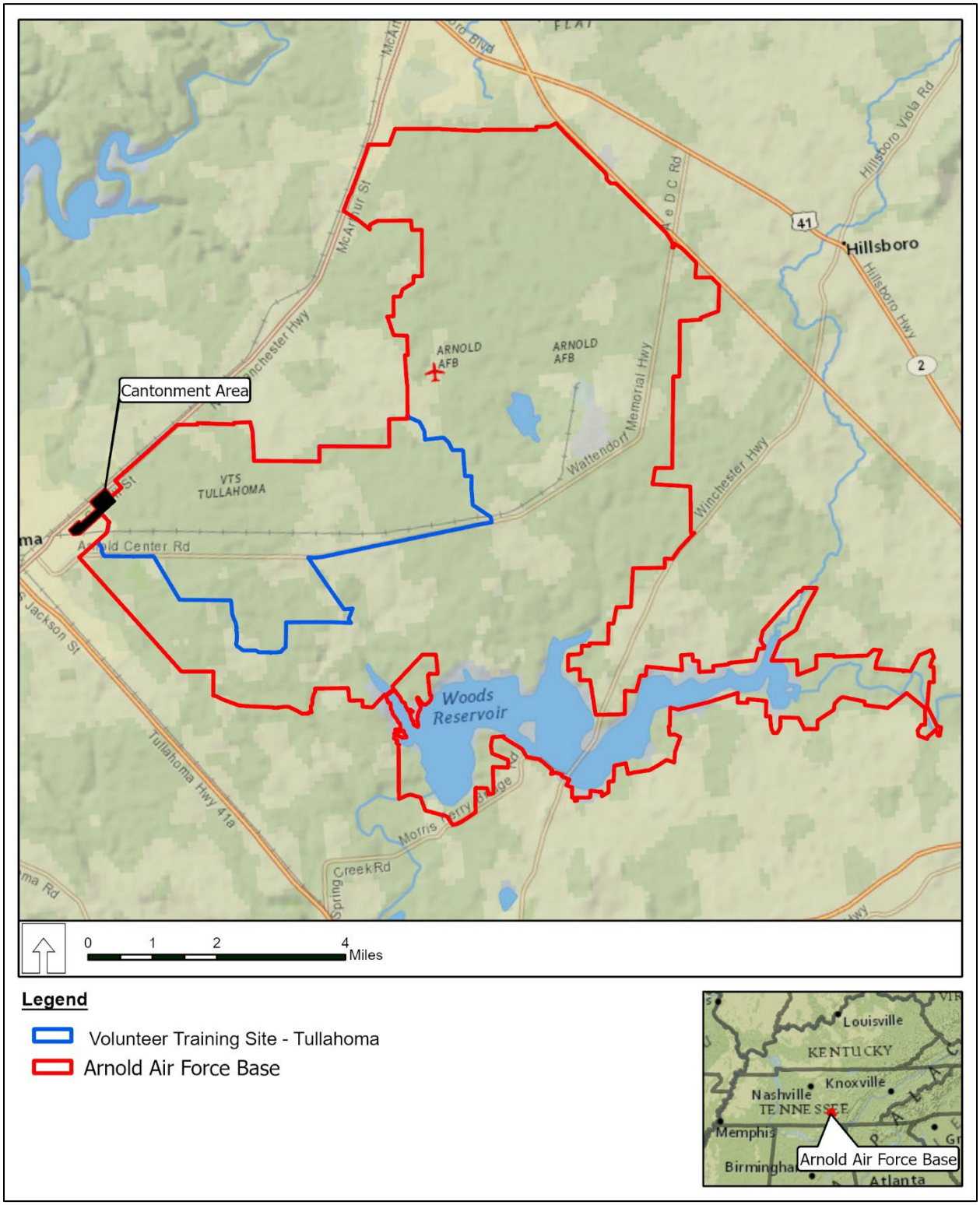

Figure 2-1. Location of Volunteer Training Site – Tullahoma at Arnold Air Force Base

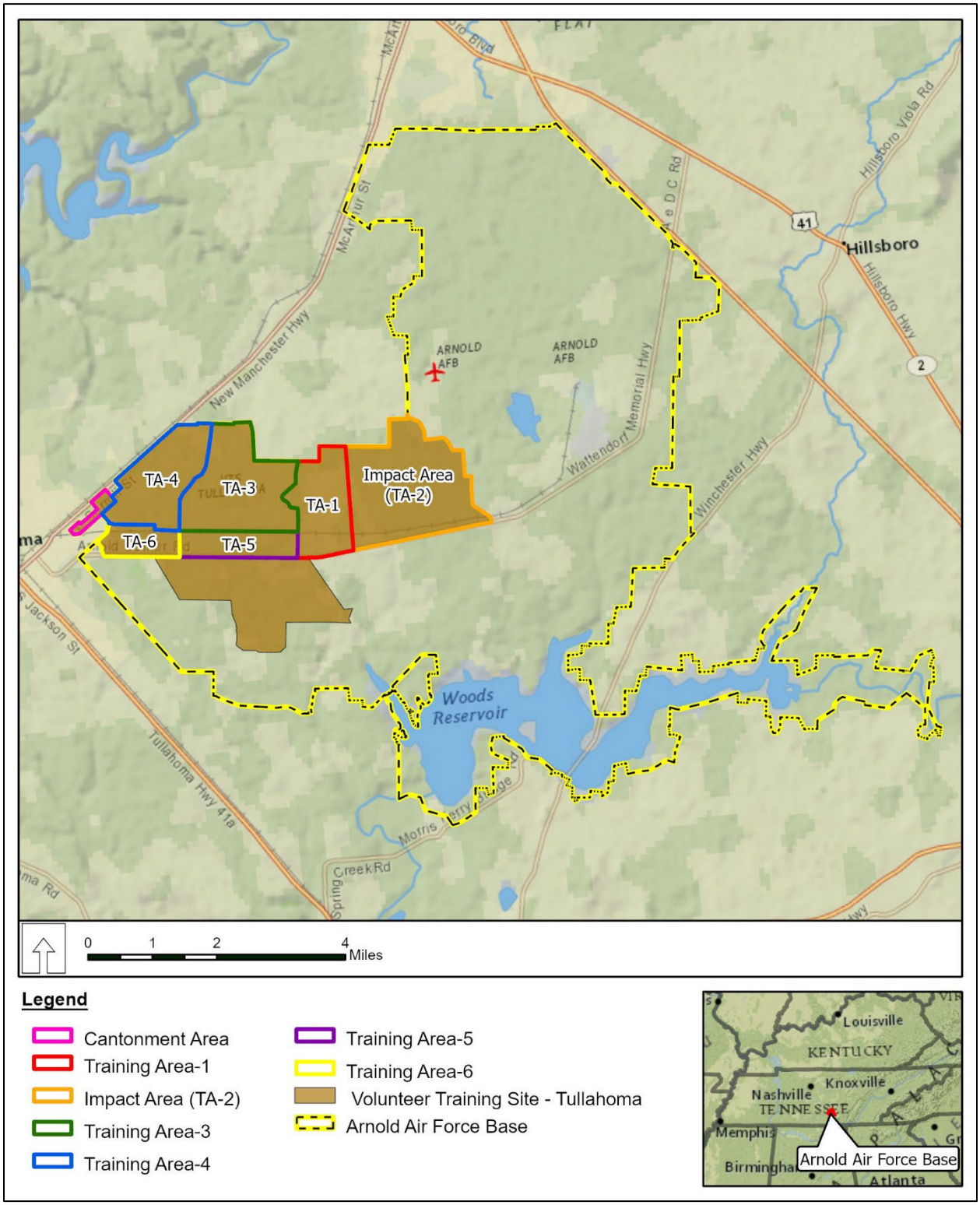

Figure 2-2. Training Area Locations at Volunteer Training Site – Tullahoma on Arnold Air Force Base

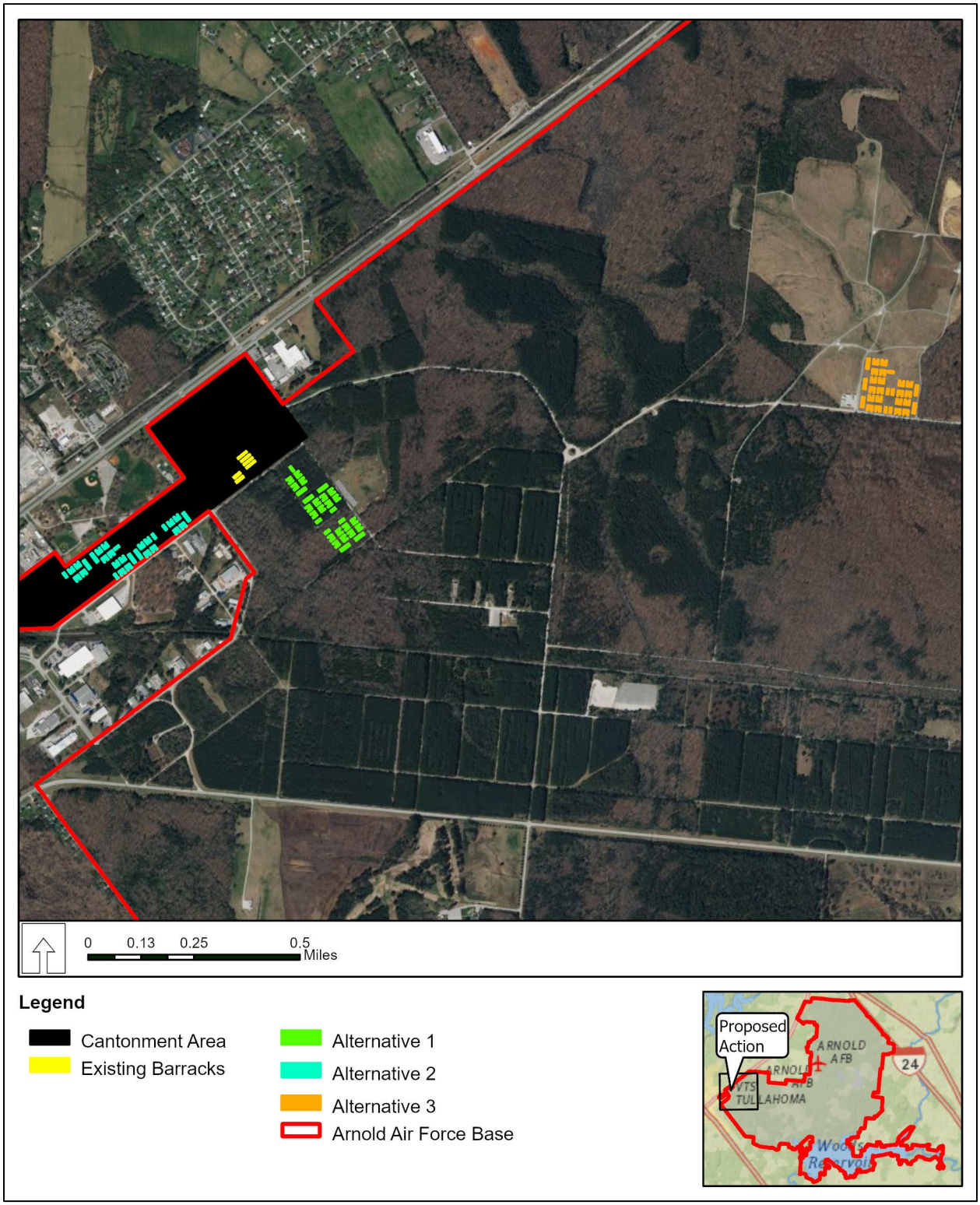

Figure 2-3. Alternative Locations Considered at the Volunteer Training Site – Tullahoma at Arnold Air Force Base

Table 2-1. Alternatives Considered Compared to Selection Standards

Selection Standard	Alternative 1 Undeveloped Forested Parcel at VTS-T	Alternative 2 Site Support/ Motor Pool Area at VTS-T	Alternative 3 Landing Zone at VTS-T	Alternative 4 Constructing New Barracks outside TNARNG-licensed Areas on Arnold AFB	No Action Alternative
Standard 1: The alternative(s) must be sited on existing TNARNG-licensed lands at Arnold AFB with available area (minimum of approximately 14.9 acres) for construction of up to 20 new 5,000 SF barracks to maximize operational security and be proximate to existing TNARNG VTS-T Training Areas.	Yes	Yes	Yes	No	No
Standard 2: The alternative(s) must be sited proximate to existing utilities on Base and within walking distance to the current VTS-T cantonment area.	Yes	Yes	No	No	No
Standard 3: The alternative(s) must comply with the VTS-T SDP and Arnold AFB IDP.	Yes	Yes	No	Yes	No
Standard 4: The alternative(s) must ensure that construction does not disrupt current or planned training.	Yes	No	No	Yes	No

VTS-T – Volunteer Training Site – Tullahoma; **TNARNG** – Tennessee Army National Guard; **AFB** – Air Force Base; **SF** – square foot/feet; **NGB** – National Guard Bureau; **SDP** – Site Development Plan; **IDP** – Installation Development Plan

2.4.1 Alternative 1. Siting the Barracks on an Undeveloped Forested Parcel near the Current Obstacle Course at Volunteer Training Site – Tullahoma

Alternative 1 would site the new TNARNG barracks, dining, administrative, and storage facilities on an approximately 14.9-acre parcel of undeveloped, forested land in Training Area 4 near the TNARNG VTS-T cantonment area and current training facilities including the current VTS-T obstacle course (**Figure 2-4**). A portion of the current parking area for the obstacle course would be utilized for the barracks under this alternative. Existing utilities exist at the Alternative 1 location. Utilities would be connected to the Preferred Alternative site from the southeast corner of the existing cantonment area through the northwest corner of the site. Existing water and gas lines run along the northern edge of the of the site and would be tied into lines in the northwest corner.

Figure 2-4. Alternative 1 Location – Undeveloped Forested Parcel

An existing electrical line runs along the north side of the northern boundary road, and this would be brought over the road to join the gas and water lines underground in the northwest corner. Lines would be run underground to the first barracks location and would be extended as additional buildings are added, eventually circling the outside edge of the project footprint.

The 14.9-acre parcel comprises three forested blocks, mostly surrounded by gravel roads (**Figure 2-5**). The two northern blocks are composed of dense young pine stands, with very sparsely intermixed hardwoods. The northern and southern blocks are 5.25 acres and 4.46 acres, respectively, and consist of pine forest (**Figure 2-5**).

The Alternative 1 location would be within the land area that is currently included in the TNARNG-licensed areas at Arnold AFB and has available land for the construction of up to 20 new barracks. Approximately 14.9 acres of land clearing would be required for construction of the new TNARNG barracks at the Alternative 1 location. Land clearing would be accomplished in two phases. A construction or land clearing company would clear the northernmost 5.25-acre block of pine forest (see **Figure 2-5**) in late summer/early fall 2022 between 1 August and 14 November 2022 to meet the required construction timeline for the initial barracks. The remaining two blocks (see **Figure 2-5**) would be cleared as part of the Arnold AFB annual forest program harvest in summer/early fall 2023 between 1 August and 14 November 2023. Trees and stumps would be removed after clearing, and the site would be regraded for proper drainage and stabilized. Trees and stumps removed from the Alternative 1 site would be staged/stored at the northwest treeless corner of the drop zone (**Figure 2-6**). All fill/borrow material is anticipated to come from commercial borrow pits located off Base, with materials being transported on paved public roads to the Alternative 1 location. Staging of vehicles and equipment would be done in the paved motor pool area, just to the east of the construction site, with vehicles accessing the site on the most direct paved and gravel roads possible (**Figure 2-6**).

Under Alternative 1, the siting and design of the proposed barracks and associated facilities would comply with the VTS-T SDP and Arnold AFB IDP. Construction and operation of up to 20 new barracks, dining, administrative, and storage facilities at the Alternative 1 location would occur over the next 20 years and would not result in any disruptions of current or future training.

2.4.2 Alternative 2. Siting the Barracks within the Current Site Support/Motor Pool Area at Volunteer Training Site – Tullahoma

Alternative 2 would site the new TNARNG barracks on an approximately 27-acre portion of VTS-T currently used as the site support/motor pool area within the existing cantonment area (**Figure 2-7**) and near the current training areas. The Alternative 2 location is within the fenced land area currently included in the TNARNG-licensed areas at Arnold AFB and has available land for the construction of up to 20 new barracks, dining, administrative, and storage facilities. No additional land clearing would be required for construction; minor site preparation would be required. Current utilities exist at the site and would be utilized for operation of the barracks. The site support/motor pool area includes a wash rack, an armored vehicle storage area, and a salvage yard that are currently in use by the TNARNG.

Figure 2-5. Alternative 1 – Forested Parcels for Harvest

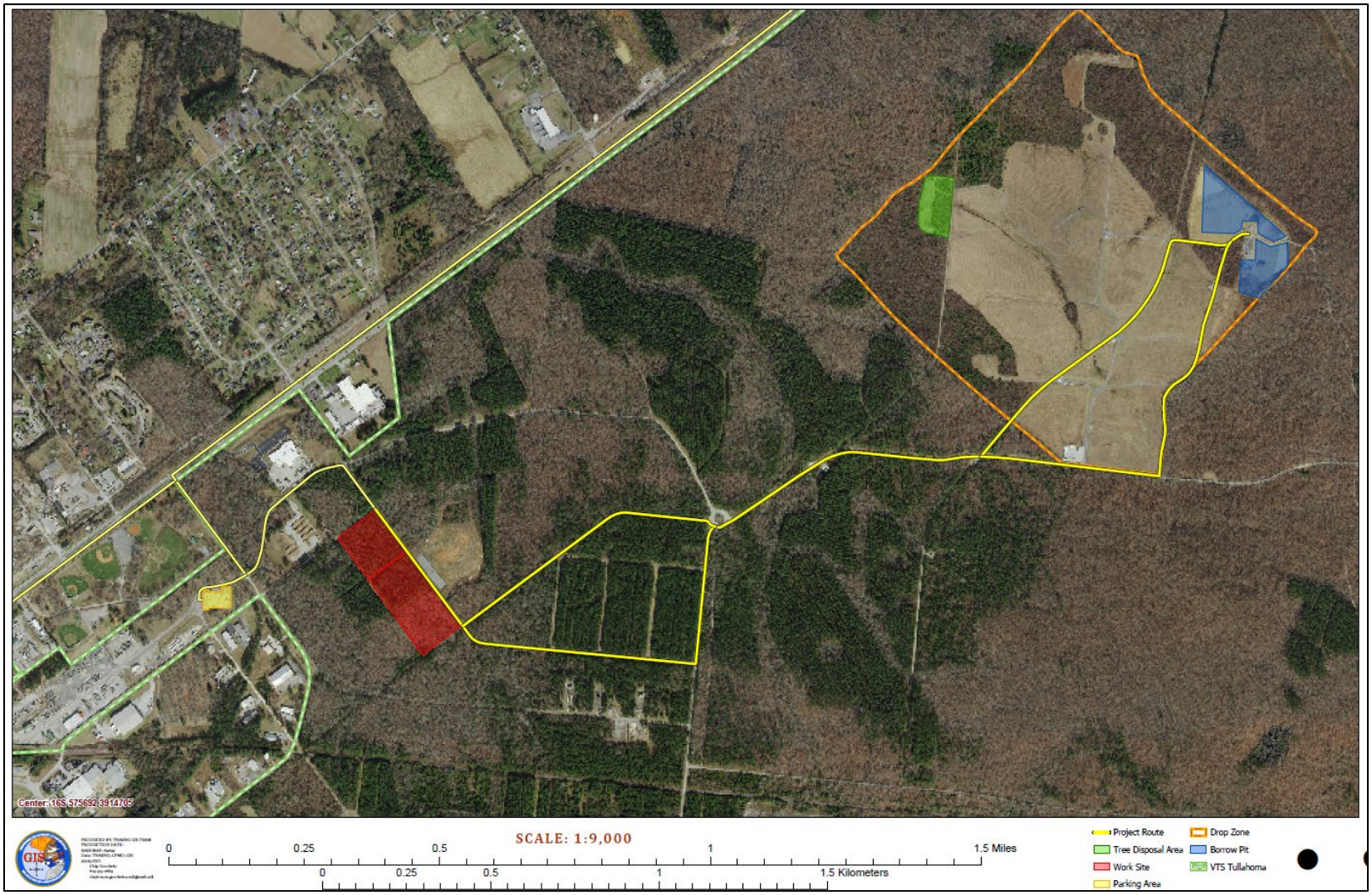

Figure 2-6. Alternative 1 Staging Areas and Construction Routes

Figure 2-7. Alternative 2 Location – Site Support/Motor Pool Area

Under Alternative 2, the siting and design of the proposed barracks and associated facilities would comply with the VTS-T SDP and Arnold AFB IDP. However, the current site support/motor pool area provides vehicle and equipment parking and maintenance facilities required for TNARNG training. All vehicle parking areas, vehicles, equipment, and facilities would have to be relocated and a new site support/motor pool area constructed elsewhere. No existing, cleared land area is currently available on VTS-T for relocation of the site support/motor pool area. As such, Alternative 2 would result in disruptions to current and future training since no site support and motor pool space would be available until a proposed new location is identified and constructed. In addition, implementation of Alternative 2 would increase construction costs because of the requirement to construct a new secure motor pool space elsewhere, and this alternative would place an administrative burden on the unit storing TNARNG vehicles. Once a new site support/motor pool area could be selected and construction on that site could begin, construction of the new TNARNG barracks, dining, administrative, and storage facilities at the Alternative 2 location would start.

2.4.3 Alternative 3. Siting the Barracks within the Existing Landing Zone at Volunteer Training Site – Tullahoma

Under Alternative 3, the TNARNG would site the proposed new barracks within the existing landing zone (LZ) at VTS-T (**Figure 2-8**). The LZ is within Training Area 4 and is within the TNARNG-licensed land at Arnold AFB, but it is not within walking distance to the cantonment area. Due to the distance that would exist between facilities, the existing dining facility could not easily support soldiers using the barracks, placing additional administrative burden on the unit to feed soldiers. The Alternative 3 location has space for the construction of up to 20 new barracks, dining, administrative, and storage facilities; and no additional land clearing would be required for construction. However, there are no existing utilities or support infrastructure located near the LZ that could be utilized for operation of the barracks. Under Alternative 3, the siting and design of the proposed barracks would not comply with the VTS-T SDP and Arnold AFB IDP. The vertical construction (e.g., buildings and overhead utility lines) associated with the barracks could pose considerable safety concerns and would not comply with current DoD standards mandating clear area distances, which are normally 500 feet or 1,000 feet clear of people, vehicles, and obstructions such as trees, utility poles, and overhead wires. Further, the VTS-T LZ is currently used by TNARNG helicopters for personnel and equipment landings and for annual training. Helicopter operations average 1 to 2 per weekend and 6 to 10 during annual training. Siting the barracks at the LZ would interfere with current and future training.

2.4.4 Alternative 4. Constructing New Barracks outside TNARNG-licensed Areas on Arnold AFB

TNARNG also considered the construction of the new barracks, dining, administrative, and storage facilities in areas outside the current TNARNG-licensed areas on Arnold AFB; however, this alternative was dismissed because it would require negotiation with the DAF in order to procure a license for additional land to be used by the TNARNG, which would not allow the Proposed Action to be constructible/implementable within the time frame needed to address the current bed, dining, administrative, and storage facilities deficit while meeting training needs.

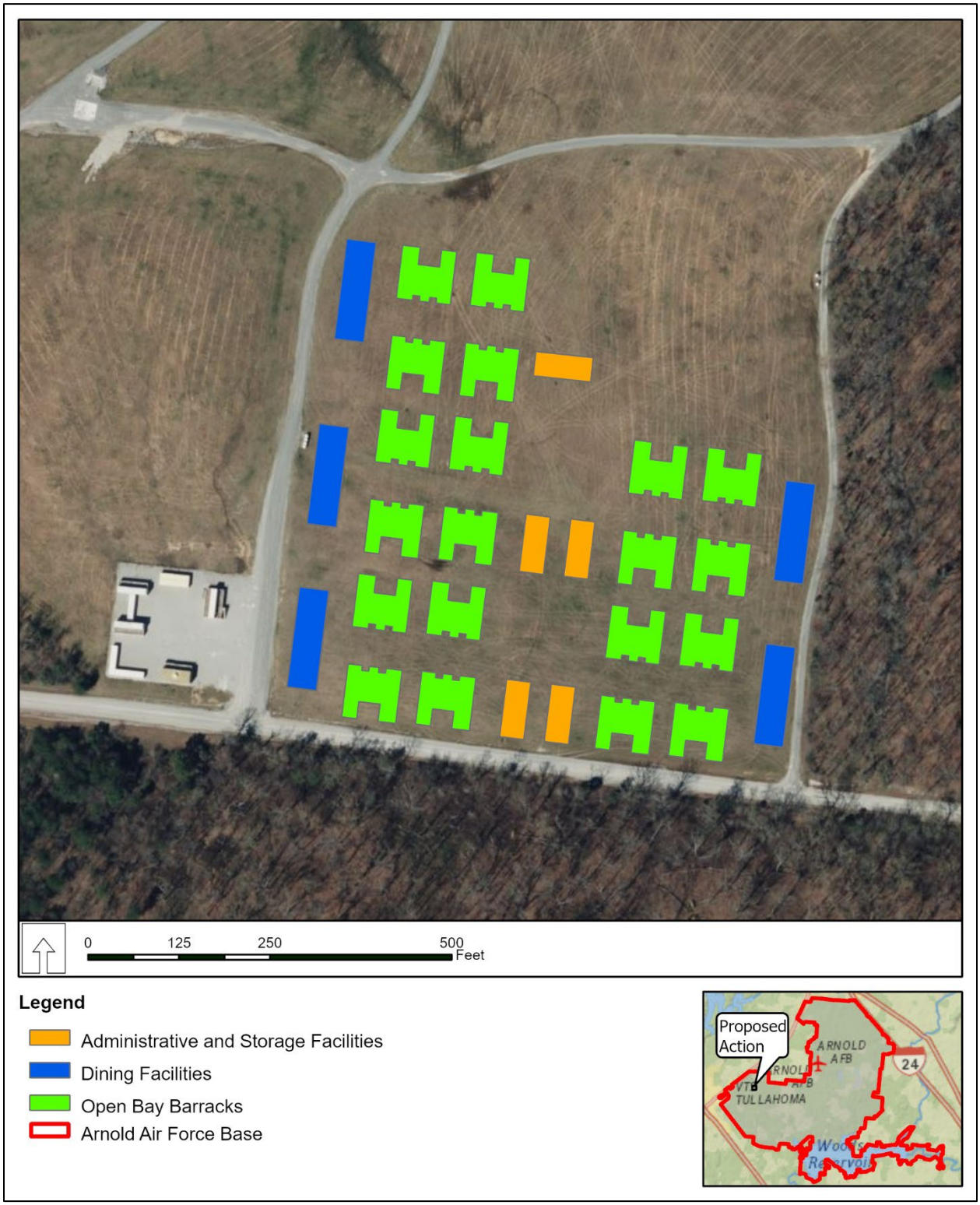

Figure 2-8. Alternative 3 Location – Landing Zone

2.4.5 No Action Alternative

Analysis of the No Action Alternative provides a benchmark, enabling decision makers to compare the magnitude of the environmental effects of the Proposed Action. NEPA requires an EA to analyze the No Action Alternative. For this EA, "no action" means that an action would not take place, and the resulting environmental effects from taking no action would be compared with the effects of allowing the proposed activity to go forward. Therefore, no action for this EA reflects the status quo, where the current bed deficit as described in **Sections 1.2.4.1** and **1.3** would continue.

Under the No Action Alternative, TNARNG would not construct any new barracks, dining, administrative, or storage facilities on Arnold AFB; bed space at VTS-T would not be expanded; programmed funding would go unexecuted; and overall mission training readiness would suffer because the lack of bed spaces negatively impacts readiness and individual small-arms weapons qualification without providing adequate living spaces.

2.4.6 Action Alternatives

Only one of the four action alternatives described in **Section 2.4**, Alternative 1, meets all the selection standards (see **Table 2-1**) and is analyzed in detail in this EA. Alternative 1 is the Preferred Alternative.

2.5 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES

The potential impacts associated with the Preferred Alternative and the No Action Alternative are summarized in **Table 2-2.** The summary is based on information discussed in detail in Chapter 3, *Affected Environment and Environmental Consequences,* of the EA and includes a concise definition of the issues addressed and the potential environmental impacts associated with each alternative.

Table 2-2. Summary of Environmental Consequences

Resource Area	Preferred Alternative	No Action Alternative
Noise	Short- and long-term, minor, adverse effects on the noise environment are anticipated. Short-term increases in noise would be caused by construction activities. No appreciable long-term noise increases in areas of incompatible land use and no violation of any federal, state, or local noise regulation are expected.	No noise impacts at VTS-T on Arnold AFB beyond baseline conditions.
Air Quality and Climate Change	Short- and long-term minor adverse effects on air quality are anticipated. There would be short-term effects due to the use of heavy equipment and generation of fugitive dust during site preparation and construction activities. Long-term effects would be due to the potential use of backup generators and HVAC systems at the proposed barracks. New stationary sources of air emissions could be subject to federal and state air permitting regulations for which TNARNG would be responsible. Permitting scenarios would vary based on the types and sizes of new stationary sources, timing of the projects, and the types of controls ultimately selected. These can differ in specific features from the ones described in this EA. It is not anticipated that the stationary sources of air emissions at VTS-T would exceed the PSD major source thresholds; however, during the final design stage and the	No short-term or long-term impacts on air quality at VTS-T on Arnold AFB beyond baseline conditions.

Resource Area	Preferred Alternative	No Action Alternative
Air Quality and Climate Change (continued)	permitting process either (1) the actual equipment, controls, or operating limitations would be selected to reduce the potential to emit less than the PSD major source threshold; or (2) the PSD permitting process would require detailed dispersion modeling to ensure that any new emission sources at Arnold AFB would not allow for concentrations above the NAAQS. The Preferred Alternative would not (1) exceed the prevention of significant deterioration major source thresholds or (2) contribute to a violation of any local, state, or federal air quality regulation. Coffee County, and therefore all areas associated with the Preferred Alternative, have been designated as being in full attainment for NAAQS. In addition to permitting of new stationary sources of air emissions, the TDEC outlines requirements with which the TNARNG must comply when constructing the new facilities, such as controlling fugitive dust and open burning.	
Earth Resources	Minor impacts on earth resources at Arnold AFB are anticipated. Negligible impacts associated with seismicity or geologic hazards are also anticipated. Impacts on topography would be negligible. There would be short-term, minor, site-specific impacts and negligible long-term impacts on soils.	No impacts on earth resources, including soils, at VTS-T on Arnold AFB beyond baseline conditions.
Water Resources	Minor impacts are anticipated on surface waters at VTS-T on Arnold AFB. There would be short-term, minor impacts and no long-term effects on groundwater. There would be no impacts on floodplains or wetlands on Arnold AFB associated with the Preferred Alternative. The site is located approximately 2.7 miles from the nearest floodplain area and the nearest wetland is approximately 0.31 mile away.	No impacts on water resources at VTS-T on Arnold AFB beyond baseline conditions.
Biological Resources	Minor impacts on vegetation and the associated wildlife are anticipated. Impacts on wildlife would be short term and would affect only wildlife in the immediate project area. A list of federally protected species to be evaluated for potential effects of the Proposed Action was generated using the USFWS IPaC tool and the USFWS 2022 Listing Workplan. Potential effects of the Proposed Action were evaluated on three ESA listed species that have been documented on Arnold AFB (Indiana bat, *Myotis sodalis*; northern long-eared bat, *Myotis septentrionalis*; and gray bat, *Myotis grisescens*), one candidate species (monarch butterfly, *Danaus plexippus*) documented on Arnold AFB, and four listed mollusk species that have not been documented on Base (pale lilliput, *Toxolasma cylindrellus*; slabside pearlymussel, *Pleuronaia dolabelloides*; snuffbox mussel *Epioblasma triquetra*; and turgid blossom *E. turgidula*), despite survey efforts. Two unlisted bat species previously documented on Arnold AFB (tricolored bat, *Perimyotis subflavus*; and little brown bat *Myotis lucifugus*) are currently under review for listing determination and are scheduled to have listing determinations made prior to completion of the Preferred Alternative. Potential effects on these two bat species were also evaluated. Considering the species' biology and habitat requirements, the permanent removal of 5.19 acres of good-quality hardwood bat habitat and construction of buildings *may affect, and is likely to adversely affect* the Indiana, northern long-eared, tricolored, and little brown bats. TNARNG also determined that the Proposed Action	No impacts on biological resources at VTS-T on Arnold AFB beyond baseline conditions.

Resource Area	Preferred Alternative	No Action Alternative
Biological Resources (continued)	*may affect, but is not likely to adversely affect* the gray bat. TNARNG determined that the Proposed Action would have no effect on the monarch butterfly, the four listed mollusks, or any designated critical habitat. TNARNG would implement avoidance and minimization measures to minimize potential impacts and would contribute to the TN IBCF to compensate for the 5.19 acres of good-quality bat habitat that would be permanently eliminated.	
Cultural Resources	No impacts on cultural resources are expected. No historic built resources are present within or adjacent to the Preferred Alternative; therefore, no effects on historic properties are anticipated. Arnold AFB is consulting with the Tennessee SHPO on behalf of TNARNG pursuant to 36 CFR 800.14 regarding the proposed actions within the TNARNG-licensed land areas at the Installation.	No effect on cultural resources at VTS-T on Arnold AFB beyond baseline conditions.
Hazardous Materials and Wastes	Not likely to interfere with the long-term monitoring of ERP sites at Arnold AFB and similarly no effects on human health or safety or the Preferred Alternative from any existing ERP sites. Negligible short-term, construction-related impacts associated with hazardous materials and wastes.	No impacts on hazardous materials and wastes or because of hazardous materials and wastes at VTS-T on Arnold AFB beyond baseline conditions.
Infrastructure and Transportation	Short-term, minor adverse effects on transportation and traffic are expected. Short-term effects from construction vehicles and small changes in localized traffic patterns are anticipated. No impacts on utilities or utility infrastructure on Base are anticipated.	No impacts on infrastructure or transportation at VTS-T on Arnold AFB beyond baseline conditions.
Health and Safety	Short-term, minor adverse impacts on health and safety during site preparation and construction activities.	No impacts on health and safety at VTS-T on Arnold AFB beyond baseline conditions.

VTS-T – Volunteer Training Site – Tullahoma; AFB – Air Force Base; HVAC – heating, ventilation, and cooling; TNARNG – Tennessee Army National Guard; EA – Environmental Assessment; PSD – prevention of significant deterioration; NAAQS – National Ambient Air Quality Standards; TDEC – Tennessee Department of Environmental Conservation; NLEB – northern long-eared bat; USFWS – US Fish and Wildlife Service; ESA – Endangered Species Act; IPaC – Information for Planning and Consultation; TN IBCF – Tennessee Imperiled Bat Conservation Fund; SHPO – State Historic Preservation Office; CFR – Code of Federal Regulations; ERP – Environmental Restoration Program

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the environment potentially affected by the Preferred Alternative at VTS-T on Arnold AFB. NEPA requires the analysis address those areas and components of the environment with the potential to be affected; locations and resources with no potential to be affected need not be analyzed. The existing conditions of each relevant environmental resource are described to give the public and agency decision makers a meaningful point from which to compare potential future environmental, social, and economic effects.

Sections 3.1 through 3.9 provide the baseline environment potentially affected by the Preferred Alternative at Arnold AFB and the environmental consequences. The expected geographic scope of any potential consequences is identified as the Region of Influence (ROI). For most resources in this chapter, the ROI is defined as the boundaries of Arnold AFB unless otherwise specified for a particular resource area.

Those resource areas that are anticipated to experience no impacts under implementation of the Preferred Alternative are not examined in detail in this EA and include land use; prime, unique, and important farmlands; wetlands and floodplains; socioeconomics; environmental justice and protection of children; airspace management; and Air Installation Compatible Use Zones (AICUZs). The brief summary of the reasons for not undertaking detailed analyses for these resource areas is provided below.

Land Use. The Preferred Alternative would result in new development within the cantonment area at VTS-T on Arnold AFB. Land use at VTS-T is predominantly range areas, open space, administrative, industrial, and troop support (CH2MHILL 2016). The current land use designation at the Preferred Alternative site is open space, the majority of which is included in Tract 3 (CH2MHILL 2016) of the current TNARNG-licensed areas. The licensed areas are licensed to TNARNG as exclusive use for a 25-year period ending on 3 November 2035 (License Number DACA01-3-11-0661) (CH2MHILL 2016). The remaining portion of the Preferred Alternative site is covered under a five-year joint-use license (Permit Number USAF-AFMC-ANZY-17-2-0029). All portions of the Preferred Alternative site are included in areas where construction can occur without modification to any existing license agreement or land use designations (CH2MHILL 2016). There would be no change in land use from implementation of the Preferred Alternative and the Preferred Alternative is compatible with all nearby land uses. As such, land use impacts are not analyzed further in this EA.

Prime, Unique, and Important Farmlands. Important farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance. Prime farmland is of major importance in meeting the nation's short- and long-range needs for food and fiber. Prime farmland, as defined by the US Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, and other fruits and vegetables.

It has the special combination of soil quality, growing season, moisture supply, temperature, humidity, air drainage, elevation, and aspect needed for the soil to economically produce sustainable high yields of these crops when properly managed. In some areas, land that does not meet the criteria for prime or unique farmland is considered to be farmland of statewide importance for the production of food, feed, fiber, forage, and oilseed crops. The criteria for defining and delineating farmland of statewide importance are determined by the appropriate state agencies. In other areas that are not identified as having national or statewide importance, land is considered to be farmland of local importance for the production of food, feed, fiber, forage, and oilseed crops. This farmland is identified by the appropriate local agencies. The Preferred Alternative would occur on land underlain by Lobelville silt loam, local alluvium phase (Lk) series soil and Mountview silt loam, eroded, gently sloping phase (Mu) series soil; Mu soils compose most of the underlying land at the proposed project area. All soils in the Lk and Mu series are considered prime farmland; however, existing land cover on these soil series includes range areas, open space, administrative, industrial, and troop support and the soils are not used as farmland. Further, there are no unique farmlands present at VTS-T or on Arnold AFB that are suitable for the production of specific high-value food and fiber crops (Arnold AFB 2021a), and important farmlands are not analyzed further in this EA.

Floodplains. There would be no impacts on floodplains at VTS-T or on Arnold AFB associated with the Preferred Alternative. The Preferred Alternative would not take place within a floodplain; the site is located approximately 2.7 miles from the nearest floodplain area.

***Socioeconomics*.** No personnel relocation would be required to implement the Preferred Alternative. It is anticipated that construction labor would be performed by the local work force; therefore, the Preferred Alternative would not impact housing or population in the region, nor would there be any impact on community resources such as emergency services, schools, or jobs in the region.

Environmental Justice (EO 12898) and Protection of Children (EO 13045). The Preferred Alternative site is located on DAF property, and the nearest low-income or minority population is approximately 25 miles away from the Preferred Alternative area (US Environmental Protection Agency [USEPA] 2021a). Children are not typically located within the project area; however, Waggoner Park, a multiuse park, is located adjacent to VTS-T. Waggoner Park is separated from VTS-T by a security fence. The Preferred Alternative would have no effect on children or families using the park, as TNARNG currently trains at VTS-T with no significant impact to the park or its users.

Airspace Management. There would be no interactions between airspace and the Preferred Alternative at Arnold AFB. The airfield at Arnold AFB is located more than 4.5 miles away from the Preferred Alternative. No airspace modification would occur, and no additional air operations from the Arnold AFB airfield are proposed.

Air Installation Compatible Use Zones. The Preferred Alternative would not have any effect on airfield usage or aircraft operations; therefore, the AICUZ program is not applicable.

The cumulative direct and indirect effects associated with reasonably foreseeable proposed projects at Arnold AFB (**Appendix B**) and recently completed projects near Arnold AFB are also analyzed for each resource. Reasonably foreseeable proposed projects on Arnold AFB include the construction and operation of hypersonic clean air ground test facility within the AEDC,

construction and operation of an Aerothermal Materials Ground Test Facility within the AEDC, and approximately 357 proposed projects, including demolition of aging facilities, new facility construction, facility upgrades, facility repair and renovation, utilities upgrades, and infrastructure improvement, and road maintenance. These proposed projects are identified in Arnold AFB's IDP (Arnold AFB 2017) and analyzed in the Programmatic EA for installation development at Arnold AFB (Arnold AFB 2021b). Recently completed projects near Arnold AFB include construction of a Love's Travel stop across Interstate 24 (I-24) from the Base. In addition, across I-24 from Arnold AFB is the Manchester Industrial Park, which is large enough to support additional industry in the future.

3.1 NOISE

"Noise" is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise intrusive. Human response to noise varies depending on the type and characteristics of the noise, distance between the noise source and the receptor, receptor sensitivity, and time of day. Noise often is generated by activities essential to a community's quality of life, such as construction or vehicular traffic.

Sound varies by both intensity and frequency. Sound pressure level, described in decibels (dB), is used to quantify sound intensity. The dB is a logarithmic unit that expresses the ratio of a sound pressure level to a standard reference level. The hertz is the unit used to quantify sound frequency. The human ear responds differently to different frequencies. "A-weighting," measured in A-weighted decibels (dBA), approximates a frequency response expressing the perception of sound by humans. **Table 3-1** lists sounds encountered in daily life and their dBA levels.

Table 3-1. Common Sounds and Their Levels

Outdoor Sound	Sound Level (dBA)	Indoor Sound
Motorcycle	100	Subway train
Tractor	90	Garbage disposal
Noisy restaurant	85	Blender
Downtown (large city)	80	Ringing telephone
Freeway traffic	70	TV audio
Normal conversation	60	Sewing machine
Rainfall	50	Refrigerator
Quiet residential area	40	Library

Source: Harris 1998
dBA – A-weighted decibel

3.1.1 Existing Conditions

Background noise levels without aircraft operations or training activities were estimated for the areas surrounding Arnold AFB using the techniques specified in the *American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound, Part 3: Short-Term Measurements with an Observer Present* (American National Standards Institute [ANSI] 2013). **Table 3-2** outlines the land use categories, off-Base noise-sensitive areas and their distance to the proposed projects, and the estimated background noise levels in areas surrounding the Base (ANSI 2013). These estimates provide an indication of a range of sound levels in a

given area, and land use categories with estimated sound levels above 50 dBA have an uncertainty of approximately 10 dBA (ANSI 2013).

Table 3-2. Estimated Background Noise Levels

Land Use Category	Nearest Off-Base Noise-Sensitive Area		Average Sound Level (dBA)	
	Direction	Distance	Daytime	Nighttime
Quiet suburban residential	North	17,000 feet	45	39
Rural residential	East	4,000 feet	40	34

Source: ANSI 2013
dBA – A-weighted decibel

3.1.2 Environmental Consequences

Effects on the noise environment would be significant if a proposed action would change the existing noise environment such that it increased exposure to unacceptable noise levels. Potential changes in the noise environment because of a proposed action could also be (1) beneficial (i.e., if they reduce the number of sensitive receptors exposed to unacceptable noise levels), (2) negligible (i.e., if the total area exposed to unacceptable noise levels is essentially unchanged), or (3) adverse. Further, an increase in noise levels due to introduction of new noise sources could create an impact on the surrounding environment.

3.1.2.1 Preferred Alternative

The Preferred Alternative would have short- and long-term, minor, adverse effects on the noise environment. Short-term increases in noise would be caused by construction activities. The Preferred Alternative would not create appreciable long-term increases in areas of incompatible land use due to noise and would not lead to a violation of any federal, state, or local noise regulation.

Table 3-3 presents typical noise levels (dBA at 50 feet) that the USEPA has estimated for the main phases of outdoor construction. Individual pieces of construction equipment typically generate noise levels of 80 to 90 dBA at a distance of 50 feet. With multiple pieces of equipment operating concurrently, the zone of relatively high construction noise typically extends to distances of 400 to 800 feet from the site of major equipment operations. There are no noise-sensitive areas within 800 feet of the proposed site that would experience appreciable construction noise. Limited truck and worker traffic might be audible at locations beyond 800 feet. Given the temporary nature of proposed construction activities and the limited amount of noise generated by heavy equipment, these effects would be minor.

Although construction-related noise impacts would be minor, the following best management practices (BMPs) would be implemented to further reduce these already limited effects:

- Heavy equipment mufflers would be properly maintained and in good working order. Personnel, particularly equipment operators, would don adequate personal hearing protection to limit exposure and ensure compliance with federal health and safety regulations.

Following the completion of construction, noise levels proximate to the barracks would be similar to the noise levels at the existing barracks at VTS-T. Noise would primarily be generated from

vehicle movement went the barracks are being used to support training activities. There are no sensitive noise receptors proximate to the Preferred Alternative locations.

Table 3-3. Noise Levels Associated with Outdoor Construction

Construction Phase	L_{eq} (dBA)
Ground clearing	84
Excavation, grading	89
Foundations	78
Structural	85
Finishing	89

Source: USEPA 1971
L_{eq} – equivalent continuous sound level; **dBA** – A-weighted decibel

3.1.2.2 Cumulative Effects

The majority of all reasonably foreseeable future actions at Arnold AFB would be located within the test operations district. Implementation of the Preferred Alternative, in conjunction with other reasonably foreseeable projects that may be planned in the near future, would not change the character or nature of the noise environment at Arnold AFB. Cumulative noise impacts would not be expected to be significant as construction-related noise associated with the Preferred Alternative would be short term and temporary and would be similar in nature to the existing noise environment. No significant long-term cumulative noise impacts associated with the implementation of the Preferred Alternative in combination with reasonably foreseeable projects would occur at Arnold AFB.

3.1.2.3 No Action Alternative

No adverse effects on the noise environment would be expected under the No Action Alternative. The overall noise environment would remain unchanged when compared to existing conditions.

3.2 AIR QUALITY

Air pollution is the presence in the outdoor atmosphere of one or more contaminants (e.g., dust, fumes, gas, mist, odor, smoke, vapor) in quantities and duration such as to be injurious to human, plant, or animal life, or to interfere unreasonably with the comfortable enjoyment of life and property. Air quality as a resource incorporates several components that describe the levels of overall air pollution within a region, sources of air emissions, and regulations governing air emissions. The following sections include a discussion of the existing conditions, a regulatory overview, and a summary of greenhouse gases (GHGs) and global warming.

3.2.1 Existing Conditions

3.2.1.1 National Ambient Air Quality Standards and Attainment Status

The USEPA Region 4 and the TDEC regulate air quality in Tennessee. The CAA (42 USC § 7401-7671q), as amended, assigns the USEPA responsibility to establish the primary and secondary National Ambient Air Quality Standards (NAAQS) (40 CFR 50) that specify acceptable concentration levels of six criteria pollutants: particulate matter (measured as both particulate

matter less than 10 microns in diameter [PM_{10}] and particulate matter less than 2.5 microns in diameter [$PM_{2.5}$]), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and lead. Short-term NAAQS (1-, 8-, and 24-hour periods) have been established for pollutants contributing to acute health effects, while long-term NAAQS (annual averages) have been established for pollutants contributing to chronic health effects. **Table 3-4** outlines the NAAQS for each criteria pollutant. Notably, the state of Tennessee has adopted statewide air quality standards that are slightly more restrictive than the NAAQS.

Federal regulations designate regions in violation of the NAAQS as *nonattainment* areas. Federal regulations designate regions with levels less than the NAAQS as *attainment* areas. CAA Section 176(c), *General Conformity*, requires federal agencies to demonstrate that their proposed activities would conform to the applicable State Implementation Plans (SIPs) for attainment of the NAAQS. General conformity applies to federal actions within nonattainment areas (40 CFR 93.153). Coffee County, and therefore all areas associated with the Preferred Alternative, have been designated as being in full attainment for the NAAQS. As the region is in full attainment for all criteria pollutants, the general conformity rules do not apply (USEPA 2021b; 40 CFR 93.153).

3.2.1.2 Permitting Overview

New stationary sources of air emissions, such as backup generators or other combustion sources would require permits to construct. There are three types of construction permits available for new emissions sources in attainment areas in Tennessee: (1) prevention of significant deterioration (PSD) permits for major sources in attainment areas, (2) minor new source construction permits, and (3) minor modification permits.

The PSD permitting program protects air quality by imposing limits on emissions from major sources in attainment areas. The PSD process applies to all proposed new major sources of air pollutants in attainment areas, such as VTS-T on Arnold AFB, and typically takes 18 to 24 months to complete. New emission sources, or a combination of sources in a single project that exceed the PSD major modification thresholds outlined in **Table 3-5,** would require TNARNG to apply for and obtain a PSD permit before construction or installation of any new sources of air emissions. Major new sources of air emissions subject to PSD typically require a review of control technologies for criteria pollutants, predictive dispersion modeling of air emissions, and a separate public involvement process. State regulations require applications be submitted 120 days prior to the estimated start date for construction of major new sources or major modifications to existing major sources.

A minor new source construction permit would be required to construct any new significant sources of air emissions not subject to PSD; this typically takes four to five months to complete. Sources subject to minor new source construction permitting could be required to review control technologies for criteria pollutants, and upon request from the state, conduct predictive dispersion modeling of air emissions. State regulations require applications be submitted 90 days prior to the estimated start date for construction of minor new source review.

Table 3-4. National Ambient Air Quality Standards

Pollutant	Primary/ Secondary	Averaging Time	Level	Form
	Primary	8-hour	9 ppm	

Pollutant		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)			1-hour	35 ppm	Not to be exceeded more than once per year
Lead		Primary and Secondary	Rolling 3-month average	0.15 micrograms/m^3	Not to be exceeded
Nitrogen Dioxide (NO_2)		Primary	1-hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Primary and Secondary	Annual	53 ppb	Annual mean
Ozone (O_3)		Primary and Secondary	8-hour	0.070 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particulate Matter	($PM_{2.5}$)	Primary	Annual	12 micrograms/m^3	Annual mean, averaged over 3 years
		Secondary	Annual	15 micrograms/m^3	Annual mean, averaged over 3 years
		Primary and Secondary	24-hour	35 micrograms/m^3	98th percentile, averaged over 3 years
	(PM_{10})	Primary and Secondary	24-hour	150 micrograms/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)		Primary	1-hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Source: USEPA 2020a
ppm – parts per million; **m^3** – cubic meters; **ppb** – parts per billion

Table 3-5. Prevention of Significant Deterioration Permitting – Major Modification Threshold

Criteria Pollutant	Major Source Modification (tpy)
Carbon monoxide (CO)	100
Nitrogen oxides (NO_x)	40
Sulfur dioxide (SO_2)	40
Volatile organic compounds (VOCs)	40
Particulate matter less than 2.5 microns in diameter ($PM_{2.5}$)	10
particulate matter less than 10 microns in diameter (PM_{10})	15
Lead	0.6

Source: 40 CFR § 51.166(b)(23)
tpy – tons per year

3.2.1.3 Greenhouse Gases and Climate Change

EO 14008, *Tackling the Climate Crisis at Home and Abroad* (2021), outlines policies to reduce GHG emissions and to bolster resilience to the impacts of climate change. The EO directs the CEQ to review, revise, and update its 2016 final guidance titled, *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews.* When considering GHG emissions and their significance, agencies should use appropriate tools and methodologies for

quantifying GHG emissions and comparing GHG quantities across alternative scenarios. The CEQ guidance specifically requires agencies within the DoD to quantify GHG emissions in NEPA assessments and review federal actions in the context of future climate scenarios and resiliency.

In addition, EO 14008 requires federal agencies to capture the full costs of GHG emissions as accurately as possible, including taking global damages into account. Doing so facilitates sound decision making, recognizes the breadth of climate impacts, and supports the international leadership of the United States on climate issues. USEPA and other federal agencies use estimates of the social cost of carbon (SC-CO_2) to determine a value of the climate impacts of rulemakings. The SC-CO_2 is a measure, in dollars, of the long-term damage done by a ton of carbon dioxide (CO_2) emissions in a given year. This dollar figure also represents the value of damages avoided for a small emission reduction (i.e., the benefit of a CO_2 reduction). The current SC-CO_2 is estimated at $51.00 per ton (Interagency Working Group on the Social Cost of Greenhouse Gases 2021).

The Preferred Alternative site is located within the Coffee County portion of Arnold AFB. Coffee County's average high temperature is 87.1 degrees Fahrenheit (°F) in the hottest month of July, and an average low temperature of 27.6°F in the coldest month of January. Coffee County has average annual precipitation of 60 inches per year. The wettest month of the year is March, with an average rainfall of 6.7 inches (Idcide 2020). GHGs (e.g., CO_2, methane, nitrous oxide) are components of the atmosphere that trap heat near the surface of the earth and contribute to the greenhouse effect and climate change. Most GHGs occur naturally in the atmosphere, but increases in their concentration result from human activities such as the burning of fossil fuels.

Global temperatures are expected to continue to rise as human activities continue to add GHGs to the atmosphere. Whether or not rainfall will increase or decrease remains difficult to project for specific regions (Intergovernmental Panel on Climate Change 2014).

Tennessee is in the southeast climate region of the United States, where climate change is expected to contribute to declining water supplies, reduced agricultural yields, and health impacts in cities due to heat. In addition, increased heat, drought, and insect outbreaks are expected to increase wildfires throughout the region (National Climate Assessment 2019). Although the annual average temperatures in Tennessee have not increased over the last 100 years, they are projected to rise by 3°F by 2041 and by 8°F by 2099, with the greatest increases in the summer and fall. Summertime heat waves are projected to become longer and hotter, whereas the number of wintertime cold-air outbreaks will decrease (National Oceanic and Atmospheric Administration 2019; USEPA 2020b).

3.2.2 Environmental Consequences

Effects on air quality would be considered significant if air emissions resulting from a proposed action would (1) exceed the PSD major source thresholds or (2) contribute to a violation of any local, state, or federal air quality regulation.

3.2.2.1 Preferred Alternative

The Preferred Alternative would have short- and long-term minor adverse effects on air quality. Short-term effects would be due to the use of heavy equipment and generation of fugitive dust during site preparation and construction activities. In accordance with TDEC recommendations,

TNARNG would enact idle restrictions for heavy construction equipment and dump trucks when in use and on site to minimize emissions associated with the Preferred Alternative. In addition, all construction equipment employed on site would be well maintained and equipped with the emissions control equipment relevant to its model year. Long-term effects would be due to the potential use of backup generators and heating, ventilation, and cooling (HVAC) systems at the proposed barracks, which TNARNG would be responsible for permitting. The Preferred Alternative would not (1) exceed the PSD major source thresholds or (2) contribute to a violation of any local, state, or federal air quality regulation.

The Air Conformity Applicability Model (ACAM) was used to estimate emissions resulting from the Preferred Alternative (**Table 3-6**). Site preparation and construction emissions were estimated for fugitive dust, on- and off-road diesel equipment and vehicles, worker trips, architectural coatings, and paving off-gases. Operational emissions were estimated for the addition of HVAC systems and backup generators. Estimated annual emissions from the Preferred Alternative would be less than the PSD major source thresholds for all criteria pollutants; therefore, the level of effects would be minor. ACAM output files containing detailed emissions calculations are provided in **Appendix C.**

Table 3-6. Annual Emissions Compared to Significance Indicators

Pollutant	Emissions (tpy)	Significance Indicator (tpy)	Exceedance (Yes or No)
Volatile organic compounds (VOCs)	1.43	250	No
Nitrogen oxides (NO_X)	11.95	250	No
Carbon monoxide (CO)	6.59	250	No
Sulfur oxides (SO_X)	0.031	250	No
Particulate matter less than 10 microns in diameter (PM_{10})	140	250	No
Particulate matter less than 2.5 microns in diameter ($PM_{2.5}$)	0.41	250	No
Lead	0.000	25	No
Carbon dioxide equivalent (CO_2e)	3,432.6	-	-

Sources: DAF 2020a and 40 CFR 52.21
tpy – tons per year; **CO_2e** – carbon dioxide equivalent

For purposes of analysis, it was assumed that all construction would be compressed into a single 12-month period. Therefore, regardless of the ultimate implementation schedule, annual emissions would be equal to or less than those specified herein. Small changes in facility siting and ultimate design, and moderate changes in quantity and types of equipment used, would not substantially change these emission estimates, the determination under the general conformity rule, or level of effects under NEPA. Notably, the emissions for all criteria pollutants would be below the *de minimis* thresholds; therefore, the general conformity rule would not apply regardless of any changes in the attainment status of the region for any criteria pollutant.

New stationary sources of air emissions could be subject to federal and state air permitting regulations, including New Source Review, PSD, National Emission Standards for Hazardous Air Pollutants, or New Source Performance Standards. Permitting scenarios would vary based on the types and sizes of new stationary sources, timing of the projects, and the types of controls ultimately selected. These can differ in specific features from the ones described in this EA. It is

not anticipated that the stationary sources of air emissions at VTS-T would exceed the PSD major source thresholds; however, during the final design stage and the permitting process either (1) the actual equipment, controls, or operating limitations would be selected to reduce the potential to emit less than the PSD major source threshold; or (2) the PSD permitting process would require detailed dispersion modeling to ensure that any new emission sources at VTS-T would not allow for concentrations above the NAAQS. This process is inherent to federal and state air regulations and leads to a built-in protection of air quality in attainment areas. Therefore, regardless of the equipment ultimately selected or permitting scenario, these effects would be minor.

In addition to permitting of new stationary sources of air emissions, the TDEC outlines requirements with which the TNARNG must comply when constructing the new facilities, such as controlling fugitive dust and open burning. All persons responsible for any operation, process, handling, transportation, or storage facility that could result in fugitive dust would take reasonable precautions to prevent such dust from becoming airborne. Reasonable precautions might include using water to control dust or suitable chemicals to limit its creation during building construction, road grading, or land clearing. During site preparation and construction, methods other than open burning would be considered and, if found to be practical, employed for disposal actions. In the event open burning takes place, TDEC good smoke management practices would be followed, and in compliance with TDEC regulations, no expressly prohibited materials would be burned. In addition, site preparation and construction would proceed in full compliance with TDEC requirements, with compliant practices or products.

Greenhouse Gases and Climate Change. This EA examines GHGs as a category of air emissions. It also looks at issues of temperature and precipitation trends to determine whether the affected environment or elements of the action would be affected by climate change. This EA does not attempt to measure the actual incremental impacts of GHG emissions from the Preferred Alternative. There is a lack of consensus on how to measure such impacts. Existing climate prediction models have substantial variation in output and do not have the ability to measure the actual incremental impacts of a project on the environment.

Changes in GHG emissions from the Preferred Alternative would primarily come from the use of backup generators and HVAC systems. **Table 3-7** compares the estimated GHG emissions from the Preferred Alternative to the global, nationwide, and statewide GHG emissions. Using carbon dioxide equivalents (CO_2e) as a surrogate for CO_2 emissions, the SC-CO_2 for implementing construction of all 20 barracks proposed under the Preferred Alternative was estimated to be $158,814.12 per year (**Table 3-7**).

Table 3-7. Comparison of Preferred Alternative's Greenhouse Gas Emissions

Scale	CO_2e Emissions (MMT)	Change from Preferred Alternative	Social Cost of Carbon ($)
Global	43,125	0.0000007%	$2,242,500,000,000
United States	5,249	0.000006%	$272,948,000,000
Tennessee	99.8	0.0003%	$5,189,600,000
Preferred Alternative	0.00311	–	$158,814.12

Sources: DAF 2020; US Energy Information Administration 2016; USEPA 2020c

CO_2e – carbon dioxide equivalent; **MMT** – million metric tons

Table 3-8 outlines potential climate stressors and their effects on site preparation and construction of TNARNG barracks at VTS-T on Arnold AFB. The proposed activities in and of themselves are only indirectly dependent on any of the elements associated with future climate scenarios (e.g., meteorological changes). At this time, no future climate scenario or potential climate stressor would have appreciable effects on any element of the proposed development.

Table 3-8. Effects of Potential Climate Stressors

Potential Climate Stressor	Effects on the Proposed Development
More frequent and intense heat waves	Negligible
Longer fire seasons and more severe wildfires	Negligible
Changes in precipitation patterns	Negligible
Increased drought	Negligible
Harm to water resources, agriculture, wildlife, ecosystems	Negligible

Source: National Climate Assessment 2019

3.2.2.2 Cumulative Effects

By directly inventorying all emissions in nonattainment regions and monitoring concentrations of criteria pollutants in attainment regions, Tennessee takes into account the effects of all past and present emissions in the state. This structure of rules and regulations is contained in the SIP. SIPs contain the regulations and other materials for meeting clean air standards and associated CAA requirements. SIPs include (1) USEPA-approved and state-implemented air quality regulations, (2) USEPA-approved and state-implemented pollution controls for individual sources of air emissions, and (3) planning documents such as areawide emissions estimates, modeling analyses, and regulatory requirements that ensure that the state will meet air quality standards. Therefore, no significant cumulative impacts on air quality associated with the implementation of the Preferred Alternative in combination with reasonably foreseeable projects would occur at Arnold AFB.

3.2.2.3 No Action Alternative

No adverse effects on air quality would be expected under the No Action Alternative. Air quality would remain unchanged when compared to existing conditions.

3.3 EARTH RESOURCES

Earth resources consist of surface and subsurface materials and their properties. Principal geologic factors affecting the ability to support structural development include seismic properties (i.e., the potential for subsurface shifting, faulting, or crustal disturbance), soil stability, and topography. The term “soil,” in general, refers to unconsolidated materials overlying bedrock or other parent material. Soil structure, elasticity, strength, shrink-swell potential, and erodibility all determine the ability for the ground to support human-made structures. Soils typically are described in terms of their complex type, slope, physical characteristics, and relative compatibility or constraining properties with regard to particular construction activities and types of land use. Topography is the change in elevation over the surface of a land area. An area’s topography is influenced by many factors, including human activity, underlying geologic material, seismic activity, climatic conditions, and erosion. A discussion of topography typically encompasses a description of surface

elevations, slope, and distinct physiographic features (e.g., mountains) and their influence on human activities.

3.3.1 Existing Conditions

3.3.1.1 Geology

Arnold AFB is located within the Eastern Highland Rim (EHR) physiographic region of Tennessee (Miller 1974). The constituent bedrock is composed primarily of Mississippian, St. Louis, and Warsaw limestone with Fort Payne chert underlain by Chattanooga shale. The EHR is generally flat because the limestone strata underlying the area are almost flat, dipping slightly toward the east. Extensive and prolonged weathering of this limestone has produced a thick mantle of chert and residual clay soil, often a reddish to reddish-orange color. Additionally, separating the Highland Rim from the Cumberland Plateau are steep-walled karst valleys, which are often wide in proportion to their length, largely created by the solution of the underlying limestone geology (Moore 1994).

3.3.1.2 Seismicity

While earthquake events have been recorded across Tennessee in the past, the locations of the most likely occurrences in the future are in areas of western Tennessee that lie along the New Madrid Seismic Zone (Tennessee Emergency Management Agency 2018). The New Madrid Seismic Zone is located over 250 miles to the west northwest of Arnold AFB, and seismic hazards are considerably less severe in Middle Tennessee where Arnold AFB is located (US Geological Survey [USGS] 2014).

3.3.1.3 Topography

Arnold AFB is located on a gently sloping plain just north of the Cumberland Mountain Plateau. Elevations in the region range from 800 to 1,300 feet above mean sea level, with isolated areas of moderate slope (e.g., 15 percent) (Natural Resources Conservation Service [NRCS] 1959). The topography in the northern portion of Arnold AFB is relatively flat with poor surface drainage, while the topography in the southern region of the Installation is moderately rolling and slopes toward the Woods Reservoir.

3.3.1.4 Soils

Soils in the Arnold AFB area vary in composition and permeability characteristics and primarily belong to the Dickson-Mountview-Guthrie Association (NRCS 2013). The soils underlying the Preferred Alternative site include Lobelville silt loam, local alluvium phase (Lk) series soil and Mountview silt loam, eroded, gently sloping phase (Mu) series soil (**Figure 3-1**). The Lk silt loam soils are moderately well drained and are associated with floodplains and foot slopes (NRCS 1959). The Mu silt loam series consist of well-drained soils of uplands and underlie the majority of the Preferred Alternative site (NRCS 1959, 2013).

3.3.2 Environmental Consequences

Effects on earth resources would be considered significant if a proposed action would (1) increase potential occurrences of soil erosion, siltation, or geological hazards (e.g., landslides); (2) incorporate engineering or construction techniques that do not adequately address potential

geologic hazards; or (3) expose people or structures to substantial geological hazards. Generally, impacts with regard to earth resources can be avoided or minimized if proper construction techniques, soil erosion/siltation control measures, and structural engineering designs are incorporated into project development.

3.3.2.1 Preferred Alternative

Geology. The Preferred Alternative would result in minor impacts on geological resources at Arnold AFB. Potential impacts on geological resources associated with the Preferred Alternative would be limited to ground-disturbing activities occurring during site preparation and construction. Minor impacts would result from the proposed new construction; however, the ground-disturbing activities associated with the Preferred Alternative would be localized and would not impact sensitive or regionally significant geologic or physiographic features.

Seismicity. The Preferred Alternative would result in negligible impacts associated with seismicity or geologic hazards. Seismic hazards in Middle Tennessee are relatively low. There are no known active faults underlying Arnold AFB, and consequently there is no known potential for fault rupture (USGS 2014). Preferred Alternative would include proper construction techniques, soil erosion/siltation control measures, and structural engineering designs which would minimize potential impacts. Topography across Arnold AFB is gently sloping, and there are no excessive slopes (i.e., greater than 8 percent) at the Preferred Alternative site. Further, the proposed project has been sited away from slopes toward water features, and the Preferred Alternative location is generally level.

Topography. Impacts on topography resulting from implementation of the Preferred Alternative would be negligible. Topography across Arnold AFB is gently sloping, and there are no excessive slopes (i.e., greater than 8 percent) at the Preferred Alternative site. Further, the proposed project has been sited away from slopes toward water features, and the Preferred Alternative location is generally level.

Soils. The Preferred Alternative would result in short-term, minor, site-specific impacts and negligible long-term impacts on soils. The Preferred Alternative would include excavation and site preparation activities associated with construction. As described in **Section 3.3.1.4**, most soils at the proposed project location are in the Mu series. Soils in the Mu series have features that are moderately favorable for construction (NRCS 2013). Any construction limitations can be overcome or minimized by planning, design, or installation (NRCS 2013), and implementation of the Preferred Alternative would include proper construction techniques, soil erosion/siltation control measures, and structural engineering designs that would minimize potential soil limitations related to construction. The Preferred Alternative would therefore not pose a substantial erosion hazard. However, where erosion hazards may exist, the use of BMPs, including erosion and turbidity control structures, would substantially reduce the potential for erosion and siltation. Since the Preferred Alternative would result in the disturbance or redisturbance of more than 1 acre, a NPDES Construction General Permit would be required. In addition to the BMPs that would be implemented under the Preferred Alternative, the proposed project would comply with the measures outlined in the NPDES permits.

To minimize potential erosion, siltation, and soil compaction during site preparation and construction, BMPs would be incorporated as part of the Preferred Alternative, including erosion

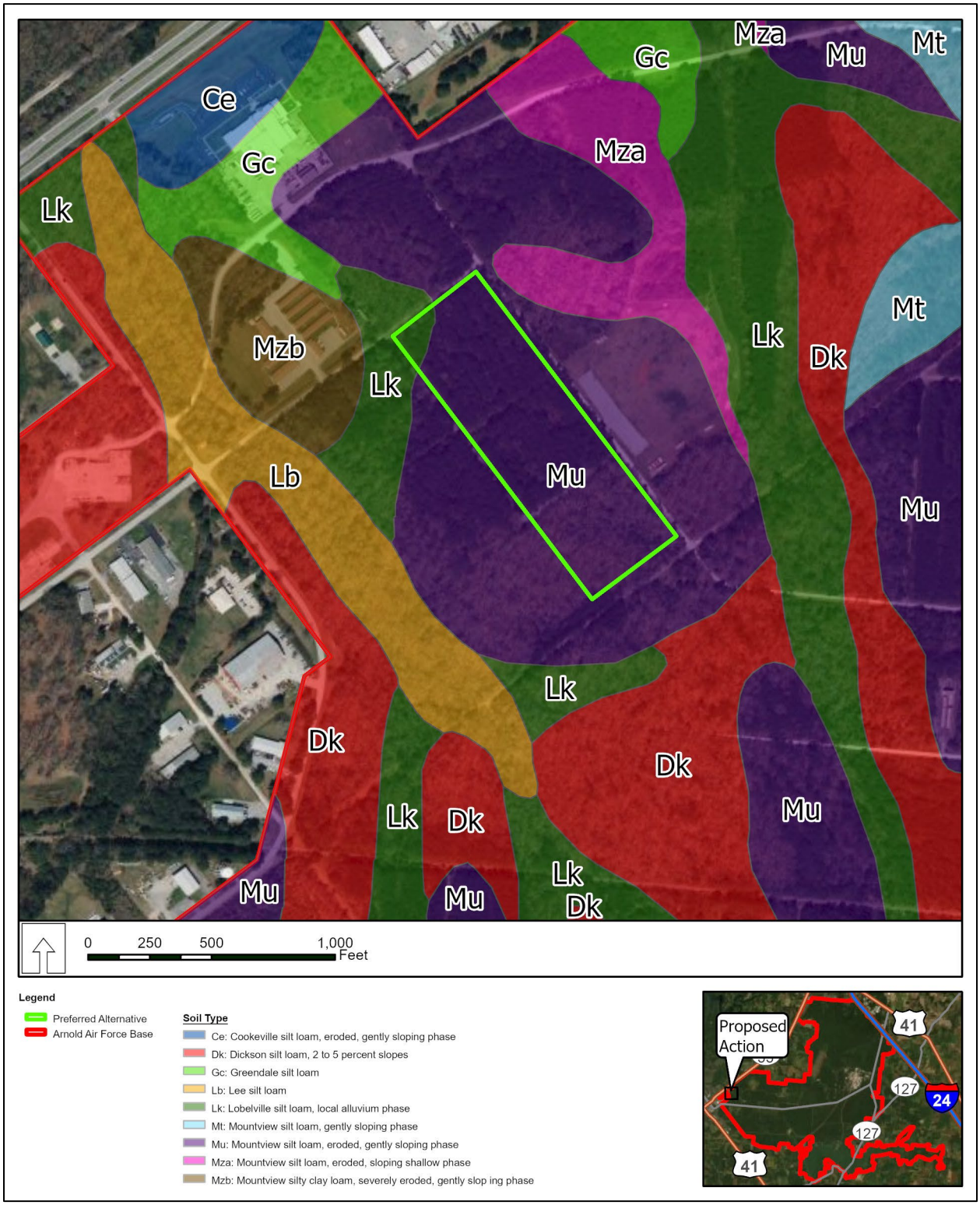

Figure 3-1. Soils at and near the Preferred Alternative Site

and siltation prevention measures (e.g., watering for dust suppression, use of netting and silt fencing), covering stockpiled soils and excavated areas during rains, and limiting the use of heavy equipment to the extent practicable. With implementation of these BMPs, construction- and road-maintenance-related impacts on soils would be minimal and localized to the proposed project footprints. Once the proposed facilities are operational, potential impacts on soils would be negligible. All project components would be engineered so that potential impacts resulting from erosion, siltation, and geological hazards (e.g., landslides) would be minimized.

3.3.2.2 Cumulative Effects

Potential cumulative effects on earth resources associated with implementation of the Preferred Alternative would be limited to ground-disturbing activities (e.g., excavation, grading) during demolition, construction, or operational maintenance activities within developed areas of Arnold AFB. BMPs would be implemented to minimize potential erosion, siltation, and soil compaction, and any impacts would be minor and would last only for the duration of ground-disturbing activities. Implementation of the Preferred Alternative, in conjunction with other reasonably foreseeable projects, would not result in long-term significant cumulative impacts on regional geology, topography, seismicity, or soils.

3.3.2.3 No Action Alternative

No effects on geologic resources would occur. The Preferred Alternative would not take place. There would be neither beneficial, nor adverse, effects on earth resources or soils from these activities, and these resources would not change when compared to existing conditions.

3.4 WATER RESOURCES

Water resources analyzed in this EA include surface water and groundwater. Surface water resources include lakes, rivers, and streams that collect and distribute water from precipitation and natural or human-created water collection systems. Groundwater comprises subsurface water resources that are interlaid in layers of rock and soil and recharged by surface water seepage. Other issues relevant to water resources include watershed areas affected by existing and potential hazards related to floodplains.

3.4.1 Existing Conditions

3.4.1.1 Surface Water

Arnold AFB lies within the Duck River and the Elk River watersheds. The drainage divide between these two watersheds runs southwest to northeast through the AEDC Security Area on Base (Arnold AFB 2021a). The Duck River Basin lies to the north of the divide and receives drainage from Hunt, Huckleberry, Wiley, Crumpton, and Bobo creeks and the Hickerson Spring Branch (Arnold AFB 2021a). The Elk River watershed is to the south of the divide and collects surface drainage primarily from Bradley, Brumalow, and Rowland creeks and from smaller creeks such as Dry Creek, Hardaway Branch, Saltwell Hollow Creek, and Spring Creek (Arnold AFB 2021a). Poorhouse Creek also contributes to the Elk River (Wolfe 1996). The closest named surface water features to the Preferred Alternative are Bobo Creek, located approximately 0.75 mile to the east, and Poorhouse Creek, located approximately 1 mile to the south (**Figure 3-2**).

Figure 3-2. Surface Water Features in the Vicinity of the Preferred Alternative Site

Arnold AFB currently has 20 point sources of wastewater/stormwater and two sanitary treatment centers. The Base discharges into local waters under NPDES Permit Number TN0003751.

3.4.1.2 Groundwater

Regional groundwater resources include the Highland Rim aquifer, which consists of a karst geology. This aquifer consists of flat-lying carbonate rocks of Mississippian age and underlies the Highland Rim physiographic province. The three primary groundwater units beneath Arnold AFB are the St. Louis, Manchester, and Fort Payne aquifers. The Manchester aquifer is the region's primary groundwater well source. Groundwater underlying Arnold AFB can be found at depths of 10 to 40 feet below the ground surface (Arnold AFB 2013).

Karst areas are characterized by sinkholes, springs, disappearing streams and caves, and rapid, highly directional groundwater flow in discrete channels. Since water can travel rapidly over long distances through conduits that lack natural filtering processes for soil and bacteria, karst systems are easily contaminated. Over 800 groundwater wells monitor the groundwater within the three groundwater units underlying Arnold AFB. There are three different types of wells: compliance monitoring wells associated with landfills, investigative wells for the assessment of groundwater contamination related to Environmental Restoration Program (ERP) sites (these make up about 75 percent of the wells on Arnold AFB), and wells that measure groundwater on a regional basis (Arnold AFB 2021c).

3.4.1.3 Wetlands

The Preferred Alternative would not take place within any portion of a designated wetland; the nearest wetland to the Preferred Alternative site is approximately 0.31 mile away and is located outside the boundaries of Arnold AFB (see **Figure 3-2**).

3.4.2 Environmental Consequences

Effects on water resources would be significant if a proposed action would (1) reduce water availability to or interfere with the supply of existing users, (2) create or contribute to the overdraft of groundwater basins or exceed decreed annual yields of water supply sources, (3) adversely affect surface or groundwater quality, (4) threaten or damage unique hydrologic characteristics, or (5) violate established laws or regulations, including management plans adopted by Arnold AFB, that have been adopted to protect or manage water resources.

3.4.2.1 Preferred Alternative

Surface Water. The Preferred Alternative would result in minor short-term and long-term impacts on surface waters at VTS-T on Arnold AFB. Site preparation and new construction activities associated with the Preferred Alternative could potentially temporarily increase the turbidity of surface waters at VTS-T on Arnold AFB due to increased airborne dust and siltation from soil erosion. However, the soils underlying the proposed project location are moderately well drained, and because of the distance between the project site and potential receiving waters, it is unlikely that soil disturbance would have an impact on surface waters. Additionally, the implementation of BMPs and erosion control measures described in the project-specific Stormwater Pollution Prevention Plan (SWPPP) would further reduce impacts associated with the Preferred Alternative.

A stormwater management system would be designed and installed to manage drainage for the TNARNG barracks as part of the Preferred Alternative. The areas surrounding the new foundations for buildings and equipment would be appropriately graded to direct stormwater away from foundation to the appropriate stormwater ditch. During the design phase, a grading plan would be prepared to identify how the site would be graded, how drainage patterns would be directed, and how runoff velocities would affect receiving waters. The grading plan would also include information regarding when earthwork would start and stop, establish the degree and length of finished slopes, and specify where and how excess material would be disposed of or where borrow materials would be obtained if needed. Berms, diversions, and other stormwater practices that require excavation and filling would be incorporated into the grading plan. The grading plan would be designed with erosion and sediment control and stormwater management goals in mind. Grading crews would be supervised to ensure that the plans are implemented as intended.

TNARNG would prepare and submit a project-specific SWPPP and a NPDES permit. BMPs and erosion control measures described in Arnold AFB's SWPPP would be implemented to further reduce impacts associated with the Preferred Alternative. The project-specific SWPPP would further reduce impacts associated with the proposed reconfiguration. Since the Preferred Alternative would result in the disturbance or redisturbance of more than 1 acre, a NPDES Construction General Permit to address stormwater discharges from the site during construction would be required from the TDEC. Water quality protection measures and BMPs, to be identified in the SWPPP required by TDEC for soil disturbance greater than 1 acre, and those meeting requirements of the Arnold AFB Integrated Natural Resources Management Plan (INRMP), would prevent sediment and contaminants from entering nearby water bodies (Bobo Creek).

There would be a minor increase in the impervious area at VTS-T on Arnold AFB from the Preferred Alternative, but the Preferred Alternative would not significantly impact hydrology or water quality on the Installation. The existing infrastructure for handling stormwater runoff, in combination with the proposed drainage improvements at the facility, would be able to accommodate the slight increase in stormwater runoff resulting from implementation of the Preferred Alternative. Further, in accordance with Section 438 of the EISA (requiring federal facility projects over 5,000 SF to maintain or restore the predevelopment hydrology of the property), low-impact development techniques would be incorporated into the Preferred Alternative.

Groundwater. The Preferred Alternative would have short-term minor impacts on groundwater. Unconfined aquifers like those that underlie Arnold AFB do not have any impermeable layers above them and are vulnerable to contamination by leaching from infiltrating precipitation. Consequently, impacts on groundwater in the vicinity of the proposed project site could result from spills of diesel fuel or lubricants from construction equipment. However, the volume of any potential spill, while unlikely, would be small. No long-term adverse impacts on groundwater would occur from the construction activities. Impacts on groundwater from construction activities would be minimized by use of BMPs such as the use of drip pans beneath parked vehicles and equipment to catch and collection petroleum, oils, and lubricants that could otherwise leak on to the soil surface. Further, any potential spills would be the responsibility of the construction contractor, and cleanup would be conducted in compliance with the project-specific Spill Prevention, Control, and Countermeasure Plan. Ensuring on-site stormwater infiltration during construction activities, as required by EISA Section 438, would also sustain groundwater recharge.

Wetlands. There would be no impacts on wetlands at VTS-T or on Arnold AFB associated with the Preferred Alternative. No portion of the Preferred Alternative would take place within any designated wetlands, and water quality protection measures and BMPs would prevent sediment, runoff, and contaminants from entering nearby wetlands.

3.4.2.2 Cumulative Effects

The Preferred Alternative when combined with future proposed projects would have minor short-term direct and minor long-term indirect cumulative impacts on surface water from increased impermeable surfaces leading to additional stormwater runoff, increased pollutants from parked and stored vehicles and equipment, and periodic soil disturbance during construction, renovation, or demolition projects. There would be no direct or indirect cumulative impacts on groundwater from the Preferred Alterative when combined with future proposed projects. There would be no reduced water availability or supply to existing users, no overdrafts of groundwater basins, or exceedance of safe annual yield of water supply sources.

3.4.2.3 No Action Alternative

No effects on water resources would occur. The Preferred Alternative would not be implemented. There would be neither beneficial, nor adverse, effects on water resources from these activities, and water resources would not change when compared to existing conditions.

3.5 BIOLOGICAL RESOURCES

Biological resources include native or naturalized plants and wildlife and the habitats in which they occur. Sensitive biological resources are defined as those plant and wildlife species listed as threatened or endangered, or proposed as such, by the USFWS. These resources also include plant and wildlife species listed as threatened or endangered, or as state designated species of special concern, by the Tennessee Wildlife Resources Agency. The ESA protects listed species against killing, harming, harassment, or any action that may damage their habitat. The BGEPA is a federal statute that protects two species of eagle. The BGEPA prohibits anyone without a permit issued by the Secretary of the Interior from taking bald eagles (*Haliaeetus leucocephalus*) or golden eagles (*Aquila chrysaetos*), including their parts (feathers, nests, or eggs). State listed wildlife species are protected in accordance with the Tennessee Nongame and Endangered or Threatened Wildlife Species Conservation Act of 1974, Tennessee Statutes 70.8.101-112. Similarly, state listed plant species are protected under the Rare Plant Protection and Conservation Act of 1985, Tennessee Code Annotated §70-8-301 et seq.

Sensitive habitats include those areas designated by the USFWS as critical habitat protected by the ESA and sensitive ecological areas as designated by state or federal rulings. Sensitive habitats also include wetlands, plant communities that are unusual or of limited distribution, and important seasonal use areas for wildlife (e.g., migration routes, breeding areas, crucial summer/winter habitats).

Migratory birds, as listed in 50 CFR 10.13, are ecologically and economically important to the United States, and recreational activities such as bird watching, studying, and feeding are practiced by many Americans. The MBTA of 1918 makes it unlawful for anyone to take migratory birds or their parts, nests, or eggs unless permitted to do so by regulations. Per the Migratory Bird Treaty Act, “take” is defined as “pursue, hunt, shoot, wound, kill, trap, capture, or collect” (50 CFR

10.12). Migratory birds include nearly all species in the US, with the exception of some upland game birds and nonnative species. EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds,* requires all federal agencies undertaking activities that may negatively impact migratory birds to follow a prescribed set of actions to further implement the Migratory Bird Treaty Act. EO 13186 directs federal agencies to develop a Memorandum of Understanding with the USFWS that promotes the conservation of migratory birds. The National Defense Authorization Act for Fiscal Year 2003 (Public Law 107-314, 116 Stat. 2458) provided the Secretary of the Interior the authority to prescribe regulations to exempt the armed forces from the incidental take of migratory birds during authorized military readiness activities. Congress defined military readiness activities as all training and operations of the US armed forces that relate to combat and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. In December 2017, the US Department of the Interior issued M-Opinion 37050, which concluded that the take of migratory birds from an activity is not prohibited by the Migratory Bird Treaty Act when the underlying purpose of that activity is not the take of a migratory bird. The USFWS interprets the M-Opinion to mean that the Migratory Bird Treaty Act's prohibition on take does not apply when the take of birds, eggs, or nests occurs as a result of an activity, the purpose of which is not to take birds, eggs, or nests.

On 4 October 2021, the USFWS published a Final Rule (86 Federal Register 54642) revoking the 7 January 2021 Final Rule (86 Federal Register 1134) that limited the scope of the MBTA. This Final Rule went into effect on 3 December 2021. With the publication of this rule, the USFWS returned to "implementing the MBTA as prohibiting incidental take and applying enforcement discretion, consistent with judicial precedent and long-standing agency practice prior to 2017." Additionally, the USFWS published a Final Record of Decision revoking the 7 January 2021 regulation and initiating the process to define the MBTA's scope as prohibiting actions that incidentally take migratory birds. Further, the Director's Order specifies that "the Service will focus our enforcement efforts on specific types of activities that both foreseeably cause incidental take and where the proponent fails to implement known beneficial practices to avoid or minimize incidental take." The Order defines beneficial practice as "an action implemented in an effort to avoid and minimize the incidental take of migratory birds."

3.5.1 Existing Conditions

3.5.1.1 Vegetation

Vegetation on Arnold AFB is predominately upland mixed hardwood forest and swamp oak forest (Arnold AFB 2021a). Vegetation within VTS-T is composed primarily of mixed hardwood forests (**Figure 3-3**) dominated by scarlet oak (*Quercus coccinea*), southern red oak (*Quercus falcata*), post oak (*Quercus stellata*), and hackberry (*Celtis occidentalis*). Loblolly pine plantations are also present at VTS-T and include loblolly pine (*Pinus taeda*), sweetgum (*Liquidambar styraciflua*), and yellow poplar (*Liriodendron tulipifera*) as the dominant vegetation species. The Preferred Alternative is located entirely within an undeveloped, forested portion of VTS-T (**Figure 3-3**).

Figure 3-3. Major Vegetation Types at and near the Preferred Alternative Site

3.5.1.2 Fish and Wildlife

Arnold AFB has a diverse assemblage of fish and wildlife. To date, 422 species of vertebrates (Arnold AFB 2021a) have been identified from the Base including:

- 234 species of birds (includes summer residents, migrants, and wintering species)
- 35 species of reptiles
- 26 species of amphibians
- 44 species of mammals
- 83 species of fish

Two species of animals at Arnold AFB are considered big-game species, white-tailed deer (*Odocoileus virginianus*) and eastern wild turkey (*Meleagris gallopavo silvestris*) (Arnold AFB 2021a). The most popular small-game animals are squirrels, quail, rabbits, and various waterfowl species (Arnold AFB 2021a).

Arnold AFB has been designated as an Important Bird Area (IBA) in Tennessee. The IBA program is founded on the premise that identifying and conserving key habitat areas for significant populations of birds is essential to the overall bird conservation effort. There are no legal or management requirements associated with an IBA designation (Arnold AFB 2021a).

This designation is a recognition by the American Bird Conservancy and National Audubon Society of the excellent stewardship in managing and conserving habitats on military lands for resident and migratory birds.

3.5.1.3 Sensitive Species

Wildlife. The Arnold AFB INRMP (Arnold AFB 2021a) and the USFWS Information for Planning and Consultation project planning tool (USFWS 2022a, 2022b, 2022c) were reviewed to determine if any federally listed, proposed, or candidate species, or their habitats, potentially occur in the vicinity of the Preferred Alternative (**Table 3-9**). Potential effects of the Proposed Action were evaluated on three ESA listed species that have been documented on Arnold AFB (Indiana bat, *Myotis sodalis*; northern long-eared bat, *Myotis septentrionalis*; and gray bat, *Myotis grisescens*), one candidate species (monarch butterfly, *Danaus plexippus*) documented on Arnold AFB, and four listed mollusk species that have not been documented on Base (pale lilliput, *Toxolasma cylindrellus*; slabside pearlymussel, *Pleuronaia dolabelloides*; snuffbox mussel *Epioblasma triquetra*; and turgid blossom *E. turgidula*), despite survey efforts (**Table 3-9**). Two unlisted bat species previously documented on Arnold AFB (tricolored bat, *Perimyotis subflavus*; and little brown bat *Myotis lucifugus*) (**Table 3-9**) are currently under review for listing determination and are scheduled to have determinations made prior to completion of the Preferred Alternative. Potential effects on these two bat species were also evaluated.

Based on habitat requirements outlined in the Arnold AFB INRMP, current habitat, and recent surveys on the Base (Arnold AFB 2021a), the gray bat, Indiana bat, northern long-eared bat (NLEB), and monarch butterfly are the only federally listed species with the potential to occur at VTS-T. The NLEB was listed as threatened by USFWS on 4 May 2015; however, USFWS is currently assessing its listing status. TNARNG contacted the USFWS on 19 April 2022, after learning the potential listing timelines for the tricolored bat and the little brown bat had been moved forward on the USFWS National Listing Workplan for Fiscal Years 2022-2027 (USFWS 2022d)

to Fiscal Years 2022 and 2023, respectively. The new timelines could potentially see the species listed prior to completion of the Preferred Alternative. On 20 April 2022, USFWS advised TNARNG to include potential effects of the Proposed Action on these species to avoid reopening consultation in the future. There is no habitat for the four listed mussel species in VTS-T on Arnold AFB (**Table 3-9**), and these species are not discussed in detail in this EA.

Table 3-9. Potential Occurrence of Federally Listed Species at the Preferred Alternative Location

Species	Status	Species Presence on Arnold AFB	Habitat Present at VTS-T	Critical Habitat Present at VTS-T
Indiana bat (*Myotis sodalist)*	Endangered	Documented	Yes	No
Northern long-eared bat (*Myotis septentrionalis*)	Threatened	Documented	Yes	No
Gray bat (*Myotis grisescens*)	Endangered	Documented	Yes	No
Tricolored bat (*Perimyotis subflavus*)	Unlisted*	Documented	Yes	No
Little brown bat (*Myotis lucifugus*)	Unlisted*	Documented	Yes	No
Pale lilliput (pearlymussel) (*Toxolasma cylindrellus*)	Endangered	Remains undetected in surveys	No	No
Slabsied pearlymussel (*Pleuronaia dolabelloides*)	Endangered	Remains undetected in surveys	No	No
Snuffbox mussel (*Epioblasma triquetra*)	Endangered	Remains undetected in surveys	No	No
Turgid blossom (pearlymussel) (*Epioblasma turgidula*)	Endangered	Remains undetected in surveys	No	No
Monarch butterfly (*Danaus plexippus*)	Candidate	Documented	Yes	No

AFB – Air Force Base; **VTS-T** – Volunteer Training Site – Tullahoma
***** Species not listed but under review for listing determination during the life of the project.

Gray bats were first documented in the mid-1970s using the Elk River Dam at Woods Reservoir on Arnold AFB. Annual surveys of the dam itself began in 1998, and mist net and acoustic surveys throughout the Base began in 2000. A gray bat maternity colony occurs on Arnold AFB at the Elk River Dam during the summer months. The maternity colony at Elk River Dam is the only known roost site at Arnold AFB. However, gray bats have been physically and acoustically captured throughout Arnold AFB every year since 2000. A telemetry project in 2018 tracked gray bats to determine foraging areas, travel corridors, and day roost sites and found that males traveled great distances foraging on and off Base and roosting in caves up to 29 miles away.

Arnold AFB has conducted surveys almost every year since 2000 and performed acoustic surveys during many of those years for the Indiana bat. Two Indiana bats, one adult male and one juvenile female, were captured in the summer of 2010 (Arnold AFB 2021a). While the species has been documented from acoustic recordings at several sites, these represent the only captures of Indiana bats on Arnold AFB. Abundant potential summer habitat, including roost trees in riparian, bottomland, and upland forests, is present on Arnold AFB for Indiana bat; however, no maternity roosts for Indiana bats have been identified to date on Arnold AFB. The NLEB has been well-documented at several capture sites on Arnold AFB since annual baseline bat surveys began in 2000 (Arnold AFB 2021a). Potential suitable habitat for the NLEB occurs in forested areas

throughout the Base, encompassing approximately 15,935 acres (Arnold AFB 2021a). Maternity colonies are also known to occur at Arnold AFB. Based on previous survey efforts, NLEBs utilize the Base during the summer months.

The monarch butterfly (*Danaus plexippus*), a candidate species, has also been documented on Arnold AFB, though not to a level representing its once great abundance (Brandon Baily, personal communication 2021). All life stages of monarchs were once so ubiquitous throughout the installation that location or date of observations were not officially documented, and it was assumed monarchs occurred wherever milkweed (genus *Asclepias*) was found (Brandon Baily, personal communication 2021). Personnel in the field on Arnold AFB have noticed declines in monarch butterfly observations, but no surveys have been conducted. The list of invertebrate species in the Arnold AFB INRMP documents the species' presence on the Installation (Arnold AFB 2021a). A 1999 rare, threatened, and endangered terrestrial invertebrate survey documented the capture of one monarch butterfly near Sinking Pond (CH2M Hill 1999), approximately 6.7 miles from the Preferred Alternative site.

Bald eagles nest and winter at Arnold AFB and are protected by the BGEPA. In addition, 61 animals are state listed as endangered, threatened, wildlife in need of management, and/or species of greatest conservation need (see the complete list in **Appendix C**).

Migratory Birds. Using the USFWS iPaC tool (see **Appendix C**), the following migratory birds were identified as having the potential to occur at Arnold AFB: prairie warbler (*Setophaga discolor*), red-headed woodpecker (*Melanerpes erythrocephalus*), and wood thrush (*Hylocichla mustelina*). These migratory bird species could be present and breeding on Arnold AFB during the summer months, particularly July.

***Plants*.** No federally listed plant species are known to occur at Arnold AFB. However, 63 plants are state listed as endangered, threatened, and/or species of greatest conservation need (see the complete list in **Appendix C**).

3.5.2 Environmental Consequences

The significance criteria for effects of the Preferred Alternative on biological resources are based on (1) the importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource, (2) the proportion of the resource that would be affected relative to its occurrence in the region, (3) the sensitivity of the resource to the proposed activities, and (4) the duration of ecological ramifications. Effects on biological resources would be considered significant if implementation of a proposed action would adversely impact a threatened or endangered species and could not be mitigated, greatly diminish habitat for a plant or animal species, substantially diminish a regionally or locally important plant or animal species, interfere with wildlife movement or reproductive behavior, and/or result in an infusion of exotic plant or animal species.

3.5.2.1 Preferred Alternative

***Vegetation*.** Impacts on vegetation and the associated wildlife would be long term and minor. The Preferred Alternative occurs in an undeveloped forested area that provides habitat for wildlife. Vegetation removal associated with new construction would represent long-term habitat loss; however, the mixed hardwood forest habitat loss would be small in area when compared to total available habitat on Arnold AFB. The removal of trees as part of the Preferred Alternative may

have minor impacts on foraging, nesting, and other behaviors for mammals, birds (including migratory birds), reptiles, and amphibians. While any habitat loss could adversely affect individual plants and animals, the amount of impacted habitat is small compared with similar habitat available in the vicinity. Overall, population-level effects on any species are not expected as a result of vegetation removal.

Fish and Wildlife. Impacts on wildlife would be short term and would affect only wildlife in the immediate project area. Wildlife in the proposed project area could be temporarily disturbed or displaced due to increased noise and human activity associated with the site preparation and construction activities. While some individuals might avoid the Preferred Alternative site for the long term, the affected area is very small compared with other, similar available habitat nearby.

Construction activities would also have the potential for injury or mortality from direct wildlife strikes by vehicles or construction equipment. Mobile species, such as adult birds, would not be as susceptible to physical strikes, while others, such as smaller and/or less mobile species, would have greater potential to be impacted. To the extent practicable, TNARNG and Arnold AFB would schedule any vegetation removal associated with the Preferred Alternative to occur outside of times of increased migratory bird and bat activity. Most of the wildlife species expected at the Preferred Alternative site are locally and regionally common, and mortality or injury to a small number of individuals would not result in an overall decrease in population diversity, abundance, or fitness of any species.

Sensitive Species. The gray bat, NLEB, and Indiana bat have the potential to occur within the proposed project area. No Indiana bat roosts or maternity colonies have been identified on Arnold AFB. However, there are known NLEB roosts and maternity colonies on Arnold AFB. Nearly annual bat surveys conducted by Arnold AFB since 2000 have documented the presence of the NLEB on the Installation. Bat surveys have captured the NLEB at 30 locations on Arnold AFB and detected it acoustically at 14 locations. The nearest capture and acoustic detection sites to the proposed Preferred Alternative location are approximately 2.94 miles and 2.76 miles, respectively. Twelve NLEB roost trees have been documented on Arnold AFB, with the closest one approximately 2.82 miles away, and the closest known maternity colony is located approximately 3.44 miles from the proposed site. It is approximately 6 miles to the nearest known NLEB hibernacula. The Preferred Alternative is located in a Swarming 2 Area, which provides swarming habitat for NLEB and Indiana bats. Swarming habitat refers to suitable roosting, foraging, and travel habitat for the bats that is within a specific distance of a known hibernaculum. For the NLEB, this distance is 5 miles from a known hibernaculum (USFWS 2016a). For the Indiana bat, this distance is 10 miles from a Priority 1 or Priority 2 hibernaculum, and 5 miles from a Priority 3 or Priority 4 hibernaculum (USFWS 2016a).

The Elk River Dam, which impounds the Woods Reservoir, is the only known roost site for gray bats at Arnold AFB, is located over 6.5 miles south of the Preferred Alternative. Gray bat roosting caves or similar structures are not known to exist at the Preferred Alternative site. The Preferred Alternative may impact the Indiana bat. The project site is located approximately 2.75 miles from a site where Indiana bats have been acoustically detected. Therefore, there is the potential for use of the Preferred Alternative site for roosting by Indiana bats. Because limiting the clearing of trees to only take place during the winter hibernation season is not feasible under the Preferred

Alternative, Indiana bats could be injured or killed if present at the site during site preparation for construction.

Nearly annual bat surveys conducted by Arnold AFB since 2000 have documented the presence of the tricolored bat. Bat surveys have captured the species at 27 locations on Base since 1998 and detected it acoustically at all five monitoring locations used since 2015 (Lamb 2021). The nearest capture and acoustic detection sites to the Preferred Alternative are approximately 2.9 miles and 3.2 miles, respectively. It is approximately 6 miles to the nearest known hibernacula, which the tricolored bat shares with NLEB, gray, little brown, and Indiana bats. It is assumed that the tricolored bat, since present in the same hibernacula, could be using the area during swarming much like the listed bat species.

Bat surveys have captured little brown bats at 13 locations on Base since 1998 and detected them acoustically at all five monitoring locations used since 2015 (Lamb 2021). The nearest capture and acoustic detection sites to the Preferred Alternative are approximately 2.3 miles and 3.2 miles, respectively. It is approximately 6 miles to the nearest known hibernacula. It is assumed that the little brown bat, since present in the same hibernacula, could be using the area during swarming much like the listed bat species. Lamb (2020) indicates that while capture rates have been highly variable on Arnold AFB since 1998, they have been at or near zero since 2014.

Arnold AFB, TNARNG, and USFWS conducted a site visit and evaluation of habitat at the Preferred Alternative site on 2 February 2022. During evaluation of the habitat, it was determined that only 5 acres of mixed hardwood forest location in the southeastern portion of the Preferred Alternative site provide suitable roost habitat for listed bat species (see **Figure 2-5** and **Appendix A**). The remaining mixed pine portions of the Preferred Alternative site do not contain suitable roost trees (see **Figure 2-5** and **Appendix A**).

TNARNG prepared a Biological Assessment (BA) to facilitate consultation with the USFWS and is in formal consultation with the USFWS under the ESA for the gray bat, NLEB, Indiana bat, tricolored bat, and little brown bat. The Draft BA is provided in **Appendix C.** Considering the species' biology and habitat requirements, TNARNG has made the determination that the proposed timber clearing associated with the Proposed Action at VTS-T, as well as operation and maintenance of the proposed barracks and associated facilities, *may affect, and is likely to adversely affect* the NLEB, Indiana bat, tricolored bat, and little brown bat through the permanent conversion of 5.19 acres of good-quality habitat to a developed land use and through potential timber harvest and construction noise effects (**Table 3-10**; **Appendix C**). TNARNG also determined that the Proposed Action *may affect, but is not likely to adversely affect* the gray bat. TNARNG determined that the Proposed Action would have no effect on the monarch butterfly, the four listed mollusks, or any designated critical habitat (**Table 3-10; Appendix C**). TNARNG proposes to contribute to the Tennessee Imperiled Bat Conservation Fund (TN IBCF) to compensate for potential impacts on the NLEB and Indiana bat. The current per-acre cost for bat habitat compensation is $4,260.00. TNARNG is proposing to contribute a total payment to the TN IBCF of $22,109.40 (5.19 acres x 1.0 multiplier x $4,260 per acre) for good-quality NLEB and Indiana bat habitat to adequately compensate for NLEB and Indiana bat habitat loss.

TNARNG has determined that the Preferred Alternative would have no effect on all other ESA listed species and candidate species with the potential to occur at or near the site (**Table 3-10; Appendix C**).

Table 3-10. Effects Determination for Federally Listed Species with the Potential to Occur on or near the Preferred Alternative Location

Species	Status	Effects Determination
Indiana bat (*Myotis sodalist)*	Endangered	May affect, likely to adversely affect
Northern long-eared bat (*Myotis septentrionalis*)	Threatened	May affect, likely to adversely affect
Gray bat (*Myotis grisescens*)	Endangered	May affect, not likely to adversely affect
Tricolored bat (*Perimyotis subflavus*)	Unlisted*	May affect, likely to adversely affect
Little brown bat (*Myotis lucifugus*)	Unlisted*	May affect, likely to adversely affect
Pale lilliput (pearlymussel) (*Toxolasma cylindrellus*)	Endangered	No effect
Slabsied pearlymussel (*Pleuronaia dolabelloides*)	Endangered	No effect
Snuffbox mussel (*Epioblasma triquetra*)	Endangered	No effect
Turgid blossom (pearlymussel) (*Epioblasma turgidula*)	Endangered	No effect
Monarch butterfly (*Danaus plexippus*)	Candidate	No effect

* Species not listed but under review for listing determination during the life of the project.

Avoidance and Minimization to Be Implemented by TNARNG

TNARNG would make every effort to avoid and minimize the project's potential impacts on listed species. The project location and orientation of buildings have been chosen to leave only minimal space between developed areas, eliminate interspersed openings, and reduce parking area size. TNARNG also reduced the site footprint from the originally planned 27 acres to 14.9 acres in order to limit the need for additional forest clearing and potential impacts on listed bat species. The originally proposed site layout included small forest patches that would have remained on the site and been dispersed among the buildings. The smaller site layout removes the dispersed forest patches and allows a large block of bottomland forest west of the site along Bobo Creek to remain. Leaving this larger forested patch intact would provide better habitat for the NLEB and Indiana bat than smaller patches of trees interspersed among buildings. Additionally, leaving the larger forest patch intact increases the standoff distance from the creek, reducing potential for siltation and other water quality impacts to the creek. This benefits aquatic insects that may serve as bat forage species, and listed mollusks if present.

Tree clearing associated with initial barracks under the Preferred Alternative cannot be accomplished during the winter months due to harvest logistics, required initial barracks construction timelines, and winter soil moisture levels potentially causing extensive problems such as soil disturbance, erosion, siltation, soil compaction, etc. The tree harvests would therefore be conducted during the late summer/early fall (1 August to 14 November) timeframe, when bat pups will be volant and all bats will be capable of escaping disturbance from tree harvesting operations. TNARNG already conducts all its activities and training within compliance of state and federal

law. The TDEC required a SWPPP containing water quality protection measures and BMPs to be implemented throughout the life of the project, preventing siltation and contamination of nearby Bobo Creek from impacting aquatic insects that could serve as bat forage species as well as listed mollusks if present.

Operation and maintenance of the proposed barracks and associated facilities have the potential to impact listed species over time. To prevent or minimize potential impacts, the outdoor lighting plan would include bat-friendly lighting that incorporates the use of building and security light fixtures that direct light downward and not sideways or up, in conjunction with light-emitting diodes (LEDs) designed to produce wavelengths less visible and less disturbing to listed bats (amber to red spectrum). These LED lights would prevent concentrating insects and therefore bats in open areas near occupied buildings, reducing impediments to commuting and foraging, and reducing susceptibility to predation. Use of pesticides would be restricted to the minimum effective amount/concentration, using methods that minimize drift, and adhering to the application situation restrictions of the label. This would minimize potential effects to plants and insects, including the monarch butterfly, in surrounding areas, water bodies, bat insect forage species, and the potential for impacting nearby water sources. Further, TNARNG would make efforts to avoid and minimize the project's potential impacts on milkweed, the host plant for the monarch butterfly.

3.5.2.2 Cumulative Effects

The Preferred Alternative and reasonably foreseeable future actions would result in localized, direct and indirect cumulative impacts on vegetation and wildlife due to demolition and construction activities, including excavation, grading, and site preparation. The proposed demolition and new construction activities could result in potential direct and indirect cumulative impacts on federally listed species, none of which would be significant. Prior to demolition, buildings would be inspected for use by bats, and no demolition activities would occur until after inspections for bats have been completed. Further, Arnold AFB completed a Programmatic BA in March 2015 to evaluate and document the effects of ongoing, routine operations on Arnold AFB on the Indiana bat and the gray bat; the USFWS issued its Programmatic BO in 2016 (USFWS 2016b). Arnold AFB would consult with the USFWS under the existing 2016 Programmatic BO for future DAF projects that have the potential to affect habitat for federally listed bat species. Arnold AFB would incorporate all existing requirements and recommendations and any new requirements and recommendations provided by the USFWS.

3.5.2.3 No Action Alternative

No effects on biological resources would occur. The Preferred Alternative would not be implemented. There would be neither beneficial nor adverse effects on vegetation, fish, and wildlife, or sensitive species, and these resources would not change when compared to existing conditions.

3.6 CULTURAL RESOURCES

Cultural resources can include prehistoric and historic archaeological sites, traditional cultural properties, buildings, structures, objects, districts, and landscapes. In addition to NEPA, several federal laws and regulations govern the consideration and treatment of cultural resources in federal undertakings, including the NHPA of 1966, as amended; the Archaeological and Historic

Preservation Act of 1974; the American Indian Religious Freedom Act of 1978; the Archaeological Resources Protection Act (1970); and the Native American Graves Protection and Repatriation Act (1990).

The NHPA created the National Register of Historic Places (NRHP) as a planning tool to recognize cultural resources that possess significance and integrity applying the National Register Criteria for Evaluation (36 CFR 60.4[a-d]). Properties listed in, or eligible for listing in, the NRHP are legally defined as historic properties that require consideration under Section 106 (54 USC 306108) of NHPA in federal actions.

3.6.1 Existing Conditions

Arnold AFB has an established cultural resources management program that is in compliance with DoD Instruction 4715.16, *Cultural Resources Management* (18 September 2008, updated 31 August 2018) and Air Force Manual 32-7003, *Environmental Conservation* (20 April 2020). Arnold AFB also conducts tribal consultation in accordance with DAF Instruction 90-2002, *Interactions with Federally Recognized Tribes* (24 August 2020). Arnold AFB is consulting with the Tennessee SHPO on behalf of TNARNG pursuant to 36 CFR 800.14 regarding the management of historic properties within the TNARNG-licensed land areas at the Installation (**Appendix A**). In 2014, Arnold AFB, the Tennessee SHPO, tribal representatives, local governmental jurisdictions, and other parties consulted on a *Programmatic Agreement (PA) between Arnold Engineering Development Complex, Arnold Air Force Base and the Tennessee State Historic Preservation Officer Regarding Management of Historic Properties at Arnold Air Force Base, Tennessee Pursuant to 36 CFR Part 800.14* regarding the management of historic properties at the Installation (Arnold AFB 2014a). The PA is effective until 2024 and may be modified, terminated, or extended dependent on review by the signatories. The PA establishes procedures to implement Section 106, standards and procedures for the treatment of historic properties, classes of undertakings exempt from further review, standardized treatments for project effects, and documentation, reporting, and monitoring requirements. Implementation of the PA and its terms fulfills Arnold AFB's responsibilities under Section 106 of NHPA for all individual undertakings of the program. The Arnold AFB Integrated Cultural Resource Management Plan provides managers with a guide to ensure compliance with applicable cultural resource requirements (Arnold AFB 2021d).

3.6.1.1 Area of Potential Effect

For cultural and historic resource analysis in this EA, the Area of Potential Effect (APE) is defined as the area directly impacted by construction and operation of the barracks plus those areas indirectly affected in the vicinity of the barracks. The APE for the Preferred Alternative encompasses the entire 16-acre parcel on which the barracks would be constructed. The area of indirect effects for the Preferred Alternative is defined as 100 feet surrounding the perimeter of the parcel (**Figure 3-4**).

3.6.1.2 Cultural and Historic Resources Studies

Arnold AFB has been the subject of numerous studies to identify and to evaluate cultural resources at the Installation. These studies have identified several archaeological sites and architectural and

Figure 3-4. Area of Potential Effect and Area of Indirect Effects for Cultural Resources Associated with the Preferred Alternative

landscape resources. Some resources have been evaluated as possessing the qualities of significance necessary for listing in the NRHP.

Archaeological Investigations. Archaeological investigations at Arnold AFB have been conducted over three decades and have identified a total of 187 prehistoric and historic sites bridging nearly the entire span of human settlement in the region. Numerous Phase I archaeological surveys have been completed at the Installation, encompassing all the land currently managed by Arnold AFB. These investigations have included several very large identification surveys, including investigations encompassing 40,000 acres (Matternes et al. 1997) and 16,825 acres (Wampler et al. 2010) of the Installation. Many other investigations encompassed smaller areas and were conducted for Section 106 undertakings, such as timber harvests or construction of facilities (Alexander and Redwine 2009). Other studies focused on evaluating the eligibility of sites. The eligibility status of most archaeological sites was assessed during these studies. Of the 187 sites identified on Arnold AFB, 18 sites were determined eligible for listing in the NRHP, 151 sites were determined not eligible for listing, and 18 sites were considered potentially eligible. Two of the archaeological sites have been identified as potential traditional cultural properties, and traditional use of plants was identified as a tribal concern (Arnold AFB 2021d). Based on the previous archaeological investigations, the archaeological inventory of the Installation complete, but few site evaluations have been completed yet.

Archaeological identification surveys have been completed at the Preferred Alternative location. Portions of the Preferred Alternative were included in three separate archaeological surveys. One of the survey areas examined by Matternes extended into the northwestern portion of the Preferred Alternative (Matternes et al. 1997). Other portions of the Preferred Alternative were examined as part of an evaluation of historic farmsteads present prior to acquisition of the land for Camp Forrest (Bennett et al. 2002). The entire area within the Preferred Alternative was also included in an archaeological survey of 100 acres for the TNARNG (Deter-Wolf and Karpynec 2006). That study resulted in the identification of Site 40CF310, the Camp Forrest Site, which consists of approximately 2,451 acres associated with the Camp Forrest World War II military post. An 8.3-acre portion of the Camp Forrest Site contained structural remains and was marked on historic maps as the segregated barracks and associated facilities occupied by African-American troops stationed at Camp Forrest. Historical research was conducted in 2010 to evaluate the eligibility of the African-American barracks located at Camp Forrest (Schenker et al. 2010).

Architectural investigations. Architectural investigations at Arnold AFB have been focused on built resources constructed between 1946 and 1991, which have been surveyed and evaluated in five architectural reports. The architectural survey efforts completed in 2014 and 2017 resulted in a 100 percent comprehensive survey and evaluation for architectural resources constructed during the Cold War era (1946 to 1991) applying the NRHP criteria for evaluation (36 CFR 60.4[a-d]) (Prybylski et al. 2014; Prybylski and Edge 2017). The four-volume Cold War report recommended NRHP eligibility for the Arnold AFB Test Facilities Historic District, the Elk River Dam-Woods Reservoir Historic Landscape, the Test Utilities Historic Landscape, five individual buildings, and contributing buildings to the historic district and landscapes. The results and evaluation recommendations were accepted by the Tennessee SHPO. The list of 88 facilities designated as either “eligible as a contributing element to Arnold AFB Test Facilities Historic District” or “individually eligible under Criteria A and C” was most recently codified in an April 2021

memorandum (Allen 2021); assessments and recommendations used for facility inclusion in the list are from Prybylski et al. (2014) and Prybylski and Edge (2017).

3.6.1.3 Evaluated Built Resources Included in the Preferred Alternative

No historic built resources are located within or adjacent to the Preferred Alternative. The existing TNARNG barracks (Buildings 2830 through 2842) located immediately northwest of the Preferred Alternative were constructed in 1987. In 2014, the barracks buildings were evaluated as not eligible for listing in the NRHP (Prybylski et al. 2014: Vol. 1, pages 76-77). Therefore, no historic built resources are present within the Preferred Alternative or its vicinity.

3.6.1.4 Archeological Resources and Traditional Cultural Properties

Archaeological resources are recorded within the area encompassed by the Preferred Alternative; however, no traditional cultural properties are recorded (Arnold AFB 2021d). The Camp Forrest Site (40CF310) is a very large archaeological site consisting of the remains of the World War II-era military training center. The site encompasses 2,451 acres in the western portion of the Arnold AFB, including the Preferred Alternative. Although property formerly associated with the Mitchell Farm appears to extend into a small portion of the Preferred Alternative, the archaeological remains of this farm (Site 40CF286) are located over 0.4 mile to the north (Cochrane et al. 2006; Deter-Wolf and Karpynec 2006). Neither site is eligible for listing in the NRHP.

The Camp Forrest Site (40CF310) was identified during an archaeological survey of 100 aces at VTS-T. The site includes all areas containing structures as depicted on historic maps and aerial photographs based on background research and consultation with the Tennessee Division of Archaeology (Deter-Wolf and Karpynec 2006). The Camp Forrest Site includes roadbeds and remnants of former structures, including those associated with prisoner-of-war activity at the camp. Previous investigations within the boundary of the 40CF310 site focused on pre-World War II historic farmsteads and prehistoric sites recorded there (Anderson 1996; Bennett et al. 2002; Johnson 1998a, 1998b; Lanham et al. 1995; Matternes et al. 1997).

The 2006 archaeological survey of 100 acres of the VTS-T included the area encompassed by the Preferred Alternative (Deter-Wolf and Karpynec 2006). The survey recorded a variety of features associated with Camp Forrest, including roadbeds, sewer lines, and structure foundations. Eighteen of the 24 structure foundations identified were located within an 8.3-acre area marked on historic maps as segregated barracks and associated facilities occupied by African-American troops stationed at Camp Forrest. Those facilities extended into the southwestern portion of the Preferred Alternative. Archival research conducted on the African-American barracks determined that they were not eligible for the NRHP due to the lack of material remains and disturbed deposits (Schenker et al. 2010).

The Mitchell Farm Site (40CF286) was originally mapped on the basis of property lines and aerial photographs rather than archaeological data (Bennett et al. 2002). Subsequent archaeological investigations indicate that the remains of the early twentieth-century farm are located well outside of the Preferred Alternative and are not eligible for the NRHP (Cochran et al. 2006).

3.6.2 Environmental Consequences

Under NEPA, effects include impacts on cultural and historic resources. Similarly, Section 106 (54 USC 306108) of the NHPA requires that federal agencies take into account the effects of proposed undertakings on any historic properties. Effects on cultural and historic resources would be significant if a proposed action would affect properties within the APE that are listed on or eligible for listing on the NRHP.

3.6.2.1 Preferred Alternative

No impacts on cultural resources are expected. No historic built resources are present within or adjacent to the Preferred Alternative; therefore, no historic properties would be affected. The Preferred Alternative is situated in the portion of the Camp Forrest Site (40CF310) where the African-American barracks were located. Archaeological and historical research on these resources determined that neither the Camp Forrest Site nor the African-American barracks are eligible for listing on the NRHP. Should archaeological discoveries be made during project activities, Arnold AFB's *Standard Operation Procedure for Discovery of Archaeological Resources and Native American Graves Protection and Repatriation Act Cultural Items* would be implemented (Arnold AFB 2021d). These procedures were developed by the Installation and consulting tribes to address such circumstances.

Arnold AFB is consulting with the Tennessee SHPO on behalf of TNARNG pursuant to 36 CFR 800.14 regarding the proposed actions within the TNARNG-licensed land areas at the Installation (**Appendix A**). To comply with the NHPA and its implementing regulations at 36 CFR 800, Arnold AFB invited federally recognized tribes affiliated historically with the geographic region to consult on the proposed undertaking. Letters were mailed to tribes on 17 January 2022. The Thlopthlocco Tribal Town, Eastern Shawnee Tribe, Poarch Band of Creek Indians, and Cherokee Nation responded on (28 January, 1 February, 15 February, and 22 February 2022, respectively) stating the Preferred Alternative would have no adverse effect on tribal resources. No other tribal letters have been received. The tribes that responded indicated that the Preferred Alternative would have no adverse effect on them or their resources. Records of correspondence with the Native American tribal governments are included in **Appendix A**.

3.6.2.2 Cumulative Effects

There would be no significant cumulative effects on cultural resources from the Preferred Alternative in combination with other reasonably foreseeable future projects. All historic properties at Arnold AFB are managed in accordance with the provisions of the 2014 PA (Arnold AFB 2014a), which applies best preservation practices within the mission of the AFB. The stipulations of the 2014 PA (Arnold AFB 2014a) establish the standards, process for effects determination, and treatment of all historic properties affected by the reasonably foreseeable projects. All effects determinations, including potential adverse effects on historic properties, would be mitigated through the provisions of the executed agreement.

3.6.2.3 No Action Alternative

No effects on cultural resources would occur under the No Action Alternative. The Preferred Alternative would not be implemented. There would be no effects on cultural resources or historic properties, and these resources would remain in their existing conditions.

3.7 HAZARDOUS MATERIALS AND WASTES

Hazardous wastes are defined by the RCRA, as amended, as any solid, liquid, contained gaseous, or semisolid waste, or any combination of wastes that pose a substantial present or potential hazard to human health or the environment. Hazardous materials are defined by the CERCLA, as amended, as any substance with physical properties of ignitability, corrosivity, reactivity, or toxicity that might cause an increase in mortality, serious irreversible illness, or incapacitating reversible illness, or pose a substantial threat to human health or the environment. Issues associated with hazardous materials and wastes typically center on underground storage tanks, aboveground storage tanks, and the storage, transport, and use of pesticides, fuels, and other petroleum-based products, lubricants, antifreeze, and paint solvents. When such resources are improperly used in any way, they can threaten the health and well-being of wildlife species, vegetation communities, soil systems, water resources, and people.

To protect habitats and people from inadvertent and potentially harmful releases of hazardous substances, the DAF, through AFIs 10-2510, *Emergency Management Program,* and 32-7002, *Hazardous Materials Management*, has dictated that all facilities develop and implement Hazardous Materials Management Plans, Hazardous Waste Management Plans, and/or Spill Prevention, Control, and Countermeasure Plans. Also, the DoD has developed the ERP to facilitate the thorough investigation and cleanup of contaminated sites located at military installations. These plans and programs, in addition to established legislation (e.g., CERCLA, RCRA), effectively form the "safety net" intended to protect the ecosystems on which most living organisms depend.

3.7.1 Existing Conditions

3.7.1.1 Environmental Restoration Program

ERP sites at Arnold AFB include areas where hazardous wastes, substances, pollutants, radioactive wastes, or petroleum were released. The ERP program also manages Military Munitions Response Program (MMRP) sites. Investigations at Arnold AFB have identified 41 ERP sites since the program was initiated in 1982. Of the 41 identified sites, 14 sites required no further action (NFA) and are considered closed, 5 are undergoing remedial action operations, 15 are undergoing long-term monitoring (LTM) and/or have land use controls (LUCs) in place, and 7 sites are the in remedial investigation phase as a part of the ongoing perflurooctane sulfonate/perfluorooctanoic acid investigation. Eighteen MMRP sites have been identified, of which 13 are closed with NFA and 5 sites remain open with LUCs in place.

Arnold AFB developed a Land Use Control Assurance Manual (LUCAM) to manage sites where levels of hazardous constituents remain in soil and/or groundwater above appropriate risk levels for unrestricted use. Land Use Control Implementation Plans (LUCIPs), which outline the specific types of physical and administrative mechanisms to be maintained at the respective sites, are prepared for each applicable site. The LUCAM process includes annual or biannual monitoring of any LTMs, LUCs, or remedial action operations (AEDC 2021).

The Preferred Alternative is located within Solid Waste Management Unit 24 (SWMU 24) – Camp Forrest (**Figure 3-5**). SWMU 24 is located on the western side of Arnold AFB and is the former US Army World War II training base that was built in 1941 and decommissioned in 1946 (Arnold

AFB 2014b). Camp Forrest was built as an infantry training camp for the US Army. The camp covered over 5,000 acres and included gas stations, motor repair facilities, landfills, barracks, a water treatment plant, a sewage treatment plant, a hospital, and an incinerator (Arnold AFB 2014b). At the end of World War II, the camp was dismantled with its buildings being torn down and the underground storage tanks removed (Arnold AFB 2014b). Investigations at SWMU 24 have identified areas of soil and groundwater contamination (Arnold AFB 2014b). Several sites within SWMU 24 have required corrective action (Arnold AFB 2014b), including a former landfill, Landfill 1 (LF1) which is proximate to the Preferred Alternative (**Figure 3-5**). Interim measures have been implemented at LF1 to achieve site-specific media cleanup objectives including placement of a security fence around LF1 in 2003 (Arnold AFB 2014b). Soil samples have been collected from LF1 for screening of dioxins and metals. Of the 31 samples analyzed for dioxin at LF1, one sample was above the industrial preliminary remediation goal (Arnold AFB 2014b). Of the 31 samples analyzed for arsenic at LF1, one sample was above the background concentration (Arnold AFB 2014b). The interim measures have been upgraded to final remedies at LFI as described below:

- The existing fence would be maintained, and access gates secured.
- LUC measures are inspected quarterly per the LUCAM and the site-specific LUCIP. Any deficiencies would be corrected in a timely manner.
- Construction and digging permits are required on all Arnold AFB property.

3.7.1.2 Hazardous Materials and Wastes

Hazardous substances are corrosive, toxic, flammable, and reactive materials that, when spilled or released into the environment, are dangerous to public health. Hazardous substances include those materials used in the cleaning, maintenance, and repair of buildings, equipment, and vehicles. Examples include motor oil, gasoline, jet fuel, coolants, hydraulic fluids, paints, paint thinners, strippers, and degreasing agents. At Arnold AFB, up to 55 gallons of hazardous waste or 1 quart of acutely hazardous waste may be stored at initial accumulation points before being picked up by the Hazardous Waste Operations Group and transferred to 90-day accumulation points. From the 90-day accumulation points, hazardous waste is moved to Building 1456, the RCRA-permitted storage facility at Arnold AFB. Final disposition of hazardous waste is managed by the Defense Logistics Agency Disposition Services at Warner Robbins, Georgia.

The USEPA identification number for Arnold AFB is TN8 570 024 044 (Arnold AFB 2013). Under RCRA, Arnold AFB is a large-quantity generator of hazardous waste (i.e., generating 2,200 pounds per month or more) and maintains a RCRA-permitted storage facility. Hazardous wastes that are regulated under RCRA are defined as any solid, liquid, contained gaseous, or semisolid waste; or any combination of wastes that either exhibit one or more of the hazardous characteristics of ignitability, corrosivity, toxicity, or reactivity; or are listed as a hazardous waste under 40 CFR 261. Further, any wastes associated with the Preferred Alternative, including any materials destined for disposal, would be managed in accordance with the Solid and Hazardous Waste Rules and Regulation of the state of Tennessee.

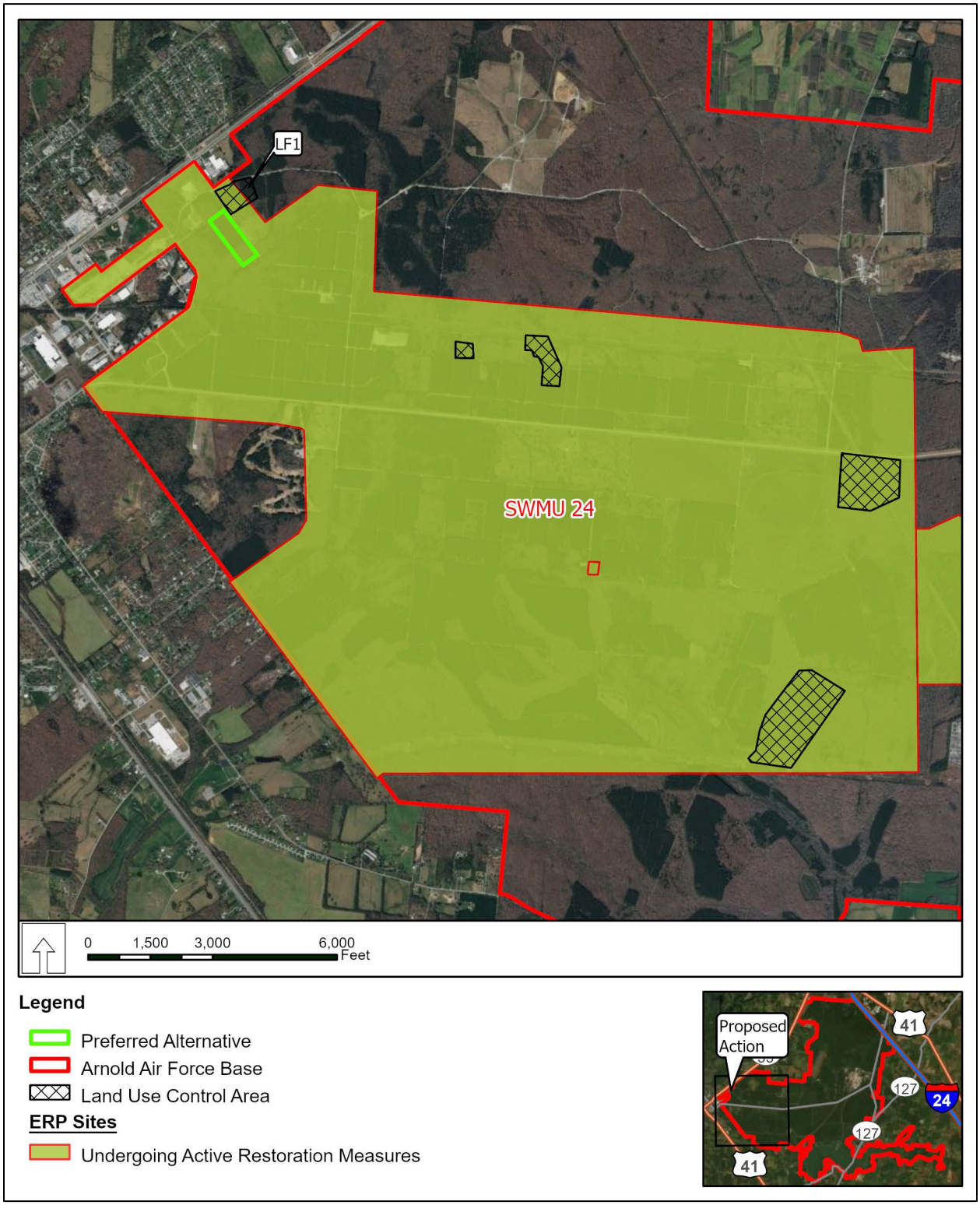

Figure 3-5. Environmental Restoration Program Sites at and near the Preferred Alternative Site

3.7.1.3 Asbestos

Asbestos is a mineral fiber that was historically added to products to strengthen them and provide heat insulation and fire resistance. Breathing high levels of asbestos fibers has been associated with some types of cancer. Many building products contained asbestos prior to the 1970s. AFI 32-1001 implements 29 CFR 1910.1001, *Asbestos*; 29 CFR 1926.1101, *Asbestos*; and 40 CFR 61, subpart M, *National Emission Standard for Asbestos*. DAF regulations prohibit the use of asbestos-containing materials (ACMs) for new construction. TNARNG and Arnold AFB have implemented asbestos management and operations programs to provide proper procedures for the inspection, monitoring, abatement, and disposal of ACMs. The programs are designed to prevent potential health hazards from the inhalation of unsafe levels of airborne asbestos fibers (Arnold AFB 2013). In addition to these programs, there are federal and state regulations in place regarding asbestos renovation and demolition activities, enforced by the USEPA's and TDEC's Division of Air Pollution Control, which contain the requirements for building demolition and asbestos removal. This rule requires advance notification to Air Pollution Control before any structures are renovated or demolished and for procedures to be followed when asbestos is removed.

3.7.1.4 Lead-Based Paint

Lead-based paints are also considered hazardous materials. TNARNG and Arnold AFB implement lead and heavy metal management programs to educate and protect Base personnel and the surrounding environment from the dangers of lead and materials containing heavy metals. Lead-based paint is found in most of Arnold AFB's existing facilities because of their age and industrial-type use. When renovations are done to existing facilities, replacement of paint is completed, in accordance with all appropriate regulations and BMPs, when economically feasible.

3.7.2 Environmental Consequences

Numerous local, state, and federal laws regulate the storage, handling, disposal, and transportation of hazardous materials and wastes, with the purpose of protecting public health and the environment. The severity of potential impacts associated with hazardous substances is based on their toxicity, ignitability, and corrosivity. Impacts associated with hazardous materials and wastes would be considered significant if the storage, use, transportation, or disposal of hazardous substances substantially increases the human health risk or environmental exposure. Impacts on identified ERP sites would be considered significant if a proposed action disturbed or created contaminated sites that would result in adverse effects on human health or the environment.

3.7.2.1 Preferred Alternative

Environmental Restoration Program. The Preferred Alternative would not likely interfere with the long-term monitoring of ERP sites at Arnold AFB, and similarly no effects on human health or safety or the Preferred Alternative are expected from any existing ERP sites. Further, the measures are in place, which would reduce the likelihood of the Preferred Alternative affecting any ERP sites and any ERP sites affecting human health and safety or the Preferred Alternative. LUC areas are present within SWMU 24; however, the Preferred Alternative is not located within one of these areas. Nearby LF1 is fully fenced, and the existing fence would continue to be maintained and the access gates would continue to be secured. LUC measures are in place and are inspected annually in accordance with the Arnold AFB Hazardous and Solid Waste Amendments

Permit, and any deficiencies are corrected in a timely manner. Construction and digging permits are also required on Arnold AFB property, which would limit any potential effects from soil disturbance proximate to LF1 during construction.

Hazardous Materials and Waste Storage and Generation. Short-term, construction-related impacts associated with hazardous materials and wastes would be negligible. TNARNG and Arnold AFB would comply with CERCLA and RCRA and all applicable state and federal regulations concerning the transport, storage, use, and disposal of hazardous substances, including all hazardous materials and wastes. The use and storage of minor amounts of hazardous materials related to the Preferred Alternative activities would increase temporarily during site preparation and construction activities. Any hazardous materials used, or hazardous wastes generated as a result of implementation of the Preferred Alternative would be accumulated and removed in compliance with the procedures included in VTS-T's hazardous materials management guidance. Implementation of the Preferred Alternative would not be expected to result in any substantial changes in the use or storage of hazardous materials at Arnold AFB.

Asbestos. No demolition or renovations of existing buildings are included in the Preferred Alternative, and asbestos is no longer used in new construction; therefore, there would be no impacts associated with asbestos with implementation of the Preferred Alternative.

Lead-Based Paint. No demolition or renovations to existing buildings are included in the Preferred Alternative, and lead-based paint is no longer used in new construction; therefore, there would be no impacts associated with lead-based paint with implantation of the Preferred Alternative.

3.7.2.2 Cumulative Effects

Implementation of the Preferred Alternative along with other reasonably foreseeable actions would not be expected to result in any significant cumulative changes in storage or generation of hazardous materials at Arnold AFB. All ACM from other reasonably foreseeable projects on Arnold AFB would be disposed of according to the Installation's Asbestos Management Plan as well as in compliance with all applicable federal, state, and local regulations. Implementation of appropriate BMPs would further limit potential direct and indirect cumulative impacts associated with hazardous materials, which are anticipated to be minor.

3.7.2.3 No Action Alternative

No effects on hazardous materials and wastes would occur. The Preferred Alternative would not be implemented. Hazardous materials and wastes would not change when compared to existing conditions.

3.8 INFRASTRUCTURE AND TRANSPORTATION

Infrastructure consists of the systems and physical structures that enable a population in a specified area to function. Infrastructure is wholly human made, with a high correlation between the type and extent of infrastructure and the degree to which an area is characterized as "urban" or developed. The availability of infrastructure and its capacity for expansion are generally regarded as essential to the economic growth of an area. The infrastructure components discussed in this section include transportation, AT/FP, and utilities. Transportation is limited to the major and minor roadways that feed into the Installation and the security gates, and roadways and parking

areas on the Installation. Utilities include public water and cooling water. The infrastructure information contained in this section provides a brief overview of each infrastructure component and comments on its existing general condition at the Installation.

3.8.1 Existing Conditions

3.8.1.1 Transportation

Major roads near Arnold AFB and VTS-T are I-24 and State Route 41 (Hillsboro Highway) to the north, Highway 55 (New Manchester Highway) to the west, Alternate State Route 41/State Highway 16 (Tullahoma Highway) to the south, and State Highway 127 (Winchester Highway) to the east. I-24 provides easy access to and from Nashville and Chattanooga (**Figure 3-6**). Access to Arnold AFB is provided by Wattendorf Memorial Highway from the north, Decherd Road to the east, and Arnold Center Road to the southwest (from Tullahoma) (**Figure 3-6**). Existing traffic volumes along roads in the area are suitable for the existing infrastructure (DAF 2014, 2016a, 2016b). Tennessee Highway 55/East Carrol Street is the major roadway used to access VTS-T (**Figure 3-7**). The annual average daily traffic volume experienced along Highway 55 between State Route 41 and 1-24 near the Preferred Alternative is approximately 15,204 vehicles (Tennessee Department of Transportation 2021).

Level of service (LOS) is a term used to qualitatively describe the operating conditions of a roadway based on factors such as speed, travel time, maneuverability, delay, and safety. The LOS of a roadway is designated with a letter, A to F, with A representing the best operating conditions and F representing the worst. As a general rule, a level of service of C or better is desirable, with a level of service of D considered the lowest acceptable during peak hours (City of Tullahoma 2013). The 2010 LOS provided along Highway 55 between State Route 41 and 1-24 near the Preferred Alternative is B, and the 2030 LOS is projected to remain as B (City of Tullahoma 2013). Designation of a B LOS means that vehicle operation is reasonably unimpeded with slightly restricted maneuverability and stopped delays are not bothersome (Transportation Research Board 1994). Access to the Preferred Alternative site would most likely be via HETT Road or Industrial Boulevard to Road U1, or Road A3 Trail, or Road A2 Trail, or Jeep Drive (**Figure 3-7**).

3.8.1.2 Antiterrorism/Force Protection

The DoD has developed AT/FP standards, which are designed to reduce the likelihood of casualties from potential terrorist attacks. Requirements include mandated setbacks of parking areas from buildings, increased security measures such as barricades at military facility entrances and exits, and AT/FP-compliant perimeter fences. Requirements also include mandates regarding emergency notification systems and procedures. The *United States Air Force Installation Force Protection Guide* contains information on installation planning, engineering design, and construction techniques that can preclude or minimize the effects of terrorist attacks upon existing and future facilities. It addresses the comprehensive planning process, facility site design, and building systems design. Additional criteria are available in UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings. At Arnold AFB, the AT/FP office is included in the design meetings for facilities and reviews plans against UFC 4-010-01.

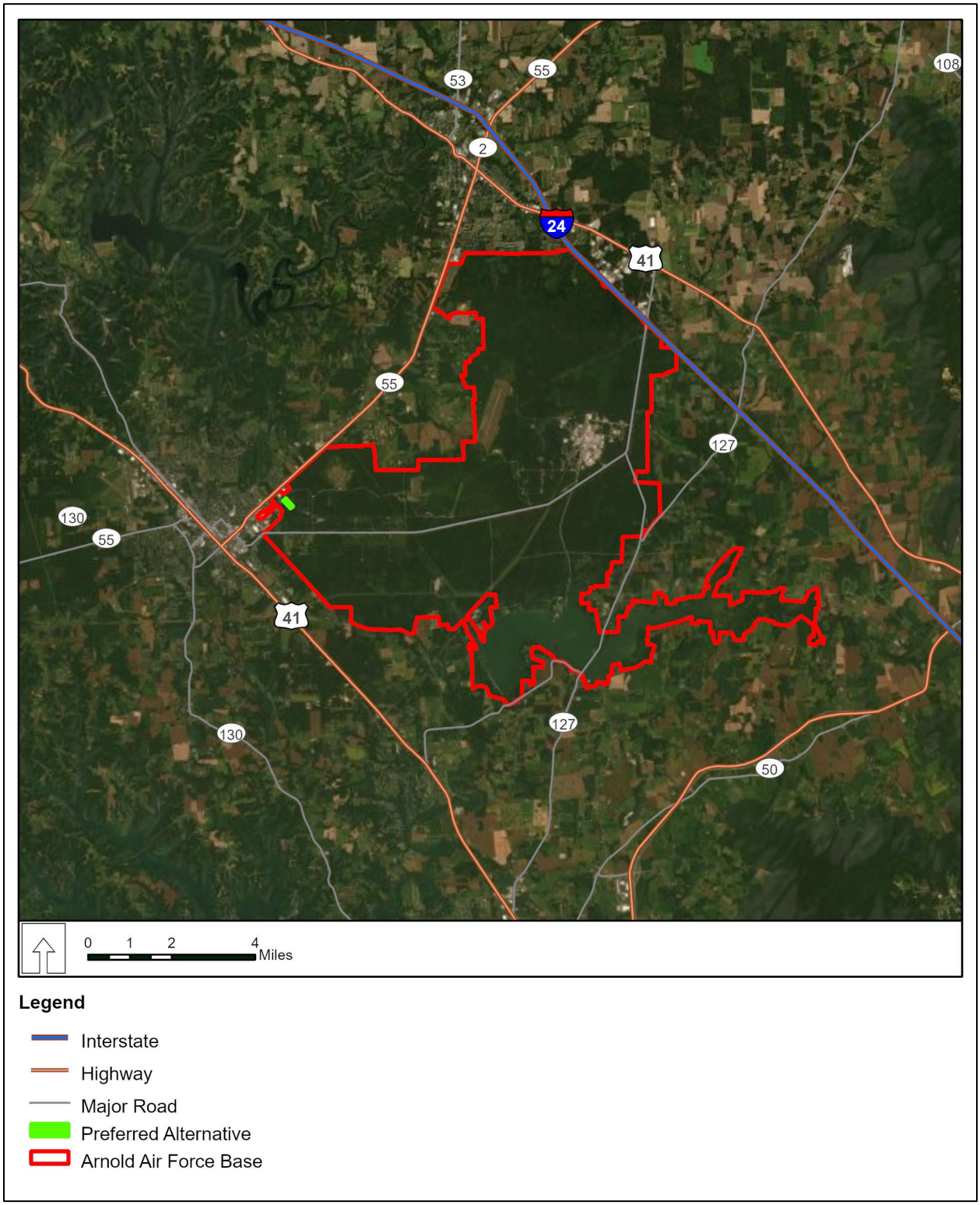

Figure 3-6. Major Roadways in the Vicinity of Arnold Air Force Base

Figure 3-7. Major Roadways in the Vicinity of the Preferred Alternative

3.8.1.3 Water System

VTS-T is connected to the Tullahoma Utilities Authority's municipal water source for the city of Tullahoma. Currently, the Tullahoma Utilities Authority serves 10,500 water customers. The system maintains 270 miles of water mains and eight elevated water storage tanks with a total storage capacity of 4 million gallons. The Tullahoma Utilities Authority's customers use an average of 3 million gallons of water each day. The Tullahoma Utilities Authority purchases potable water from the Duck River Utility Commission, whose source is Normandy Lake.

3.8.1.4 Wastewater System

VTS-T is connected to the Tullahoma Utilities Authority's wastewater system. The Tullahoma Utilities Authority's wastewater treatment facility accommodates nearly 8,000 sewer customers and maintains 200 miles of collection lines and 42 lift stations. The collection system consists of gravity sewers, grinder pumps, and force mains. The Tullahoma Utilities Authority operates its own state-of-the-art wastewater treatment plant.

3.8.1.5 Stormwater Drainage System

VTS-T has its own stormwater collection system, which consists of curbs, gutters, underground storm mains, and open ditches that convey water off site.

3.8.1.6 Natural Gas System

VTS-T is connected to the Elk River Public Utility District's natural gas system. Natural gas is supplied to the Elk River Public Utility District by the East Tennessee Natural Gas Company.

3.8.1.7 Electrical Distribution System

Electricity is supplied to VTS-T by the Tennessee Valley Authority via the Tullahoma Utilities Authority's electrical distribution system. The Tullahoma Utilities Authority's electrical distribution system serves 11,000 commercial and industrial customers with power. Over 250 miles of distribution lines are maintained by the electrical department. The Tullahoma Utilities Authority provides power through two main 161-kilovolt substations. Each main substation has the capacity of 75 megavolt-amperes, and each typically carries a winter peak load of 32 megawatts. The Tullahoma Utilities Authority's distribution voltage is nominally 13 kilovolt, three phase, 60 hertz.

3.8.1.8 Solid Waste System

A variety of solid wastes are generated at VTS-T on Arnold AFB. Municipal waste is transported off the site for disposal

3.8.2 Environmental Consequences

Impacts on infrastructure are evaluated based on their potential for disruption or improvement of existing levels of service and additional needs for energy and water consumption, sanitary sewer and wastewater systems, and transportation patterns and circulation. Impacts might arise from physical changes to circulation, construction activities, introduction and use of construction-related traffic on local roads or changes in daily or peak-hour traffic volumes, and energy needs created by either direct or indirect workforce and population changes related to Installation

activities. An effect might be considered adverse if a proposed action exceeded the capacity of a utility. A proposed action could have a significant effect with respect to infrastructure if the following were to occur: (1) exceedance of a utility's capacity, (2) long-term interruption of a utility, (3) violation of a permit condition, or (4) violation of an approved plan for that utility.

3.8.2.1 Preferred Alternative

Transportation. The Preferred Alternative would have short-term, minor adverse effects on transportation and traffic. Short-term effects would result from construction vehicles and small changes in localized traffic patterns due to the Preferred Alternative. Effects on transportation and traffic would primarily be confined to on-Base areas but would have short-term, negligible, adverse effects on off-Base traffic. These effects would be from incremental increases in the number of vehicles accessing Arnold AFB in support of site preparation and construction activities.

Site preparation and construction would require use of privately owned vehicles and delivery trucks to and from the sites. Construction traffic would comprise a small percentage of the total existing traffic both on and off the Installation and would occur for no longer than a 12-month period. Road closures or detours to accommodate utility system work could be necessary, creating short-term traffic delays. These effects would be primarily confined to on-Base areas, temporary in nature, and would end with the construction phase.

There would be an incremental increase in off-Base traffic from worker commutes and delivery trucks in support of the on-Base demolition and construction activities. The local roadway infrastructure would be sufficient to support this limited increase in construction vehicle traffic, and there would be no perceptible change in off-Base traffic conditions when compared to existing conditions. No LOS change is expected as a result of the minor, short-term increase in traffic associated with construction. Although the effects would be minor, the following measures would be implemented: all site preparation and construction vehicles would be equipped with backing alarms, two-way radios, and slow-moving-vehicle signs, when appropriate; site preparation and construction traffic would be routed and scheduled to minimize conflicts with other traffic; and staging areas would be located to minimize traffic impacts. The Preferred Alternative would not introduce long-term increases in personnel or traffic at the Base.

Antiterrorism/Force Protection. The Preferred Alternative would result in no impacts associated with AT/FP. Buildings associated with the Preferred Alternative would be constructed to the minimum DoD antiterrorism standards for buildings and the Preferred Alternative location meets AT/FP requirements. All construction personnel associated with the project would be directed to enter at a designated access control point and would be required to complete all access requirements and badging prior to arriving onsite. Once operational, space would be allocated at the perimeter of the barracks site for an entry control facility/access control point designed in accordance with UFC 4-002-01, if the need arises.

Water Systems. The Preferred Alternative would not result in any changes to the Tullahoma Utilities Authority's municipal water system. Under the Preferred Alternative, no additional TNARNG troops would be assigned to training at VTS-T. The existing barracks are connected to the existing Tullahoma Utilities Authority municipal water system. While the proposed new TNARNG barracks would also be connected to the water system, no additional use of the system

is anticipated. Implementation of the Preferred Alternative would not cause the municipal water system to exceed its 4-million-gallon capacity.

Wastewater System. The Preferred Alternative would not result in any changes to the Tullahoma Utilities Authority wastewater system. Under the Preferred Alternative, no additional TNARNG troops would be assigned to training at VTS-T. The existing barracks are connected to the existing sanitary sewer system at VTS-T. While the proposed new TNARNG barracks would also be connected to the wastewater system at VTS-T, no additional use of the system is anticipated; therefore, no known impacts on the wastewater system would occur.

Stormwater Drainage System. The capacity of the stormwater drainage system at VTS-T would not be exceeded with implementation of the Preferred Alternative, and no long-term changes would occur. As part of the Preferred Alternative, on-site stormwater management would be designed and installed to manage drainage. The areas surrounding the new foundations of buildings and equipment would be appropriately graded to direct stormwater away from the foundation to the appropriate stormwater ditch. During the design phase, a grading plan would be prepared to identify how the site would be graded, how drainage patterns would be directed, and how runoff velocities would affect receiving waters. The grading plan would also include information regarding when earthwork would start and stop, establish the degree and length of finished slopes, and specify where and how excess material would be disposed or where borrow materials would be obtained if needed. Berms, diversions, and other stormwater practices that require excavation and filling would be incorporated into the grading plan. The grading plan would be designed with erosion and sediment control and stormwater management goals in mind. Grading crews would be supervised to ensure that the plans are implemented as intended.

The Preferred Alternative would increase the area of impervious surfaces at VTS-T; however, implementation of project-specific BMPs and the BMPs and erosion control measures described in the project-specific would further reduce stormwater drainage impacts associated with the Preferred Alternative. Since the Preferred Alternative would result in the disturbance or redisturbance of more than 1 acre, a NPDES Construction General Permit would be required to address stormwater discharges from construction projects, and the project would be included under the existing Tennessee Multi-Sector Permit. In addition to the BMPs that would be implemented under the Preferred Alternative, the contracted construction crews would comply with the measures outlined in the NPDES permits. In accordance with Section 438 of the EISA, low-impact development techniques would be incorporated into the Preferred Alternative.

Natural Gas System. The TNARNG barracks would result in negligible increases in natural gas system demand. Minimal temporary outages, localized to VTS-T, could be required to connect the new barracks to the existing natural gas supply. However, the Preferred Alternative would not introduce long-term major increases or disruptions in natural gas use or availability at VTS-T or in Tullahoma. Therefore, no long-term changes in the natural gas system are anticipated.

Electrical Distribution System. The TNARNG barracks would result in negligible increases in electrical distribution system demand. Minimal temporary outages, localized to VTS-T, could be required to connect the new barracks to the existing electrical supply. However, the Preferred Alternative would not introduce long-term major increases or disruptions in electricity use or availability at VTS-T or in Tullahoma. Therefore, no long-term changes in the electrical distribution system are anticipated.

Solid Waste System. The proposed site preparation and construction activities included in the Preferred Alternative would temporarily increase the volume of solid waste generated at VTS-T. However, construction and municipal waste are transported off site for disposal at landfills. The capacity of local landfills is more than sufficient for disposal of the debris that would be generated by implementation of the Preferred Alternative. Any wastes that may be unearthed during the Preferred Alternative would be subject to a hazardous waste determination and would be managed appropriately. Therefore, no negative long-term changes in the solid waste system would occur.

3.8.2.2 Cumulative Effects

The size and scope of the changes in the transportation systems associated with the Preferred Alternative would be extremely small when compared to other reasonably foreseeable planned transportation related projects in the area. No projects or proposals have been identified that, when combined with the Preferred Alternative, would have significant cumulative impacts on transportation.

Implementation of the Preferred Alternative and reasonably foreseeable future actions would not exceed the capacity of utilities at Arnold AFB nor would utility use on the Base affect the regional utility infrastructure or users; no significant cumulative impacts are expected. Further, implementation of these actions with other projects that may be planned in the near future could cumulatively result in long-term, minor beneficial effects as portions of the aging utility infrastructure on Base would be updated.

3.8.2.3 No Action Alternative

No effects on infrastructure and transportation would occur. The Preferred Alternative would not be implemented. Infrastructure and transportation would not change when compared to existing conditions.

3.9 HEALTH AND SAFETY

A safe environment is one in which the potential for death, serious bodily injury, illness, or property damage is reduced to the greatest extent practicable. Human health and safety addresses health and safety for the public and workers during construction, demolition, and operations and training activities. Site safety is achieved by following regulatory requirements imposed for the benefit of employees and the public. Site safety includes implementation of engineering and administrative practices that aim to reduce risks of illness, injury, death, and property damage. The Occupational Safety and Health Administration (OSHA), through the Occupational Safety and Health Act and other relevant laws, ensures safe and healthful working conditions by setting and enforcing standards and by providing health and safety training, outreach, education, and assistance. The health and safety of on-site military and civilian workers are also safeguarded by numerous DoD and DAF regulations designed to comply with the standards issued by OSHA and USEPA. These include the amount and type of safety training required for workers, the use of personal protective equipment (PPE), administrative controls, engineering controls, and permissible exposure limits for workplace stressors. The DAF has policies and regulations developed to protect workers associated with DAF activities. AFI 91-202, *US Air Force Mishap Prevention Program,* "establishes mishap prevention program requirements, assigns responsibilities for program elements, and contains program management information." To meet

the goals of minimizing loss of DAF resources and protecting military personnel, mishap prevention programs address groups at increased risk for mishaps, injury, or illness; a process for tracking incidents; funding for safety programs; metrics for measuring performance; safety goals; and methods to identify safety BMPs.

3.9.1 Existing Conditions

Site preparation and construction activities are common on Arnold AFB and have associated inherent risks such as chemical (e.g., asbestos, lead, hazardous materials) and physical (e.g., noise propagation, falling, electrocution, collisions with equipment) sources. Companies and individuals contracted to perform construction activities on DAF installations are responsible for adhering to OSHA requirements to minimize these hazards. Industrial hygiene programs address exposure to hazardous materials, use of PPE, and the availability and use of safety data sheets, the latter of which are also the responsibility of construction contractors to provide to workers. Construction and digging permits are also required on all of Arnold AFB property. Federal civilian and military personnel who have a need to enter areas under construction should be familiar with and adhere to OSHA and Air Force Occupational Safety and Health requirements, as well as applicable industrial hygiene programs. Individuals tasked to operate and maintain equipment during construction and demolition are responsible for following all applicable technical guidance, as well as adhering to established OSHA and DAF safety guidelines.

Health and safety hazards can be identified and subsequently reduced or eliminated before an activity begins. Necessary elements for an accident-prone situation or environment include the presence of the hazard itself, together with the exposed population. The degree of exposure to hazards depends primarily on the proximity of the hazard to the population. Hazards include transportation, maintenance and repair activities, noise, and fire. The proper operation, maintenance, and repair of vehicles and equipment are important for reducing safety risks. Any facility or human-use area with potential explosive or other rapid oxidation process creates unsafe environments due to noise and fire hazards for nearby populations. Loud environments can also mask verbal or mechanical warning signals such as horns and sirens.

All personnel involved with TNARNG and DAF activities on Arnold AFB are responsible for following occupational safety regulations. Contractors are responsible for following workers' compensation programs and are required to conduct construction activities in a manner that does not pose any risk to workers or personnel. Construction contractors are responsible for reviewing potentially hazardous workplace operation, monitoring exposure to workplace chemicals, and mitigating for physical hazards such as noise exposure and biological agents.

3.9.2 Environmental Consequences

Effects on health and safety would be significant if a proposed action interferes with the ability of emergency responders to attend to an emergency, introduces a new health and safety risk for which there is not a planned response, or substantially increases risks associated with the health and safety of TNARNG or DAF personnel, construction personnel, contractors, or the local community.

3.9.2.1 Preferred Alternative

The Preferred Alternative would have short-term, minor adverse impacts on health and safety during site preparation and construction activities. Although construction activities pose an

increased risk of construction-related accidents, construction contractors would comply with all appropriate Army and DAF regulations and policies and wear appropriate PPE. Health and safety during construction for non-construction-related personnel or dependents who might be in the area would be maintained through administrative controls and engineering controls, such as construction barriers and warning posters and signs. Construction equipment would be used only as necessary during the daylight hours and would be maintained to the manufacturer's specifications to minimize noise impacts. These measures would minimize adverse effects associated with health and safety.

3.9.2.2 Cumulative Effects

Implementation of the Preferred Alternative, in conjunction with other reasonably foreseeable projects, could cumulatively pose an increased risk for a safety mishap during site preparation and construction activities. Construction activities occurring at the same time and in the same vicinity could have short-term, minor, adverse cumulative effects by increasing local construction traffic accessing sites, increasing maintenance and repair activities, and creating highly noisy environs that could mask verbal or mechanical warning signals. Adherence to Army, DAF, and OSHA regulations would minimize the potential for adverse cumulative effects on construction workers, and none are expected to be significant. Numerous Arnold AFB facilities have the potential for large-scale destruction. Explosive Safety Quantity Distance safety zones have been established at Arnold AFB to limit development around test and storage facilities. Even so, the proposed TNARNG barracks construction, in conjunction with other reasonably foreseeable projects, could cumulatively have a long-term minor adverse effect on health and safety.

3.9.2.3 No Action Alternative

Health and safety would be unaffected at Arnold AFB. The Preferred Alternative would not be implemented, and health and safety would not change when compared to existing conditions.

FORMAT PAGE

4.0 LIST OF PREPARERS

This EA has been prepared under the direction of the NGB, TNARNG, DAF Civil Engineer Center, DAF, and Arnold AFB. The individuals who contributed to the preparation of this EA are listed in Table 4-1.

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FORMAT PAGE

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FORMAT PAGE

Appendix A

Agency and Tribal Correspondence

FORMAT PAGE

Agency Coordination Letters

FORMAT PAGE

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

14 December 2021

AEDC/TSDCI
100 Kindel Drive, Suite B-322
Arnold AFB TN 37389-2322

USDA NRCS Area 3
Cookeville Area Office
Attn: Mr. Chase Coakley
900 South Walnut Avenue, Room 3
Cookeville, TN 38501

Dear Mr. Coakley

An environmental assessment (EA) is being prepared jointly by the Tennessee Army National Guard (TNARNG) and the Department of the Air Force (DAF) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site – Tullahoma (VTS-T) on Arnold Air Force Base (AFB), Tennessee as shown in Figure 1. A copy of the Draft EA will be made available for your review and comment when complete.

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Sincerely

LAVIOLETTE.JOHN.W.1010835212 Digitally signed by LAVIOLETTE.JOHN.W.1010835212 Date: 2021.12.15 07:21:55 -06'00'

JOHN W. LAVIOLETTE
BASE CIVIL ENGINEER

Attachments:
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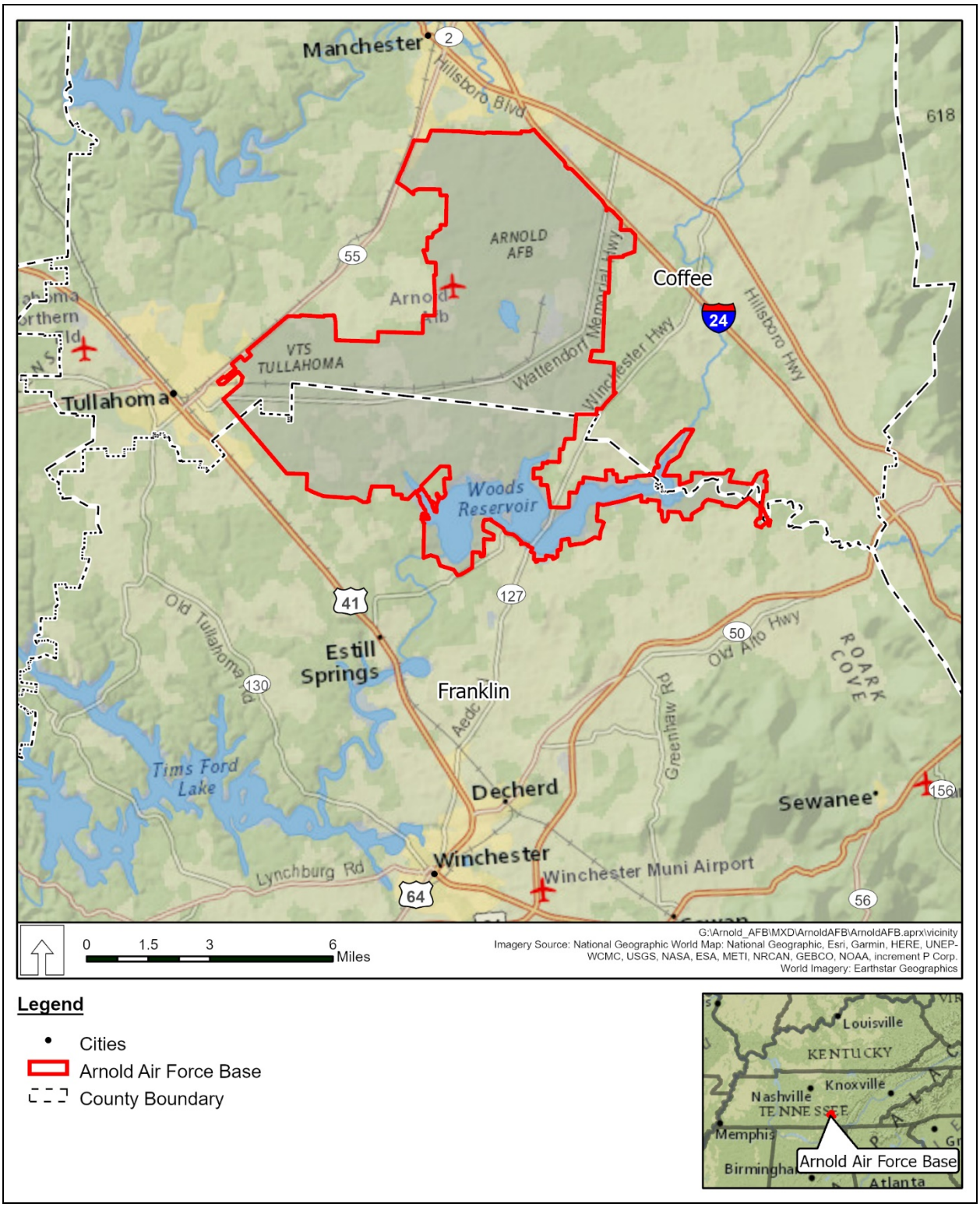
2. Figure 2. Preferred Alternative Location – Undeveloped Forested Parcel

cc:
AEDC/JA, Lt Col N. Frommelt
TNARNG/Environmental Branch, Mr. Greg Turner



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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

14 December 2021

AEDC/TSDCI
100 Kindel Drive, Suite B-322
Arnold AFB TN 37389-2322

U.S. EPA Region 4
Attn: Mr. John Blevins
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303-8960

Dear Mr. Blevins

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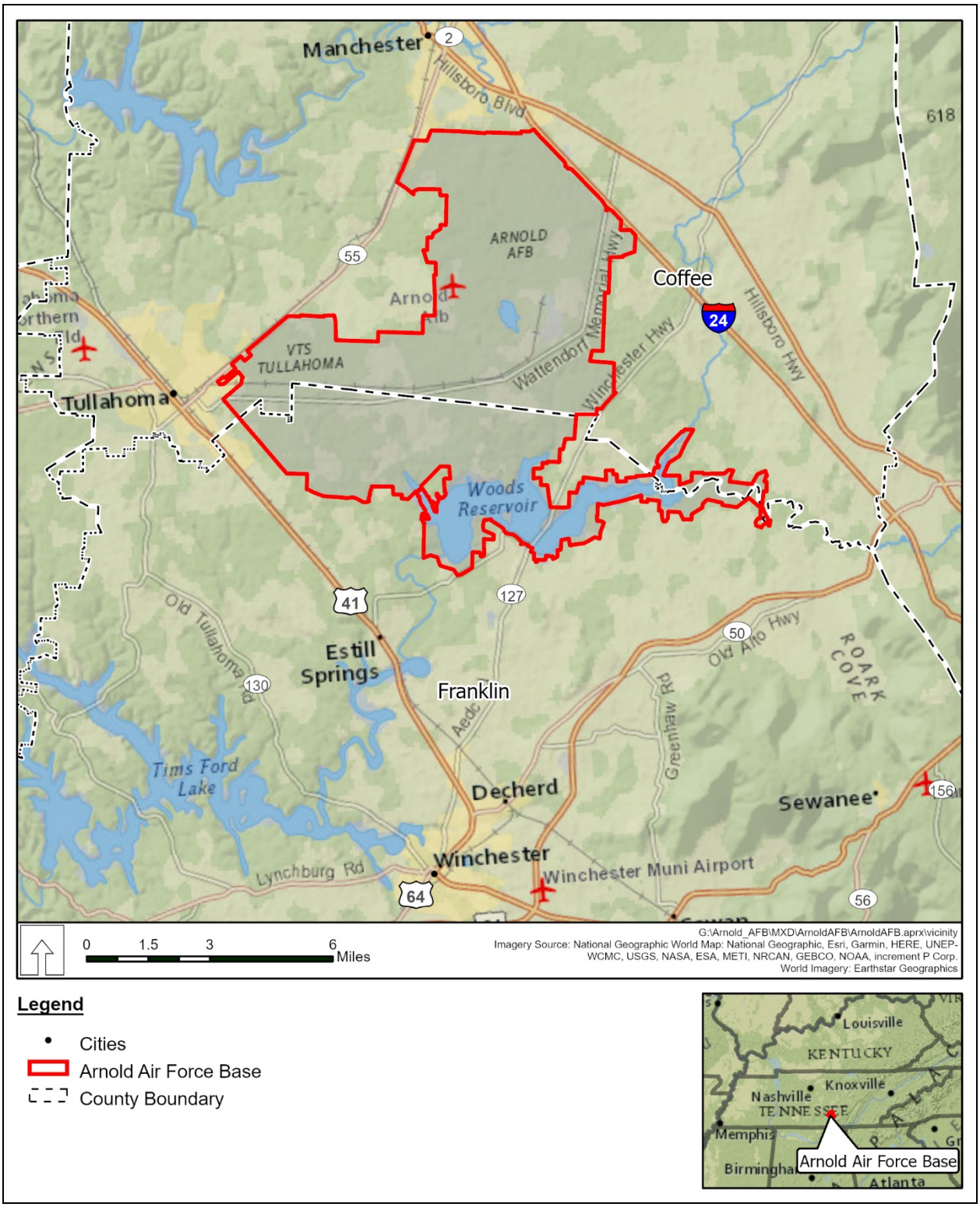

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

14 December 2021

AEDC/TSDCI
100 Kindel Drive, Suite B-322
Arnold AFB TN 37389-2322

Tennessee Division of Archaeology
Attn: Mr. Phil Hodge
Cole Building #3
1216 Foster Avenue
Nashville, TN 37243

Submitted via email to phil.hodge@tn.gov.

Dear Mr. Hodge

An environmental assessment (EA) is being prepared jointly by the Tennessee Army National Guard (TNARNG) and the Department of the Air Force (DAF) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site – Tullahoma (VTS-T) on Arnold Air Force Base (AFB), Tennessee as shown in Figure 1. A copy of the Draft EA will be made available for your review and comment when complete.

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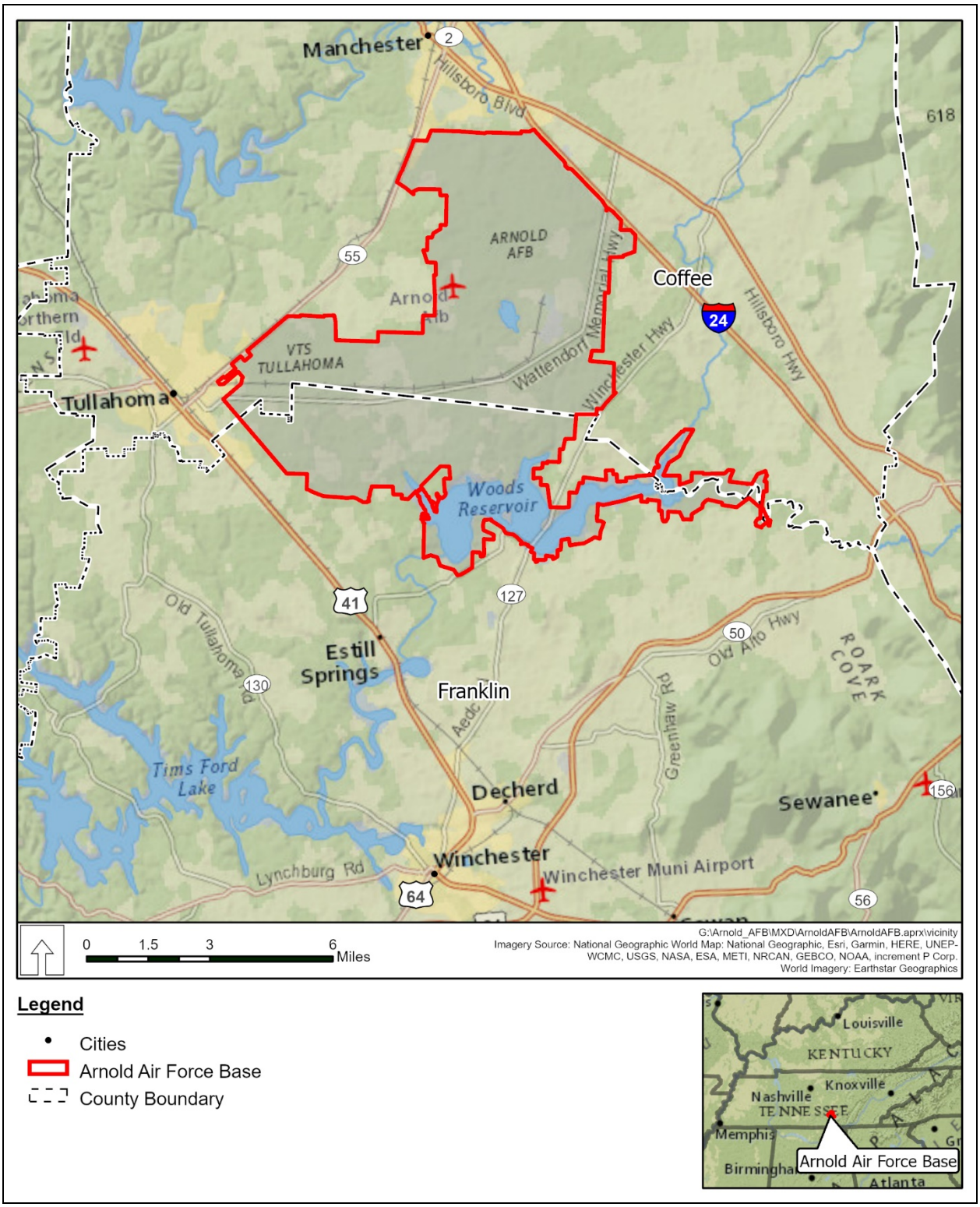

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

14 December 2021

AEDC/TSDCI
100 Kindel Drive, Suite B-322
Arnold AFB TN 37389-2322

Tennessee Department of Environment & Conservation
Division of Natural Areas
Attn: Mr. Roger McCoy
William R. Snodgrass TN Tower
312 Rosa L. Parks Avenue, 2nd Floor
Nashville, TN 37243

Submitted via email to roger.mccoy@tn.gov.

Dear Mr. McCoy

An environmental assessment (EA) is being prepared jointly by the Tennessee Army National Guard (TNARNG) and the Department of the Air Force (DAF) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site – Tullahoma (VTS-T) on Arnold Air Force Base (AFB), Tennessee as shown in Figure 1. A copy of the Draft EA will be made available for your review and comment when complete.

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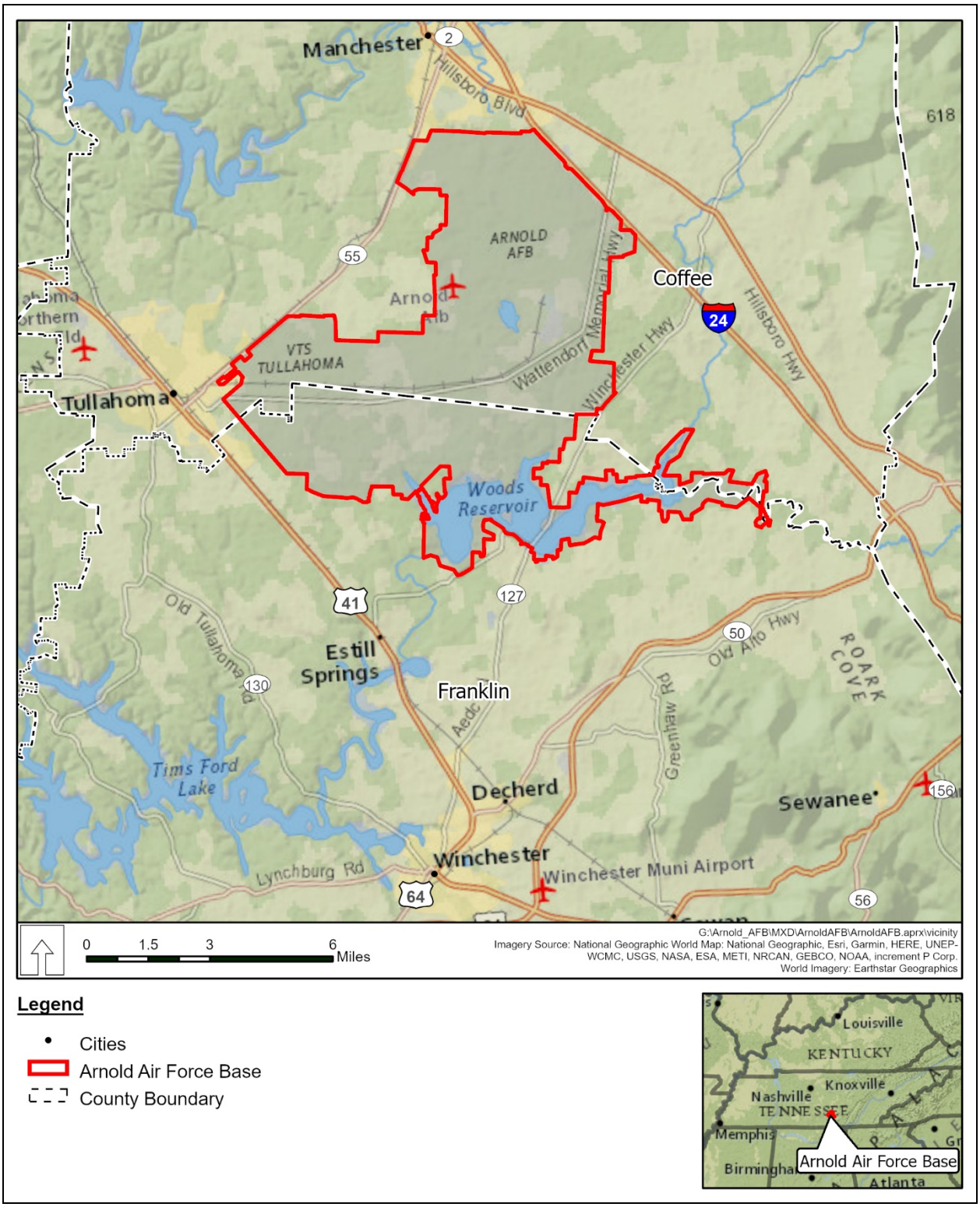

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ARNOLD AIR FORCE BASE TENNESSEE

14 December 2021

AEDC/TSDCI
100 Kindel Drive, Suite B-322
Arnold AFB TN 37389-2322

Tennessee Historic Commission
Attn: Mr. Patrick McIntyre Jr.
Executive Director
2941 Lebanon Road
Nashville TN 37243-0442

Submitted via email to patrick.mcintyre@tn.gov.

Dear Mr. McIntyre

An environmental assessment (EA) is being prepared jointly by the Tennessee Army National Guard (TNARNG) and the Department of the Air Force (DAF) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site – Tullahoma (VTS-T) on Arnold Air Force Base (AFB), Tennessee as shown in Figure 1. A copy of the Draft EA will be made available for your review and comment when complete.

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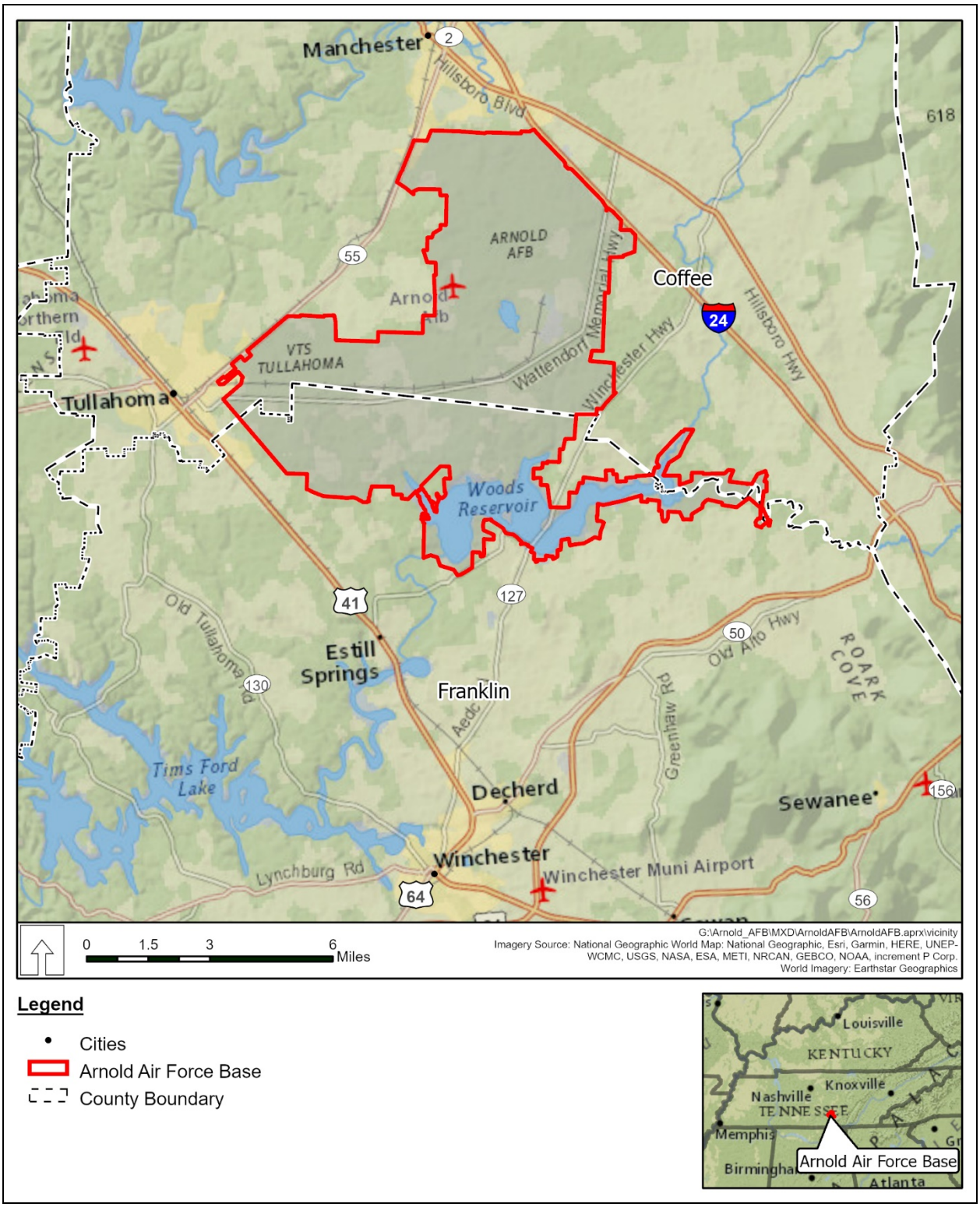

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ARNOLD AIR FORCE BASE TENNESSEE

14 December 2021

AEDC/TSDCI
100 Kindel Drive, Suite B-322
Arnold AFB TN 37389-2322

TN Wildlife Resources Agency Region II
Attn: Mr. Wes Winton
Ellington Agricultural Center
5105 Edmonson Pike
Nashville, TN 37211

Submitted via email to wes.winton@tn.gov.

Dear Mr. Winton

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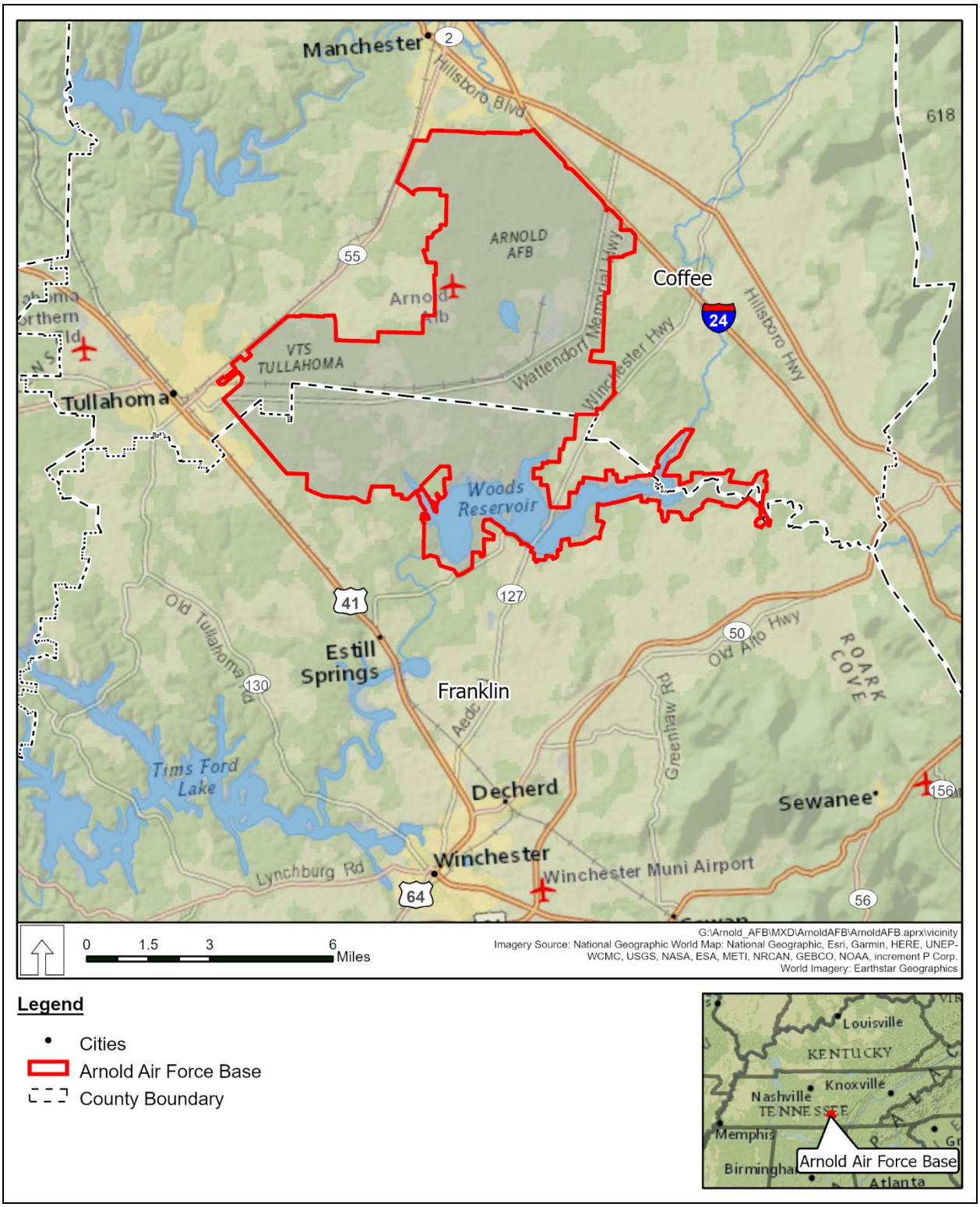

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ARNOLD AIR FORCE BASE TENNESSEE

14 December 2021

AEDC/TSDCI
100 Kindel Drive, Suite B-322
Arnold AFB TN 37389-2322

Tennessee Department of Environment and Conservation
Columbia Environmental Field Office
Attn: Ms. Jennifer Greer
1421 Hampshire Pike Columbia, TN 38401

Dear Ms. Greer

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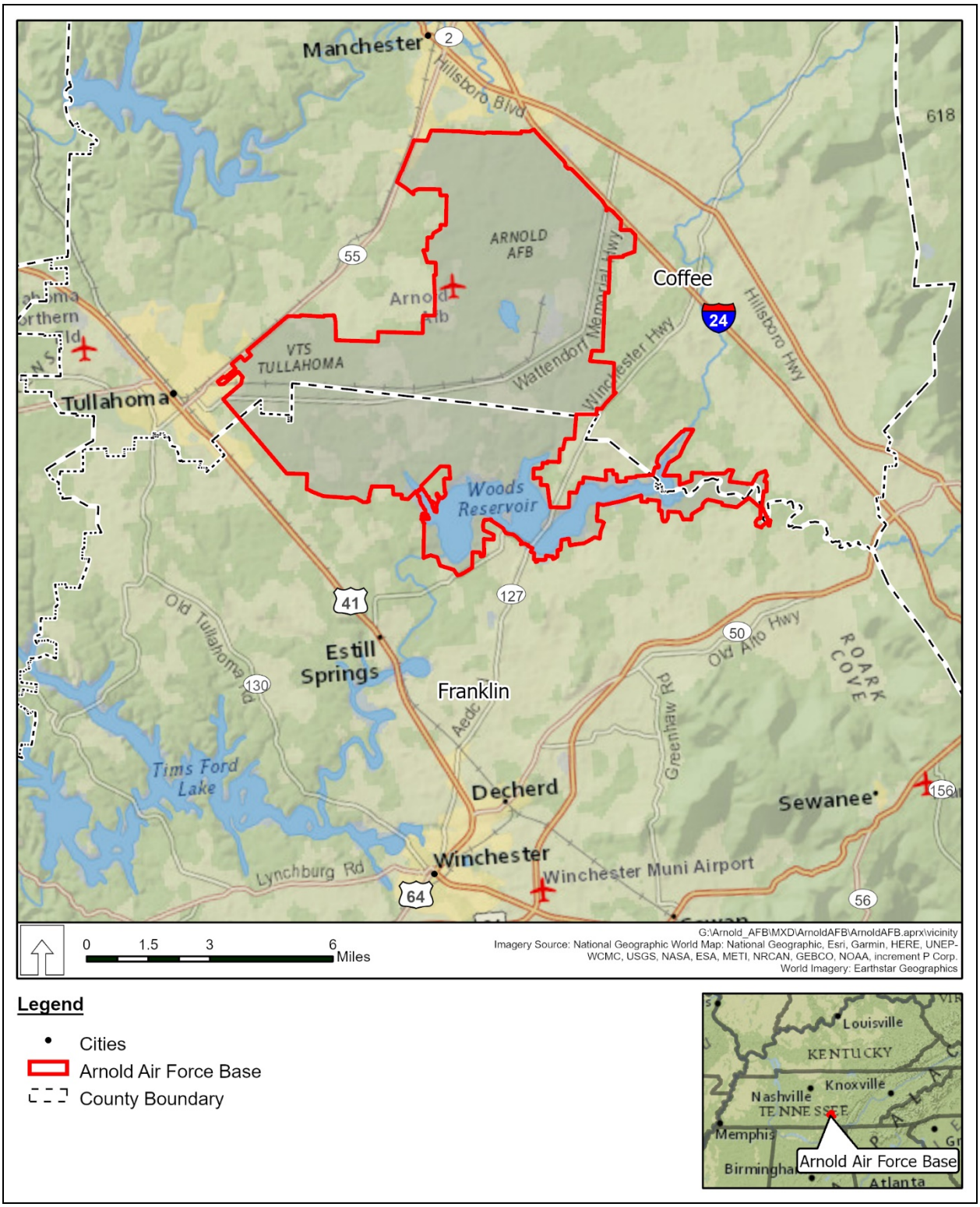

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AEDC/TSDCI
100 Kindel Drive, Suite B-322
Arnold AFB TN 37389-2322

Attn: Mr. Matthew Taylor
Tennessee Department of Environment & Conservation
Senior Policy Analyst
Office of Policy and Sustainable Practices

Submitted via email to matthew.k.taylor@tn.gov.

Dear Mr. Taylor

An environmental assessment (EA) is being prepared jointly by the Tennessee Army National Guard (TNARNG) and the Department of the Air Force (DAF) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site – Tullahoma (VTS-T) on Arnold Air Force Base (AFB), Tennessee as shown in Figure 1. A copy of the Draft EA will be made available for your review and comment when complete.

The purpose of the action is to enhance the ability of the TNARNG to fulfill its military training mission by fully supporting all units assigned to training at Arnold AFB. The Proposed Action is needed to rectify bed space, dining, administrative, and storage facilities deficits for TNARNG units training at the Installation. The existing barracks space is too small for the number of TNARNG troops assigned to train at Arnold AFB.

The Proposed Action would construct and operate up to 20 new one-story, 5,000-square-foot (SF) open-bay barracks with latrines; showers; laundry; exterior paving; stairs, ramps, and walkways; and grading and drainage; and would include all related work for a new functional and energy-efficient barracks for the TNARNG at the Preferred Alternative location on Arnold AFB (Figure 2). The 20 new barracks would increase bed capacity by 640. The proposed five new dining facilities and five new administrative and storage facilities associated with the barracks would also be constructed at the Preferred Alternative location. TNARNG would construct each new barracks as funding becomes available. Construction of one new 5,000 SF barracks would take no more than 12 months. The additional required bed, dining, and administrative spaces would be programmed and constructed in the future, as funding becomes available.

If you have any comments or concerns you would like to provide regarding the Proposed Action or its environmental impacts, please respond to us within 30 days of receipt of this letter. Any comments received will be shared with TNARNG staff at VTS-T. Please send your written responses via e-mail (preferred) at shannon.allen.1@us.af.mil or by regular mail to: Ms. Shannon Allen, NEPA, Natural & Cultural Resources Planner, AEDC/TSDCI, 100 Kindel Drive, Arnold AFB TN 37389-2322.

Sincerely

LAVIOLETTE.JOHN.W.1010835212 Digitally signed by LAVIOLETTE.JOHN.W.1010835212 Date: 2021.12.15 07:21:55 -06'00'

JOHN W. LAVIOLETTE
BASE CIVIL ENGINEER

Attachments:
1. Figure 1. Location of the Volunteer Training Site – Tullahoma on Arnold Air Force Base
2. Figure 2. Preferred Alternative Location – Undeveloped Forested Parcel

cc:
AEDC/JA, Lt Col N. Frommelt
TNARNG/Environmental Branch, Mr. Greg Turner

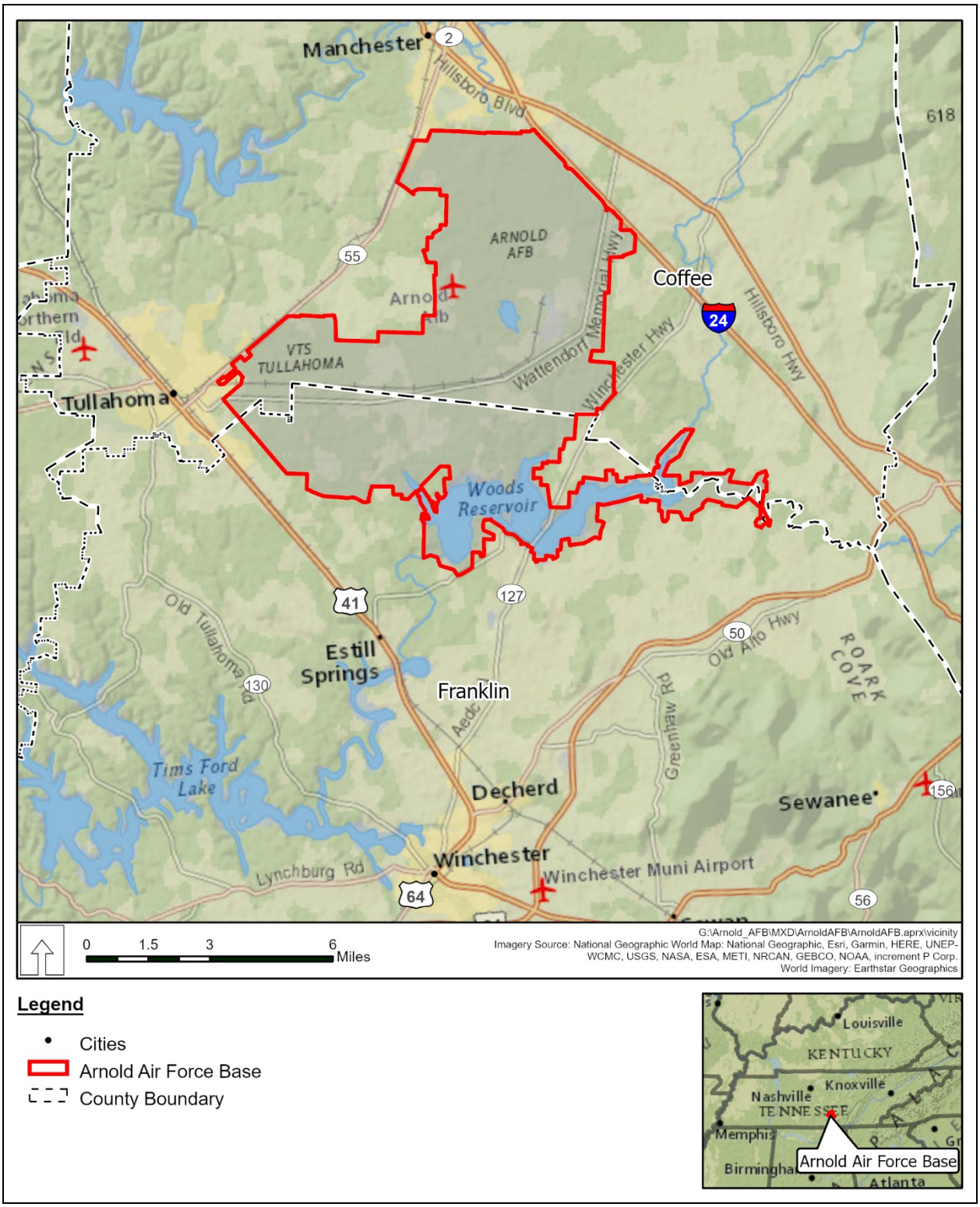

Figure 1. Location of the Volunteer Training Site – Tullahoma on Arnold Air Force Base

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

14 December 2021

AEDC/TSDCI
100 Kindel Drive, Suite B-322
Arnold AFB TN 37389-2322

USACE Nashville District
Attn: Ms. Tammy Turley
Estes Kefauver Federal Building & Courthouse Annex
801 Broadway
Nashville, TN 37203

Dear Ms. Turley

An environmental assessment (EA) is being prepared jointly by the Tennessee Army National Guard (TNARNG) and the Department of the Air Force (DAF) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site – Tullahoma (VTS-T) on Arnold Air Force Base (AFB), Tennessee as shown in Figure 1. A copy of the Draft EA will be made available for your review and comment when complete.

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If you have any comments or concerns you would like to provide regarding the Proposed Action or its environmental impacts, please respond to us within 30 days of receipt of this letter. Any comments received will be shared with TNARNG staff at VTS-T. Please send your written responses via e-mail (preferred) at shannon.allen.1@us.af.mil or by regular mail to: Ms. Shannon Allen, NEPA, Natural & Cultural Resources Planner, AEDC/TSDCI, 100 Kindel Drive, Arnold AFB TN 37389-2322.

Sincerely

LAVIOLETTE.JOHN.W.1010835212 Digitally signed by LAVIOLETTE.JOHN.W.1010835212 Date: 2021.12.15 07:21:55 -06'00'

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cc:
AEDC/JA, Lt Col N. Frommelt
TNARNG/Environmental Branch, Mr. Greg Turner

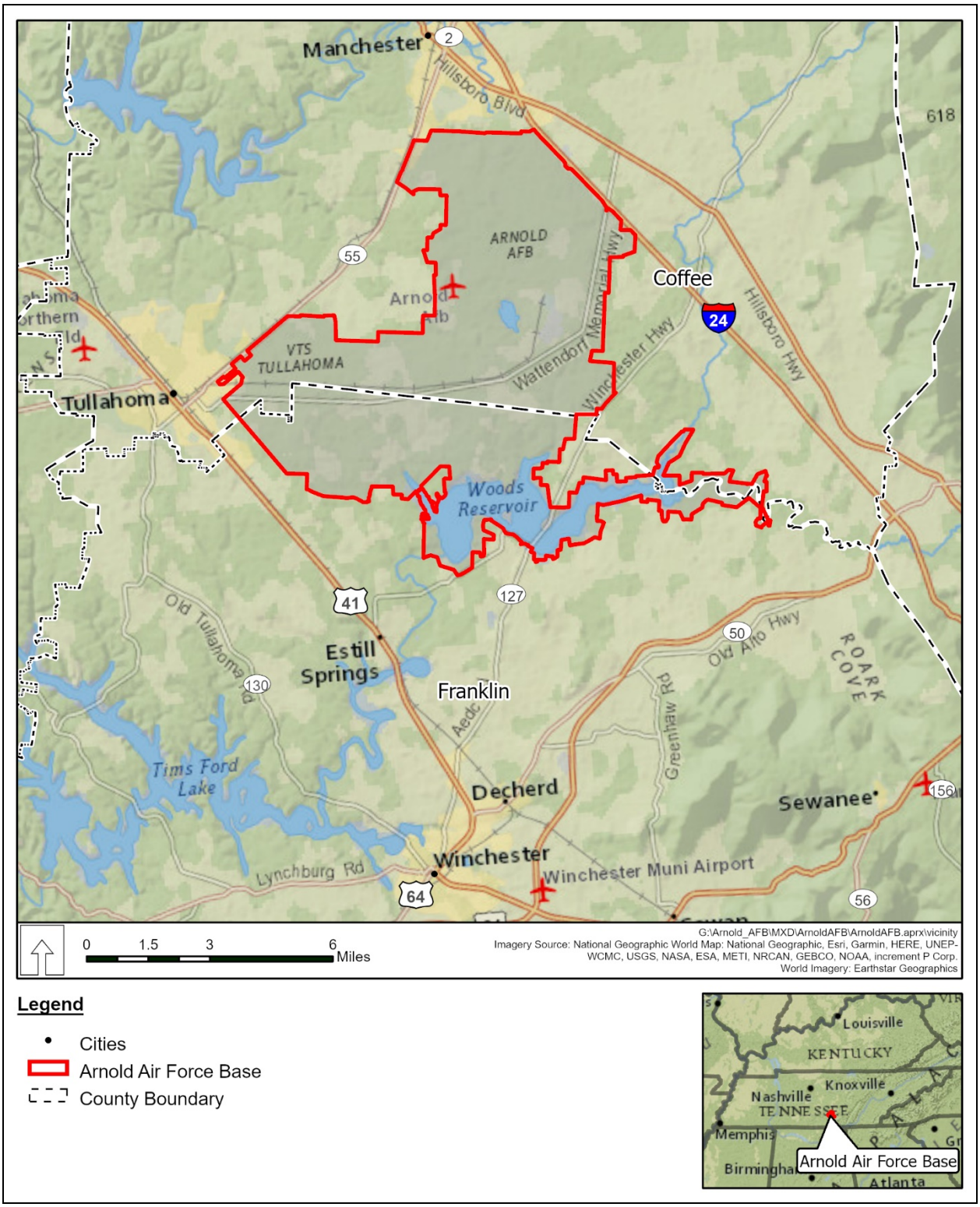

Figure 1. Location of the Volunteer Training Site – Tullahoma on Arnold Air Force Base

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

14 December 2021

AEDC/TSDCI
100 Kindel Drive, Suite B-322
Arnold AFB TN 37389-2322

U.S. Fish and Wildlife Service Tennessee Field Office
Attn: Mr. Daniel Elbert
Field Supervisor
446 Neal Street
Cookeville, TN 38501

Submitted via email to tennesseeES@FWS.GOV.

Dear Mr. Elbert

An environmental assessment (EA) is being prepared jointly by the Tennessee Army National Guard (TNARNG) and the Department of the Air Force (DAF) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site – Tullahoma (VTS-T) on Arnold Air Force Base (AFB), Tennessee as shown in Figure 1. A copy of the Draft EA will be made available for your review and comment when complete.

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The EA will analyze the potential range of environmental impacts that would result from the Proposed Action. The TNARNG and DAF are currently considering two proposed alternatives (the Preferred Alternative and the No Action Alternative). The Preferred Alternative would site the new TNARNG barracks, dining, administrative, and storage facilities on an approximately 16-acre parcel of undeveloped, forested land near the cantonment area at VTS-T

(Figure 2). VTS-T is located off Industrial Boulevard at the eastern edge of the Arnold AFB boundary; the only improved portion of VTS-T is the cantonment area. The proposed new TNARNG barracks would be located near the current VTS-T obstacle course, and a portion of the current parking area for the obstacle course would be utilized for the barracks. The No Action Alternative, which reflects the status quo, is analyzed as a benchmark against which effects of the Proposed Action can be evaluated.

In preparation of the EA, we will obtain details of federally listed, proposed, and candidate species or designated or proposed critical habitats that may be in the action area from the US Fish and Wildlife Service Information for Planning and Consultation website. Pursuant to Section 7 of the Endangered Species Act, we request additional information or any comments that may be beneficial in the development of the EA and for determination of potential impacts to listed species or critical habitat. This information and your comments on the Proposed Action will help us develop the scope of our environmental review. Any Section 7 consultation or mitigation requirements associated with this Proposed Action will ultimately be the responsibility of the TNARNG.

If you have any comments or concerns you would like to provide regarding the Proposed Action or its environmental impacts, please respond to us within 30 days of receipt of this letter. Any comments received will be shared with TNARNG staff at VTS-T. Please send your written responses via e-mail (preferred) at shannon.allen.1@us.af.mil or by regular mail to: Ms. Shannon Allen, NEPA, Natural & Cultural Resources Planner, AEDC/TSDCI, 100 Kindel Drive, Arnold AFB TN 37389-2322.

Sincerely,

LAVIOLETTE.JOHN.W.1010835212

Digitally signed by LAVIOLETTE.JOHN.W.1010835212
Date: 2021.12.15 07:23:19 -06'00'

JOHN W. LAVIOLETTE
BASE CIVIL ENGINEER

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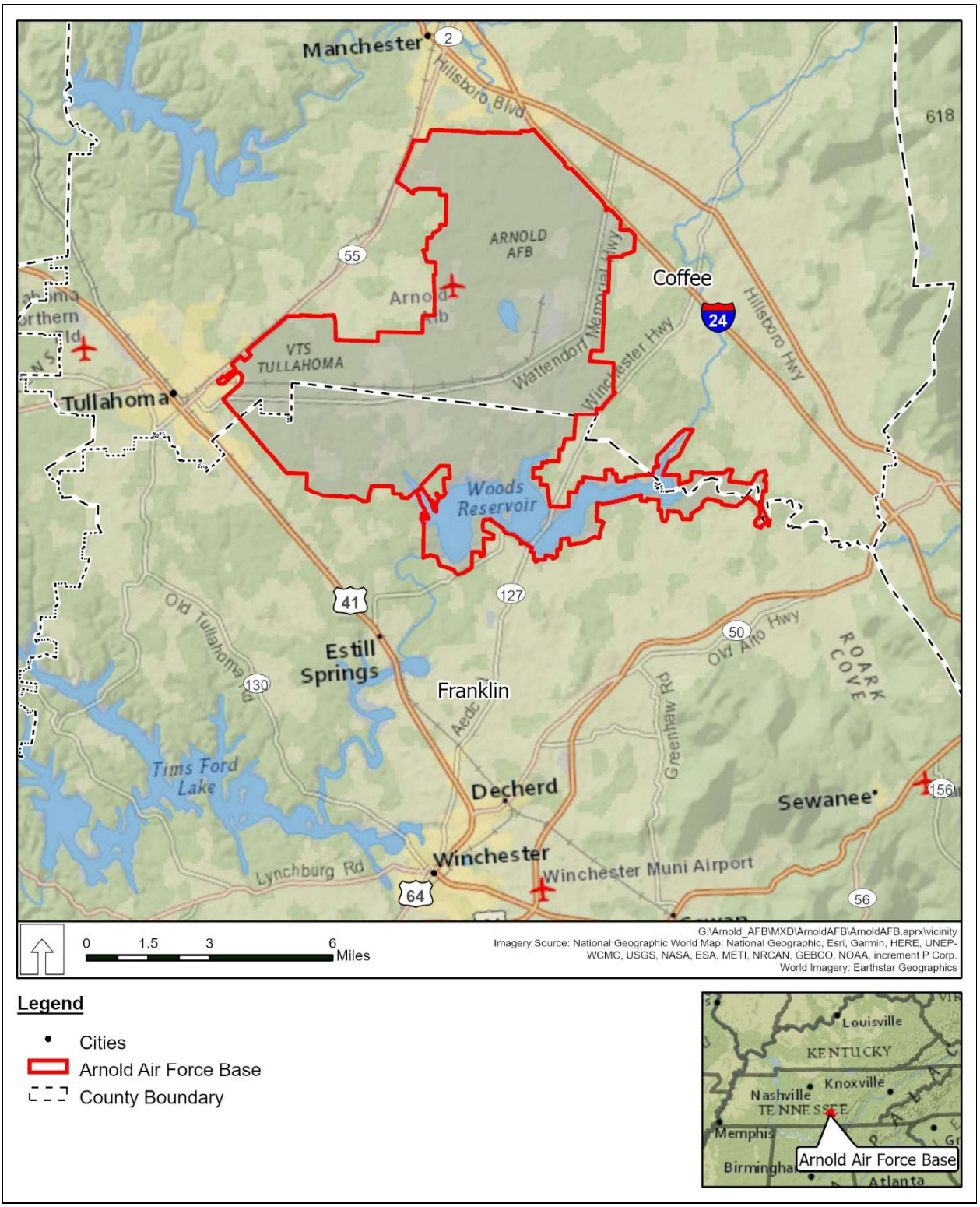
cc:
AEDC/TSDCI, Ms. Shannon Allen
AEDC/TSDCI, Mr. Brandon Bailey
AEDC/JA, Lt Col N. Frommelt
TNARNG/Environmental Branch, Mr. Greg Turner



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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

3 February 2022

AEDC/TSDCI
100 Kindel Drive, Suite B-322
Arnold AFB TN 37389-2322

TN Wildlife Resources Agency Region II
Attn: Mr. Vincent Pontello
Ellington Agricultural Center
5105 Edmonson Pike
Nashville, TN 37211

Submitted via email to vincent.pontello@tn.gov.

Dear Mr. Pontello

An environmental assessment (EA) is being prepared jointly by the Tennessee Army National Guard (TNARNG) and the Department of the Air Force (DAF) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site – Tullahoma (VTS-T) on Arnold Air Force Base (AFB), Tennessee as shown in Figure 1. A copy of the Draft EA will be made available for your review and comment when complete.

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Sincerely

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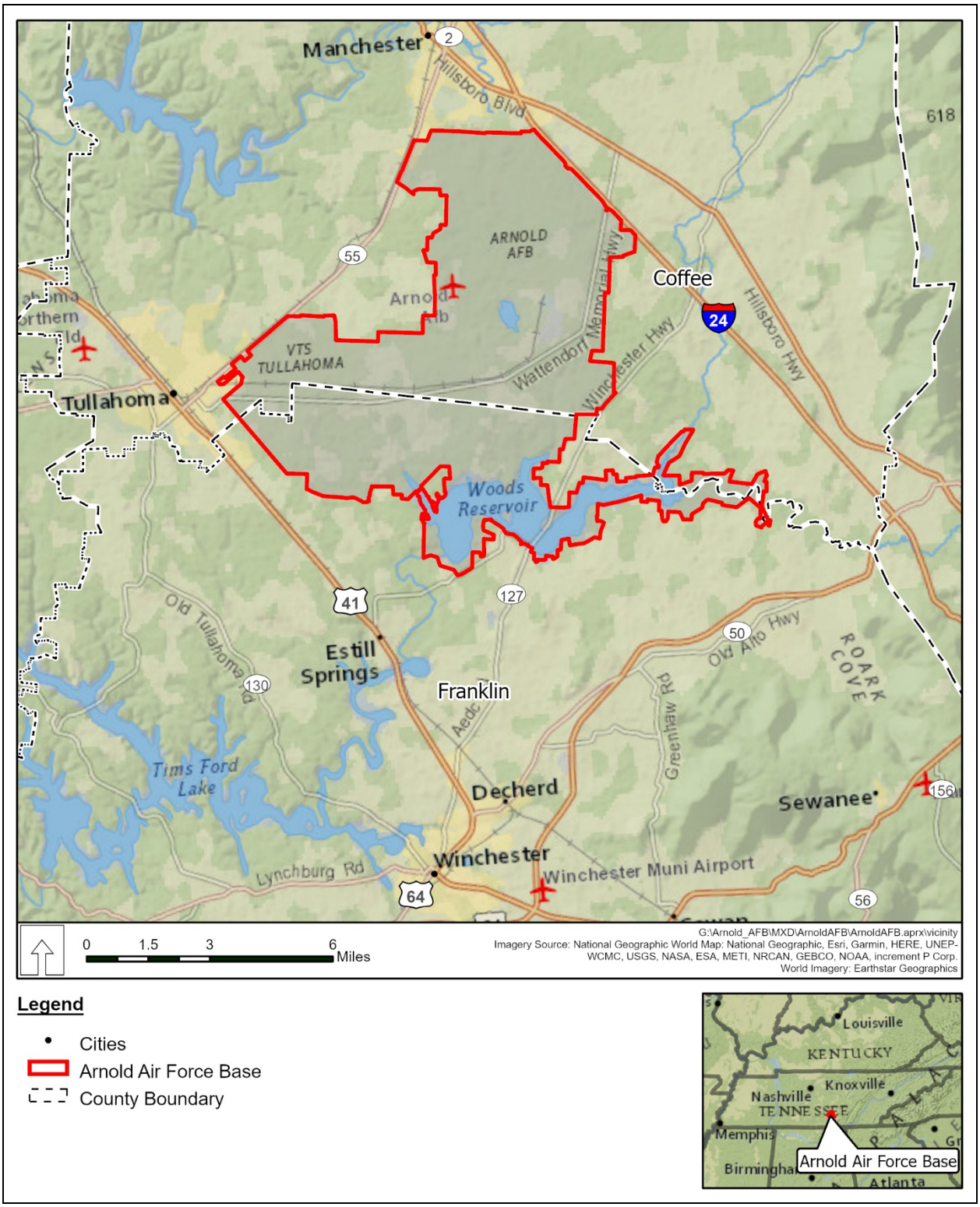

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Agency Responses

FORMAT PAGE

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER RESOURCES
William R. Snodgrass - Tennessee Tower
312 Rosa L. Parks Avenue, 11th Floor
Nashville, Tennessee 37243-1102

December 20, 2021

Ms. Shannon Allen
NEPA
Natural and Cultural Resources Planner
AEDC/TSDCI
100 Kindel Drive
Arnold AFB, TN 37389-2322

re: AFB/TNARNG Barracks
Coffee County, TN

Sent via email to: shannon.allen.1@us.af.mil

Dear Ms. Allen:

Staff within the Division of Water Resources have reviewed the document regarding the construction of barracks and associated appurtenances on Arnold Air Force Base (AFB), TN. The Proposed Action would construct and operate up to 20 new one-story, 5,000-squarefoot (SF) open-bay barracks with latrines; showers; laundry; exterior paving; stairs, ramps, and walkways; and grading and drainage as well as a proposed five new dining facilities and five new administrative and storage facilities associated with the barracks. Unless each phase of construction disturbs less than one acre of land, the overall project will disturb well more than one acre of land, including staging areas, and require a stormwater construction permit (CGP). Even where the activity does not disturb an acre of more of land, the Division encourages the use of erosion control measures, where appropriate. This project will need to be included under the existing NPDES Tennessee Multi Sector Permit (TMSP), including the Storm Water Pollution Prevention Plan (SWPPP).

If you have any further questions, I will be glad to try to assist you. You may reach me at (615) 532-0170 or tom.moss@tn.gov.

Sincerely,

Tom Moss

Tom Moss, P.G.
Environmental Review Coordinator
Compliance and Enforcement Unit

cc: Sherry Glass, DWR Columbia Field Office Manager
Bryan Davidson, Policy and Planning Office

From: Wes Winton <Wes.Winton@tn.gov>
Sent: Tuesday, January 18, 2022 1:38 PM
To: ALLEN, SHANNON L NH-03 USAF AFMC AEDC/TSDCI <shannon.allen.1@us.af.mil>
Subject: [URL Verdict: Unknown][Non-DoD Source] FW: Early Agency Notification -- Tennessee Army National Guard and Department of the Air Force Proposed Barracks at Volunteer Training Site - Tullahoma on Arnold AFB, TN

TWRA has reviewed the proposal for TNARNG barracks expansion and we have no comment on the proposed action or its environmental impacts. Thank you for the opportunity for us to comment.

From: ALLEN, SHANNON L NH-03 USAF AFMC AEDC/TSDCI
To: Carey Perry
Cc: gregory.m.turner.nfg@army.mil; Henry, Stephanie A NFG NG TNARNG (USA)
Subject: FW: FWS #2022-CPA-0137 TN Army National Guard Barracks project at AAFB
Date: Monday, February 7, 2022 1:39:26 PM

Carey,

Below is the response to the scoping letter from USFWS. After a site visit with USFWS, TNARNG, and AF on 2 Feb 22, it was determined that only 5 acres of the entire site is suitable bat habitat. The first block was determined to be no adverse effect and no consultation is required. The other acreage will be consulted on by TNARNG, with resolution likely occurring after the EA is completed.

Thanks,
Shannon

Shannon Allen
NEPA, Natural & Cultural Resources Planner, CWB®
AEDC/TSDCI
100 Kindel Drive
Arnold Air Force Base, TN 37389-2322
Office: 931-454-5466
DSN: 340-5466
Fax: 931-454-7270
E-mail: Shannon.allen.1@us.af.mil

From: Pelren, David <david_pelren@fws.gov>
Sent: Monday, February 7, 2022 12:53 PM
To: ALLEN, SHANNON L NH-03 USAF AFMC AEDC/TSDCI <shannon.allen.1@us.af.mil>
Cc: Knapp, Brian E NFG NG TNARNG (USA) <brian.e.knapp.nfg@mail.mil>; LAMB, JOHN W CTR USAF AFMC AEDC/XP <john.lamb.6.ctr@us.af.mil>; Tennessee ES, FWS <tennesseeES@fws.gov>; Sikula, Nicole R <nicole_sikula@fws.gov>
Subject: [Non-DoD Source] FWS #2022-CPA-0137 TN Army National Guard Barracks project at AAFB

Ms. Shannon Allen, NEPA / Natural & Cultural Resources Planner
Arnold Air Force Base

Shannon:

We understand that the Department of the Air Force and the Tennessee Army National Guard (TNARNG) are preparing an Environmental Assessment (EA) regarding a proposed barracks project at the Volunteer Training Site – Tullahoma, Arnold Air Force Base (AAFB), Tennessee. As you are aware, the TNARNG is consulting with us on Endangered Species Act requirements for the project. This email is provided as an update on that process in response to Mr. Laviolette's letter of solicitation for our input regarding the project, and we will continue coordination with you as the

project plan develops.

In addition to our recent communication with you about this project, we have coordinated with Brian Knapp, of TNARNG, regarding preliminary environmental concerns and potential methods for addressing them. Three federally listed species have the potential to occur within the proposed project area. Those are the gray bat (*Myotis grisescens*), northern long-eared bat (*Myotis septentrionalis*), and Indiana bat (*Myotis sodalis*). We understand that potential gray bat roosting caves or similar structures are not known to exist on the project site and that, therefore, potential impacts to the species are not anticipated.

As discussed with you, other AAFB personnel, and TNARNG personnel during a visit to the site on February 2, 2022, we have some concern about the potential for impact to the Indiana bat. The project site is located approximately 2.75 miles from a site at which the species has been acoustically detected. Therefore, the potential for use of the proposed barracks site for roosting by Indiana bats is likely. Because clearing of trees only during the winter hibernation season is not to be feasible, we are concerned that the species could be injured or killed if present at the site during site preparation for construction. During evaluation of the habitat on February 2, we recognized the presence of several highly suitable roost trees in the 5-acre hardwood lot and no suitable roost trees in the two pinewood lots. Therefore, Indiana bats could reasonably be expected to roost within the hardwood habitat component of the project site (i.e., the approximately five-acre block located on the southeast portion of the site). TNARNG personnel indicated during the site visit that they plan to provide a Biological Assessment in the near future to facilitate the consultation process, and they are prepared to coordinate in formal consultation as appropriate.

Due to the presence of suitable roost trees, we are also concerned about potential impacts to the northern long-eared bat. We are not aware of documented use of roosting structures by the species within 0.25 mile of the project area. Therefore, conservation measures could be applied relative to fulfillment of section 4(d) of the Endangered Species Act in addressing the potential for "take" of the species during actions taken in the near future. However, the Fish and Wildlife Service (Service) is currently assessing the listing status of the northern long-eared bat; and there is the potential for change to a status of "endangered", with removal of 4(d) rule specifications for the species. We understand that, because some clearing of trees for this project would not be completed until 2023 or later, TNARNG will likely include this species in its consultation with the Service.

We are not aware of the presence of other federally listed species within the anticipated area of impact for this action. We will welcome further coordination if potential concerns arise.

Thank you for your early coordination with us on this project, especially the discussion during our site visit. It was very helpful in gaining a greater understanding of the habitat conditions and consideration of the path forward. We look forward to further work with you on this project. Feel free to contact David Pelren of my staff at 931-261-5844 or by email at *david_pelren@fws.gov* if you have questions about our comments.

David Pelren
Fish and Wildlife Biologist

Ecological Services
U.S. Fish and Wildlife Service
446 Neal St.
Cookeville, TN 38501
office phone: 931-525-4974
mobile phone: 931-261-5844

STATE OF TENNESSEE

DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Division of Natural Areas
Natural Heritage Program
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 2nd Floor
Nashville, Tennessee 37243
Phone 615/532-0431 Fax 615/532-0046

February 2, 2022

Carey Perry
Vernadero Group Incorporated
3400 S. Carrollton Avenue #850752
New Orleans, LA 70185

Subject: Barracks at Volunteer Training Site at Arnold Air Force Base
(35.36901°, -86.17649°)
Coffee County, TN
Rare Species Database Review

Dear Carey Perry:

Thank you for your correspondence of 21 December 2021 requesting a rare species database review for the proposed barracks construction project near the western edge of Arnold Air Force Base in Coffee County, Tennessee.

Per your submittal:

> *The Proposed Action would construct and operate up to 20 new one-story, 5,000-squarefoot (SF) open-bay barracks with latrines; showers; laundry; exterior paving; stairs, ramps, and walkways; and grading and drainage; and would include all related work for a new functional and energy-efficient barracks for the TNARNG at the Preferred Alternative location on Arnold AFB... The 20 new barracks would increase bed capacity by 640. The proposed five new dining facilities and five new administrative and storage facilities associated with the barracks would also be constructed at the Preferred Alternative location. TNARNG would construct each new barracks as funding becomes available. Construction of one new 5,000 SF barracks would take no more than 12 months. The additional required bed, dining, and administrative spaces would be programmed and constructed in the future, as funding becomes available.*

We have reviewed the state's natural heritage database with regard to the project boundaries, and we find that the following rare species have been observed previously within one mile of the project area:

Type	Scientific Name	Common Name	Global Rank	St. Rank	Fed. Prot.	St. Prot.	Habitat
Vascular Plant	*Dichanthelium acuminatum ssp. leucothrix*	Roughish Witchgrass	G4?Q	S1	--	S	Moist Pine Barrens
Vascular Plant	*Drosera brevifolia*	Dwarf Sundew	G5	S2	--	T	Wet Barrens and Ecotones
Vascular Plant	*Gaylussacia dumosa*	Dwarf Huckleberry	G5	S3	--	T	Barrens
Vascular Plant	*Gymnopogon brevifolius*	Broad-leaved Beardgrass	G5	S1S2	--	S	Barrens
Vascular Plant	*Helianthemum propinquum*	Low Frostweed	G4	S1S2	--	E	Barrens
Vascular Plant	*Helianthus eggertii*	Eggert's Sunflower	G3	S3	DM	S	Barrens And Roadsides
Vascular Plant	*Iris prismatica*	Slender Blue Flag	G4G5	S2S3	--	T	Wet Barrens
Vascular Plant	*Juncus elliottii*	Elliott's Rush	G4G5	S1	--	S	Wet Barrens
Vascular Plant	*Lespedeza angustifolia*	Narrowleaf Bushclover	G5	S2	--	T	Barrens
Vascular Plant	*Prenanthes aspera*	Rough Rattlesnake-root	G4?	S1	--	E	Barrens And Roadsides
Vascular Plant	*Prunus pumila*	Sand Cherry	G5	S1	--	E	Barrens
Vascular Plant	*Rhynchospora perplexa*	Obscure Beak-rush	G5	S2	--	T	Marshes, Wet Barrens
Vertebrate Animal	*Pituophis melanoleucus melanoleucus*	Northern Pinesnake	G4T4	S3	--	T	Well-drained sandy soils in pine/pine-oak woods; dry mountain ridges; E portions of west TN, E to lower elev of the Appalachians.

Within four miles of the project area the following additional rare species have been reported:

Type	Scientific Name	Common Name	Global Rank	St. Rank	Fed. Prot.	St. Prot.	Habitat
Vascular Plant	*Agalinis oligophylla*	Ridge-stem False-foxglove	G4	S1	--	E	Barrens
Vascular Plant	*Echinacea pallida*	Pale-purple Coneflower	G4	S1	--	E	Barrens And Dry Openings
Vascular Plant	*Eleocharis wolfii*	Wolf Spike-rush	G3G5	S1	--	E	Wet Woods on Floodplains
Vascular Plant	*Festuca paradoxa*	Cluster Fescue	G5	S1	--	S	Wet Woods and Prairies
Vascular Plant	*Liparis loeselii*	Fen Orchis	G5	S1	--	T	Calcareous Seeps
Vascular Plant	*Marshallia trinervia*	Broad-leaved Barbara's-buttons	G3	S2S3	--	T	Rocky Ravines

Type	Scientific Name	Common Name	Global Rank	St. Rank	Fed. Prot.	St. Prot.	Habitat
Vascular Plant	*Melanthium latifolium*	Broadleaf Bunchflower	G5	S1S2	--	E	Oak Forest
Vascular Plant	*Nestronia umbellula*	Nestronia	G4	S1	--	E	Upland Woods
Vascular Plant	*Panax quinquefolius*	American Ginseng	G3G4	S3S4	--	S-CE	Rich Woods
Vascular Plant	*Rhynchospora harveyi*	Harvey's Beakrush	G4	S1	--	T	Barrens And Other Open Areas
Vascular Plant	*Stenanthium tennesseense*	Death-camas	G2	S2	--	T	Acidic Wetlands
Vascular Plant	*Trichomanes boschianum*	Bristle-fern	G4	S1S2	--	T	Rocky Seeps
Vascular Plant	*Vaccinium elliottii*	Mayberry	G5	S1	--	E	Open Flat Woods and Dry Slopes
International Terrestrial Ecological System Classification	*Eastern Highland Rim Prairie and Barrens*	Eastern Highland Rim Prairie and Barrens	GNR	S2	--	Rare, Not State Listed	
Invertebrate Animal	*Pseudanophthalmus tullahoma*	Duck River Cave Beetle	G1G2	S1	--	Rare, Not State Listed	Terrestrial cave obligate; Central Basin; Duck River drainage.
Vertebrate Animal	*Etheostoma luteovinctum*	Redband Darter	G4	S4	--	D	Limestone streams; Nashville Basin & portions of Highland Rim.
Vertebrate Animal	*Fundulus julisia*	Barrens Topminnow	G1	S1	LE	E	Springs, spring runs, and first- and second-order headwaters and creeks in the Barrens of Cannon, Coffee, & Warren counties.
Vertebrate Animal	*Hemitremia flammea*	Flame Chub	G3	S3	--	D	Springs and spring-fed streams with lush aquatic vegetation; Tennessee & middle Cumberland river watersheds.
Vertebrate Animal	*Myotis grisescens*	Gray Myotis	G4	S2	LE	E	Cave obligate year-round; frequents forested areas;

Type	Scientific Name	Common Name	Global Rank	St. Rank	Fed. Prot.	St. Prot.	Habitat
							migratory.
Vertebrate Animal	*Ophisaurus attenuatus longicaudus*	Eastern Slender Glass Lizard	G5T5	S3	--	D	Dry upland areas including brushy, cut-over woodlands and grassy fields; nearly statewide but obscure; fossorial.
Vertebrate Animal	*Perimyotis subflavus*	Tri-colored bat	G2G3	S2S3	--	T	Generally associated with forested landscapes but may roost near openings.
Vertebrate Animal	*Peucaea aestivalis*	Bachman's Sparrow	G3	S1B	--	E	Dry open pine or oak woods; nests on the ground in dense cover.

The Division of Natural Areas - Natural Heritage Program has reviewed the location of the proposed project workspace with respect to rare plant species. Based on the habitat within the project area, we do not anticipate any impacts to occurrences of rare, threatened, or endangered plant species from this project.

We ask that you coordinate this project with the Tennessee Wildlife Resources Agency (Region 2, Vincent Pontello, vincent.pontello@tn.gov) to ensure that legal requirements for protection of state listed rare animals are addressed. Additionally, we ask that you contact the U.S. Fish and Wildlife Service Field Office, Cookeville, Tennessee (931-525-4970) for comments regarding federally listed species. Please ensure that best management practices to address erosion and sediment are implemented and maintained during construction activities. Note that the General Aquatic Resource Alteration Permit states that "use of monofilament-type erosion control netting or blanket is prohibited in the stream channel, stream banks, or any disturbed riparian areas within 30 feet of top of bank." Where necessary and feasible, we encourage use of biodegradable netting under the CGP (Construction General Stormwater Permit) as well.

Thank you for considering Tennessee's rare species throughout the planning of this project. Should you have any questions, please do not hesitate to contact me at 615-532-4799 or dillon.blankenship@tn.gov.

Sincerely,

Dillon

Dillon Blankenship | Environmental Review Coordinator
Tennessee Natural Heritage Program

TENNESSEE WILDLIFE RESOURCES AGENCY

ELLINGTON AGRICULTURAL CENTER
5107 EDMONDSON PIKE
NASHVILLE, TENNESSEE 37211

February 25th, 2022

Carey Lynn Perry
Senior Project Manager / NEPA Specialist
VERNADERO GROUP INCORPORATED
3400 S. Carrollton Ave. #850752
New Orleans, LA 70185

Re: Early Agency Notification -- Tennessee Army National Guard and Department of the Air Force Proposed Barracks at Volunteer Training Site - Tullahoma on Arnold AFB, TN

Dear Ms. Perry:

The Proposed Action would construct and operate up to 20 new one-story, 5,000-square foot open-bay barracks with latrines; showers; laundry; exterior paving; stairs, ramps, and walkways; and grading and drainage; and would include all related work for a new functional and energy-efficient barracks for the TNARNG at the Preferred Alternative location on Arnold AFB.

The Tennessee Wildlife Resources Agency has reviewed the information you have provided. My data does not show current occurrences of state listed species within one mile of the proposed project location. If the project will require the clearing of trees and since we share authority with the U.S. Fish and Wildlife Service (USFWS) on the Indiana Myotis (Myotis sodalist) and the Northern Long-eared Bat (Myotis septentrionalis), we request that you consult with the USFWS Cookeville, Tennessee Field Office regarding potential impacts to these listed species; and will defer to the opinion of the U.S. Fish and Wildlife Service's Cookeville Field Office regarding potential impacts to the state and federally endangered bats due to the proposed project. Otherwise, we do not anticipate adverse impacts to state listed species under our authority due to the proposed construction; provided that best management practices to address erosion and sediment are implemented and maintained during construction activities.

Thank you for the opportunity to review and comment on this proposed project. If you have further questions regarding this matter, please contact me at (865) 755-4995.

Sincerely,

Vincent Pontello
Assistant Chief, Biodiversity Division
Tennessee Wildlife Recourses Agency

Tribal Coordination Letters

FORMAT PAGE

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

17 January 2022

Colonel Jeffrey T. Geraghty, USAF
Commander
Arnold Engineering Development Complex
100 Kindel Drive, Suite A303
Arnold AFB TN 37389

Governor Edwina Butler-Wolfe
Absentee Shawnee Tribe of Oklahoma
2025 S. Gordon Cooper Drive
Shawnee OK 74801

Dear Governor Butler-Wolfe

The Tennessee Army National Guard (TNARNG) and Arnold Air Force Base (AFB) are jointly preparing an Environmental Assessment (EA) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site – Tullahoma (VTS-T) on Arnold AFB, Tennessee as shown in Figure 1. Per Section 3016108 of the National Historic Preservation Act (NHPA) and its implementing regulations at 36 CFR part 800, Arnold AFB is accounting for various environmental concerns by engaging early with tribal governments as it formulates the undertaking.

As part of the proposed undertaking, the TNARNG would construct and operate up to 20 new one-story, 5,000-square-foot (SF) open-bay barracks with latrines; showers; laundry; exterior paving; stairs, ramps, and walkways; grading and drainage; and would include all related work for a new functional and energy-efficient barracks for the TNARNG at the Preferred Alternative location on Arnold AFB. The 20 new barracks would increase bed capacity by 640. The proposed five new dining facilities and six new administrative and storage facilities associated with the barracks would also be constructed at the Preferred Alternative location. TNARNG would construct each new barracks as funding becomes available. Construction of one new 5,000 SF barracks would take no more than 12 months. The additional required bed, dining, and administrative spaces would be programmed and constructed in the future, as funding becomes available.

The Preferred Alternative would site the new TNARNG barracks, dining, administrative and storage facilities on an approximately 16-acre parcel of undeveloped, forested land near the cantonment area at VTS-T (Figure 2). VTS-T is located off Industrial Boulevard at the eastern edge of the Arnold AFB boundary; the only improved portion of VTS-T is the cantonment area. The proposed new TNARNG barracks would be located near the current VTS-T obstacle course and a portion of the current parking area for the obstacle course would be utilized for the barracks.

The Preferred Alternative site location was surveyed as part of a 2006 study of 100 acres for the TNARNG by Deter-Wolf and Karpynec, and they determined that the Camp Forrest Site (40CF310), an

8.3-acre African American Barracks area in particular, extended into the location proposed for the new TNARG barracks and support/administrative facilities. Phase II testing was recommended to evaluate eligibility of Site 40CF310 for the National Register of Historic Places (NRHP). However, after discussion between Arnold AFB, TNARNG, the archaeological contracting firm TRC, Inc., and the Tennessee State Historic Preservation Office it was determined that the archaeological recovery of material remains from the African American Barracks area would not provide the necessary information from which to determine NRHP eligibility. This conclusion was based on the results of the 2006 Phase I survey and previous investigations at other areas within Camp Forrest. The existing deposits were shown to be heavily disturbed by previous construction and demolition, and any evidence of the actual occupation was shown to have no integrity by previous investigations. It was decided between the meeting participants that an archival literature and informant interview investigation would be the most likely route to gathering the information needed to determine the area's NRHP eligibility. This decision resulted in the 2010 Schenker et al. report. The study by Schenker et al. (2010) found that the African American Barracks locale of Camp Forrest is not eligible and concurrence was received. No prehistoric artifacts were recovered as a result of the original 2006 survey effort and there is no prehistoric archaeological component identified within the boundaries of the proposed development area.

In accordance with the NHPA, Arnold AFB would like to initiate government-to-government consultation regarding the proposed construction and operation of new TNARNG barracks, dining, administrative and storage facilities. Arnold AFB requests your input in identifying any issues or areas of concern you feel should be addressed in the environmental analysis. Additionally, please let us know if you believe this undertaking might adversely affect historic properties of religious or cultural significance to the Absentee Shawnee Tribe of Oklahoma.

If you have questions, please contact Shannon Allen, our Installation Tribal Relations Officer/Cultural Resources Manager, via email at shannon.allen.1@us.af.mil or by regular mail to: Ms. Shannon Allen, AEDC/TSDCI, 100 Kindel Drive, Suite B-322, Arnold AFB, TN 37389, or by phone at 931-454-5466. Thank you in advance for your assistance in this effort.

Sincerely

JEFFREY T. GERAGHTY, Colonel, USAF
Commander

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2. Figure 2. Preferred Alternative Location – Undeveloped Forested Parcel

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AID (Shawn Chapman)
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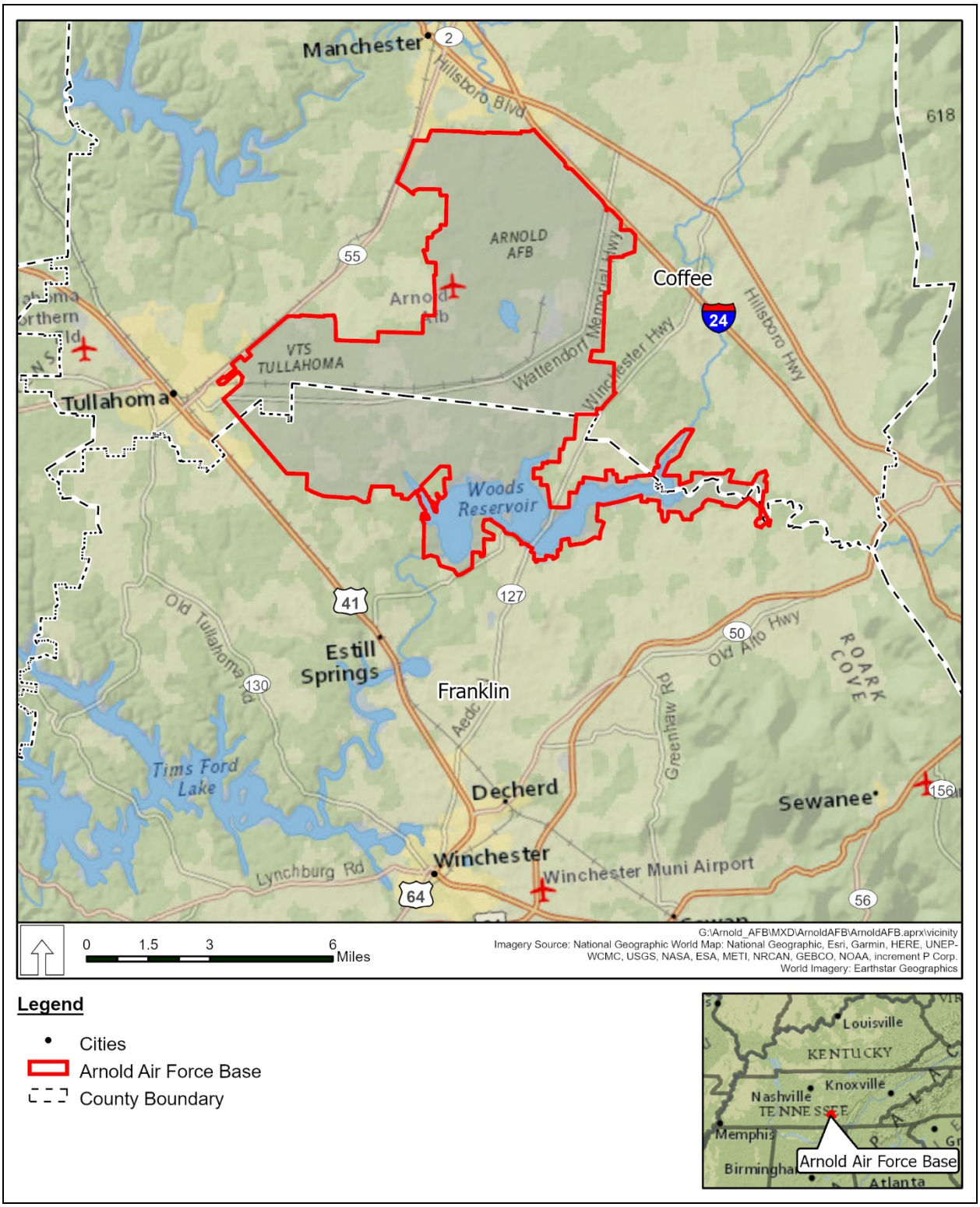

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

17 January 2022

Colonel Jeffrey T. Geraghty, USAF
Commander
Arnold Engineering Development Complex
100 Kindel Drive, Suite A303
Arnold AFB TN 37389

First Chief Herbert Johnson Sr.
Alabama-Coushatta Tribe of Texas
571 State Park Road 56
Livingston TX 77351

Dear First Chief Johnson

The Tennessee Army National Guard (TNARNG) and Arnold Air Force Base (AFB) are jointly preparing an Environmental Assessment (EA) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site – Tullahoma (VTS-T) on Arnold AFB, Tennessee as shown in Figure 1. Per Section 3016108 of the National Historic Preservation Act (NHPA) and its implementing regulations at 36 CFR part 800, Arnold AFB is accounting for various environmental concerns by engaging early with tribal governments as it formulates the undertaking.

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If you have questions, please contact Shannon Allen, our Installation Tribal Relations Officer/Cultural Resources Manager, via email at shannon.allen.1@us.af.mil or by regular mail to: Ms. Shannon Allen, AEDC/TSDCI, 100 Kindel Drive, Suite B-322, Arnold AFB, TN 37389, or by phone at 931-454-5466. Thank you in advance for your assistance in this effort.

Sincerely

JEFFREY T. GERAGHTY, Colonel, USAF
Commander

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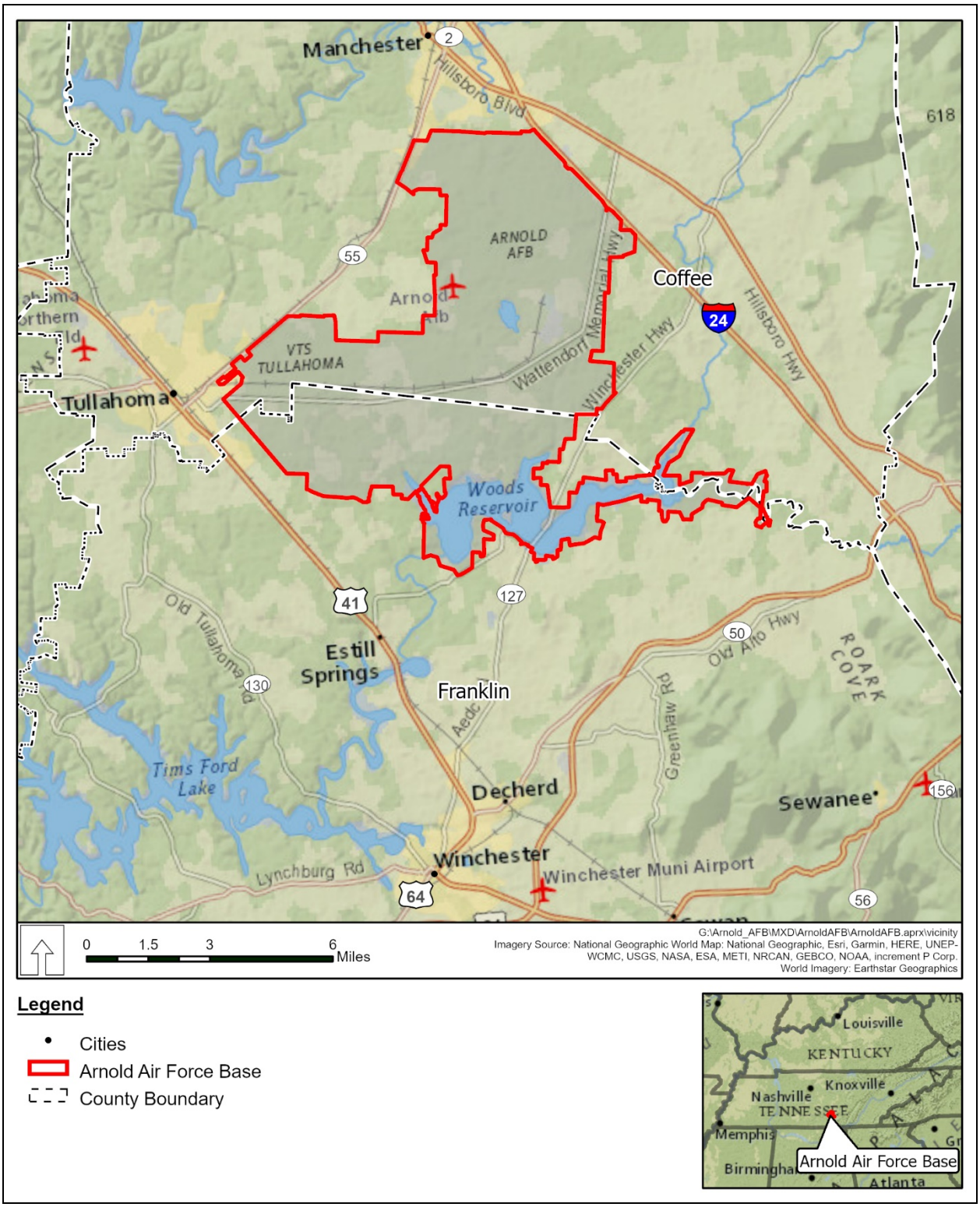

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

17 January 2021

Colonel Jeffrey T. Geraghty, USAF
Commander
Arnold Engineering Development Complex
100 Kindel Drive, Suite A303
Arnold AFB TN 37389

Chief Nelson Harjo
Alabama-Quassarte Tribal Town
P.O. Box 187
Wetumka OK 74883

Dear Chief Harjo

The Tennessee Army National Guard (TNARNG) and Arnold Air Force Base (AFB) are jointly preparing an Environmental Assessment (EA) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site – Tullahoma (VTS-T) on Arnold AFB, Tennessee as shown in Figure 1. Per Section 3016108 of the National Historic Preservation Act (NHPA) and its implementing regulations at 36 CFR part 800, Arnold AFB is accounting for various environmental concerns by engaging early with tribal governments as it formulates the undertaking.

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JEFFREY T. GERAGHTY, Colonel, USAF
Commander

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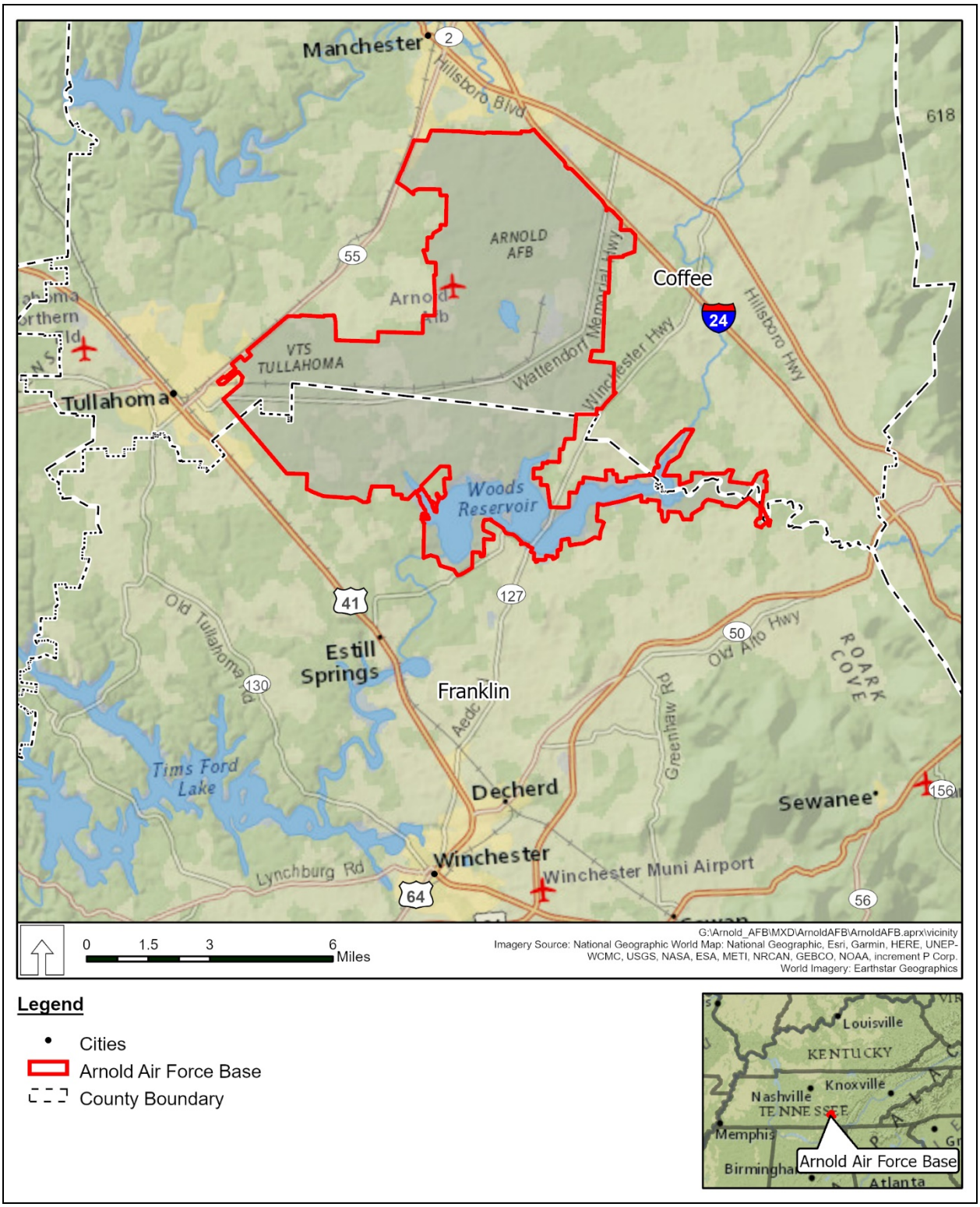

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

17 January 2022

Colonel Jeffrey T. Geraghty, USAF
Commander
Arnold Engineering Development Complex
100 Kindel Drive, Suite A303
Arnold AFB TN 37389

Chief Chuck Hoskin Jr.
Cherokee Nation
P.O. Box 948
Tahlequah OK 74465-0948

Dear Chief Hoskin

The Tennessee Army National Guard (TNARNG) and Arnold Air Force Base (AFB) are jointly preparing an Environmental Assessment (EA) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site – Tullahoma (VTS-T) on Arnold AFB, Tennessee as shown in Figure 1. Per Section 3016108 of the National Historic Preservation Act (NHPA) and its implementing regulations at 36 CFR part 800, Arnold AFB is accounting for various environmental concerns by engaging early with tribal governments as it formulates the undertaking.

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JEFFREY T. GERAGHTY, Colonel, USAF
Commander

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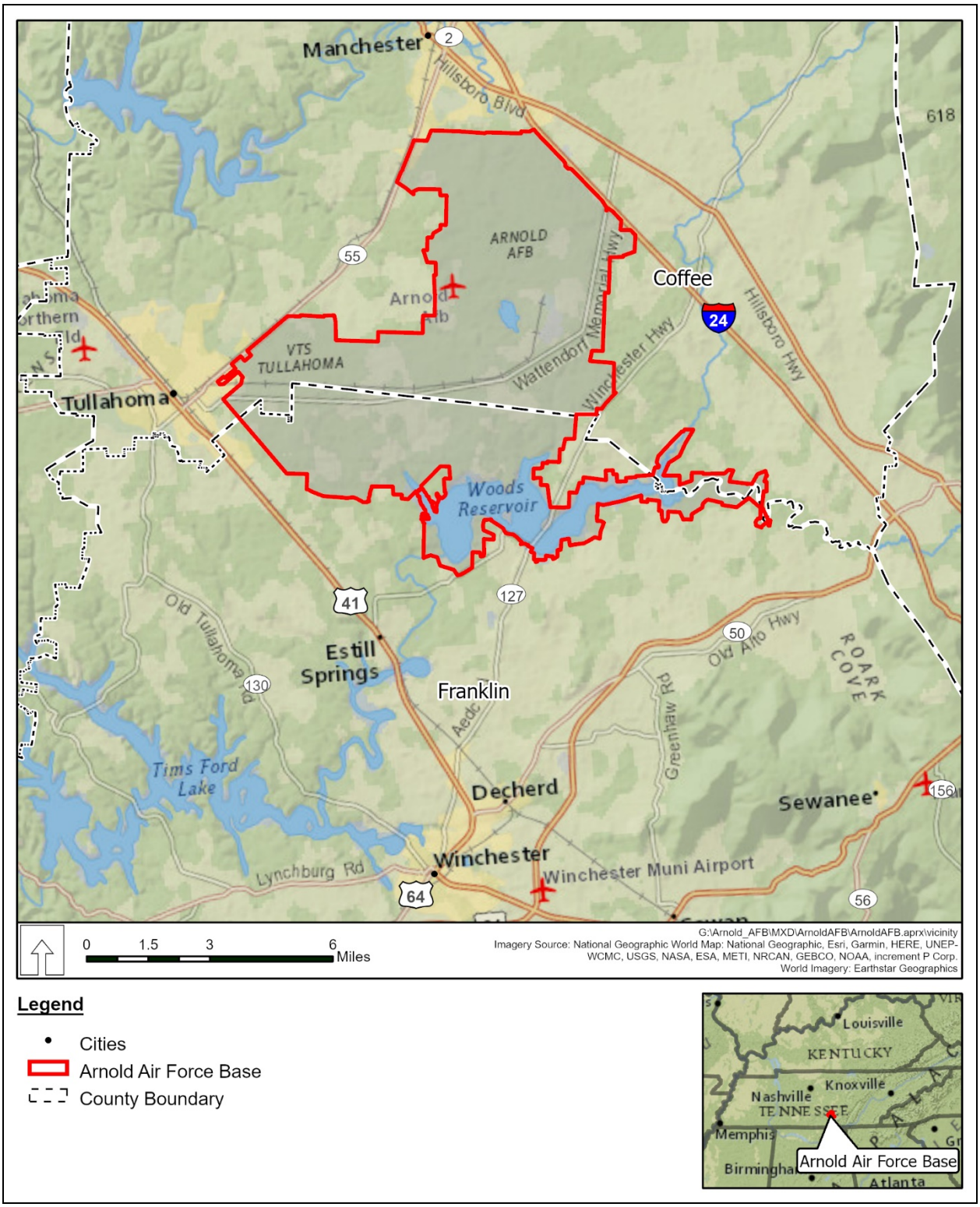

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

17 January 2022

Colonel Jeffrey T. Geraghty, USAF
Commander
Arnold Engineering Development Complex
100 Kindel Drive, Suite A303
Arnold AFB TN 37389

Governor Bill Anoatubby
Chickasaw Nation
P.O. Box 1548
Ada OK 74821-1548

Dear Governor Anoatubby

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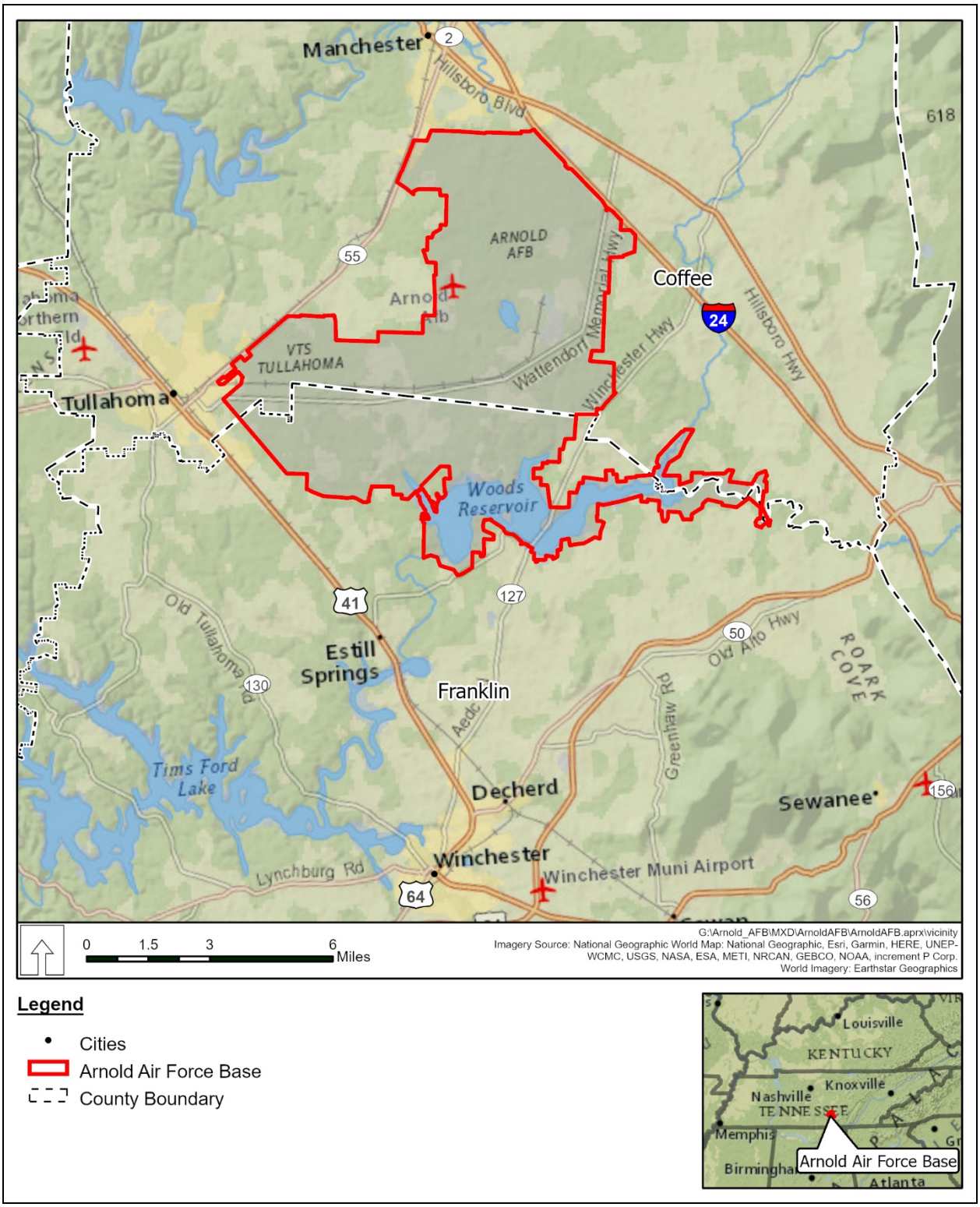

Figure 1. Location of the Volunteer Training Site – Tullahoma on Arnold Air Force Base

Figure 2. Preferred Alternative Location – Undeveloped Forested Parcel

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

17 January 2022

Colonel Jeffrey T. Geraghty, USAF
Commander
Arnold Engineering Development Complex
100 Kindel Drive, Suite A303
Arnold AFB TN 37389

Chairman Jonathan Cernek
Coushatta Tribe of Louisiana
P.O. Box 10
Elton LA 70532

Dear Chairman Cernek

The Tennessee Army National Guard (TNARNG) and Arnold Air Force Base (AFB) are jointly preparing an Environmental Assessment (EA) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site – Tullahoma (VTS-T) on Arnold AFB, Tennessee as shown in Figure 1. Per Section 3016108 of the National Historic Preservation Act (NHPA) and its implementing regulations at 36 CFR part 800, Arnold AFB is accounting for various environmental concerns by engaging early with tribal governments as it formulates the undertaking.

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Commander

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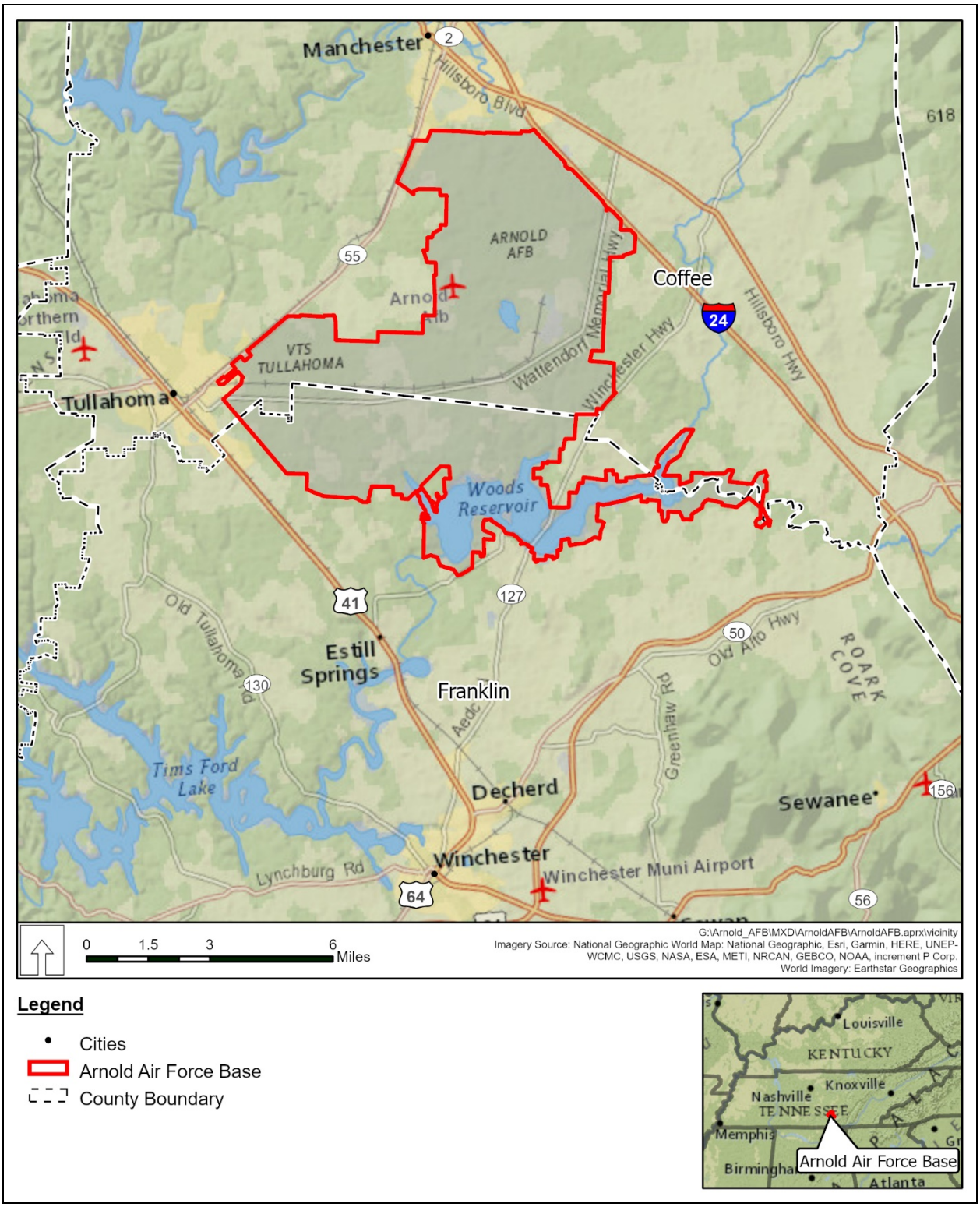

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

17 January 2022

Colonel Jeffrey T. Geraghty, USAF
Commander
Arnold Engineering Development Complex
100 Kindel Drive, Suite A303
Arnold AFB TN 37389

Chief Richard Sneed
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee NC 28719

Dear Chief Sneed

The Tennessee Army National Guard (TNARNG) and Arnold Air Force Base (AFB) are jointly preparing an Environmental Assessment (EA) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site – Tullahoma (VTS-T) on Arnold AFB, Tennessee as shown in Figure 1. Per Section 3016108 of the National Historic Preservation Act (NHPA) and its implementing regulations at 36 CFR part 800, Arnold AFB is accounting for various environmental concerns by engaging early with tribal governments as it formulates the undertaking.

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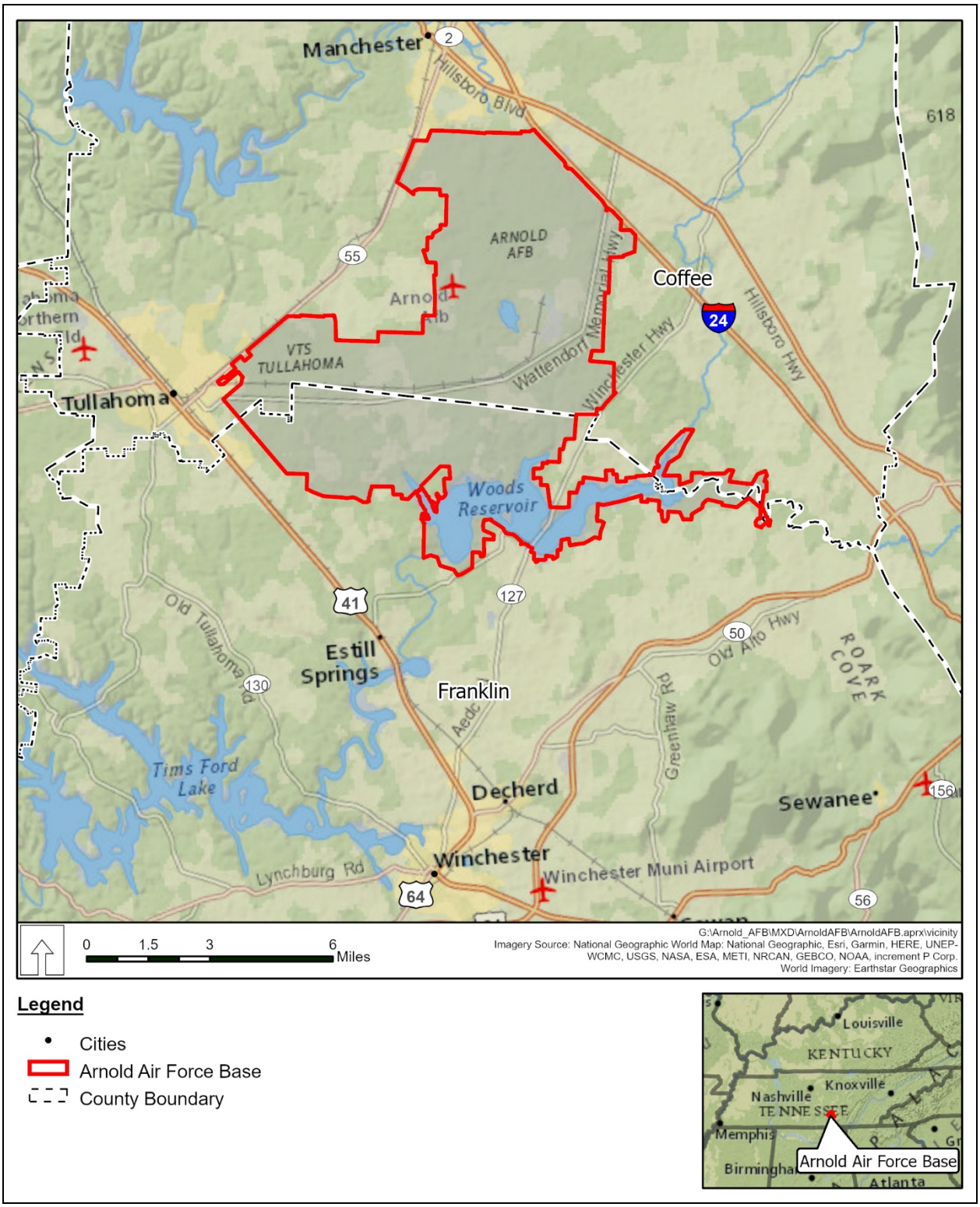

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

17 January 2022

Colonel Jeffrey T. Geraghty, USAF
Commander
Arnold Engineering Development Complex
100 Kindel Drive, Suite A303
Arnold AFB TN 37389

Chief Glenna J. Wallace
Eastern Shawnee Tribe of Oklahoma
12755 South 705 Road
Wyandotte OK 74370

Dear Chief Wallace

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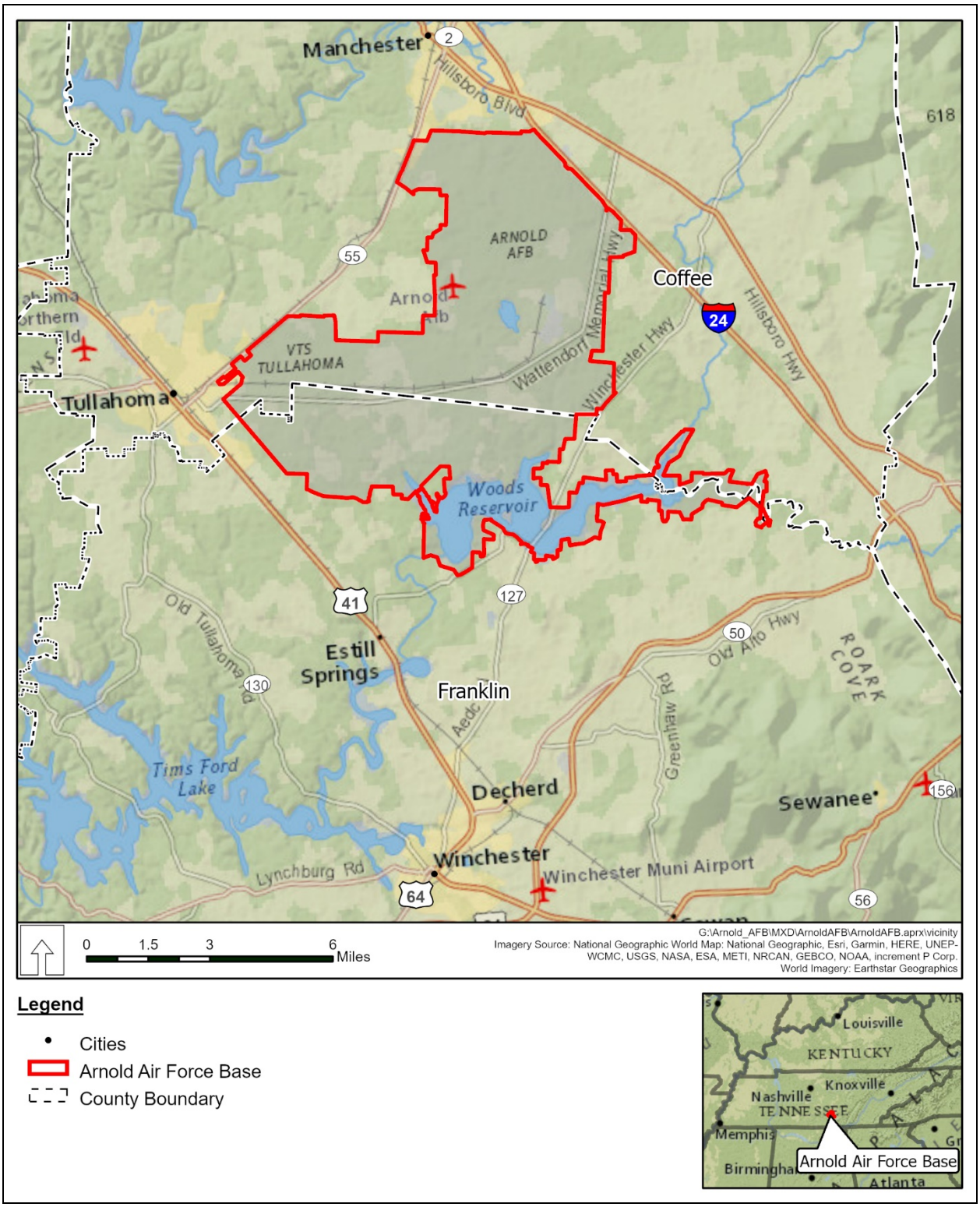

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

17 January 2022

Colonel Jeffrey T. Geraghty, USAF
Commander
Arnold Engineering Development Complex
100 Kindel Drive, Suite A303
Arnold AFB TN 37389

Chief Joe Bunch
United Keetoowah Band of Cherokee
P.O. Box 746
Tahlequah OK 74464

Dear Chief Bunch

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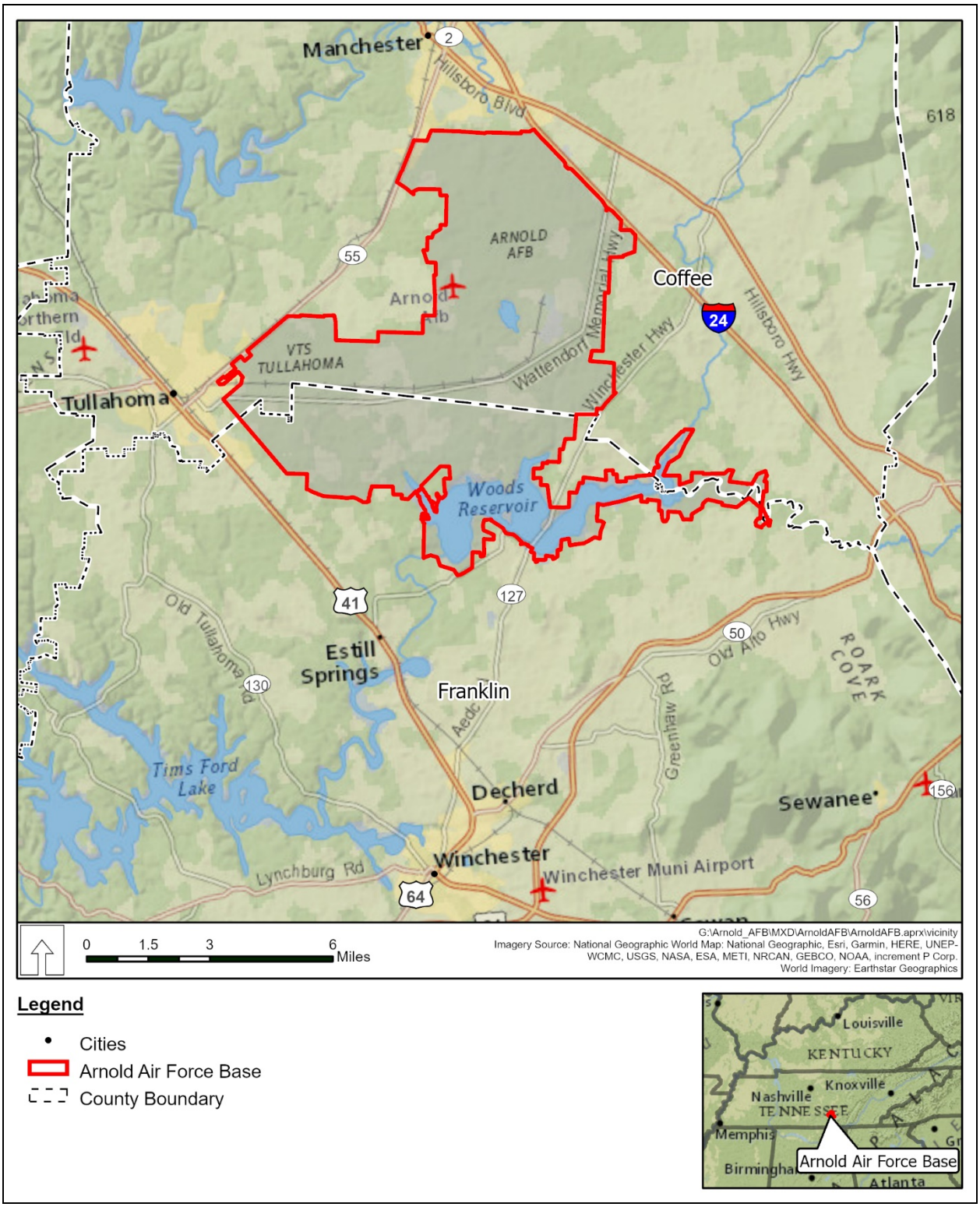

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

17 January 2022

Colonel Jeffrey T. Geraghty, USAF
Commander
Arnold Engineering Development Complex
100 Kindel Drive, Suite A303
Arnold AFB TN 37389

Chief Tiger Hobia
Kialegee Tribal Town
P.O. Box 332
Wetumka OK 74883

Dear Chief Hobia

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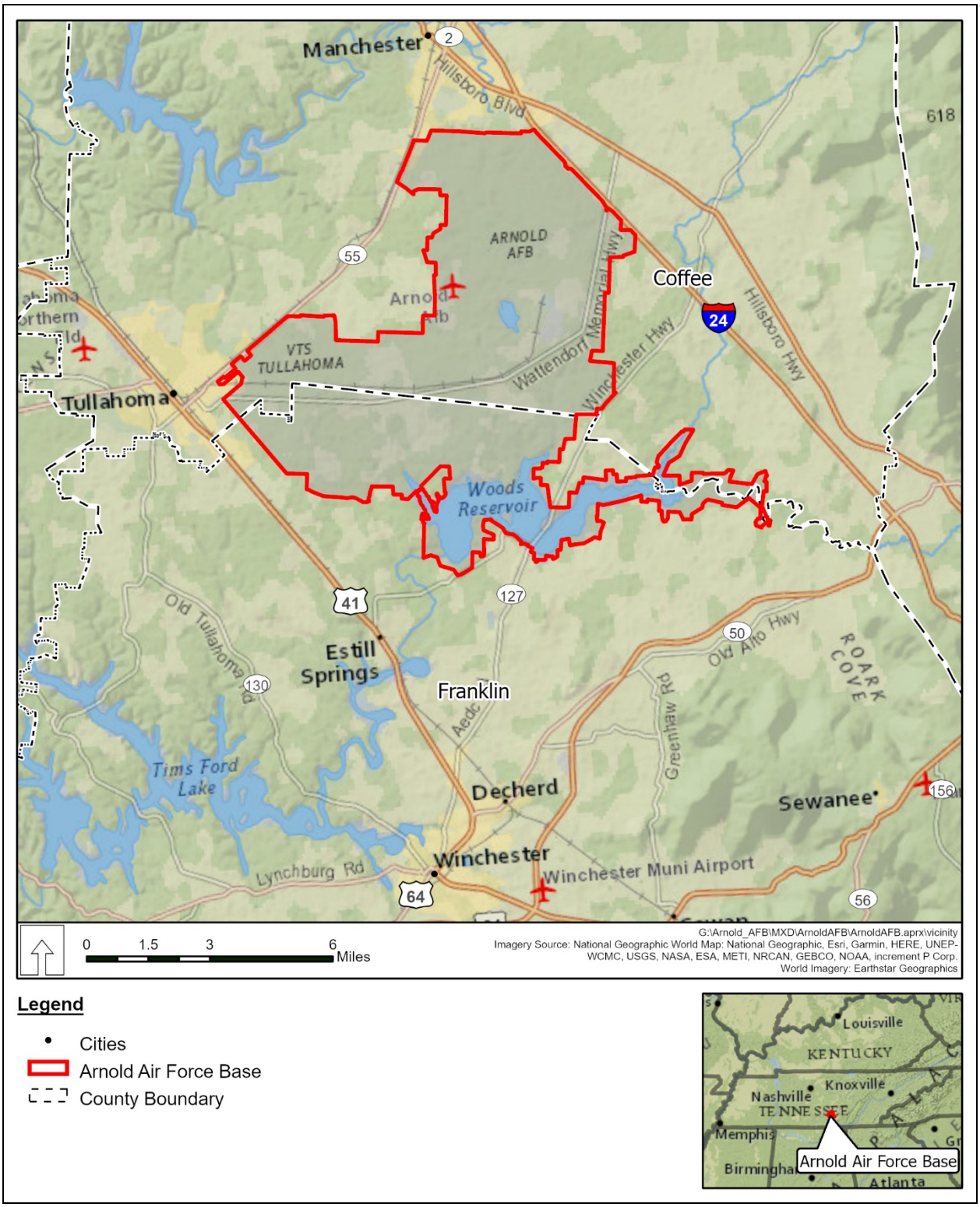

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17 January 2022

Colonel Jeffrey T. Geraghty, USAF
Commander
Arnold Engineering Development Complex
100 Kindel Drive, Suite A303
Arnold AFB TN 37389

Principal Chief David Hill
Muscogee (Creek) Nation of Oklahoma
P.O. Box 580
Okmulgee OK 74447

Dear Principal Chief Hill

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Sincerely

JEFFREY T. GERAGHTY, Colonel, USAF
Commander

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AID (Shawn Chapman)
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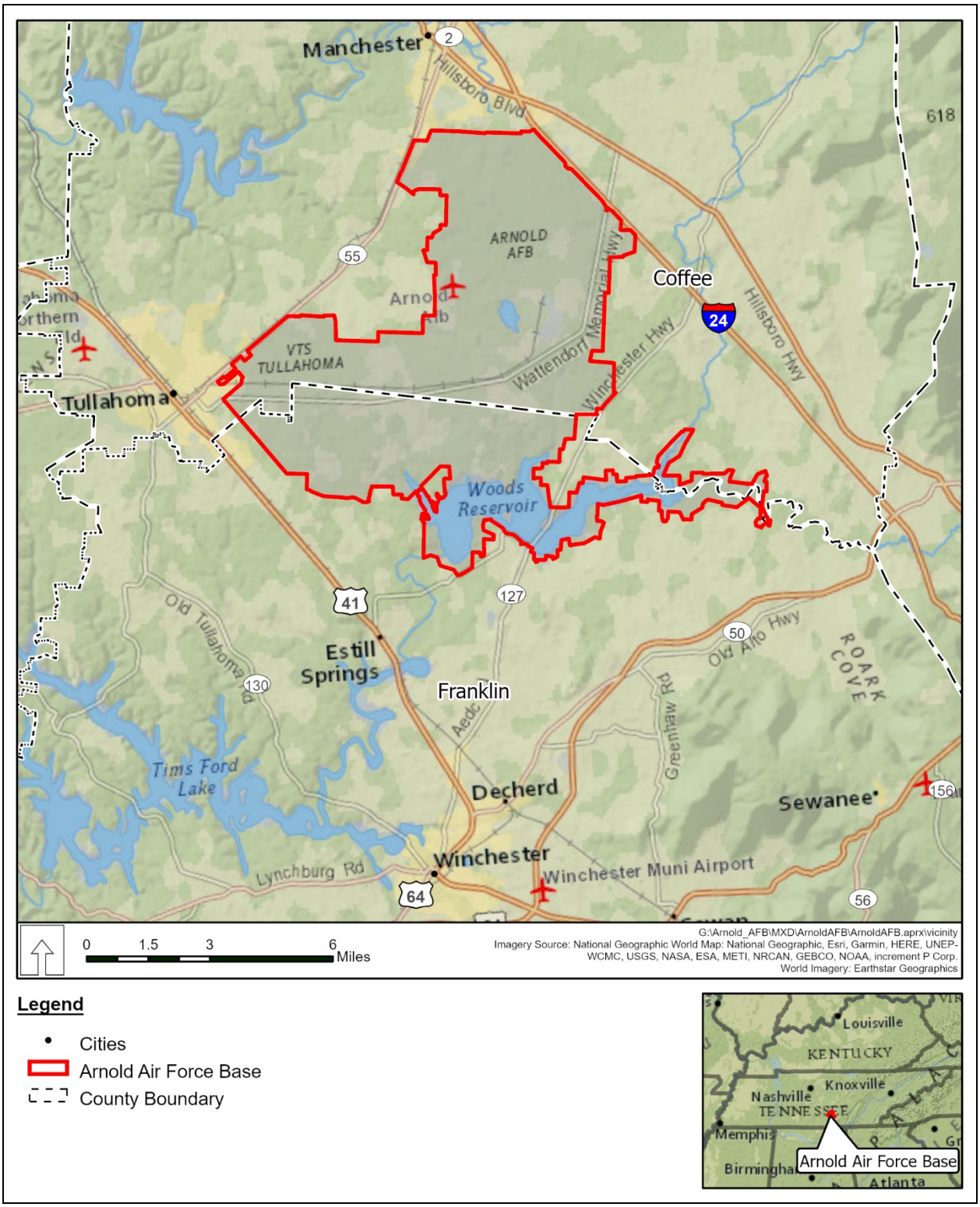

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

17 January 2022

Colonel Jeffrey T. Geraghty, USAF
Commander
Arnold Engineering Development Complex
100 Kindel Drive, Suite A303
Arnold AFB TN 37389

Tribal Chair Stephanie Bryan
Poarch Band of Creek Indians
5811 Jack Springs Road
Atmore AL 36502

Dear Ms. Bryan

The Tennessee Army National Guard (TNARNG) and Arnold Air Force Base (AFB) are jointly preparing an Environmental Assessment (EA) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site – Tullahoma (VTS-T) on Arnold AFB, Tennessee as shown in Figure 1. Per Section 3016108 of the National Historic Preservation Act (NHPA) and its implementing regulations at 36 CFR part 800, Arnold AFB is accounting for various environmental concerns by engaging early with tribal governments as it formulates the undertaking.

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JEFFREY T. GERAGHTY, Colonel, USAF
Commander

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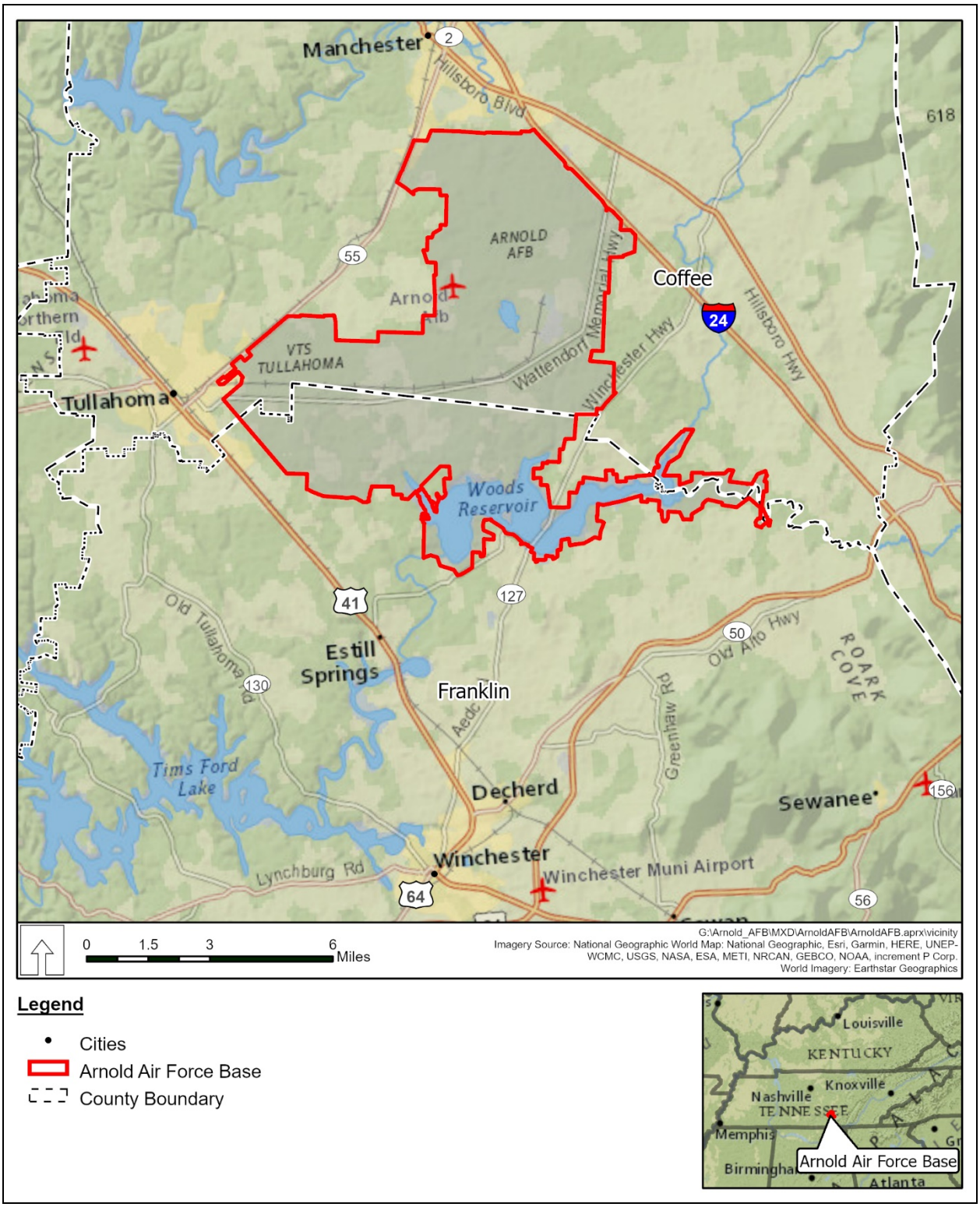

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

17 January 2022

Colonel Jeffrey T. Geraghty, USAF
Commander
Arnold Engineering Development Complex
100 Kindel Drive, Suite A303
Arnold AFB TN 37389

Principal Chief Greg P. Chilcoat
Seminole Nation of Oklahoma
P.O. Box 1498
Wewoka OK 74884

Dear Principal Chief Chilcoat

The Tennessee Army National Guard (TNARNG) and Arnold Air Force Base (AFB) are jointly preparing an Environmental Assessment (EA) to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site – Tullahoma (VTS-T) on Arnold AFB, Tennessee as shown in Figure 1. Per Section 3016108 of the National Historic Preservation Act (NHPA) and its implementing regulations at 36 CFR part 800, Arnold AFB is accounting for various environmental concerns by engaging early with tribal governments as it formulates the undertaking.

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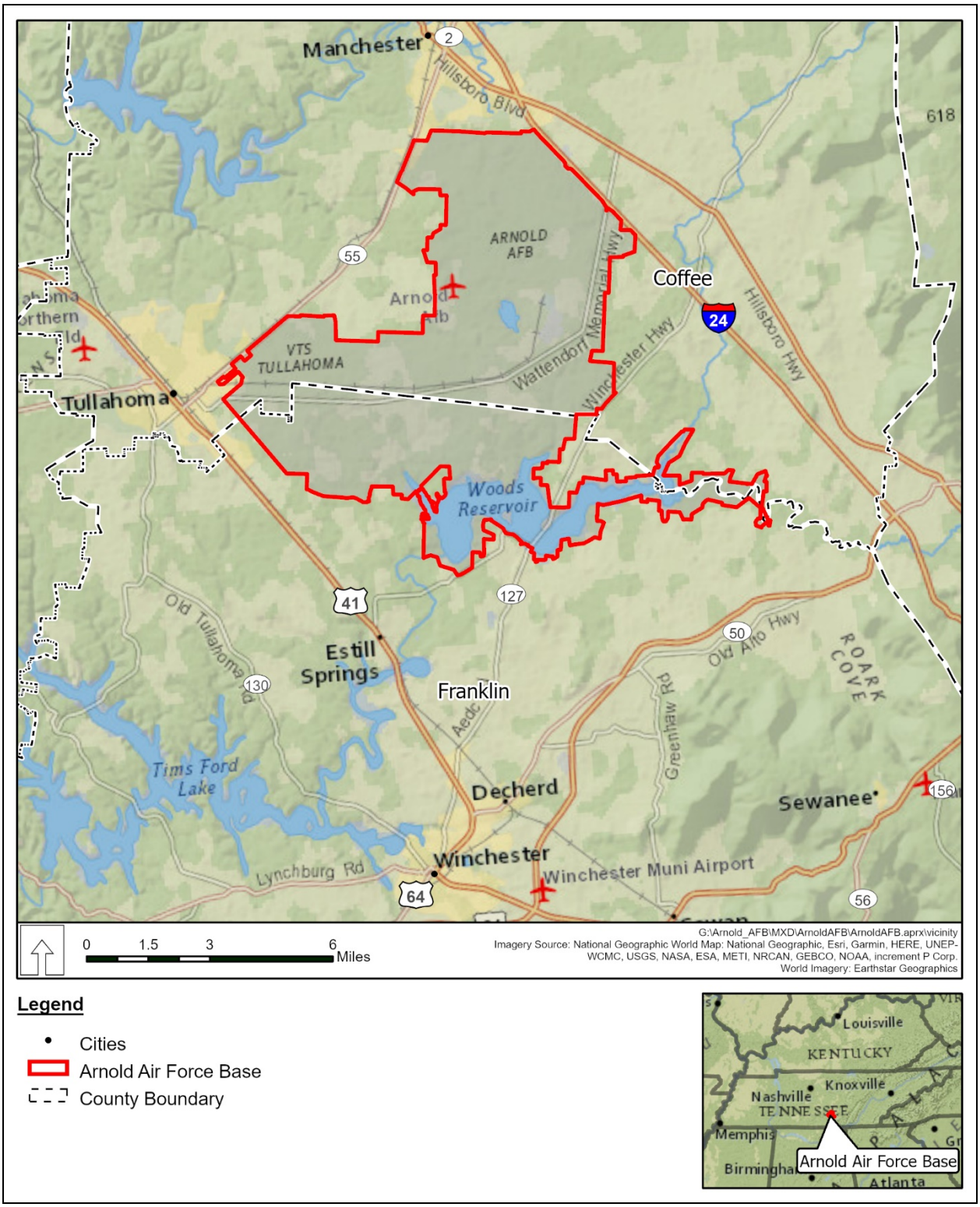

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

17 January 2022

Colonel Jeffrey T. Geraghty, USAF
Commander
Arnold Engineering Development Complex
100 Kindel Drive, Suite A303
Arnold AFB TN 37389

Tribal Chairman Ben Barnes
Shawnee Tribe of Oklahoma
29 South Hwy 69A
Miami OK 74354

Dear Chairman Barnes

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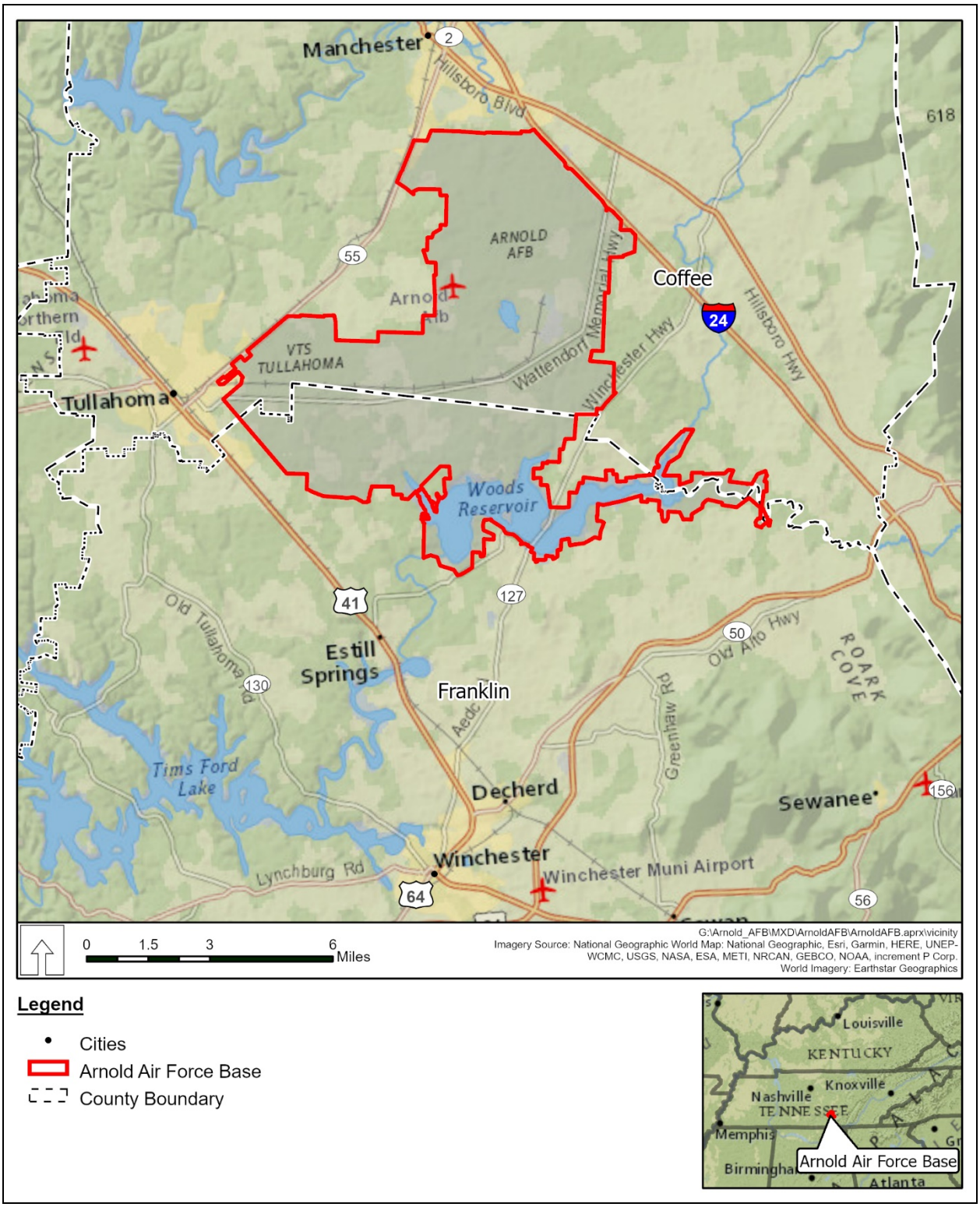

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT COMPLEX (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE

17 January 2022

Colonel Jeffrey T. Geraghty, USAF
Commander
Arnold Engineering Development Complex
100 Kindel Drive, Suite A303
Arnold AFB TN 37389

Mekko (Chief) Ryan Morrow
Thlopthlocco Tribal Town
P.O. Box 188
Okemah OK 74859

Dear Mekko (Chief) Morrow

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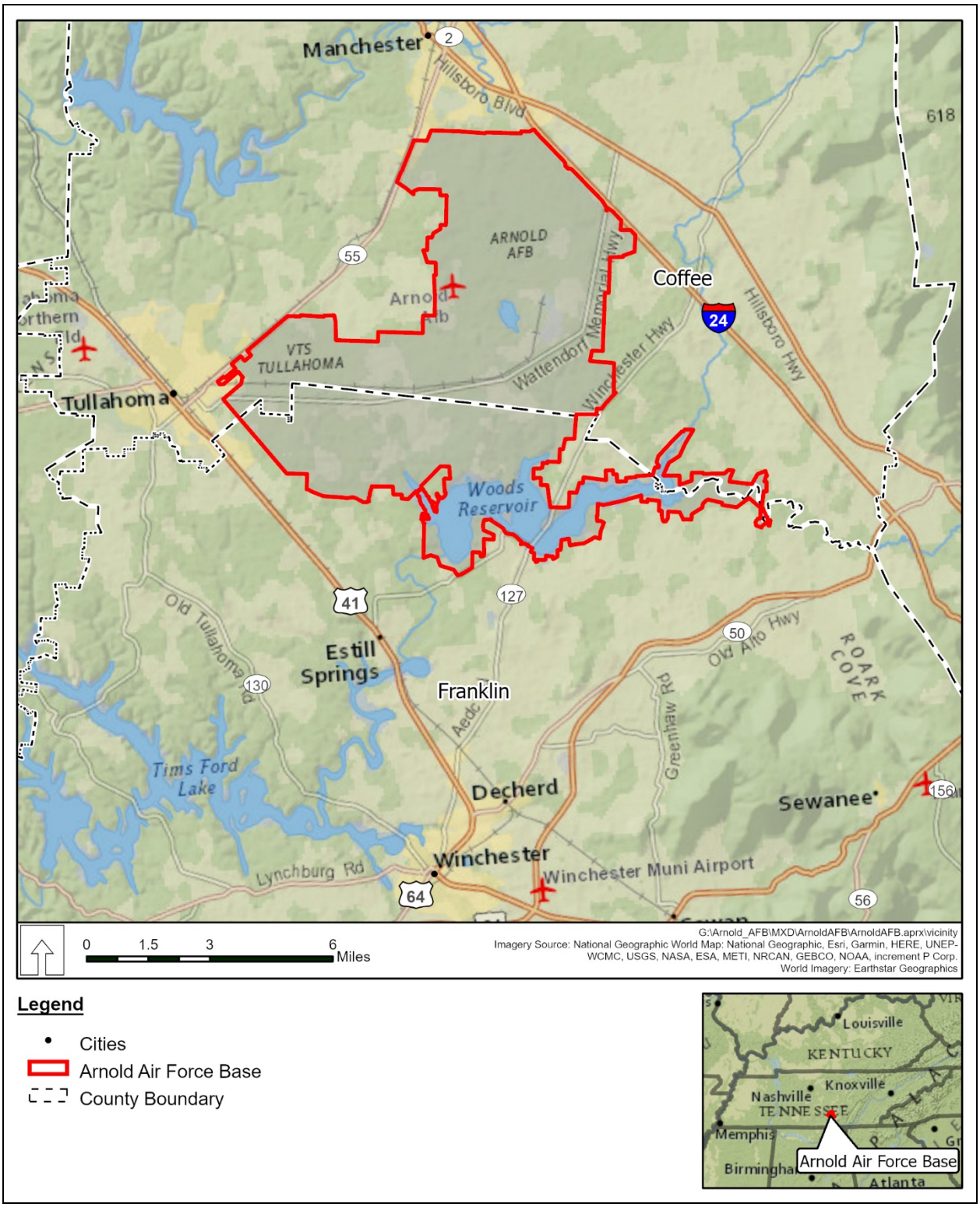

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Tribal Responses

FORMAT PAGE

From: THPO <THPO@tttown.org>
Sent: Friday, January 28, 2022 2:42 PM
To: ALLEN, SHANNON L NH-03 USAF AFMC AEDC/TSDCI <shannon.allen.1@us.af.mil>
Subject: [Non-DoD Source] VTS-T

Greetings from Thlopthlocco Tribal Town

In regards to the TNARNG and Arnold AFB project at VTS-T
Thlopthlocco Tribal Town concurs with No Adverse Effects associated with this project.
Also please email only (eco-friendly)

Thank you,

David Frank
THPO
Thlopthlocco Tribal Town
P.O. Box 188
Okemah, OK 74859
(918) 560-6113

From: Tonya Tipton <tonya@shawnee-tribe.com>
Sent: Tuesday, February 1, 2022 10:07 AM
To: ALLEN, SHANNON L NH-03 USAF AFMC AEDC/TSDCI <shannon.allen.1@us.af.mil>
Subject: [URL Verdict: Unknown][Non-DoD Source] RE: EA for TNARNG Barracks Construction at Arnold AFB, TN

This letter is in response to the above referenced project.

The Shawnee Tribe's Tribal Historic Preservation Department concurs that no known historic properties will be negatively impacted by this project.

We have no issues or concerns at this time, but in the event that archaeological materials are encountered during construction, use, or maintenance of this location, please re-notify us at that time as we would like to resume immediate consultation under such a circumstance.

If you have any questions, you may contact me via email at tonya@shawnee-tribe.com

Thank you for the opportunity to comment on this project.

Sincerely,

Tonya Tipton
Tribal Historic Preservation Officer
Phone: (918)542-2441
Email: tonya@shawnee-tribe.com
29 S Highway 69A
Miami, OK 74354
www.Shawnee-Tribe.org

EASTERN SHAWNEE
CULTURAL PRESERVATION DEPARTMENT
70500 East 128 Road, Wyandotte, OK 74370

February 22, 2022
Department Of The Air Force, AFMC
100 Kindel Drive, Suite B-322
Arnold AFB, TN 37389

RE: ***TNARNG Volunteer Training Site-Tullahoma, Coffee and Franklin County, TN***

Dear Ms. Allen,

The Eastern Shawnee Tribe has received your letter regarding the above referenced project(s) within Coffee and Franklin County, TN. The Eastern Shawnee Tribe is committed to protecting sites important to Tribal Heritage, Culture and Religion. Furthermore, the Tribe is particularly concerned with historical sites that may contain but not limited to the burial(s) of human remains and associated funerary objects.

As described in your correspondence, and upon research of our database(s) and files, we find our people occupied these areas historically and/or prehistorically. However, the project proposes **NO Adverse Effect** or endangerment to known sites of interest to the Eastern Shawnee Tribe. Please continue project as planned. However, should this project inadvertently discover an archeological site or object(s) we request that you immediately contact the Eastern Shawnee Tribe, as well as the appropriate state agencies (within 24 hours). We also ask that all ground disturbing activity stop until the Tribe and State agencies are consulted. Please note that any future changes to this project will require additional consultation.

In accordance with the NHPA of 1966 (16 U.S.C. § 470-470w-6), federally funded, licensed, or permitted undertakings that are subject to the Section 106 review process must determine effects to significant historic properties. As clarified in Section 101(d)(6)(A-B), historic properties may have religious and/or cultural significance to Indian Tribes. Section 106 of NHPA requires Federal agencies to consider the effects of their actions on all significant historic properties (36 CFR Part 800) as does the National Environmental Policy Act of 1969 (43 U.S.C. § 4321-4347 and 40 CFR § 1501.7(a). This letter evidences NHPA and NEPA historic properties compliance pertaining to consultation with this Tribe regarding the referenced proposed projects.

Thank you, for contacting the Eastern Shawnee Tribe, we appreciate your cooperation. Should you have any further questions or comments please contact our Office.
Sincerely,

Paul Barton, Tribal Historic Preservation Officer (THPO)
Eastern Shawnee Tribe of Oklahoma
(918) 666-5151 Ext:1833

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CHEROKEE NATION®
P.O. Box 948 • Tahlequah, OK 74465-0948
918-453-5000 • www.cherokee.org

Chuck Hoskin Jr.
Principal Chief
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Bryan Warner
Deputy Principal Chief
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February 22, 2022

Shannon Allen
Department of the Air Force
100 Kindel Drive, Suite B-322
Arnold Air Force Base, TN 37389

Re: Volunteer Training Site – Tullahoma (TVS-T)

Ms. Shannon Allen:

The Cherokee Nation (Nation) is in receipt of your correspondence about the proposed **Volunteer Training Site – Tullahoma (TVS-T)**, and appreciates the opportunity to provide comment upon this project. Please allow this letter to serve as the Nation's interest in acting as a consulting party to this proposed project.

The Nation maintains databases and records of cultural, historic, and pre-historic resources in this area. Our Historic Preservation Office reviewed this project, cross referenced the project's legal description against our information, and found no instances where this project intersects or adjoins such resources. Thus, the Nation does not foresee this project imparting impacts to Cherokee cultural resources at this time.

However, the Nation requests that the Tennessee Army National Guard (TNARNG) halt all project activities immediately and re-contact our Offices for further consultation if items of cultural significance are discovered during the course of this project. Additionally, the Nation requests that the TNARNG conduct appropriate inquiries with other pertinent Tribal and Historic Preservation Offices regarding historic and prehistoric resources not included in the Nation's databases or records.

If you require additional information or have any questions, please contact me at your convenience. Thank you for your time and attention to this matter.

Wado,

Elizabeth Toombs

Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation Tribal Historic Preservation Office
elizabeth-toombs@cherokee.org
918.453.5389

POARCH BAND OF CREEK INDIANS

5811 Jack Springs Road • Atmore, Alabama 36502
Tribal Offices: (251) 368-9136 • Administrative Fax: (251) 368-4502
www.poarchcreekindians-nsn.gov

February 15, 2022

Mr. Colonel Jeffrey T. Geraghty, USAF
Commander
Department of the Air Force, Arnold Engineering Development Complex
100 Kindel Drive, Suite A303
Arnold AFB TN 37389

Re: 2022-02-0009: Environmental Assessment to evaluate potential environmental impacts associated with the proposed construction and operation of barracks and associated infrastructure to support the continued weapons training of TNARNG soldiers at Volunteer Training Site-Tullahoma (VTS-T) on Arnold AFB, TN

Dear Mr. Geraghty,

The Poarch Band of Creek Indians, Tribal Historic Preservation Office has received and reviewed the documentation submitted for the referenced project in Franklin County, Tennessee. Based upon the information submitted we concur with the determination of no effect.

Should implementation of the project result in an inadvertent discovery of any material remains of past human life or activities of archaeological interest, such as chipped stone tools, pottery, bone, historic crockery, glass, metal items or building materials, the project should be halted until evaluation and consultation is complete.

Thank you for the opportunity to comment on this project. We look forward to working with you in the future. Should further correspondence pertaining to the project be necessary, please reference the above file number when responding. If you have any questions, please do not hesitate to call 251-368-9136 extension 2072.

Sincerely,

Larry D. Haikey
Tribal Historic Preservation Officer

FORMAT PAGE

Appendix B

Reasonably Foreseeable Future Actions

FORMAT PAGE

This section identifies reasonably foreseeable future projects that could result in cumulative effects to environmental resources in conjunction with the Preferred Alternative. Actions identified in Table B-1 would not interact with all resources; therefore, resources that potentially could result in reasonably foreseeable future direct or indirect impact with the addition of the Preferred Alternative are noted in Table B-1.

Table B-1. Reasonably Foreseeable Project at and near Arnold Air Force Base

Project	Project Summary	Time Frame	Relevance to Preferred Alternative	Resource Interaction
On-Base Activities				
Construction and Operation of a Hypersonic Clean Air Ground Test Facility	An EA is being prepared for construction and operation of the Hypersonic Clean Air Ground Test Facility at the AEDC on Arnold Air AFB. The Proposed Action would include construction and operation of the new facility and related utilities and infrastructure as well as demolition of some existing infrastructure.	Future	Would utilize existing utility systems and roadways; disturb vegetation and soils on Base; operate concurrently with the Proposed Action; and has the potential to impact health and safety on Base.	Noise, Air Quality, Earth Resources, Hazardous Materials and Wastes, Utility Infrastructure, Health and Safety
Construction and Operation of an Aerothermal Materials Ground Test Facility	An EA is being prepared for construction and operation of the Aerothermal Materials Ground Test Facility at the AEDC on Arnold Air AFB. The Proposed Action would include construction and operation of the new facility and related utilities and infrastructure as well as demolition of some existing infrastructure.	Future	Would utilize existing utility systems and roadways; disturb vegetation and soils on Base; operate concurrently with the Proposed Action and has the potential to impact health and safety on Base.	Noise, Air Quality, Earth Resources, Hazardous Materials and Wastes, Utility Infrastructure, Health and Safety
Installation Development Projects	This would implement facility and infrastructure construction, demolition, and renovation projects at Arnold AFB as described in the 2021 Arnold AFB IDP Programmatic EA.	Future	Would implement approximately 357 projects, including demolition of aging facilities, new facility construction, facility upgrades, facility repair and renovation, utilities upgrades, and infrastructure improvement, and road maintenance, identified in Arnold AFB's IDP.	Noise, Air Quality, Earth Resources, Water Resources, Biological Resources, Cultural Resources, Hazardous Materials and Wastes, Transportation, Utility Infrastructure, Health and Safety
Off-Base Activities				
Love's Travel Stop	A Love's Travel Stop was completed near Arnold AFB in April 2021. It is located across I-24 from the Base.	Present	This was a large undertaking (approximately 17 acres), and it directly impacted 10 acres of wetlands in the region, which were mitigated through an USACE Section 404 permit.	Water Resources

Project	Project Summary	Time Frame	Relevance to Preferred Alternative	Resource Interaction
Manchester Industrial Park	The Manchester Industrial Park, which is large enough (approximately 300 acres) to support additional light industry in the future, is located across I-24 from Arnold AFB.	Present	Would disturb vegetation and soils.	Noise, Air Quality, Earth Resources

EA – Environmental Assessment; **AEDC** – Arnold Engineering Development Complex; **AFB** – Air Force Base; **IDP** – Installation Development Plan; **I-24** – Interstate 24; **USACE** – US Army Corps of Engineers

Appendix C

National Environmental Policy Act Supporting Documentation

FORMAT PAGE

Air Quality Analysis

FORMAT PAGE

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- Action Location

Base: ARNOLD AFB
State: Tennessee
County(s): Coffee
Regulatory Area(s): NOT IN A REGULATORY AREA

- Action Title: CONSTRUCTION AND OPERATION OF BARRACKS, DINING HALLS, AND ADMINISTRATION BUILDINGS FOR THE TENNESSEE ARMY NATIONAL GUARD

- Project Number/s (if applicable):

- Projected Action Start Date: 9 / 2022

- Action Purpose and Need:

The purpose of the action is to enhance the ability of the TNARNG to fulfill its military training mission by fully supporting all units assigned to training at Arnold AFB. The Proposed Action is needed to rectify bed space, dining, administrative, and storage facilities deficits for TNARNG units training at the Installation. The existing barracks space is too small for the number of TNARNG troops assigned to train at Arnold AFB.

- Action Description:

The Proposed Action would construct and operate up to 20 new one-story, 5,000-square-foot (SF) open-bay barracks with latrines; showers; laundry; exterior paving; stairs, ramps, and walkways; and grading and drainage; and all related work for a new functional and energy-efficient barracks for the TNARNG at VTS-T on Arnold AFB. The 20 new barracks would increase bed capacity by 640. The proposed five new 200-person dining facilities (each approximately 4,500 SF) and five new administrative and storage facilities totaling approximately 5,960 SF associated with the barracks would also be constructed at VTS-T. TNARNG would construct each new barracks in the coming years as funding becomes available. Currently, TNARNG has only secured funding for one one-story 5,000 square foot open-bay barracks building. If TNARNG obtains funds for additional barracks buildings and the proposed dining halls and administration/storage buildings, then TNARNG would review this EA to determine if language regarding site conditions and potential environmental consequences need to be revised and updated. TNARNG would coordinate its EA review findings with ARNG-G9 NEPA staff. As funding is realized for any of the remaining barracks included in the Proposed Action, this EA would be revisited and additional analysis would be completed as deemed appropriate. Construction of one new 5,000 SF barracks would take no more than 12 months. The additional required bed, dining, and administrative spaces would be programmed and constructed in the future, as funding becomes available. TNARNG has sought National Guard Bureau approval and programming for the construction of new barracks for several years, with a two- to three-story barracks as the preferred design type, which would reduce the facility footprint, save land, decrease walking distances, and make VTS-T more compliant with a sustainable planning strategy that promotes compact development. However, TNARNG's proposed new two-story barracks construction has been unsuccessful in being selected using the preferred design. The need for additional bed space to accommodate the annual throughput of soldiers training at VTS-T has continued to grow and, consistent with the Army's Sustainable Design and Development policy, TNARNG proposes construction of multiple open-bay barracks to meet need and to align the barracks design with the currently available funding priorities. Therefore, the construction of multiple barracks of only one specific type, open bay, is being considered as part of the Proposed Action in this EA.

Under the No Action Alternative, TNARNG would not construct any new barracks, dining, administrative, or storage facilities on Arnold AFB; bed space at VTS-T would not be expanded; programmed funding would go unexecuted; and overall mission training readiness would suffer because the lack of bed spaces negatively impacts readiness and individual small-arms weapons qualification without providing adequate living spaces. The No Action Alternative assumes the Proposed Action would not occur. Although the No Action Alternative does not meet the purpose and need to rectify bed space, dining, administrative, and storage facilities deficits for TNARNG units, it is carried forward for detailed analysis in this EA as required under NEPA. The No Action

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

Alternative is a baseline to assess any consequences that might occur if the Proposed Action is not implemented.

- Point of Contact

Name: Carey Lynn Perry
Title: Senior Project Manager
Organization: Vernadero Group Inc
Email: cperry@vernadero.com
Phone Number: 504-584-7366

- Activity List:

Activity Type		Activity Title
2.	Construction / Demolition	Proposed Action
3.	Heating	CONSTRUCTION AND OPERATION OF BARRACKS, DINING HALLS, AND ADMINISTRATION BUILDINGS FOR THE TENNESSEE
4.	Emergency Generator	CONSTRUCTION AND OPERATION OF BARRACKS, DINING HALLS, AND ADMINISTRATION BUILDINGS FOR THE TENNESSEE

Emission factors and air emission estimating methods come from the United States Air Force's Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and Air Emissions Guide for Air Force Transitory Sources.

2. Construction / Demolition

2.1 General Information & Timeline Assumptions

- Activity Location

County: Coffee
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Proposed Action

- Activity Description:

construct and operate up to 20 new one-story, 5,000-square-foot (SF) open-bay barracks with latrines; showers; laundry; exterior paving; stairs, ramps, and walkways; and grading and drainage; and all related work for a new functional and energy-efficient barracks for the TNARNG at VTS-T on Arnold AFB.

- Activity Start Date

Start Month: 9
Start Month: 2022

- Activity End Date

Indefinite: False
End Month: 10
End Month: 2023

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	1.425265
SO_x	0.030915
NO_x	11.949092
CO	6.594777
PM 10	140.093678

Pollutant	Total Emissions (TONs)
PM 2.5	0.407569
Pb	0.000000
NH_3	0.052753
CO_2e	3432.6

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

2.1 Site Grading Phase

2.1.1 Site Grading Phase Timeline Assumptions

- Phase Start Date
Start Month: 9
Start Quarter: 4
Start Year: 2022

- Phase Duration
Number of Month: 2
Number of Days: 0

2.1.2 Site Grading Phase Assumptions

- General Site Grading Information
Area of Site to be Graded (ft^2): 13939200
Amount of Material to be Hauled On-Site (yd^3): 774400
Amount of Material to be Hauled Off-Site (yd^3): 774400

- Site Grading Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Graders Composite	2	8
Other Construction Equipment Composite	2	8
Rollers Composite	1	8
Rubber Tired Dozers Composite	3	8
Scrapers Composite	6	8
Tractors/Loaders/Backhoes Composite	2	8

- Vehicle Exhaust
Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.1.3 Site Grading Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Graders Composite

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0806	0.0014	0.4657	0.5731	0.0217	0.0217	0.0072	132.92
Other Construction Equipment Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0507	0.0012	0.2785	0.3488	0.0105	0.0105	0.0045	122.61
Rollers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0499	0.0007	0.3198	0.3798	0.0180	0.0180	0.0045	67.149
Rubber Tired Dozers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.1919	0.0024	1.3611	0.7352	0.0536	0.0536	0.0173	239.51
Scrapers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.1723	0.0026	1.1176	0.7579	0.0447	0.0447	0.0155	262.87
Tractors/Loaders/Backhoes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	0.0034	66.884

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.283	000.002	000.217	003.292	000.007	000.006		000.023	00324.051
LDGT	000.361	000.003	000.383	004.629	000.009	000.008		000.024	00417.982
HDGV	000.727	000.005	001.011	015.230	000.021	000.019		000.045	00771.997
LDDV	000.109	000.003	000.133	002.561	000.004	000.004		000.008	00314.635
LDDT	000.249	000.004	000.379	004.384	000.007	000.006		000.008	00446.751
HDDV	000.510	000.013	004.987	001.786	000.170	000.156		000.029	01506.976
MC	002.595	000.003	000.737	013.274	000.028	000.024		000.054	00396.864

2.1.4 Site Grading Phase Formula(s)

- Fugitive Dust Emissions per Phase
$PM10_{FD} = (20 * ACRE * WD) / 2000$

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)

$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

2.2 Trenching/Excavating Phase

2.2.1 Trenching / Excavating Phase Timeline Assumptions

- Phase Start Date
Start Month: 9
Start Quarter: 4
Start Year: 2022

- Phase Duration
Number of Month: 2
Number of Days: 0

2.2.2 Trenching / Excavating Phase Assumptions

- General Trenching/Excavating Information
Area of Site to be Trenched/Excavated (ft^2): 100000
Amount of Material to be Hauled On-Site (yd^3): 5000
Amount of Material to be Hauled Off-Site (yd^3): 5000

- Trenching Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Excavators Composite	2	8
Other General Industrial Equipmen Composite	1	8
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust

Average Hauling Truck Capacity (yd^3): 20 (default)
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips

Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.2.3 Trenching / Excavating Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Graders Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0806	0.0014	0.4657	0.5731	0.0217	0.0217	0.0072	132.92
Other Construction Equipment Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0507	0.0012	0.2785	0.3488	0.0105	0.0105	0.0045	122.61
Rollers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0499	0.0007	0.3198	0.3798	0.0180	0.0180	0.0045	67.149
Rubber Tired Dozers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.1919	0.0024	1.3611	0.7352	0.0536	0.0536	0.0173	239.51
Scrapers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.1723	0.0026	1.1176	0.7579	0.0447	0.0447	0.0155	262.87
Tractors/Loaders/Backhoes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	0.0034	66.884

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.283	000.002	000.217	003.292	000.007	000.006		000.023	00324.051
LDGT	000.361	000.003	000.383	004.629	000.009	000.008		000.024	00417.982
HDGV	000.727	000.005	001.011	015.230	000.021	000.019		000.045	00771.997
LDDV	000.109	000.003	000.133	002.561	000.004	000.004		000.008	00314.635
LDDT	000.249	000.004	000.379	004.384	000.007	000.006		000.008	00446.751
HDDV	000.510	000.013	004.987	001.786	000.170	000.156		000.029	01506.976
MC	002.595	000.003	000.737	013.274	000.028	000.024		000.054	00396.864

2.2.4 Trenching / Excavating Phase Formula(s)

- Fugitive Dust Emissions per Phase
$PM10_{FD} = (20 * ACRE * WD) / 2000$

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds

EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

2.3 Building Construction Phase

2.3.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 9
Start Quarter: 4
Start Year: 2022

- Phase Duration
Number of Month: 12
Number of Days: 30

2.3.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (ft^2): 100000
Height of Building (ft): 20
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cranes Composite	1	6
Forklifts Composite	2	6
Generator Sets Composite	1	8
Tractors/Loaders/Backhoes Composite	1	8
Welders Composite	3	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
Average Vendor Round Trip Commute (mile): 40 (default)

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

2.3.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Cranes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0797	0.0013	0.5505	0.3821	0.0203	0.0203	0.0071	128.81
Forklifts Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0274	0.0006	0.1265	0.2146	0.0043	0.0043	0.0024	54.457
Generator Sets Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0340	0.0006	0.2783	0.2694	0.0116	0.0116	0.0030	61.069
Tractors/Loaders/Backhoes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	0.0034	66.884
Welders Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0260	0.0003	0.1557	0.1772	0.0077	0.0077	0.0023	25.661

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.283	000.002	000.217	003.292	000.007	000.006		000.023	00324.051
LDGT	000.361	000.003	000.383	004.629	000.009	000.008		000.024	00417.982
HDGV	000.727	000.005	001.011	015.230	000.021	000.019		000.045	00771.997
LDDV	000.109	000.003	000.133	002.561	000.004	000.004		000.008	00314.635
LDDT	000.249	000.004	000.379	004.384	000.007	000.006		000.008	00446.751
HDDV	000.510	000.013	004.987	001.786	000.170	000.156		000.029	01506.976
MC	002.595	000.003	000.737	013.274	000.028	000.024		000.054	00396.864

2.3.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = BA * BH * (0.42 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase
$VMT_{VT} = BA * BH * (0.38 / 1000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

2.4 Paving Phase

2.4.1 Paving Phase Timeline Assumptions

- Phase Start Date
Start Month: 9
Start Quarter: 4
Start Year: 2022

- Phase Duration

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

Number of Month: 2
Number of Days: 0

2.4.2 Paving Phase Assumptions

- General Paving Information
Paving Area (ft^2): 87120

- Paving Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cement and Mortar Mixers Composite	4	6
Pavers Composite	1	7
Paving Equipment Composite	2	6
Rollers Composite	1	7
Tractors/Loaders/Backhoes Composite	1	7

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 20 (default)

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 20 (default)

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.4.3 Paving Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour) (default)

Graders Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0806	0.0014	0.4657	0.5731	0.0217	0.0217	0.0072	132.92
Other Construction Equipment Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0507	0.0012	0.2785	0.3488	0.0105	0.0105	0.0045	122.61
Rollers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0499	0.0007	0.3198	0.3798	0.0180	0.0180	0.0045	67.149
Rubber Tired Dozers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.1919	0.0024	1.3611	0.7352	0.0536	0.0536	0.0173	239.51
Scrapers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.1723	0.0026	1.1176	0.7579	0.0447	0.0447	0.0155	262.87
Tractors/Loaders/Backhoes Composite								

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	0.0034	66.884

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.283	000.002	000.217	003.292	000.007	000.006		000.023	00324.051
LDGT	000.361	000.003	000.383	004.629	000.009	000.008		000.024	00417.982
HDGV	000.727	000.005	001.011	015.230	000.021	000.019		000.045	00771.997
LDDV	000.109	000.003	000.133	002.561	000.004	000.004		000.008	00314.635
LDDT	000.249	000.004	000.379	004.384	000.007	000.006		000.008	00446.751
HDDV	000.510	000.013	004.987	001.786	000.170	000.156		000.029	01506.976
MC	002.595	000.003	000.737	013.274	000.028	000.024		000.054	00396.864

2.4.4 Paving Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
PA: Paving Area (ft^2)
0.25: Thickness of Paving Area (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase
$VOC_P = (2.62 * PA) / 43560$

VOC_P: Paving VOC Emissions (TONs)
2.62: Emission Factor (lb/acre)
PA: Paving Area (ft^2)
43560: Conversion Factor square feet to acre (43560 ft2 / $acre)^2$ / acre)

3. Heating

3.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Coffee
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: CONSTRUCTION AND OPERATION OF BARRACKS, DINING HALLS, AND ADMINISTRATION BUILDINGS FOR THE TENNESSEE

- Activity Description:
The Proposed Action would construct and operate up to 20 new one-story, 5,000-square-foot (SF) open-bay barracks with latrines; showers; laundry; exterior paving; stairs, ramps, and walkways; and grading and drainage; and all related work for a new functional and energy-efficient barracks for the TNARNG at VTS-T on Arnold AFB. The 20 new barracks would increase bed capacity by 640. The proposed five new 200-person dining facilities (each approximately 4,500 SF) and five new administrative and storage facilities totaling approximately 5,960 SF associated with the barracks would also be constructed at VTS-T. TNARNG would construct each new barracks in the coming years as funding becomes available. Currently, TNARNG has only secured funding for one one-story 5,000 square foot open-bay barracks building. If TNARNG obtains funds for additional barracks buildings and the proposed dining halls and administration/storage buildings, then TNARNG would review this EA to determine if language regarding site conditions and potential environmental consequences need to be revised and updated. TNARNG would coordinate its EA review findings with ARNG-G9 NEPA staff. As funding is realized for any of the remaining barracks included in the Proposed Action, this EA would be revisited and additional analysis would be completed as deemed appropriate. Construction of one new 5,000 SF barracks would take no more than 12 months. The additional required bed, dining, and administrative spaces would be programmed and constructed in the future, as funding becomes available. TNARNG has sought National Guard Bureau approval and programming for the construction of new barracks for several years, with a two- to three-story barracks as the preferred design type, which would reduce the facility footprint, save land, decrease walking distances, and make VTS-T more compliant with a sustainable planning strategy that promotes compact development. However, TNARNG's proposed new two-story barracks construction has been unsuccessful in being selected using the preferred design. The need for additional bed space to accommodate the annual throughput of soldiers training at VTS-T has continued to grow and, consistent with the Army's Sustainable Design and Development policy, TNARNG proposes construction of multiple open-bay barracks to meet need and to align the barracks design with the currently available funding

priorities. Therefore, the construction of multiple barracks of only one specific type, open bay, is being considered as part of the Proposed Action in this EA.

- Activity Start Date
Start Month: 9
Start Year: 2023

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.019460
SO_x	0.002123
NO_x	0.353810
CO	0.297200
PM 10	0.026890

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.026890
Pb	0.000000
NH_3	0.000000
CO_2e	426.0

3.2 Heating Assumptions

- Heating
Heating Calculation Type: Heat Energy Requirement Method

- Heat Energy Requirement Method
Area of floorspace to be heated (ft^2): 100000
Type of fuel: Natural Gas
Type of boiler/furnace: Industrial (10 - 250 MMBtu/hr)
Heat Value ($MMBtu/ft^3$): 0.00105
Energy Intensity ($MMBtu/ft^2$): 0.0743

- Default Settings Used: Yes

- Boiler/Furnace Usage
Operating Time Per Year (hours): 900 (default)

3.3 Heating Emission Factor(s)

- Heating Emission Factors (lb/1000000 scf)

VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
5.5	0.6	100	84	7.6	7.6			120390

3.4 Heating Formula(s)

- Heating Fuel Consumption ft^3 per Year
FC_{HER}= HA * EI / HV / 1000000

FC_{HER}: Fuel Consumption for Heat Energy Requirement Method
HA: Area of floorspace to be heated (ft^2)
EI: Energy Intensity Requirement ($MMBtu/ft^2$)
HV: Heat Value ($MMBTU/ft^3$)
1000000: Conversion Factor

- Heating Emissions per Year

HE_{POL}= FC * EF_{POL} / 2000

HE_{POL}: Heating Emission Emissions (TONs)
FC: Fuel Consumption
EF_{POL}: Emission Factor for Pollutant
2000: Conversion Factor pounds to tons

4. Emergency Generator

4.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Coffee
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: CONSTRUCTION AND OPERATION OF BARRACKS, DINING HALLS, AND ADMINISTRATION BUILDINGS FOR THE TENNESSEE

- Activity Description:
The Proposed Action would construct and operate up to 20 new one-story, 5,000-square-foot (SF) open-bay barracks with latrines; showers; laundry; exterior paving; stairs, ramps, and walkways; and grading and drainage; and all related work for a new functional and energy-efficient barracks for the TNARNG at VTS-T on Arnold AFB. The 20 new barracks would increase bed capacity by 640. The proposed five new 200-person dining facilities (each approximately 4,500 SF) and five new administrative and storage facilities totaling approximately 5,960 SF associated with the barracks would also be constructed at VTS-T. TNARNG would construct each new barracks in the coming years as funding becomes available. Currently, TNARNG has only secured funding for one one-story 5,000 square foot open-bay barracks building. If TNARNG obtains funds for additional barracks buildings and the proposed dining halls and administration/storage buildings, then TNARNG would review this EA to determine if language regarding site conditions and potential environmental consequences need to be revised and updated. TNARNG would coordinate its EA review findings with ARNG-G9 NEPA staff. As funding is realized for any of the remaining barracks included in the Proposed Action, this EA would be revisited and additional analysis would be completed as deemed appropriate. Construction of one new 5,000 SF barracks would take no more than 12 months. The additional required bed, dining, and administrative spaces would be programmed and constructed in the future, as funding becomes available. TNARNG has sought National Guard Bureau approval and programming for the construction of new barracks for several years, with a two- to three-story barracks as the preferred design type, which would reduce the facility footprint, save land, decrease walking distances, and make VTS-T more compliant with a sustainable planning strategy that promotes compact development. However, TNARNG's proposed new two-story barracks construction has been unsuccessful in being selected using the preferred design. The need for additional bed space to accommodate the annual throughput of soldiers training at VTS-T has continued to grow and, consistent with the Army's Sustainable Design and Development policy, TNARNG proposes construction of multiple open-bay barracks to meet need and to align the barracks design with the currently available funding priorities. Therefore, the construction of multiple barracks of only one specific type, open bay, is being considered as part of the Proposed Action in this EA.

- Activity Start Date
Start Month: 9
Start Year: 2023

- Activity End Date
Indefinite: Yes

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.028249
SO_x	0.023794
NO_x	0.116438
CO	0.077760
PM 10	0.025414

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.025414
Pb	0.000000
NH_3	0.000000
CO_2e	13.5

4.2 Emergency Generator Assumptions

- Emergency Generator
Type of Fuel used in Emergency Generator: Diesel
Number of Emergency Generators: 5

- Default Settings Used: Yes

- Emergency Generators Consumption
Emergency Generator's Horsepower: 135 (default)
Average Operating Hours Per Year (hours): 30 (default)

4.3 Emergency Generator Emission Factor(s)

- Emergency Generators Emission Factor (lb/hp-hr)

VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
0.00279	0.00235	0.0115	0.00768	0.00251	0.00251			1.33

4.4 Emergency Generator Formula(s)

- Emergency Generator Emissions per Year

AE_{POL}= (NGEN * HP * OT * EF_{POL}) / 2000

AE_{POL}: Activity Emissions (TONs per Year)
NGEN: Number of Emergency Generators
HP: Emergency Generator's Horsepower (hp)
OT: Average Operating Hours Per Year (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hp-hr)

List of Federal and State Threatened, Endangered, and Special Concern Species and Rare Communities with the Potential to Occur at Arnold Air Force Base

FORMAT PAGE

List of Federal and State Threatened, Endangered, and Special Concern Species and Rare Communities

Scientific Name	Common Name	State Status	GCN Species	State Rank	Federal Status	Global Rank
Plants						
Agalinis oligophylla	Ridge-Stem FALSE Foxglove	E		S1		G4
Carex barrattii	Barratt's Sedge	E		S2		G4
Carex buxbaumii	Brown Bog Sedge	S		S1		G5
Castanea dentata	American Chestnut	S		S2S3		G4
Clethra alnifolia	Coastal Sweet-Pepperbush	T		S1		G5
Cypripedium acaule	Pink Lady's-Slipper	E-CE		S4		G5
Cypripedium kentuckiense	Southern Lady's-Slipper	E		S2		G3
Dichanthelium aciculare	Needle-Leaf Rosette Grass	E		S1		G4G5
Dichanthelium dichotomum var. ensifolium	Small-leaved panic grass; Eaton's Witchgrass	S		S2		G4
Drosera brevifolia	Dwarf Sundew	T		S2		G5
Echinacea pallida	Pale Purple-Coneflower	T		S1		G4
Eleocharis intermedia	Intermediate Spike-Rush	S		S1		G5
Eryngium integrifolium	Blue-flower Coyote-thistle	T		S1		G5
Eupatorium leucolepis var. leucolepis	White-bracted throughwort	E		S1		G5
Festuca paradoxa	Clustered Fescue	S		S1		G5
Gaylussacia dumosa	Dwarf Huckleberry	T		S3		G5
Gentiana puberulenta	Downy Gentian	E		S1		G4G5
Gymnopogon brevifolius	Short-Leaf Skeleton Grass	S		S1S2		G5
Helianthemum propinquum	Low Frostweed	S		S1S2		G4
Helianthus eggertii	Eggert's Sunflower	S		S3		G3
Hypericum adpressum	Creeping St. John's-Wort	E		S1		G2G3
Iris prismatica	Slender Blue Iris	T		S2S3		G4G5
Isoetes melanopoda	Black-Foot Quillwort	E		S1S2		G5
Juglans cinerea	White Walnut	T		S3		G3G4
Lachnanthes caroliana	Carolina Redroot	E		S1		G4
Lechea pulchella var. pulchella	Legget's pinweed	E		S1		G5
Lejeunea sharpii	(Liverwort) Sharp's Lejeunea	E		S1S2		G1G2

Scientific Name	Common Name	State Status	GCN Species	State Rank	Federal Status	Global Rank
Lespedeza angustifolia	Narrow-Leaf Bush-Clover	T		S2		G5
Lilium michiganense	Michigan Lily	T		S3		G5
Liparis loeselii	Yellow Wide-Lip Orchid	T		S1		G5
Listera australis	Southern Twayblade	E		S1S2		G4
Ludwigia sphaerocarpa	Globe-Fruit Primrose-Willow	T		S1		G5
Lycopodiella alopecuroides	Fox-Tail Club-Moss	T		S2		G5
Lysimachia quadrifolia		E		S1		G5?
Marshallia trinervia	Broad-Leaf Barbara's-Buttons	T		S2S3		G3
Muhlenbergia glabriflora	Smooth Muhly	S		S1		G4?
Muhlenbergia torreyana	New Jersey Muhly	E		S1		G3
Myriophyllum pinnatum	Cut-Leaf Water-Milfoil	T		S1		G5
Panicum hemitomon	Maiden-Cane	S		S2		G5?
Pellia appalachiana	(a Liverwort)	S		S2		G1?
Platanthera integra	Yellow Fringeless Orchid	E		S1		G3G4
Pogonia ophioglossoides	Snake-Mouth Orchid	E		S2		G5
Polygala mariana	Maryland Milkwort	S		S1		G5
Polygala nuttallii	Nuttall's Milkwort	E		S1		G5
Prenanthes aspera	Rough Rattlesnake-Root	E		S1		G4?
Prunus pumila var. depressa	Sand cherry	T		S1		G5
Pseduognaphalium helleri	Heller's Rabbit-tobacco	S		S2		G4G5
Ranunculus flabellaris	Greater Yellow Water Buttercup	T		S2		G5
Rhynchospora caduca	Angle-Stem Beak Sedge	S		S1		G5
Rhynchospora perplexa	Pineland Beak Sedge	T		S2		G5
Riccardia jugata	A liverwort	S		S2		G2
Sagittaria graminea var. graminea	Grassleaf Arrowhead	T		S1		G5
Solidago gracillima	Virginia Goldenrod	S		S1		G4?
Symphyotrichum oolentangiensis	Sky-blue Aster	S		S1		G5
Trillium pusillum var. pusillum	Least Trillium	E		S2		G3
Utricularia subulata	Zigzag Bladderwort	T		S1		G5
Vaccinium elliottii	Elliott's Blueberry	E		S1		G5Q
Vaccinium macrocarpon	Large Cranberry	T		S2		G4
Woodwardia virginica	Virginia Chain Fern	S		S2		G5
Xyris fimbriata	Fringed Yellow-Eyed-Grass	E		S1		G5
Xyris laxifolia var. iridifolia	Wide-leaved yellow-eyed-grass	T		S2		G4G5T4T5

Scientific Name	Common Name	State Status	GCN Species	State Rank	Federal Status	Global Rank
Zigadenus leimanthoides	Pine-Barren Deathcamas	T		S2		G4Q
Plant Communities						
CEGL004112 - *Juncus effusus* Herbaceous Vegetation	Soft Rush Seasonally Flooded Herbaceous Vegetation		NA			G5
CEGL004126 - *Panicum hemitomon* - *Dulichium arundinaceum* Herbaceous Vegetation	Maidencane - Threeway Sedge Herbaceous Vegetation		NA			G1
CEGL004150 - *Typha latifolia* Herbaceous Vegetation	Common Cattail Southern Herbaceous Vegetation		NA			G5
CEGL004709 - *Quercus stellata* - (*Quercus coccinea*) / *Quercus marilandica* / *Vaccinium pallidum* - (*Vaccinium stamineum*) Woodland	Post Oak - (Scarlet Oak) / Blackjack Oak / Hillside Blueberry - (Deerberry) Woodland		NA			G2G3
CEGL004712 - *Nyssa aquatica* / *Cephalanthus occidentalis* Forest	Swamp Tupelo / Buttonbush Seasonally Flooded		NA			G1?
CEGL004742 - *Cephalanthus occidentalis* - *Hibiscus moscheutos* ssp. *moscheutos* Shrubland	Buttonbush - Eastern Rose-mallow Shrubland		NA			G3?
CEGL004748 - *Eleocharis microcarpa* - *Juncus repens* - *Rhynchospora corniculata* - (*Mecardonia acuminata* - *Proserpinaca* spp.) Herbaceous Vegetation	Small-fruit Spikerush - Creeping Rush - Shortbristle Horned Beaksedge - (Mecardonia - Mermaid-weed species) Herbaceous Vegetation		NA			G2G3
CEGL004750 - *Saccharum baldwinii* - *Calamagrostis coarctata* - *Panicum rigidulum* - *Rhynchospora capitellata* Herbaceous Vegetation	Slender Plumegrass - Nuttall Reedgrass - Redtop Panicgrass - Northern Beaksedge Herbaceous Vegetation		NA			G2G3
CEGL004751 - S*cirpus cyperinus* - *Panicum rigidulum* var. *elongatum* - *Rhynchospora corniculata* Herbaceous Vegetation	Woolgrass Bulrush - Tall Flat Panic-grass - Shortbristle Horned Beaksedge Herbaceous Vegetation		NA			G3?

Scientific Name	Common Name	State Status	GCN Species	State Rank	Federal Status	Global Rank
CEGL004922 - *Quercus* (*falcata, stellata*) / *Quercus marilandica* / *Gaylussacia* (*baccata, dumosa*) Woodland	(Southern Red Oak, Post Oak) / Blackjack Oak / (Black Huckleberry, Dwarf Huckleberry) Woodland		NA			G2G3
CEGL004975 - *Quercus lyrata* / *Betula nigra* / *Pleopeltis polypodioides* Forest	Overcup Oak / River Birch / Resurrection Fern Forest		NA			G1
CEGL004979 - *Quercus nigra* - *Quercus* (*alba, phellos*) Forest	Water Oak - (White Oak, Willow Oak) Forest		NA			G3?
CEGL004986 - *Pontederia cordata* - *Sagittaria graminea* - *Sagittaria latifolia* Herbaceous Vegetation	Pickerelweed - Grassleaf Arrowhead - Broadleaf Arrowhead Semipermanently Flooded Herbaceous Vegetation		NA			G1G2Q
CEGL004987 - *Quercus velutina* - *Carya* (*alba, glabra*) / *Vaccinium arboreum* Forest	Black Oak - (Mockernut Hickory, Pignut Hickory) / Sparkleberry Forest		NA			G2G3Q
CEGL007247 - *Quercus falcata* - *Quercus coccinea* - *Quercus* (*stellata, velutina*) / *Vaccinium pallidum* Forest	Southern Red Oak - Scarlet Oak - (Post Oak, Black Oak) / Hillside Blueberry		NA			G4
CEGL007364 - *Quercus phellos* - *Quercus alba* / *Vaccinium fuscatum* - (*Viburnum nudum*) / *Carex* (*barrattii, intumescens*) Forest	Willow Oak - White Oak / Black Highbush Blueberry - (Wild Raisin) / (Barratt Sedge, Bladder Sedge) Forest		NA			G2
CEGL007405 - *Quercus phellos* - *Quercus nigra* - (*Nyssa biflora*) Forest	Willow Oak - Water Oak - (Swamp Blackgum) Forest		NA			G1?
CEGL007701 - *Platanus occidentalis* - (*Liquidambar styraciflua, Acer rubrum*) / (*Carpinus caroliniana*) / *Onoclea sensibilis* Forest	Sycamore - (Sweetgum, Red Maple) / (Ironwood) / Sensitive Fern Forest		NA			G4?
CEGL007702 - *Liquidambar styraciflua* - *Quercus michauxii* - *Carya laciniosa* / *Fagus grandifolia* -(*Aesculus flava*) Forest	Sweetgum - Swamp Chestnut Oak - Kingnut Hickory / American Beech - (Yellow Buckeye) Forest		NA			G2G3Q

Scientific Name	Common Name	State Status	GCN Species	State Rank	Federal Status	Global Rank
CEGL007703 - *Salix nigra - Acer* (*rubrum, saccharinum*) / *Alnus serrulata - Cephalanthus occidentalis* Forest	Black Willow - (Red Maple, Silver Maple) / Smooth Alder - Buttonbush Forest		NA			G5
CEGL007705 - *Andropogon gerardii* - (*Andropogon glomeratus, Panicum virgatum, Sorghastrum nutans*) Herbaceous Vegetation	Big Bluestem - (Bushy Broomsedge, Switchgrass, Yellow Indiangrass) Herbaceous Vegetation		NA			G2?
CEGL007706 - *Andropogon gerardii - Schizachyrium scoparium* - (C*alamagrostis coarctata, Panicum virgatum*) Herbaceous Vegetation	Big Bluestem - Little Bluestem - (Nuttall Reedgrass, Switchgrass) Herbaceous Vegetation		NA			G2?
CEGL007707 - *Schizachyrium scoparium - Andropogon* (*gyrans, ternarius, virginicus*) Herbaceous Vegetation	Little Bluestem - (Elliott Beardgrass, Silver Bluestem, Old-field Broomsedge) Herbaceous Vegetation		NA			G3?
CEGL007709 - *Quercus alba - Carya* (*alba, ovata*) - *Liriodendron tulipifera* -(*Quercus phellos*) / *Cornus florida* Forest	White Oak - (Mockernut Hickory, Shagbark Hickory) - Tuliptree - (Willow Oak) / Flowering Dogwood Forest		NA			G4
CEGL007724 - *Quercus falcata - Quercus alba* - (*Quercus coccinea*) / *Oxydendrum arboreum* / *Vaccinium pallidum* Forest	Southern Red Oak - White Oak - (Scarlet Oak) / Sourwood / Hillside Blueberry Forest		NA			G3?
CEGL007746 - *Quercus alba - Quercus* (*falcata, stellata*) / *Chasmanthium laxum* Forest	White Oak - (Southern Red Oak, Post Oak) / Slender Spanglegrass Forest		NA			G3G4Q
Animals						
Amphibian						
Ambystoma talpodium	Mole Salamander		Yes - 1	S4		G5
Hemidactylium scutatum	Four-Toed Salamander	WNM	Yes - 1	S3		G5
Hyla gratiosa	Barking Treefrog		Yes - 1	S3		G5
*Lithobates sevosa***	Gopher Frog		Yes - 1	S1		G3
Pseudotriton montanus	Mud Salamander		Yes - 1	S5		G5
Reptile						

Scientific Name	Common Name	State Status	GCN Species	State Rank	Federal Status	Global Rank
Apalone spinifera	Eastern Spiny Softshell Turtle		Yes - 1	S5		G5
Heterodon platirhinos	Eastern Hognosed Snake		Yes - 1	S4		G5
Nerodia erythrogaster flavigaster	YellowbellyWater Snake		Yes - 1	HYB		G5T5
Ophisaurus a. longicaudus	Eastern Slender Glass Lizard	WNM	Yes - 1	S3		G5T5
Pituophis m. melanoleucus	Northern Pine Snake	T	Yes - 1	S3	MC	G4T4
Birds						
Accipter striatus	Sharp-shinned Hawk		Yes - 1	S3		G5
Peucaea aestivalis	Bachman's Sparrow	E	Yes - 1	S1	MC, BCC	G3
Ammodramus henslowii	Henslow's Sparrow	T	Yes - 1	S1	MC, BCC	G4
Ammodramus savannarum	Grasshopper sparrow		Yes - 1	S4	BCC, PS?	G5
Ardea alba	Great Egret		Yes - 1	S2		G5
Botaurus lentiginosus	American Bittern		Yes - 1	S1	BCC	G4
Caprimulgus carolinensis	Chuck-will's-widow		Yes - 1	S3S4	BCC	G5
Caprimulgus vociferus	Whip-poor-will		Yes - 1	S3S4	BCC	G5
Chaetura pelagica	Chimney Swift		Yes - 1	S5		G5
Chordeiles minor	Common Nighthawk		Yes - 1	S4		G5
Circus cyaneus	Northern Harrier		Yes - 1	S4		G5
Coccyzus americanus	Yellow-billed Cuckoo			S4S5		G5
Colinus virginianus	Northern Bobwhite		Yes - 1	S2S3	PS?	G5
Contopus virens	Eastern Wood-pewee			S5		G5
Dendroica cerulea	Cerulean Warbler	WNM	Yes - 1	S3		G4
Dendroica discolor	Prairie Warbler		Yes - 1	S3S4	?	G5
Dendroica dominica	Yellow-throated Warbler		Yes - 1	S4		G5
Egretta caerulea	Little Blue Heron	WNM		S2B, S3N		G5
Egretta thula	Snowy Egret			S2B, S3N		G5
Empidonax virescens	Acadian Flycatcher			S5		G5
*Grus Americana**	Whooping Crane		Yes - 3	S?	LT-experimental	G1
Haliaeetus leucocephalus	Bald Eagle		Yes- 3	S3	MC	G5
Helmitheros vermivorum	Worm-eating Warbler		Yes - 1	S4	BCC	G5
Hylocichla mustelina	Wood Thrush	WNM	Yes - 1	S4	BCC	G5
Icterus virens	Yellow-breasted Chat		Yes - 1	S4		G5
Icterus spurius	Orchard Oriole		Yes - 1	S4		G5
Lanius ludovicianus	Loggerhead Shrike	WNM	Yes - 1	S1	MC	G4

Scientific Name	Common Name	State Status	GCN Species	State Rank	Federal Status	Global Rank
Melanerpes erythrocephalus	Red-headed Woodpecker		Yes - 1	S4	BCC	G5
Nycticoraxnycticorax	Black-crowned Night-heron	WNM	Yes - 1	S2S3		G5
Oporornis formosus	Kentucky Warbler		Yes - 1	S4		G5
Passerculus sandwichensis	Savannah Sparrow			S1B, S4N		G5
Pooecetes gramineus	Vesper Sparrow			S1B, S4N		G5
Protonotaria citrea	Prothonotary Warbler		Yes - 1	S4	BCC	G5
Scolopax minor	American Woodcock		Yes - 3	S4		G5
Seiurus motacilla	Louisiana Waterthrush		Yes - 1	S4	BCC	G5
Seiurus noveboracensis	Northern Waterthrush			S4N	BCC	G5
Tyto alba	Barn Owl		Yes - 1	S3		G5
Vermivora pinus	Blue-winged Warbler		Yes - 1	S4	BCC	G5
Fish						
*Clinostomas funduloides***	Rosyside Dace					
Hemitremia flammea	Flame Chub	WNM	Yes - 1	S3	MC	G3
Notropis rubellus	Rosyface Shiner		Yes - 1	S2		G5
Mammal						
Myotis grisescens	Gray Bat	E	Yes - 3	S2	LE	G3
Myotis lucifugus	Little Brown Bat	T	Yes - 1	S5		G5
Myotis septentrionalis	Northern Long-eared Bat	E	Yes - 1	S4	LT	G4
Myotis sodalis	Indiana Bat	E	Yes - 3	S1	LE	G2
Neotoma floridana	Eastern Wood Rat	WNM	Yes - 1	S3	MC	G5T5
Napeozapus insignis	Woodland Jumping Mouse		Yes - 1	S4		G5
Ochrotomys nuttalli	Golden Mouse		Yes - 1	S5		G5
Perimyotis subflavus	Tricolored Bat	T	Yes - 1	S5		G5
Sorex cinereus	Masked (Common) Shrew		Yes - 1	S4		G5
Sorex fumeus	Smoky Shrew		Yes - 1	S4		G5
Sorex longirostris	Southeastern Shrew		Yes - 1	S4		G5
Zapus hudsonius	Meadow Jumping Mouse		Yes - 1	S4		G5
Insect						
Folsomia stella	Stellate Springtail		Yes – Tier 2	S1		G1
Tomocerus flavescens	Golden Springtail		Yes – Tier 2	S?		G5

*The occurrences of whooping cranes on AAFB are sporadic and transitory.
**Taxanomix status unclear at present.

Status and Rank Designations Explanation

State Status - *Flora*

State Status indicates which plants are formally listed as state **Endangered**, **Threatened**, or **Special Concern** under the authority of the Tennessee Department of Environment and Conservation. The state status is determined by the Tennessee Rare Plant Scientific Advisory Committee using the criteria listed previously. (Adapted from the Tennessee Department of Environment and Conservation Division of Natural Heritage Inventory Program Web Site: http://www.tn.gov/environment/natural-areas/natural-heritage-inventory-program.shtml).

E - Endangered Species - any species or subspecies of plant whose continued existence as a viable component of the state's flora is determined by the commissioner [of the Department of Environment and Conservation or his/her authorized representatives] to be in jeopardy, including but not limited to all species of plants determined to be "endangered species" pursuant to the Endangered Species Act.

T - Threatened Species - any species or subspecies of plant which appears likely, within the foreseeable future, to become endangered throughout all or a significant portion of its range in Tennessee, including but not limited to all species of plants determined to be a "threatened species" pursuant to the Endangered Species Act.

LT – experimental – As applied to the whooping crane, the population is considered experimental because it is being (re)introduced into suitable habitat that is outside of the whooping crane's current range, but within its historic range. It is designated nonessential because the likelihood of survival of the whooping crane, as a species, would not be reduced if this entire population was not successful and was lost.

S - Special Concern Species - any species or subspecies of plant that is uncommon in Tennessee, or has unique or highly specific habitat requirements or scientific value and therefore requires careful monitoring of its status.

State Status - *Fauna*

Species are listed under the "Tennessee Nongame and Endangered or Threatened Wildlife Species Conservation Act of 1974" as endangered (E), threatened (T), wildlife in need of management (WNM). Species can also be classified as Greatest Conservation Need (GCN) species. The designation of GCN can be used in combination with the other designations or used alone. GCN species are identified in the Tennessee State Wildlife Action Plan (SWAP). (Adapted from the Tennessee Department of Environment and Conservation Division of Natural Heritage Inventory Program Web Site: http://www.tn.gov/environment/natural-areas/natural-heritage-inventory-program.shtml).

E - Endangered Species - any species or subspecies of wildlife whose prospects of survival or recruitment within the state are in jeopardy or are likely within the foreseeable future to become so due to any of the following factors: (i) The destruction, drastic modification, or severe curtailment of its habitat; (ii) Its overutilization for scientific, commercial or sporting purposes; (iii) The effect on it of disease, pollution, or predation; (iv) Other natural or man-made factors affecting its prospects of survival or recruitment within the state; or (v) Any combination of the foregoing factors; or (B) Any species or subspecies of fish or wildlife appearing on the United States' List of Endangered Native Fish and Wildlife as it appears on April 5, 1974 (Part 17 of Title 50, Code of Federal Regulations, Appendix D), as well as any species or subspecies of fish and wildlife appearing on the United States' List of Endangered Foreign Fish and Wildlife (Part 17 of Title 50 of the Code of Federal Regulations, Appendix A), as such list may be modified hereafter

T – Threatened Species- any species or subspecies of wildlife that is likely to become an endangered species within the foreseeable future

D – Wildlife in Need of Management - any species or subspecies of wildlife that needs specific management to prevent it from becoming a threatened species within the state in the foreseeable future.

GCN - Greatest Conservation Need - species that are endemic to the state or a particular ecological region of the state, are especially vulnerable to extirpation, or exhibiting declining trends either range wide or within specific areas of the state.

State Rank - *Fauna*

A numeric rating (S1 through S5) of relative rarity based primarily on the number of occurrences of the element in the state. Other factors in addition to the number of occurrences are considered when assigning rank, so the number of occurrences suggested for each numeric rank below is not an absolute guideline. The Division of Natural Heritage (DNH) has responsibility for assigning state ranks. Those species having a State Rank of S1 to S3, state endemics, and species with a limited distribution in Tennessee should be given special consideration in environmental planning. For further information contact DNH at (615) 532-0431.

S1 - Extremely rare and critically imperiled in the state with five or fewer occurrences, or very few remaining individuals, or because of some special condition where the species is particularly vulnerable to extirpation from Tennessee

S2 - Very rare and imperiled within the state, six to twenty occurrences and less than 3000 individuals, or few remaining individuals, or because of some factor(s) making it vulnerable to extirpation from Tennessee

S3 - Rare and uncommon in the state, from 21 to 100 occurrences

S4 - Widespread, abundant, and apparently secure within the state, though it may be quite rare in parts of its range, especially at the periphery, and is of long-term concern

S5 – Demonstrably common, widespread, and secure in the state

SH - Of historical occurrence in Tennessee, e.g. formally part of the established biota, with the expectation that it may be rediscovered

SU - Possibly in peril in Tennessee but status uncertain, need more information

SX - Believed extirpated from the state with little expectation of rediscovery

S#S# - Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2)

S? - Unranked at this time or rank uncertain

Federal Status

Federally listed species are protected by the Endangered Species Act of 1973 (as amended). The list is administered and determined by the US Fish and Wildlife Service. (Modified From Federal Register, 50 CFR Part 17, Feb. 28, 1996, Vol. 61, No. 40, pp. 7596 - 7613.)

LE - Listed Endangered - taxon is threatened by extinction throughout all or a significant portion of its range

LT - Listed Threatened - taxon is likely to become an endangered species in the foreseeable future

PE - Proposed Endangered - taxon is proposed for listing as endangered

PT - Proposed Threatened - taxon is proposed to be listed as threatened

C - Candidate Species - taxon for which the USFWS has sufficient information to support proposals to list the species as threatened or endangered, and for which the Service anticipates a listing proposal. The US Fish and Wildlife Service will determine the relative listing priority of these candidate species, and encourages other agencies, groups and individuals to give consideration to these taxa in environmental planning

DM – Delisted Taxon - recovered, being monitored for first five year

MC - Management Concern - unofficial indication that this species has been brought to federal attention for review for possible future federal listing

Global Rank

Global ranks are determined by the scientific staff of NatureServe (formerly a section of The Nature Conservancy [TNC]) and state natural heritage programs. Global ranks allow the best available and objective assessment of a rare plant's rarity and the level of threat to its existence. The total number of individuals, the number of populations, and the threats to the populations are considered throughout the plant's range

G1 - Extremely rare and critically imperiled, generally with five or fewer occurrences in the world, or very few remaining individuals, or because of some special condition the species is particularly vulnerable to extinction

G2 - Very rare and imperiled, generally with six to twenty occurrences and less than 3000 individuals, or because of some factor(s), vulnerable to extinction

G3 - Very rare and local throughout its range or found locally in a restricted range, or because of other factors, vulnerable to extinction throughout its range. Generally between 21 and 100 occurrences and fewer than 10,000 individuals.

G4 - Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery. Thus, the plant is of long-term concern.

G5 - Demonstrably secure globally, though it might be quite rare in parts of its range, especially at the periphery.

GH - Of historical occurrence throughout its range, i.e., formally part of the established biota, with the expectation that it may be rediscovered.

GU - Possibly in peril range-wide but status uncertain, need more information.

GX - Believed to be extinct throughout range, with virtually no likelihood that it will be rediscovered.

G#Q - Taxonomic status is questionable, numeric rank may change with taxonomy.

G#? - Inexact numeric rank.

T# - Taxonomic subdivision (trinomial)

Global Rank Communities

(Adapted from: The Nature Conservancy. 1998. An Investigation and Assessment of the Vegetation of Arnold Air Force Base, Coffee and Franklin Counties, Tennessee. Unpublished Report for Arnold Air Force Base, Tennessee.)

G1 - Critically imperiled globally

G2 - Imperiled globally;

G3 - Rare or uncommon;

G4 - Widespread, abundant, and apparently secure, but with cause for long-term concern

G5 - Demonstrably widespread, abundant, and secure

G? - Unranked

GH - Historic

GX - Extinct

GC - Planted/cultivated vegetation

GW - Ruderal vegetation, or vegetation dominated by invasive alien species

GM - Vegetation resulting from the management or modification of natural vegetation, it is readily restorable by management or time, and/or the restoration of ecological processes

US Fish and Wildlife Service Information for Planning and Consultation
List of Threatened and Endangered Species that may Occur in the Proposed Project Location or may be Affected by the Proposed Project

FORMAT PAGE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Tennessee Ecological Services Field Office
446 Neal Street
Cookeville, TN 38501-4027
Phone: (931) 528-6481 Fax: (931) 528-7075

In Reply Refer To: June 22, 2022
Project Code: 2022-0015159
Project Name: VTS-Tullahoma Cantonment Area Expansion and Tree Clearing

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

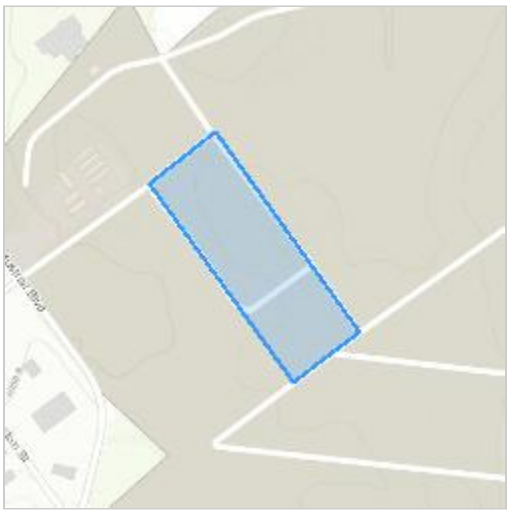
Tennessee Ecological Services Field Office
446 Neal Street
Cookeville, TN 38501-4027
(931) 528-6481

Project Summary

Project Code: 2022-0015159
Event Code: None
Project Name: VTS-Tullahoma Cantonment Area Expansion and Tree Clearing
Project Type: Military Development
Project Description: Tennessee Army National Guard needs to increase the size of its cantonment area on VTS-Tullahoma to remedy extensive shortfalls in the available bed space, dining facilities, and administration buildings for the number of soldiers assigned to train on the installation. VTS-Tullahoma is located just outside the city of Tullahoma, TN on Arnold Airforce Base, in Coffee and Franklin Counties, TN. A joint agency Environmental Assessment with the National guard bureau and Arnold Air Force Base is being conducted at this time. The project will require clearing trees from the entire approximate 16 ac. footprint of the expansion area. Infrastructure (electrical, sewers lines, parking lots, sidewalks, etc.) will be installed, and 20 barracks, 5 mess halls, and 5 administration buildings constructed over the next approximate 20 years as funds become available, with the first barracks already funded and construction set to begin in September 2022. The initial tree removal from the northern 5 ac. of the site is expected to be conducted during August 1 - November 14, 2022. The remaining trees are scheduled to be removed during August 1 - November 14, 2023.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.368366050000006,-86.1761267838929,14z



Counties: Coffee County, Tennessee

Endangered Species Act Species

There is a total of 8 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Gray Bat *Myotis grisescens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6329	Endangered
Indiana Bat *Myotis sodalis* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Clams

NAME	STATUS
Pale Lilliput (pearlymussel) *Toxolasma cylindrellus*	Endangered
No critical habitat has been designated for this species.	
Species profile: https://ecos.fws.gov/ecp/species/3118	
Slabside Pearlymussel *Pleuronaia dolabelloides*	Endangered
There is **final** critical habitat for this species. The location of the critical habitat is not available.	
Species profile: https://ecos.fws.gov/ecp/species/1518	
Snuffbox Mussel *Epioblasma triquetra*	Endangered
No critical habitat has been designated for this species.	
Species profile: https://ecos.fws.gov/ecp/species/4135	
Turgid Blossom (pearlymussel) *Epioblasma turgidula*	Endangered
Population: Wherever found; Except where listed as Experimental Populations	
No critical habitat has been designated for this species.	
Species profile: https://ecos.fws.gov/ecp/species/7659	

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus*	Candidate
No critical habitat has been designated for this species.	
Species profile: https://ecos.fws.gov/ecp/species/9743	

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Kentucky Warbler *Oporornis formosus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20

NAME	BREEDING SEASON
Prairie Warbler *Dendroica discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12

(0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

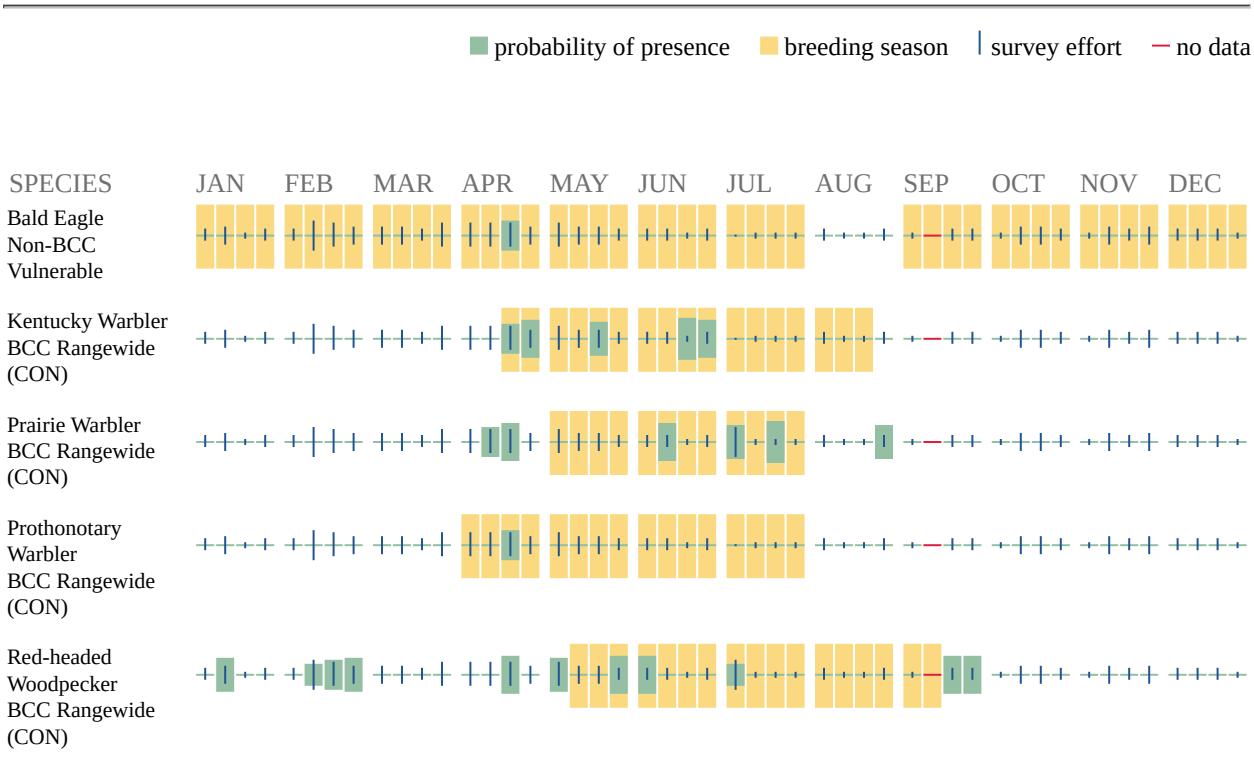
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

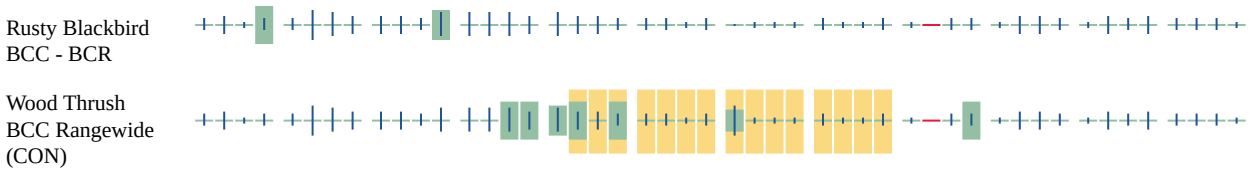
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

THERE ARE NO WETLANDS WITHIN YOUR PROJECT AREA.

IPaC User Contact Information

Agency: Army National Guard
Name: Brian Knapp
Address: JFHQ-TN-FMO-ENV, 3041 Sidco Dr.
City: Nashville
State: TN
Zip: 37204-1502
Email brian.e.knapp.nfg@army.mil
Phone: 6153395814

Draft Biological Assessment
Proposed Timber Clearing and Cantonment Area
Construction on Volunteer Training Site - Tullahoma
Arnold Air Force Base

FORMAT PAGE

NATIONAL GUARD BUREAU
111 SOUTH GEORGE MASON DRIVE
ARLINGTON VA 22204-1373

July 11, 2022

Daniel Elbert
U.S. Fish and Wildlife Service
446 Neal Street
Cookeville, TN 38501

Dear Mr. Elbert,

In accordance with §7 of the Endangered Species Act (16 USC §1531 et seq., [ESA]) and 50 CFR §402.14, the Army National Guard Installations & Environment Directorate (ARNG G-9) seeks to initiate formal consultation with the U.S. Fish and Wildlife Service (USFWS) regarding the proposed construction and operations of facilities on the Volunteer Training Site-Tullahoma Cantonment Area located within Arnold Air Force Base.

As described in the enclosed Biological Assessment (BA), ARNG G-9 and the Tennessee Army National Guard (TNARNG) have determined that the proposed project is likely to adversely affect the endangered Indiana Bat (*Myotis sodalis*) and threatened Northern Long-eared Bat (*M. septentrionalis*). We have also determined that construction activities and operations are not likely to adversely affect the endangered Gray Bat (*M. grisescens*). The Tricolored Bat (*Perimyotis subflavus*) and Little Brown Bat (*M. lucifugus*) are currently undergoing 12-month reviews for listing consideration, with listing determinations scheduled before project completion. We have determined the proposed project is likely to adversely affect both bats. To expedite the requirements of ESA 7(a)(4) or 7(a)(2), if either or both species are proposed for listing or listed, we included assessments of the species in separate appendices in the enclosed BA.

Actions covered under this consultation include clearing of timber, construction, and operation and maintenance of facilities. The permanent conversion of a 5.19 ac. block of good quality bat habitat within the project footprint is what has been determined likely to adversely affect the two listed bats, and two other bats currently being evaluated.

ARNG G-9, per 50 CFR §402.08, wishes to designate the TNARNG as a non-federal representative to conduct informal consultation with the USFWS regarding these and any other ESA listed species that may be subject to §7 consultation on TNARNG sites throughout Tennessee.

The ARNG G-9 will participate in all aspects of this formal consultation with the USFWS, to include the review of the draft Biological Opinion. The TNARNG will

coordinate all consultations with the ARNG G-9 Conservation Branch, where the ultimate responsibility for compliance with §7 remains.

Your time and assistance in this matter are greatly appreciated. Please address any questions and reply letters to Brian Knapp, TNARNG Natural Resources Manager at brian.e.knapp.nfg@army.mil or (615) 313-0945; and Jay Rubinoff, ARNG G-9 Natural Resources Program Manager at jay.m.rubinoff.civ@army.mil or (443) 616-7018.

We look forward to working with the USFWS on this consultation to promote the continued conservation of listed and other bat species.

Sincerely,

Anthony Hammett
Colonel, U.S. Army
Chief, G-9 Army National Guard

Enclosure

cc:
Chief, Arnold Air Force Base Installation Management

BIOLOGICAL ASSESSMENT

PROPOSED TIMBER CLEARING AND CANTONMENT AREA CONSTRUCTION ON VOLUNTEER TRAINING SITE – TULLAHOMA/ARNOLD AIR FORCE BASE

Consulting Agencies:
US Army National Guard G-9 (Installation & Environment)
And
US Department of the Air Force, Arnold Air Force Base

Designated Non-Federal Representative:
Tennessee Military Department/Tennessee Army National Guard

Submitted To:
US Fish and Wildlife Service
Tennessee Ecological Services Field Office
Cookeville, Tennessee

Date:
27 June 2022

Table of Contents

List of Tables

List of Figures

List of Appendices

List of Acronyms:

AFB	Air Force Base
AEDC	Arnold Engineering Development Complex
ARNG I&E	Army National Guard G-9
BA	Biological Assessment
BE	Biological Evaluation
BO	Biological Opinion
CFR	Code of Federal Regulation
DAF	Department of the Air Force
DoD	Department of Defense
DOI	Department of Interior
EA	Environmental Assessment
EPSC	Erosion Prevention and Sediment Control
ESA	Endangered Species Act of 1973
FY	Fiscal Year
INRMP	Integrated Natural Resources Management Plan
IPaC	Information for Planning and Consultation
NGB	National Guard Bureau
NLEB	Northern Long-Eared Bat
TNARNG	Tennessee Army National Guard
TN IBCF	Tennessee Imperiled Bat Conservation Fund
USFWS	US Fish and Wildlife Service
VTS	Volunteer Training Site
WNS	White Nose Syndrome

Executive Summary

The Tennessee Army National Guard (TNARNG), in conjunction with the Department of the Air Force, Arnold Air Force Base (AFB), is preparing a Joint Environmental Assessment evaluating potential environmental impacts associated with clearing forested land and expanding the Cantonment Area of Volunteer Training Site (VTS) Tullahoma. As the proponent, Army National Guard G-9 will be the lead federal action agency for consultation. This Biological Assessment was prepared in support of the joint formal consultation for the project. Expanding the cantonment area will require clearing all vegetation from 14.9 acres (ac.) of forested land, comprised of 9.71 ac. of young pine plantation in two roughly equal blocks, and a 5.19 ac. hardwood forest block. The 450-ac. action area of the project includes the 14.9 ac. project footprint, a 0.25-mile sound and vibration effects buffer surrounding the footprint, materials deposition site in the NW corner of the drop zone, parking/staging area, commercial off-site borrow pit, and all roads connecting them. Expanding the cantonment area will include constructing 20, 5000 sq. ft., open-bay barracks, 5 dining facilities, and 6 supply and administration buildings. The project is needed to remedy existing crowding, a 640-bead shortfall, and support facilities needed to support the troops assigned to train on VTS-Tullahoma. The new construction will enhance the ability of the TNARNG to fulfill its military training mission by fully supporting all units assigned to train on base.

A list of species to be evaluated for potential effects of the action was generated using the US Fish and Wildlife Service (USFWS) Information for Planning and Consultation tool and the USFWS 2022 Listing Work Plan. This BA evaluates three ESA listed species that have been documented on Arnold AFB (Indiana bat, *Myotis sodalis*; northern long-eared bat, *M. septentrionalis;* gray bat*, M. grisescens*). While the NLEB Final 4(d) Rule addresses all potential incidental take and impacts to the NLEB in this instance, the Service recently proposed to change the listing status of the species to endangered, which may occur prior to completion of the project, negating the 4(d) Rule. TNARNG therefore includes the NLEB in this formal consultation. Considering the species biology and habitat requirements, it was determined that while permanent removal of the 9.71 ac. of pine plantation “may effect, but is not likely to adversely affect”, the permanent removal of 5.19 ac. of good quality hardwood bat habitat and construction of buildings will “adversely affect” the Indiana and Northern long-eared bats. It was also determined that the action “may effect, but is not likely to adversely affect” the gray bat. TNARNG believes that in conjunction with the avoidance and minimization measures already taken, contributing to the Tennessee Imperiled Bat Conservation Fund for the 5.19 ac. of good quality bat habitat to be permanently eliminated will additionally provide a conservation benefit to these species and further ARNG G-9 responsibilities under ESA Section 7(a)(1).

1.0 Introduction:

The Tennessee Army National Guard (TNARNG), in conjunction with the Department of the Air Force (DAF)/Arnold Air Force Base (AFB), is preparing a Joint Environmental Assessment (EA) evaluating potential environmental impacts associated with clearing 14.9 acres (ac.) of forested land and expanding the Cantonment Area of Volunteer Training Site (VTS) Tullahoma to include additional barracks and supporting infrastructure. VTS-Tullahoma is located on Arnold AFB in Coffee and Franklin counties, Tennessee. The TNARNG is a subcommand of the National Guard Bureau (NGB). As the proponent, Army National Guard G-9 (Installation & Environment, ARNG I&E) will be the lead federal action agency for consultation, and per 50 Code of Federal Regulation (CFR) §402.08, has designated TNARNG as their non-federal representative for informal consultation.

Per 10 United States Code (USC) § 10501, the National Guard Bureau (NGB) is a joint activity of the Department of Defense (DoD). Pursuant to DoD Directive 5105.77, *National Guard Bureau (NGB),* dated 30 October 2015, the NGB serves as the principal advisor to US Army on matters involving the Army National Guard (ARNG), and is responsible for implementing DoD guidance on the structure and strength authorizations of the ARNG. The NGB is responsible for ensuring that ARNG activities are performed in accordance with applicable policies and regulations. As such, the NGB is the lead federal agency responsible for compliance with the Endangered Species Act (ESA) 16 USC §1531 et seq. and preparation of ESA Sec. 7 consultation documentation on projects for which the ARNG is the action agency. The NGB is ultimately responsible for ESA compliance at ARNG installations; however, local responsibility for ESA document preparation and direct interaction with US Fish and Wildlife Service (FWS) officials falls upon state Guard organizations – in this case, the TNARNG.

The purpose of this Biological Assessment (BA) is to determine potential short- and long-term, and cumulative effects of the proposed action on any species listed under the Endangered Species Act of 1973 (ESA, Act), as amended (16 US.C. 1531 et seq.) for use in formal consultation. While the NLEB Final 4(d) Rule addresses all potential incidental take and impacts to the NLEB in this instance, the Service recently proposed to change the listing status of the species to endangered (87 FR 16442 - 16452, which may occur prior to completion of the project, negating the 4(d) Rule. TNARNG therefore includes the NLEB in this formal consultation. We propose to minimize and mitigate, to the maximum extent practicable, adverse effects and incidental take from activities affecting listed species. This BA was developed in accordance with 50 CFR Part 402, and ESA as amended. ARNG G-9 and Arnold AFB recognize their obligation of furthering the purposes of the ESA and cooperation as federal agencies, and have prepared this BA for USFWS review.

1.1 Consultation History

Arnold AFB has a long history of coordination and consultation with the Service, including consultations on behalf of TNARNG for projects occurring on VTS-Tullahoma. A list of Arnold AFB's consultations and coordination with the USFWS from December 2005 through 2015 is

given in the USFWS Programmatic BO for Routine Training, Land Management and Elk River Dam Operations at Arnold Air Force Base Coffee and Franklin Counties, Tennessee (#04ET10000-2015-F-0420). Typical coordination and consultations include those for INRMP updates and revisions, construction projects, and discussions about routine land management, operations, and maintenance activities. However, the proposed timber clearing and cantonment area expansion/barracks construction project was not included in the Arnold AFB Programmatic BO, and must therefore be evaluated and consulted as a separate action.

The TNARNG first contacted the Service about the possibility of a barracks construction project on VTS-Tullahoma/Arnold AFB that would require removal of timber on 4 March 2021. TNARNG indicated there was no certainty of the project due to project funding uncertainties, but requested information on possible mitigation measures if tree clearing was to occur. Between 4 March and 22 August 2021, TNARNG and the Service exchanged e-mails discussing potential mitigation measures, distance to capture and detection locations for listed bat species, known roosts, and known hibernacula.

Upon confirming the funding for the barracks construction was secured, Arnold AFB, TNARNG, and the Service conducted a Teams meeting to discuss the project on 25 August 2021. Primary topics discussed during the meeting were a recap of TNARNG and Service discussions to that point, the joint nature of the EA to be developed, Service guidance on the best way to proceed with the consultation process given the complicated nature of the joint consultation (two federal and one state agency), and Service policy on minimization and avoidance measures prior to using the Tennessee Imperiled Bat Conservation Fund (TN IBCF).

Between 9 September and 21 October 2021, TNARNG and the Service interacted via e-mail about the potential to use the TN IBCF for mitigation of impacts to listed bats, the dollar amount per acre, and how location and timing of the timber harvests would affect the required amount of the contribution. On 21 October 2021, TNARNG contacted the Service about the potential to conduct informal consultation if using the TN IBCF. The Service indicated there was a possible method in place for this approach and it was decided TNARNG would proceed with informal consultation. TNARNG and the Service discussed the need to harvest the timber blocks during two different years and the Service confirmed that they could accommodate the two different harvests under one consultation on 12 December 2021. On 29 December 2021, the Service informed TNARNG that due to the project's initiation date requirement and the expiration of their internal BO on the TN IBCF allowing use of a project specific mini-BO under informal consultation to address ESA legal requirements, the consultation couldn't proceed as discussed. Therefore, formal consultation was/is required.

Representatives of the Service, Arnold AFB, and TNARNG held an in-person meeting at the construction and tree clearing site on 2 February 2022, to get a better understanding of existing site conditions, and discuss the best path forward in regard to the consultation. We determined that the two pine plantation blocks of the harvest area (5.25 ac. and 4.46 ac.) were unsuitable for northern long-eared bat (NLEB; *Myotis septentrionalis*) or Indiana bat (*M. sodalis*) habitat, given the lack of snags or suitable roost trees, and the extremely dense

understory vegetation within the stands, and that their removal could affect but was unlikely to adversely affect the NLEB or Indiana bat. We agreed that the hardwood timber block (5.19 ac.) forming the southern portion of the harvest area, which included snags and suitable roost trees, was suitable NLEB and Indiana bat habitat and its removal could have an adverse effect on the NLEB and Indiana bat. Given that the NLEB is currently proposed for listing as endangered with probable status change occurring prior to the second proposed timber harvest, which would include the hardwood block, the Service recommended conducting formal consultation on the NLEB in addition to the Indiana bat to prevent having to reinitiate formal consultation if the NLEB is upgraded to endangered and the Final 4(d) Rule for that species is eliminated. The Service confirmed that as part of formal consultation, TNARNG could contribute to the TN IBCF as a mitigation measure.

On 7 February 2022, the Service provided input for the joint cantonment area expansion/barracks construction EA requested by Arnold AFB on behalf of TNARNG. The Service indicated that they were coordinating with TNARNG regarding preliminary environmental concerns and potential methods for addressing them. They indicated that three listed bat species have potential to occur within the proposed project area (Indiana bat, NLEB, and gray bat), and that given the lack of potential gray bat roosting caves or similar structures, impacts to the species are not anticipated. They indicated concern of potential impacts to the Indiana bat if the hardwood block is cleared during the proposed time of year (1 August – 14 November). They further indicated concerns for NLEB impacts if the hardwoods are cleared during the proposed timeline of 1 August – 14 November during both 2022 and 2023, that it could be covered by applying section 4(d), but that the option may be eliminated if the species is listed as endangered before the proposed harvest date. The Service also indicated that they are not aware of other federally listed species within the proposed project area.

1.2 Federally Listed Species in the Action Area

The TNARNG utilized the USFWS Information for Planning and Consultation (IPaC) tool to request an official ESA species list and designated critical habitat that could occur in the project vicinity (Appendix A). Table 1 presents the seven listed species, one candidate species, critical habitats, and TNARNG determinations. Three ESA listed species, gray bat (endangered), Indiana bat (endangered), and NLEB (threatened) have been documented on Arnold AFB by the nearly annual bat surveys conducted since 2000. The monarch butterfly (*Danaus plexippus*), a candidate species, has also been documented on Arnold AFB, though not to a level representing its once great abundance (Pers. Com. Brandon Baily). In addition, four other federally protected species pale lilliput (*Toxolasma cylindrellus*, endangered), slabside pearlymussel (*Pleuronaia dolabelloides*, endangered), snuffbox mussel (*Epioblasma triquetra*, endangered), and turgid blossom (*E. turgidula*, endangered) have the potential to occur on VTS-Tullahoma/Arnold AFB, but as yet remain undetected by surveys. Two unlisted bats (tricolored bat, *Perimyotis* subflavus; and little brown bat *M. lucifugus*) are currently under evaluation with listing decisions scheduled before the project completion date, and are therefore considered in Appendices C and D for conference purposes.

Table 1. Listed Species and Critical Habitat on official species list obtained from USFWS IPaC on 22 June 2022 for the VTS-Tullahoma Tree Clearing and Cantonment Area Expansion Project.

Scientific Name Common Name	Species Presence on Arnold AFB	Habitat Present	Critical Habitat	Determination
Myotis sodalis Indiana bat	Documented	Y	N	Likely to Adversely Effect
Myotis septentrionalis Northern Long-Eared bat	Documented	Y	N	Likely to Adversely Effect
Myotis grisescens Gray bat	Documented	Y	N	May Effect, Not Likely to Adversely Effect
Toxolasma cylindrellus Pale Lilliput (pearlymussel)	-	N	N	No Effect
Pleuronaia dolabelloides Slabside Pearlymussel	-	N	N	No Effect
Epioblasma triquetra Snuffbox Mussel	-	N	N	No Effect
Epioblasma turgidula Turgid Blossom (pearlymussel)	-	N	N	No Effect
Danaus plexippus Monarch Butterfly	Documented	N	N	No Effect
Critical Habitat	*N/A*	N/A	N	No Effect

- remain undetected by surveys
N/A Not Applicable

2.0 Overview of Proposed Action:

2.1 Overview and Scope

Section 7 of the ESA, as amended, requires that, through consultation with the Service, federal actions do not jeopardize the continued existence of threatened, endangered, or proposed species or result in the destruction or adverse modification of critical habitat. Section 7(a)(1) of the Act directs federal agencies, in consultation with the Service, to use their authorities to further the purposes of the ESA by carrying out programs for the conservation of endangered and threatened species. Additionally, Section 7(a)(2) of the Act requires federal agencies to ensure that any action they authorize, fund, or carry out (i.e., has a federal nexus) is not likely to jeopardize the continued existence of any federally listed threatened or endangered species or result in the destruction or adverse modification of designated critical habitat.

VTS-Tullahoma is a 7,993 ac. TNARNG training facility that has been located on Arnold AFB (Figure 1) since the early 1970s. The land is located on and licensed from Arnold AFB. It serves as TNARNG's largest training facility. The USFWS Programmatic BO for Routine Training, Land

Management and Elk River Dam Operations at Arnold Air Force Base (USFWS 2016) addresses the normal TNARNG facilities and training uses of VTS-Tullahoma. This includes existing facilities use to conduct small arms range firing, maneuvering, and combined arms training. It supports field bivouac, tracked and wheeled vehicle operations on all military developed roads and major trails, mounted and dismounted maneuvers, and weapons firing.

Off-road maneuvers are permitted within designated open terrain areas and in designated fringe areas within 100 feet (ft.) of specified roads and trails. Arnold AFB manages all natural resources on VTS-Tullahoma under the current Arnold AFB INRMP. Natural resources, including threatened and endangered species, are regularly surveyed and inventoried under the INRMP. Information from these surveys were used to evaluate potential effects of the cantonment area expansion/barracks construction. The proposed action is intended to resolve a significant deficit of bed space (640 beds) and associated support facilities needed for the number of soldiers assigned to train on the installation. This deficit prevents the facility from meeting its mission of training TNARNG soldiers.

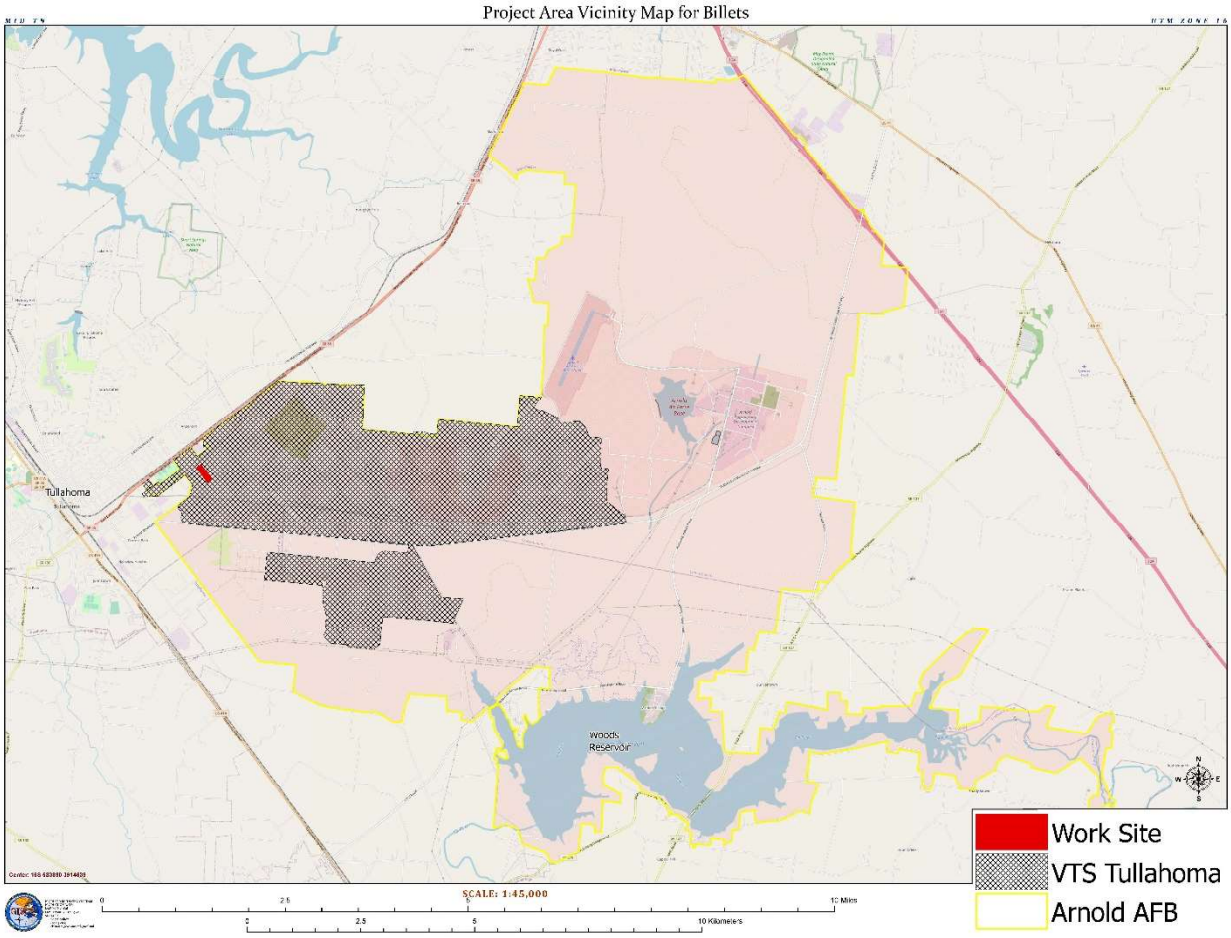


Figure 1. Map showing the vicinity of the project relative to its position in VTS-Tullahoma, Arnold AFB, and nearby towns.

2.2 Action Area

The term "action area" means all areas to be affected directly or indirectly by the proposed federal action, and not merely the immediate area involved in the action. The 450 ac. action area includes the 14.9 ac. footprint of the site, a 0.25-mile-wide area of potential noise and vibration effects around the site footprint, the roads and areas involved in acquiring borrow for needed fill, parking/staging area, and areas where excess materials will be deposited (Figure 2). Trees and stumps removed from the work site awaiting destruction will be stored at the northwest treeless corner of the drop zone. All fill/borrow will come from off Base commercial borrow pits, with materials being transported on paved public roads. Staging will be done in the paved motor pool area, just to the east of the construction site, with vehicles accessing the site on the most direct paved and gravel roads possible. Utilities will be connected to the construction site from the southeast corner of the existing cantonment area through the northwest corner of the footprint. Other than potential commercial fill transport and small portions of the noise effects area (Figure 2), it is not anticipated the action area will extend off VTS-Tullahoma.

The 14.9 ac. project footprint is comprised of three forested blocks, mostly surrounded by heavily graveled roads (Figure 3). The two northern blocks are dense young pine plantations with very sparsely intermixed hardwoods (Figures 4 & 5). The northern and southern pine plantations are 5.25 and 4.46 ac. respectively. The two pine plantations are unsuitable for bat habitat because they lack snags and damaged or diseased trees to provide suitable roosts for bats. The pine plantation understories are too dense to provide suitable bat foraging habitat (Figures 6 & 7), and are comprised of both native species and non-native invasive species. The southernmost block is a 5.19 ac. hardwood stand that provides good quality forest dwelling bat habitat (Figure 8). The hardwood block has abundant snags and diseased or damaged trees to provide potential roost and maternity colony trees. TNARNG surveyed the hardwood block and recorded 39 potential roost trees and snags, with 21 potentially meeting Indiana bat requirements based on sloughing bark or holes at least 15 feet above ground, and all meeting NLEB roost requirements. See Appendix B for more detailed data. Trees in the hardwood stand are relatively sparsely distributed, allowing adequate solar exposure for roosts. The understory is relatively open, providing potential foraging habitat for forest dwelling bats.

The 0.25-mile-wide area of potential noise and vibration effects around the construction footprint was determined using techniques and information in the Washington Departing of Transportation (WA DOT) BA training manual (WA DOT 2020). No specific noise levels are available for noise disturbance thresholds of roosting bats in the literature, so the distance of no effect currently used by USFWS for spotted owls, reported in WA DOT 2020 was used. We used owl values due to their sensitive and broad frequency range hearing. We must assume the hearing of owls simulates the sensitivity of bats closer than any of the species with information available. The 0.25 mi. distance was checked and accepted by using WA DOT methods to calculate the highest combined expected noise level from the three loudest pieces of equipment anticipated for timber harvest and construction work, calculating noise

attenuation through thick forest and over soft (noise absorbent) surfaces to where it approaches or drops below expected ambient noise levels, and in comparison, to the listed threshold. Ambient forest noise levels measured at 52 – 60 decibels (dB) on the Snoqualmie National Forest (USFS 1996) were used. WA DOT 2020 indicates USFWS historically used 92 dB for a disturbance threshold for spotted owls. Our calculations indicate the maximum timber harvest noise would drop below 92 dB at approximately 400 ft. and the maximum construction noise at 100 ft. The 0.25 mi. distance was used to be conservative, apply current standards, and consider the entire area with potential effects. It should also be noted that the BA for activities occurring on Ft. Drum NY (US Army 2014) indicates Indiana bats roosting within 400m (slightly under 0.25 miles) of active construction sites and showing normal behavior when foraging.

Figure 2. Map depicting the 450 ac. project action area including the yellow used roads, green materials disposal/storage area, red project footprint, orangish yellow parking/staging area and salmon colored perimeter of the 0.25 mile radius potential noise and vibration effect area.

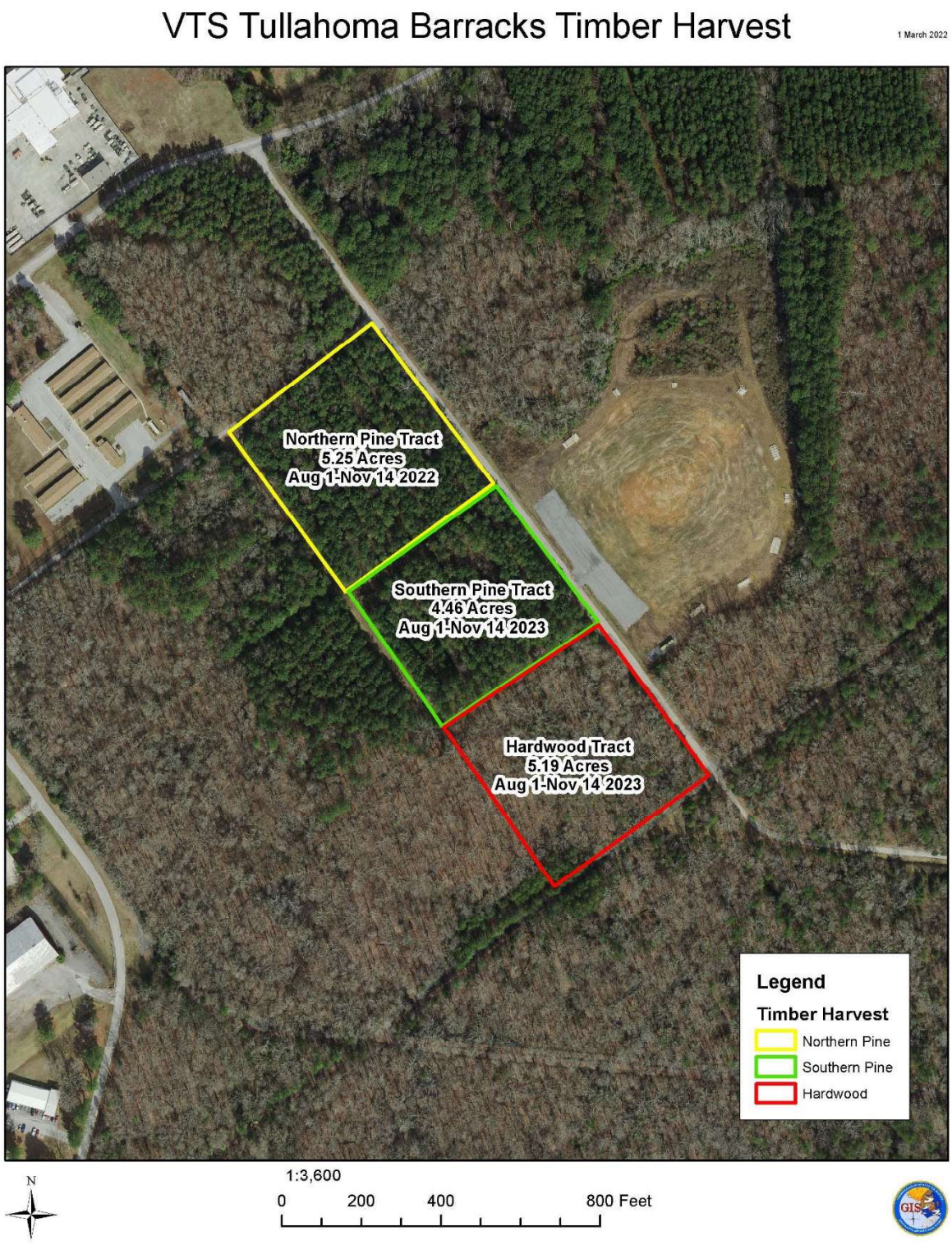


Figure 3. VTS-Tullahoma timber clearing and cantonment area expansion footprint with acres and harvest dates for the three timber stands.

Figure 4. Photo of northern pine stand depicting general stand conditions (e.g. dense young pine with very sparsely distributed hardwoods).

Figure 5. Photo of southern pine stand depicting general stand conditions (e.g., dense young pine with very sparsely distributed hardwoods.

Figure 6. Photo of Northern pine stand depicting dense understory conditions.

Figure 7. Photo of Southern pine stand depicting dense understory conditions.

Figure 8. Photo of hardwood stand depicting relative openness, allowing desirable solar exposure, and relatively open understory providing good bat foraging habitat.

3.0 Description of Action:

The TNARNG will expand the VTS-Tullahoma Cantonment Area by adding and operating up to 20, 5000 sq. ft., open-bay barracks, 5 dining facilities, and 6 supply and administration buildings (Figure 9) over the next 20 years. The additional buildings are needed to resolve existing crowding, a shortfall of bead space, and support facilities required to support the number of troops assigned to train on site. The 20 new barracks will increase bed capacity by 640. The new construction will enhance the ability of the TNARNG to fulfill its military training mission by fully supporting all units assigned to training at VTS-Tullahoma/Arnold AFB. The Proposed Action is needed to rectify bed space, dining, administrative, and storage facilities deficits for TNARNG units training at the Installation. The existing barracks space is too small for the number of TNARNG troops assigned to train at VTS-Tullahoma/Arnold AFB.

Expanding the cantonment area will require clearing all vegetation from 14.9 forested acres on VTS-Tullahoma, which is located in the western portion of Arnold AFB and VTS-Tullahoma (see Figure 1). The forested area is comprised of 9.71 ac. of pine plantation in two roughly equal

blocks, and a 5.19 ac. block of hardwood forest (see Figure 3). The pine plantation area has a variety of hardwood species mixed in at very low density, and along their north and east edges. Stumps and root-wads will remain attached to trees being removed and hauled to the materials deposition site from the initial 5.25 ac. pine plantation block (north block) clearing operation in 2022 (Figure 3). Stumps and root systems will remain in place for soil stabilization after harvesting the remaining pine plantation block (middle block) and hardwood block (south block) in 2023. Stumps from portions of these blocks will be removed and the area regraded as future construction site preparations are enacted.

Existing water and gas lines run along the northern edge of the unit and will be tied into in the northwest corner (Figure 10). An existing electrical line runs along the north side of the northern boundary road, and will be brought over the road, and join the gas and waterlines underground in the northwest corner (Figure 10). Lines will be run underground to the first barracks location, and extended as additional buildings are added, eventually circling the outside edge of the project footprint.

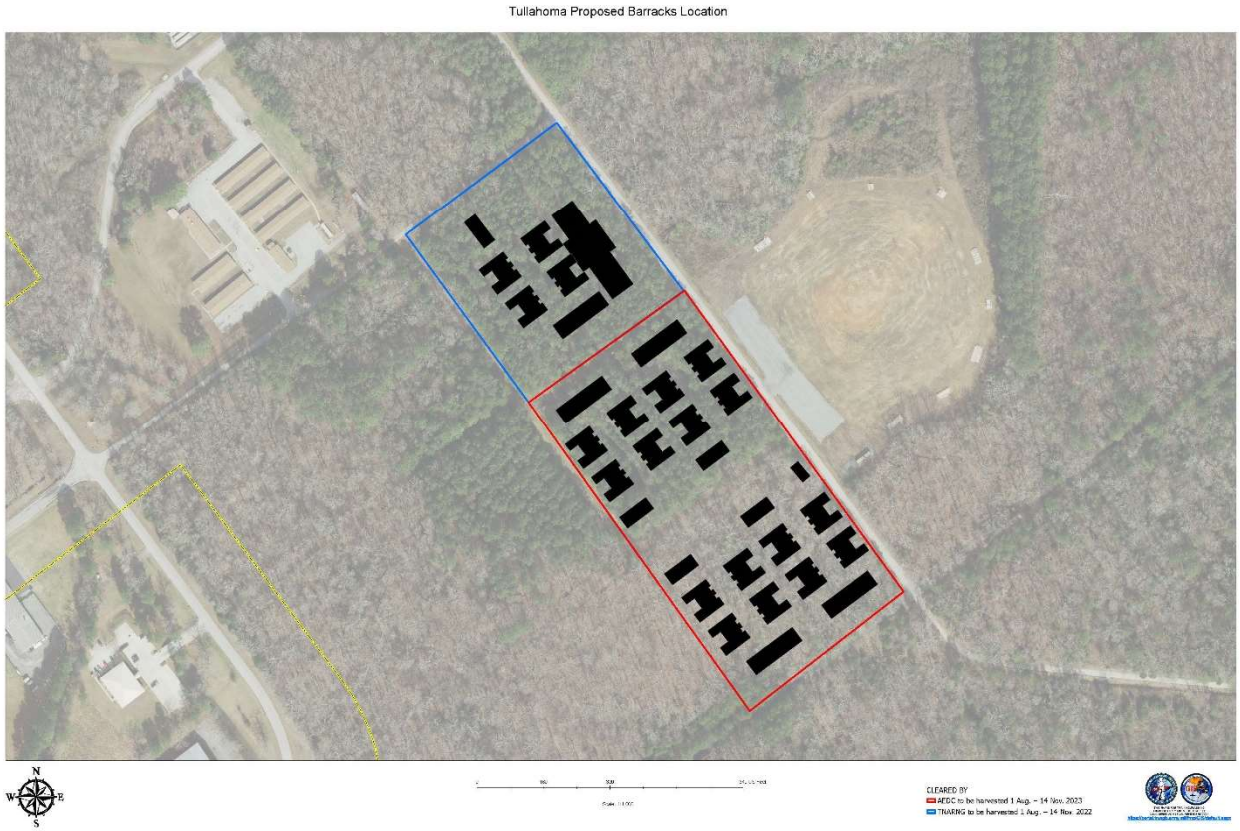


Figure 9. Map of the building layout within the project footprint.

Figure 10. Utility layout with route to first building.

The project will be implemented over an approximate 20 or more year period. All project activities will occur during daylight hours, typically between 6:30 am and 5 pm. No project work will occur at night. Timber harvests will be accomplished in two phases, between 1 August and 15 November in each of 2022 and 2023. Timber harvests should be accomplished in an approximate 35-40-day period once initiated. The initial barracks construction is scheduled to begin in September 2022 and may take up to one year to accomplish. Other buildings will be constructed as funds become available and could be initiated at any time of year dependent on when funds and contracts are awarded. It is anticipated that future building contracts will also be awarded to include a one-year timeline.

Water quality protection measures and Best Management Practices (BMPs), to be identified in the site-specific Storm Water Pollution Prevention Plan (SWPPP) required by the Tennessee Department of Environmental Conservation (TDEC) for soil disturbance greater than 1 acre, will prevent sediment and contaminants from entering nearby water bodies (Bobo Creek). Only water quality protection measures and BMPs for the first barracks construction are known at this time, as it is the only building in the design phase. Known measures for the initial barracks construction include installation of silt fence, and a sediment basin (see Figure 11). All Erosion Prevention ad Sediment Control (EPSC) measures will be designed by a Professional Engineer taking site conditions into account, and included in the SWPPP currently in development. All recommended BMPs in the SWPPP bill be installed prior to the initiation of construction and construction sequencing will be utilized. The EPSC measures likely to be employed include silt fence in downslope locations and around any soil stockpiles, construction exit, outfall protection, and temporary and permanent vegetation stabilization. All EPSC measures will be designed and installed per the current Tennessee Erosion and Sediment Control Handbook. Permit coverage under the National Pollutant Discharge Elimination System General Permit for Discharges of Stormwater Associated with Construction Activities will be obtained, and requirements followed at all times. Twice-weekly EPSC inspections will be conducted and documented by a certified individual as required to ensure EPSC measures are properly functioning and to assess whether additional EPSC measures are needed. The harvest blocks are bounded by gravel roads, which will prevent impacts from logging and construction equipment approaching and leaving the site. In general, water quality protection measures and BMPs will be broken into measures used as part of the timber removal, and those for building construction (Table 2).

Timber harvest water quality protection measures and BMPs implemented vary with the site, but follow standards established in the Tennessee Best Management Practices for Logging as stated in the Tennessee Department of Agriculture publication: Guide to Forestry Best Management Practices in Tennessee (Pers. Com. Brandon Bailey). The BMP most commonly implemented with timber harvests on Arnold AFB is utilizing logging slash to stabilize soil on logging decks and skid trails. The Arnold AFB Forest Products Program requests contractors begin scattering slash on these areas before any site degradation is visible. If stream crossings or sensitive areas are present, they will meet on site and discuss approach and expectations with the harvest contractor before any harvest operations begin, and monitor on site

conditions so they can halt operations if they believe there is a threat to water quality or site conditions (Pers. Com. Brandon Bailey). Methods implemented by TNARNG for the initial timber removal on the northern pine block are still in development with the SWPPP, but will likely include requirements for spreading slash on skid trails and loading decks, and include installing silt fence on the west boundary (the lower end) of the unit.

Land clearing will be accomplished in two phases. TNARNG staff will clear the initial (northern most) 5.25 ac. pine plantation block (see Figure 3) in late summer/ early fall (1 August – 14 November) 2022 to meet the required construction timeline for the single initial barracks. This initial pine plantation block will not be cleared as a timber harvest, but rather be cleared and timber hauled to and stored at the tree deposition site using the roads depicted in Figure 2. Trees and attached root systems will be removed using a Hyex track hoe and/or D7 bulldozer. The same pieces of equipment will transport or skid the trees to a log landing where they will be loaded on a semi-truck and flat-bed trailer using a 5-yard front-end-loader with forks. The tree removal area will be "raked" using a Hyex track hoe to fill holes left by root wads with materials from their surroundings, without altering the natural drainage path. Clearing operations will take approximately 35-40 days.

A road grader, bulldozer, track hoe, and backhoe will be used to grade and prepare the site for the first barracks construction. The first barracks construction footprint will be 0.5 ac. and will need to have approximately 500 cubic yards (cy) of soils undercut (2' deep and 5' outside the building pad. Spoils will be stored on the cleared 5 ac. in accordance with pertinent regulations and SWPPP. Standard construction tools and equipment, possibly including generators will be used to construct the single-story barracks structure. Plywood walls will be constructed around generators used for building construction to reduce potential noise effects. Water quality protection measures in accordance with the SWPPP will be in place before clearing work begins. The remaining two forested blocks will be cleared as a timber harvest through the Arnold AFB Forest Products Harvest Program in late summer/early fall (1 August – 14 November) 2023 (Figure 3). Trees will be cut down using chainsaws or a feller-buncher, pulled to log landings with a wheeled skidder, and loaded onto logging trucks using a loader. Construction of the initial barracks is scheduled to begin in September 2022, and will last approximately one year. Additional buildings will be constructed as funds become available and will occur over approximately 20 years. The entire 14.9 ac. will be maintained in early successional condition avoiding the need for additional consultation as building construction funds become available.

Maintenance of early successional condition will be accomplished using a skid-stere mounted forestry grinder or tractor mounted bush hog as appropriate. If non-native invasive plants such as privet become an issue and would be encouraged by use of a forestry grinder, herbicides such as Garlon4 Ultra with a blue die may be applied using cut stump treatment methods to assist in their control. After construction of the buildings, their developed grounds may require weed control, which is currently only accomplished with individual spot spray application of ready-to-use/premixed RoundUp. Wasp nests may also need to be controlled on buildings with the use of individual spray cans of WaspFreeze or other authorized publicly available wasp

sprays. Vegetation on road shoulders is primarily controlled through mowing and some use of spot spray application of Cornerstone herbicide (Glyphosate) with no surfactant and sprayed using backpack or vehicle mounted sprayers. Use of pesticides is restricted to the minimum effective amount/concentration, using methods that minimize drift, and adhering to the application guidance and restrictions of the label. All pesticide applications will adhere to requirements in the TNARNG Integrated Pest Management Plan and Air Force requirements. See Appendix E for the 2016 report of pesticides applied by TNARNG on VTS-Tullahoma as an example of pesticide applications in a normal year.

Figure 11. Map of water protection measures and BMPs currently incorporated into the design plans for the first barracks construction, in the northwest corner of the site. Note the silt fence (SF) line around the down-hill sides and the sediment basin with drainage systems between the silt fence and barracks.

Table 2. Table of typical water quality protection measures and BMPs used for timber harvest and building construction sites. Note that the Storm Water Pollution Prevention Plan is not completed and in place yet. This is therefore not an all-inclusive list, and additional measures will be implemented as needed.

Project Component	Method or BMP	Comments
Timber Harvest/Removal	Slash spread on log landings and skid trails to prevent erosion or damage.	Typically requested logger implement prior to signs of erosion or damage.
	Coordinate on design of best practices if stream crossings or sensitive areas are present.	Designes developed in compliance with TNDA Guide to Forestry Best Management Practices in Tennessee.
	Other methods such as seeding and rut repair in accordance with TN Forestry BMPs if needed	
	Monitor project site conditions closely and halt operations if a threat to water quality or site conditions developes.	An additional stop gap measure.
Construction	Silt Fence installed on downhill side of project site.	In design for first barracks, but no SWPPP yet.
	Sediment basin installed.	In design for first barracks, but no SWPPP yet.
	Implement all measures in accordance with design in SWPPP.	
	Rock check dams if drainage ways present	Typical requirements in SWPP if small drainages present.
	Seed and establish vegetation if project halted for more than 14 days.	Required in TN construction regulations.
	Seed and establish vegetation of at least 70% coverage at the end of construction.	Required in TN construction regulations.

3.1 Avoidance and Minimization

TNARNG has made every effort to avoid and minimize the project's potential impacts to listed species. The project location and orientation of buildings have been chosen to leave only minimal space between developed areas, eliminate interspersed openings, and reduce parking area size. TNARNG also reduced the site footprint from the originally planned 27 ac. to 14.9 ac. in order to limit the need for additional forest clearing and potential impacts on listed bat species. The originally proposed site layout included small forest patches that would have remained onsite and been dispersed among the buildings. The smaller site layout removes the dispersed forest patches and allows a large block of bottomland forest west of the site along Bobo Creek to remain. Leaving this larger forested patch intact provides better habitat for the NLEB and Indiana bat than smaller patches of trees interspersed among buildings. Additionally, leaving the larger forest patch intact increases the standoff distance from the creek, reducing potential for siltation and other water quality impacts to the creek. This benefits aquatic insects that may serve as bat forage species.

Tree clearing associated with construction of the first barracks can't be accomplished during the winter months due to harvest logistics, required initial barracks construction timelines, and winter soil moisture levels potentially causing extensive problems such as soil disturbance, erosion, siltation, soil compaction, etc. The tree harvests will therefore be conducted during the late summer/early fall (1 August – 14 November) timeframe, when pups will be volant and all bats will be capable of escaping disturbance from tree harvesting operations. TNARNG already conducts all its activities and training within compliance of state and federal law. The TDEC required SWPPP containing water quality protection measures and BMPs will be implemented throughout the life of the project, preventing siltation and contamination of nearby Bobo Creek from impacting aquatic insects that could serve as bat forage species. See Section 3.0 for a more thorough discussion of water quality protection measures and BMPs.

Operation and maintenance of the expanded cantonment area has the potential for indirect effects to listed species over time. To prevent or minimize potential impacts, the outdoor lighting plan will include bat friendly lighting that incorporates the use of building and security light fixtures that direct light downward and not sideways or up, in conjunction with Light Emitting Diodes (LEDs) designed to produce wavelengths less visible and disturbing to listed bats (amber to red spectrum). These LED lights will prevent concentrating insects and therefore bats in open areas near occupied buildings, reducing impediments to commuting and foraging, and preventing increased susceptibility to predation. Use of pesticides will be restricted to the minimum effective amount/concentration, using methods that minimize drift, and adhering to the application situation restrictions of the label. This will minimize potential effects to plants and insects in surrounding areas, water bodies, bat insect forage species, and the potential for impacting nearby water sources. See Section 3.0 for more detail on possible pesticide use.

4.0 Species Analyzed:

This BA evaluates potential effects on the NLEB, Indiana bat, and gray bat.

4.1 Indiana Bat

4.1.1 Indiana Bat Background

On 11 March 1967 the Indiana bat was listed as being in danger of extinction under the Endangered Species Preservation Act of 1966 (80 Stat. 926; 16 U.S.C. 668aa[c], 32[48]:4001). It was later listed as endangered under the ESA of 1973, and amendments, extending full protection to the species. The Service approved its recovery plan on 14 October 1983 (USFWS 1983) and a later revision on 13 April 2007 (USFWS 2007). Critical habitat for the species was designated on 24 September 1976 (41 FR 41914), consisting of 13 winter hibernacula (11 caves and two mines) across six states, one of which is White Oak Blowhole Cave in Blount County, Tennessee (USFWS 2009). No designated critical habitat for the Indiana bat exists on Arnold AFB, VTS-Tullahoma, or the action area vicinity.

4.1.1.1 Threats

Significant threats to the Indiana bat include adverse modifications to hibernacula (USFWS 2007), summer habitat modifications, chemical exposure, vehicle and wind turbine collisions, disease, and climate change. White Nose Syndrome (WNS), a fungal disease that attacks bats during hibernation, causing them to arouse more often and burn unavailable calories, was first observed in 2007 and has rapidly spread across the species range. Most adverse modifications to caves are human induced, including commercialization of caves, mining impacts, improper gating, vandalism, flooding by reservoir creation, destruction by quarrying, and indiscriminate human interaction associated with research. Natural alterations include flooding, passage collapses, and blocked sinkholes, which can alter the climate of the cave (USFWS 2012). Spring, summer, and fall habitat are impacted by fragmentation, timber harvest, fire suppression, loss of maternity colony trees, land clearing, residential and commercial development, mining, oil and gas development, and infrastructure development. The ongoing, permanent loss, degradation, and fragmentation of forests and woodlots may have a significant cumulative effect on the species (USFWS 2012). Additionally the species is impacted by automobile and wind turbine collisions (Arnett et al. 2008, Russell et al. 2009), climate change, and possibly chemical exposure. In cases where threats have been reduced (i.e., hibernacula have been properly gated), increases in population sizes have been noted. However, increases in the overall population would be gradual due to low reproductive rates and population densities (USFWS 2012).

4.1.2 Indiana Bat Life History and Associated Habitats

4.1.2.1 Description

The Indiana bat was first described as a distinct species based on museum specimens collected in 1904 from Wyandotte Cave in Crawford County, Indiana. It is a medium-size bat, having a wing span of 9 -11 inches (in), weighing 0.25-ounces (oz), a forearm length of 1.4 to 1.6 in, and overall body length of 1.6 to 1.9 in. It has brown to dark-brown fur, and often a pinkish appearing face. The average life span is five to 10 years, but 14 to 15 year olds have been documented (Thomson 1982). Survivorship has been reported as 66-76% for females and 36-70% for males, with the upper range in ages six and below (Humphrey and Cope 1977).

4.1.2.2 Diet

Indiana bats feed exclusively on flying aquatic and terrestrial insects. Moths, beetles, midges and flies constitute the bulk of its diet, with moths preferentially selected (Brack and LaVal 1985), and beetles and flies also significant (Brack and Tyrell 1990). Other prey include wasps, flying ants, caddisflies, brown leafhoppers and treehoppers, stoneflies, and lacewings (Brack and LaVal 1985, USFWS 2007). Diet varies seasonally and among different ages, sexes and reproductive status (USFWS 2007). Reproductively active females and juveniles show greater dietary diversity, with reproductively active females eating more aquatic insects and males eating more moths and beetles (USFWS 2007).

4.1.2.2.1 Foraging Habitat

Indiana bats typically forage in and around tree canopies and within floodplain, riparian and upland forest openings (USFWS 2007). Ideal foraging habitat would have 50% to 70% canopy closure, with relatively open understory (typically, less than 40% of the trees are 2 to 4.7 in diameter at breast height [DBH]) (Rommé et al. 1995). Excellent foraging habitat has been characterized as a strip of woody vegetation at least 100 ft wide along a stream.
Brack and Tyrell (1990) found that in early summer, foraging was restricted to riparian habitats. Foraging also occurs over clearings with early successional vegetation, along cropland borders and fencerows, and over farm ponds. Indiana bats have routinely been documented flying at least 1.25 mi from their roosts to forage, and some have been tracked up to 3 mi from their roosts (USFWS 2002). Females typically utilize larger foraging ranges than males (Garner and Gardner 1992). A study in Illinois found that streams associated with floodplain forests and impounded water bodies were preferred foraging habitats for pregnant and lactating individuals.

4.1.2.3 Staging, Spring Migration, and Summer Roosting

Most Indiana bats emerge from their hibernaculum in late March or early April, forage nearby for a few days or weeks, referred to as staging, and then migrate to their traditional summer roosting areas. Female Indiana bats emerge from hibernation first. Most individual populations completely leave their hibernacula by late April, with variation based on latitude and weather. Shortly following emergence, the females become pregnant via delayed fertilization (USFWS 2007). They were thought to generally migrate north for the summer, but recent studies in Tennessee have documented migration in other directions to a lesser degree (Gardner and Cook 2002, USFWS 2007). Males disperse and roost individually or in small groups, while reproductive females form larger groups and raise offspring in maternity colonies, mostly 50-100 adults (USFWS 2007). Females can arrive in summer areas by 1 April, using temporary roosts until maternity roosts are established. Fecundity is low with females producing only one offspring per year in late June to early July. Young bats begin to fly at approximately 4 weeks old, between mid-July and mid-August.

4.1.2.3.1 Summer Roosting Habitat

Indiana bats exhibit high fidelity to traditional summer colony and foraging areas, annually returning to bear young in the same areas (Garner and Gardner 1992, Kurta et al. 2002, USFWS 2007). Maternity colonies typically occupy multiple primary and varying numbers of secondary roosts in riparian, bottomland, and upland forests. Primary roosts are often located in openings at the edge of forests where they are warmed by solar radiation, while alternate roosts can also be in forest interiors. Alternate roosts may be used when temperatures are above normal or when it rains. Roost trees generally have exfoliating bark, southeast or south-southwest exposure, open canopy, and good proximity to water sources and foraging habitat (USFWS 2007). Though trees in excess of 15.7 in DBH are considered optimal for maternity colonies, and in excess of 8.6 in DBH are used as alternate roosts (Kurta et al. 2002), females have been documented using roost trees of 5.5 in. DBH (Kurta 2005). Males roost singly or in small groups in two to five roost trees similar to those used by females, with average size being smaller due to low numbers roosting together (Gumbert et al. 2002; USFWS 2007). Roost tree structure is

probably more important than the tree species in determining whether a tree is a suitable. Tree cavities, hollow portions of tree boles or limbs, and crevice and splits are also used, usually by individual bats. Roosts may also occur in highly altered and fragmented forest landscapes including forests altered by grazing, swine feedlots, row-crops, hay fields, residential developments, lightly traveled or busy roads, clearcuts and shelterwood cuts, and near airports (Garner and Gardner 1992).

Indiana bats use separate night roosts between feeding bouts (Humphrey et al. 1977) rather than returning to day roosts, and Kiser et al. (2002) found them using concrete bridges for this purpose on Camp Atterbury. The clusters of Indiana bats, observed night-roosting under the bridges, were lactating, post-lactating and newly volant juveniles, with some males roosting singly. The warmer, more stable environments presumably decreased the energetic cost of maintaining high body temperatures, thus promoting fetal development, milk production and juvenile growth.

4.1.2.4 Fall Migration, Swarming, Mating, and Hibernation

Indiana bats spend the later part of summer accumulating fat reserves for fall migration (USFWS 2007). Most Indiana bats arrive at their traditional hibernacula in August or September, with some males arriving in July, and females arriving by September. Upon arrival at hibernacula, the bats forage in the vicinity for several weeks until sufficient fat reserves have been built to sustain them through the winter. (Cope and Humphrey 1977, USFWS 1983). In the latter part of the swarming period, copulation occurs on cave ceilings near the entrances, with females entering hibernation shortly after mating (USFWS 2007). Males may continue swarming well into October, likely to breed late arriving females. The bats hibernate in clusters on cave ceilings in densities of approximately 300-485 bats/square foot (ft^2). Most bats will continue to roost in trees during day light hours while swarming. Telemetry data indicated the majority of bats forage within 2 to 3 miles (mi.) of the hibernacula, with some bats found up to 5 or more miles away (Rommé et al. 2002). It is therefore not only important to protect caves where the bats hibernate, but also to maintain and protect the quality and quantity of roosting and foraging habitat within at least 5 mi. of hibernacula.

4.1.2.4.1 Winter Hibernation Habitat

Indiana bats hibernate in caves or mines with required October and November temperatures of approximately 50 º F, and midwinter temperatures of 39 to 46º F, allowing them maintain low metabolic rates and conserve fat to survive winter (USFWS 2007). Relative humidity of hibernacula typically ranges from 74% to just below saturation, though lows of 54% have been recorded (USFWS 2007). Only a small percentage of caves and mines meet these temperature requirements (Brack et al. 2003, USFWS 2007). Hibernacula often contain large populations of several bat species (Brack et al. 2003).

4.1.3 Indiana Bat Regional Status and Distribution

The Service compiles winter hibernacula survey data bi-annually from odd calendar years to determine the most current rangewide population estimates. The 2019 rangewide population

estimate is 537,291, down 4% from 2017 and 19% from the inception of WNS in 2007 (USFWS 2019). Winter hibernacula surveys provide the best overall population status and relative distribution (USFWS 2012). There are approximately 467 known hibernacula located in 19 states, the closest of which is located approximately 6 mi. from the proposed project site. Ninety-four percent of the estimated rangewide population hibernates in four states, Indiana (35%), Missouri (35%), Kentucky (13%) and Illinois (11%) (USFWS 2015).

The summer distribution of Indiana bats covers a broader geographic area than their winter distribution. Most of the known summer occurrences are from the upper Midwest, but extend south to northern Arkansas, southeastern Tennessee and southwestern North Carolina (Britzke 2003, USFWS 2007). Information specific to the maternity colonies (reproductive units) of the Indiana bat is limited. When the revised draft recovery plan was completed in 2007 (USFWS 2007), 269 maternity colonies in 16 states were considered extant. It is presumed that only a small fraction of extant maternity colonies have been found (USFWS 2012). Based on overall population, sex ratios, and average maternity colony size, Whitaker and Brack 2002 estimated there were 3,802 (± 877) maternity colonies in 2007. Using the same set of assumptions, there were an estimated 3,450 (± 797) maternity colonies in 2011, representing a loss of about 352 colonies over that two-year period.

The species' overall population distribution has not changed over the past several years. However, abundance has declined significantly. Recovery efforts are primarily focused on WNS due to the serious threat it poses to the continued existence of the species throughout its range. Concerns about its status arise when considering the positive trends observed over its range prior to WNS, subsequent declines, and new information about the disease. The Service considers the population trend to be declining, with no expectation of a trend reversal in the foreseeable future (USFWS 2015).

4.1.4 Indiana Bat Status in the Action Area

Arnold Air Force Base has conducted bat surveys annually since 2000 (U.S. Air Force 2015). Many of these surveys have included an acoustic component. Bat surveys have captured the Indiana bat at two locations on Arnold AFB and detected it acoustically at 14 locations (U.S. Air Force 2015). The nearest capture site to the proposed project is approximately 12.1 km (7.5 mi) away, and the closest acoustic detection approximately 4.44 km (2.76 mi). The nearest known hibernacula is approximately 9.66 km (6 mi) from the proposed site. The proposed project site is in a Swarming 2 Area. No maternity colonies or roosts have been identified on Arnold AFB, though potential habitat is abundant (approximately 15,935 ac.). This may be an artifact of the limited number of captures (n=2) and consequent inability to conduct radio telemetry work. Indiana bat captures are too infrequent and erratic to determine a population trend (Lamb 2021). However, based on acoustic data, Indiana bat activity level on Arnold AFB has significantly increased from 2015-2021 (Lamb 2021). See Lamb 2021 for a discussion of the limitations of acoustic data associated with this technique.

4.2 Northern Long-Eared Bat (NLEB)

4.2.1 NLEB Background

The NLEB was listed as a threatened species under the ESA, as amended, with a final rule on 4 May 2015 (80 FR 17973 – 18033). An interim rule under the authority of section 4(d) of the Act, providing measures that are necessary and advisable for conservation of the northern long-eared bat, also became effective on 4 May 2015 (80 FR 17973 – 18033). Critical habitat has not been proposed for the northern long-eared bat. The Service published a proposal to reclassify the NLEB's listing status to endangered and remove the species-specific 4(d) rule on 23 March 2022 (87 FR 16442 – 16452).

4.2.1.1 Threats

The final listing rule for NLEBs (80 FR 17973 - 18033) describes known threats to the species, of which disease is the dominant factor due to WNS. WNS, a fungal disease that infects hibernating bats, causes them to arouse more often and burn unavailable calories, resulting in starvation. It was first observed in 2007 and has rapidly spread across the species range. The level of mortality caused by WNS far exceeds mortality from all other known diseases and pests. The next greatest threat is modification of hibernacula, particularly altering or closing hibernacula entrances with other than bat friendly gates. Most adverse modifications to hibernacula are commercialization of caves, mining impacts, improper gating, vandalism, flooding by reservoir creation, destruction by quarrying, and indiscriminate human interaction associated with recreation and research. Another significant threat is the loss and fragmentation of forest habitat due to conversion and, to a lesser degree, forest management. Throughout their range, forest conversion is expected to increase due to commercial and urban development, energy production and transmission, and natural changes. Unlike forest conversion, forest management activities typically result in temporary impacts, but similarly, may cause direct injury or mortality to individuals. Wind energy facilities are known to cause mortality of NLEB, and development is projected to continue. Environmental contaminants, in particular pesticides and inorganics (lead, mercury, etc), bio-accumulate in bats, potentially leading to a myriad of sub-lethal and lethal effects. Climate change is a more recent threat of concern.

4.2.2 NLEB Life History and Associated Habitats

4.2.2.1 Description

The northern long-eared bat is a medium-sized bat, weighing 5 - 8 grams (g) (0.18- to 0.28-oz), with females tending to be slightly larger (Caceres and Pybus 1997). Pelage colors include medium to dark brown fur on the back, tawny to pale-brown fur on the belly, and dark brown, but not black, ears and wing membranes (Nagorsen and Brigham 1993, Whitaker and Mumford 2009). It is distinguished from other *Myotis* species by its large ears, that average 17 mm (0.67 in) (Whitaker and Mumford 2009) and, when laid forward, extend beyond the nose, but by less than 5 mm (0.20 in) (Caceres and Barclay 2000). Adults live up to 18.5 years (Hall et al. 1957), with the greatest recorded age of 19 years based on banding records (Kurta 1995). Juveniles have the highest mortality rate (Caceres and Pybus 1997).

4.2.2.2 Diet

The NLEB has a diverse diet including moths, flies, leafhoppers, caddisflies and beetles (Nagorsen and Brigham 1993, Brack and Whitaker 2001), with diet composition differing geographically and seasonally (Brack and Whitaker 2001). The most common insects found in their diets are moths and beetles (Brack and Whitaker 2001, Lee and McCracken 2004, Feldhamer et al. 2009, Dodd et al. 2012), with arachnids also being common prey (Feldhamer et al. 2009).

4.2.2.2.1 Foraging Habitat

NLEBs forage using hawking (catching insects in flight) and gleaning (picking insects from surfaces) behaviors in conjunction with passive acoustic cues (Nagorsen and Brigham 1993, Ratcliffe and Dawson 2003). Most hunting occurs above the understory, 1 to 3 m (3 to 10 ft) above ground, but under the canopy (Nagorsen and Brigham 1993) on forested hillsides and ridges, rather than along riparian areas (LaVal et al. 1977, Brack and Whitaker 2001). Data indicate that mature forests are an important habitat type for foraging northern long-eared bats (Caceres and Pybus 1997). Occasional foraging also takes place over small forest clearings, water, and along roads (Van Zyll de Jong 1985). Peaks in foraging occur within 5 and again 8 hours after sunset (Kunz 1973). The mean distance between roost trees and foraging areas in New Hampshire was 620 m (2,034.1 ft) (Sasse and Pekins 1996).

4.2.2.3 Staging, Spring Migration and Summer Roosting

In a short period referred to as staging, NLEBs gradually emerge from hibernation between mid-March and early May, before migrating to summer habitat (Caire et al. 1979, Whitaker and Hamilton 1998). They exit the hibernacula to feed and re-enter the same or alternate hibernacula to resume daily bouts of torpor (Whitaker and Hamilton 1998). Variation in onset and duration of staging is based on latitude and weather (USFWS 2007). The spring migration period typically runs from mid-March to mid-May (Caire et al. 1979, Whitaker and Mumford 2009).

The NLEB typically occupies summer roosting habitat from mid-May through mid-August. Female summer home-range size varies from 19 to 172 ha. (47 to 425 ac) (Lacki et al. 2007), with an average of 161 ac (Owen et al. 2003). NLEBs actively form colonies in the summer (Foster and Kurta 1999) exhibiting fission-fusion behavior (Garroway and Broders 2007), where members coalesce to form a larger group (fusion), but individuals frequently depart to be solitary or form smaller groups (fission), before returning to the main colony (Barclay and Kurta 2007). They switch roosts often, typically every two to three days (Timpone et al. 2010), requiring an average 8.6 with a range of 2 to 11. Consequently, they have a need for multiple, suitable roosts to be available within close proximity of each other.

Maternity colonies range from 7 to 88 individuals (Owen et al. 2002), with a maximum record of 100 (Whitaker and Mumford 2009), and an average around 31 (Menzel et al. 2002). The number within a roost declines as the summer progresses, with pregnant females forming the largest aggregations and post-lactating females forming the smallest (Foster and Kurta 1999).

Females within a colony give birth to a single pup (Barbour and Davis 1969) relatively synchronously typically between late May and early June (Easterla 1968) but as late as mid-July (Whitaker and Mumford 2009). Juvenile volancy often occurs by 21 days after birth and as early as 18 days (Krochmal and Sparks 2007).

4.2.2.3.1 Summer Roosting Habitat

During summer, NLEBs roost singly or in colonies underneath bark or in cavities, crevices, or hollows of both, live or dying trees or snags (Foster and Kurta 1999, Owen et al. 2002, Carter and Feldhamer 2005, Perry and Thill 2007a, Timpone et al. 2010). Males' and non-reproductive females' summer roost sites may also include cooler locations like caves and mines (Barbour and Davis 1969). They sometimes roost in human-made structures, such as buildings, barns, bat houses, behind window shutters and on utility poles (Whitaker and Mumford 2009, Timpone et al. 2010, 80 FR 17984).

The NLEB appears to be somewhat flexible in tree roost selection, with tree species that form suitable cavities or retain bark being used opportunistically (Foster and Kurta 1999), and structural complexity of habitat or available roost density being more important than tree species (Carter and Feldhamer 2005). Roost trees are predominantly hardwoods (Foster and Kurta 1999), with a few areas where roosts are dominated by conifer snags (Jung et al. 2004). Data suggest that hardwood trees most often provide the structural and microclimate conditions preferred by maternity colonies and groups of females, which have more specific roosting needs than solitary males (Lacki and Schwierjohann 2001). Deciduous snags may be preferred over conifer snags due to increased decay resistance and consequent roost longevity (80 FR 17984). The use of live trees versus snags may reflect the availability of such structures in study areas (Perry and Thill 2007a) and the flexibility in roost selection when there is a sympatric bat species present (e.g., Indiana bat) (Timpone et al. 2010). Most telemetry studies describe a greater number of dead than live roosts (Lacki and Schwierjohann 2001, Timpone et al. 2010).

Canopy coverage at NLEB roosts ranges from 56% in Missouri (Timpone et al. 2010), to greater than 84% in Kentucky (Lacki and Schwierjohann 2001), and is lower than in available stands (Sasse and Pekins 1996), though one study found the opposite (Carter and Feldhamer 2005). Females tend to roost in more open areas than males, likely due to increased solar radiation aiding in pup development, and benefiting pups learning to fly (Perry and Thill 2007a). Roosts are also largely selected below the canopy, which could be due to the species' ability to maneuver in cluttered environments. Roost tree diameter varies greatly, with a consolidation of range wide studies showing 80% of maternity colony roost trees being 10 - 25 centimeters (cm) (4 - 10 in) (80 FR 17985). Studies found roosts more common on upper and middle slopes, possibly due to increased solar heating (Lacki and Schwierjohann 2001), or the landscape position experiencing more disturbance (e.g., wind, intense fire, drought stress, and insect attack), creating higher suitable roost densities (Silvis et al. 2012). Some studies have found tree roost selection to differ slightly between males and females, with males more readily using smaller diameter trees (Lacki and Schwierjohann 2001, Perry and Thill 2007a) and larger canopy-dominant trees, suggesting males are more flexible in roost selection (Menzel et al.

2002, Johnson et al. 2009). Males do not use colony roosting sites, typically occupying cavities in live hardwood trees, while females used hardwood and softwood snags (Lacki and Schwierjohann 2001). However, males and non-reproductively active females are found roosting within home ranges of known maternity colonies the majority of the time (94%) in Kentucky (80 FR 17985), suggesting little segregation between reproductive females and other individuals.

4.2.2.4 Fall Migration, Swarming, Mating and Hibernation

Fall migration typically occurs between mid-August and mid-October (80 FR 17987). While they are not considered long-distance migrators, short regional movements between summer roosts and hibernacula have been documented (56 - 89 km, 35 – 55 mi.) (Caire et al. 1979, Nagorsen and Brigham 1993). They have shown a high degree of philopatry (tendency to return to the same location) for a hibernaculum (Pearson 1962), although they may not return to the same hibernaculum in successive seasons (Caceres and Barclay 2000).

Swarming fills the time between the summer and winter seasons (Lowe 2012), July through early October, varying with latitude (Caire et al. 1979, Kurta et al. 1997, Lowe 2012). The purpose of swarming behavior may include introduction of juveniles to potential hibernacula and stop over sites on migratory pathways, and copulation (Kurta et al. 1997, Lowe 2012, Randall and Broders 2014). During this time, both sexes are present exhibiting heightened activity levels, increased sexual activity, and bouts of torpor prior to hibernation (Fenton 1969, Parsons et al. 2003). They may investigate several caves or mines while transient, and may temporarily roosts in them or adjacent forest (Kurta et al. 1997, Lowe 2012). Many of the caves and mines associated with swarming are also used as hibernacula with several other bat species (Fenton 1969, Kurta et al. 1997, Randall and Broders 2014). Little is known about tree roost selection during the swarming period. They may select conifer and deciduous trees and stumps up to 3 mi. from swarming sites (Lowe 2012). Though it is hypothesized tree roosts during swarming would be similar to summer roosts, they differ in distance, orientation, species, size, and decay class (Lowe 2012). This greater variation may be due to different energy demands during swarming.

NLEBs hibernate to reduce energy demands by entering a state of torpor, when body temperatures approach ambient levels, metabolic rates are reduced, and immune function declines (Thomas et al. 1990, Thomas and Geiser 1997, Bouma et al. 2010). During hibernation, they exhibit significant weight loss (80 FR 17987), averaging 20-36% (Pearson 1962, Caire et al. 1979), varying with sex and location, to as much as 43% (Whitaker and Hamilton 1998). In general, they arrive at hibernacula in August or September, enter hibernation in October and November, and emerge in March or April, with timing varying based on latitude (Caire et al. 1979, Whitaker and Hamilton 1998). They have been observed moving among hibernacula throughout the winter (Whitaker and Rissler 1992, Caceres and Barclay 2000). Whitaker and Mumford (2009) found the species flies in and out of some hibernacula throughout winter, and are more active than other species there. This behavior is not well understood, as they do not feed while outside (Whitaker and Hamilton 1998). Studies have typically found NLEBs low in abundance and composing a small proportion of the bats observed in a hibernaculum (Barbour

and Davis 1969, Caire et al. 1979, Caceres and Barclay 2000), occasionally in clusters with other species. Barbour and Davis (1969) rarely found concentrations of more than 100 in a single hibernaculum.

4.2.2.4.1 Winter Hibernation Habitat

Hibernacula used by NLEBs vary in size from large, with large passages and entrances (Raesly and Gates 1987), to much smaller (80 FR 17984). They require relatively constant, cooler temperatures (32 to 48° F) (Raesly and Gates 1987, Caceres and Pybus 1997), with high humidity and no air currents (van Zyll de Jong 1985, Raesly and Gates 1987, Caceres and Pybus 1997). They favor very high humidity areas to such a degree that droplets of water are often observed on their fur (Barbour and Davis 1969). Within hibernacula, they are typically found in small crevices or cracks of walls or ceilings, sometimes with only their noses and ears visible (Barbour and Davis 1969, Caire et al. 1979, van Zyll de Jong 1985, Caceres and Pybus 1997, Whitaker and Mumford 2009), though are sometimes in the open (Barbour and Davis 1969, Whitaker and Mumford 2009). They are commonly observed exiting caves with mud and clay on their fur, also suggesting use of tighter recesses (Caire et al. 1979, Whitaker and Mumford 2009). To a lesser extent, they have been observed over-wintering in abandoned railroad tunnels, (80 FR 17984), storm sewer entrances (Goehring 1954), hydroelectric dam facilities (Kurta et al. 1997), aqueducts (80 FR 17984), and dry wells (Griffin 1945).

4.2.3 NLEB Regional Status and Distribution

Most records of NLEBs are from winter hibernacula surveys (Caceres and Pybus 1997). The NLEB has declined in northeastern US hibernation sites by up to 99% from pre-WNS levels. Although the disease has not yet spread throughout its entire range, it is currently found in at least 25 states, and continuing to spread. Experts expect that WNS will have the same impact as seen in the northeast wherever it spreads. More than 1,100 NLEB hibernacula have been identified throughout its range in the U.S., although many hibernacula contain only a few (one to three) individuals (Whitaker and Hamilton 1998). Within their range, hibernacula are documented in 29 of 37 states, with the remaining states possibly lacking documentation due to lack of survey effort, existence of unknown hibernacula, or having no suitable hibernacula (80 FR 17976). The species may remain undocumented in hibernacula due to their small numbers and habit of roosting in small cracks and crevices, reducing detectability (Caire et al. 1979, Van Zyll de Jong 1985, Caceres and Pybus 1997, Whitaker and Mumford 2009).

The species is found in the U.S. from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, even reaching into eastern Montana and Wyoming. In Canada, it is found from the Atlantic Coast, westward to the southern Yukon Territory and eastern British Columbia (Caceres and Pybus 1997).

Historically, the species was found in greater abundance in the eastern portions of its range (Caceres and Barclay 2000). However, throughout the majority of the species' range, it was patchily distributed (Amelon and Burhans 2006).

In Tennessee, NLEBs have been observed in both summer mist-net surveys and winter hibernacula counts. More than 1,000 individuals were captured from 2002 through 2013, and included males and juveniles or pregnant, lactating or post-lactating adult females (80 FR 17981). During the winter of 2009–2010, the Tennessee Wildlife Resource Agency (TWRA) began tracking NLEB populations and has since documented it in 58 hibernacula, with individual hibernaculum populations ranging from 1 to 136 individuals (80 FR 17981). According to TWRA, Tennessee has over 9,000 caves, with less than 2% surveyed, suggesting there could be additional unknown northern long-eared bat hibernacula in the state (80 FR 17981).

A recovery plan for the NLEB has not yet been developed. Therefore, no recovery criteria for delisting the species (recovering the species to the point that it no longer requires protection under the Act) currently exists. Additionally, the Service has not assigned northern long-eared bat cave or hibernacula priority levels based on biological significance, location, winter population sizes, vulnerability, etc.

4.2.4 NLEB Status in the Action Area

Nearly annual bat surveys conducted by Arnold AFB since 2000 have documented the presence of the NLEB on the installation (U.S. Air Force 2015). Bat surveys have captured the NLEB at 30 locations on Arnold AFB and detected it acoustically at 14 locations (U.S. Air Force 2015). The nearest capture and acoustic detection sites to the proposed project footprint are approximately 4.73 km (2.94 mi) and 4.44 km (2.76 mi) respectively. Twelve NLEB roost trees have been documented on Arnold AFB, with the closest one approximately 4.54 km (2.82 mi) away, and the closest known maternity colony approximately 5.54 km (3.44 mi). It is approximately 9.66 km (6 mi) to the nearest known NLEB hibernacula. It is important to note that the project area is in a Swarming 2 area. Using linear regression, Lamb (2021) detected a significant declining trend in NLEB capture rates on Arnold AFB between 1998 and 2021. However, Lamb (2021) also used linear regression to detect a significant increase in NLEB activity level based on acoustic detection rates on Arnold AFB 2015-2021, but noted several limitations of acoustic data for this method. See Lamb 2021 for a discussion of the limitations of acoustic data associated with this technique.

5.0 Effects of Action

The following section includes an evaluation of direct and indirect effects for the proposed action on the Indiana bat, NLEB, and gray bat. Direct effects are those that are direct or immediate effects of the project on the species or its habitat. Potential direct effects evaluated include permanent loss of habitat, noise and vibration effects leading to disturbance/harassment causing potential flushing and roost abandonment, direct injury or mortality from timber harvest, increased human activity, predation on escaping bats, and potential for siltation and degradation of nearby water bodies. Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Indirect effects may occur outside of the area directly affected by the action. Potential indirect effects

considered include area lighting near finished buildings effecting/altering behavior, potential effects from pesticide application, and potential noise associated with increased human activity and grounds maintenance.

Interdependent and interrelated actions need to be evaluated for potential direct and indirect effects. Maintenance of an early successional state in the project footprint for portions that have not already had buildings constructed or site preparation for construction accomplished is an interrelated activity as it is part of the proposed action and only justified for purposes of the project. Its effects are evaluated as direct effects because it only occurs during the project's implementation. The facility/grounds maintenance required after construction is completed is an interdependent action, as it is only required as a result of the proposed action. Grounds/facility maintenance effects are evaluated as indirect effects because they only occur after the construction portion of the action is completed on a given portion of the project area.

The project area is located within the Base, at least 0.15 mi from the nearest boundary. The land use in the off-Base area near the project has remained consistently commercial and parks (0.2 mi closest) to the west and north, with residential beginning across Highway 55 (0.35 mi closest) to the north, and military land to the south and east. TNARNG is not aware of any non-federal projects proposed or likely to occur in the foreseeable future that are within the off-base portion of the action area.. TNARNG has no additional major projects planned on VTS-Tullahoma in the foreseeable future. There should therefore be no cumulative effects beyond the loss of 5.19 ac. of NLEB and Indiana bat habitat.

5.1 Indiana Bat

The project area was inspected by USFWS, Arnold AFB, and TNARNG personnel on 2 February 2022. It was determined that the two pine blocks ware unsuitable as Indiana bat habitat. However, the 5.19 ac. hardwood block on the south end of the site was determined to be good quality Indiana bat habitat. The project will require clearing all trees and snags from all 14.9 ac., and 5.19 ac. of good quality Indiana bat habitat will be permanently eliminated. All tree clearing will occur from 1 August – 14 November, when juveniles are volant and all bats are able to escape clearing operations, minimizing mortality but still having the potential for disturbance/harassment. There is still however some potential for clearing operations to cause direct injury or mortality, injuries that affect a bat's flying and foraging ability, predation on escaping bats, and for additional stress due to the use of limited energy reserves. For example, some bats in an occupied tree may not have time to escape before the tree is felled or impacted by another tree and could be injured or killed. Additionally, fleeing bats may be more susceptible to predation during the daylight hours and could use limited energy reserves, stressing the bat. Work will be conducted during daylight hours. The site is located within a Swarming 2 area, which is suitable roosting, foraging, and travel habitat for Indiana bats within ten miles of a USFWS designated Priority 1 or Priority 2 hibernaculum.

It is possible that Indiana bats roosting in trees up to 0.25 mi. outside the project footprint could be susceptible to noise and vibration effects. Methods used to determine the 0.25 mi. distance are described in Section 2.2. Loud noise produced by chainsaws or logging equipment, as well as construction equipment could disturb roosting bats, causing them to flush from or abandon roosts. Calahan 1993 noted bats abandoning a primary roost when a bulldozer cleared brush adjacent to the tree. Bennett and Braun 2004 indicated that noise from a logging unit could cause Indiana bats to suffer harm or harassment, alter their normal behavior and cause them to flush from the roost during daylight to escape, possibly causing them to suffer higher than normal predation. Bennett and Braun 2004 also however pointed out that it is believed that this presents a very minimal risk to female and male Indiana bats. Garner and Gardener (1992) indicate that disturbance would have to be severe to cause roost abandonment. Indiana bats have also been noted as being tolerant of noise (US Army 2014). The BA for activities occurring on Ft. Drum NY describes Indiana bats roosting within 400m (a little under 0.25 miles) of active construction sites over many years and showing normal behavior when foraging (US Army 2014). Gardner et al. (1991) had evidence that Indiana bats continued to roost and forage in an area with active timber harvest. 3D Environmental Services, Inc. (1996) studied a primary maternity roost located 0.6 km (1,970 ft.) south of I-70 and near Indianapolis Airport. The fact that the roost was not abandoned indicates that the species can become habituated to high noise levels. It is reasonable to assume that noise from initial timber clearing and construction activities would be novel to bats in this quieter part of the base, potentially causing them to flush from or temporarily abandon roosts. However, they would likely become habituated to this noise over time and return to using roosts in adjacent forest stands if any already exist. While initial timber clearing would occur only between 1 August and 15 November of 2022 and 2023, when volant bats could be present, and the initial barracks construction would likely be completed during the fall and winter, future building construction projects could occur at any time of year over the next 20 years. It is however likely that bats using the surrounding forest will have become habituated to such noise before those projects begin, which would limit or prevent previously described potential impacts as well as the stress of additional energy expenditures experienced by lactating females during the breeding season. It is likely that noise impacts other than mortalities associated with predation on fleeing bats would be temporary in nature.

Operation and maintenance of the expanded cantonment area has some potential to affect the Indiana bat through artificial light induced alteration of foraging and commuting behavior, and increased risk of predation. These potential impacts will be minimized through incorporation of bat friendly lighting in the site lighting plan, as described in section 3.1. Use of pesticides also has the potential to impact bat insect forage species in the vicinity of the project site and nearby waterbodies. This will be minimized or prevented by using application methods that minimize drift and integrated pest management principals as described in Section 3.1. Noise from increased human activity and grounds maintenance, such as mowing, could become common after buildings are constructed. In addition, noise from tractors with bushhogs and skid-stere mounted forestry grinders used for maintaining undeveloped portions of the project footprint in an early successional condition will become more common. It is expected that bats remaining in the area will be habituated to machine noise and tolerant of it by that time. The

project site is located approximately 174 m (570 ft) through pine and riparian bottomland forest from the nearest stream (Bobo Creek), and the soil surface will be extensively disturbed. Water quality protection measures and BMPs, to be identified in the SWPPP (see Section 3.0) required by TDEC for soil disturbance greater than 1 acre, will prevent sediment and contaminants from entering Bobo Creek. This will prevent impacts to aquatic insects that could serve as bat forage species.

Given this information, TNARNG has determined that clearing the 9.7 ac. of pine forest and maintaining the cantonment area, *may affect, but is unlikely to adversely affect*, and clearing the 5.2 ac. hardwood block and constructing the cantonment area buildings is *likely to adversely affect* the Indiana bat. To the greatest extent possible, TNARNG has implemented avoidance and minimization measures described in Section 3.1, and with the Service's approval, intends to mitigate all remaining potential adverse effects to the Indiana bat through contribution to the TN IBCF for the 5.2 ac. of quality habitat to be removed.

5.2 Northern Long-Eared Bat (NLEB)

The project area was inspected by USFWS, Arnold AFB, and TNARNG personnel on 2 February 2022. It was determined that the two pine blocks were unsuitable as NLEB habitat. However, the 5.19 ac. hardwood block on the south end of the site was determined to be good quality NLEB habitat. The project will require clearing all trees and snags from all 14.9 ac., and 5.19 ac. of good quality NLEB habitat will be permanently eliminated. All tree clearing will occur from 1 August – 14 November, when juveniles are volant and all bats are able to escape clearing operations, minimizing mortality but still having the potential for disturbance. There is still however some potential for clearing operations to cause direct injury or mortality, injuries that affect a bat's flying and foraging ability, and for some predation on escaping bats. For example, some bats in an occupied tree may not have time to escape before the tree is felled or impacted by another tree and could be injured or killed. Additionally, fleeing bats may be more susceptible to predation during the daylight hours and could use limited energy reserves, stressing the bat. Work will be conducted during daylight hours. The site is located within a Swarming 2 area.

NLEBs roosting in trees up to 0.25 mi. outside the project footprint could be susceptible to noise and vibration effects. Methods used to determine the 0.25 mi. distance are described in Section 2.2. Loud noise produced by chainsaws or logging equipment, as well as construction equipment could disturb roosting bats, causing them to flush from or abandon roosts. Calahan 1993 noted bats abandoning a primary roost when a bulldozer cleared brush adjacent to the tree. Bennett and Braun 2004 indicated that noise from a logging unit could cause Indiana bats to suffer harm or harassment, alter their normal behavior, and cause them to flush from the roost during daylight to escape, possibly causing them to suffer higher than normal predation. Bennett and Braun 2004 also however pointed out that it is believed that this presents a very minimal risk to female and male Indiana bats. We assume the same risks apply to NLEBs. Garner and Gardener 1992 indicate that disturbance would have to be severe to cause roost

abandonment. Gardner et al. (1991) had evidence that Indiana bats continued to roost and forage in an area with active timber harvest, and we assume NLEBs would respond similarly. It is reasonable to assume that noise from initial timber clearing and construction activities would be novel to bats in this quieter part of the base, potentially causing them to flush from or temporarily abandon roosts. However, they would likely become habituated to this noise over time and return to using roosts in adjacent forest stands if any already exist. While initial timber clearing would occur only between 1 August and 15 November of 2022 and 2023, when all bats present would be volant, and the initial barracks construction would likely be completed during the fall and winter, future building construction projects could occur at any time throughout the year over the next 20 years. It is however likely that bats using the surrounding forest will have become habituated to such noise before those projects begin, which would limit or prevent previously described potential impacts as well as the stress of additional energy expenditures experienced by lactating females during the breeding season. It is likely that noise impacts other than mortalities associated with predation on fleeing bats would be temporary in nature.

Operation and maintenance of the expanded cantonment area has some potential to affect the NLEB through artificial light induced alteration of foraging and commuting behavior, and increased risk of predation. These potential impacts will be minimized through incorporation of bat friendly lighting in the site lighting plan, as described in section 3.1. Use of pesticides also has the potential to impact bat insect forage species in the vicinity of the project site and nearby waterbodies. This will be minimized or prevented by using application methods that minimize drift and integrated pest management principals as described in Section 3.1. Noise from increased human activity and grounds maintenance, such as mowing, could become common after buildings are constructed. In addition, noise from tractors with bushhogs and skid-stere mounted forestry grinders used for maintaining undeveloped portions of the project footprint in an early successional condition will become more common. It is expected that bats remaining in the area will be habituated to machine noise and tolerant of it by that time. The project site is approximately 174 m (570 ft) through pine and riparian bottomland forest from Bobo Creek, and the soil surface will be extensively disturbed. Water quality protection measures and BMPs, to be identified in the SWPPP (see Section 3.0) required by TDEC, will prevent sediment and contaminants from entering Bobo Creek. This will prevent potential impacts to aquatic insects that can serve as bat forage species.

Given this information, TNARNG has determined that clearing the 9.7 ac. of pine forest, and operating and maintaining the cantonment area, ***may affect, but is unlikely to adversely affect***, and clearing the 5.2 ac. hardwood block and constructing the cantonment area buildings is ***likely to adversely affect*** the NLEB. To the greatest extent possible, TNARNG has implemented avoidance and minimization measures described in Section 3.1, and with the Service's approval, intends to mitigate all remaining potential adverse effects to the NLEB through the same contribution to the TN IBCF.

5.3 Gray Bat

Gray bats prefer to feed over water bodies and along forest openings. While the proposed tree clearing and construction site is dense forest, the open (approximate 11 ac.) obstacle course is adjacent to the site and could be used by foraging gray bats. Clearing and construction work will be conducted during daylight hours, when gray bats will not be present. Clearing the 14.9 ac. project area would expand the size of the opening to approximately 26 ac., making the opening's edge closer to water and potential sources of aquatic insects, and could consequently make the area more attractive to foraging gray bats. Additionally, the gravel roads in the area may be used as travel corridors. Operation and maintenance of the expanded cantonment area has some potential to affect the gray bat through artificial light induced alteration of foraging and commuting behavior, and increased risk of predation. These potential impacts will be minimized through incorporation of bat friendly lighting in the site lighting plan, as described in section 3.1. Use of pesticides also has the potential to impact bat insect forage species in the vicinity of the project site and nearby waterbodies. This will be minimized or prevented by using application methods that minimize drift and integrated pest management principals as described in Section 3.1. Water quality protection measures and BMPs developed for the SWPPP required by TDEC will prevent sediment and contaminants from entering nearby (174 m, 570 ft west of site) Bobo Creek. This will prevent potential impacts to aquatic insects that can serve as bat forage species. Given this information, TNARNG has determined that the proposed project *may affect, but is unlikely to adversely affect* the gray bat.

5.4 Designated Critical Habitat

The official list of species and critical habitat acquired using IPaC indicated that no critical habitats occur in the vicinity of the project. TNARNG therefore concludes the project will have no effect on designated critical habitat.

6.0 Conclusion and Effects Determination

TNARNG doesn't anticipate any cumulative effects other than the permanent loss of 5.19 ac. of NLEB and Indiana bat habitat (see Section 5.0). TNARNG has determined the proposed timber clearing and cantonment area expansion project on VTS-Tullahoma *is likely to adversely affect* the NLEB and Indiana bat through the permanent conversion of 5.19 ac. of good quality habitat to a developed land use, and potential timber harvest and construction noise effects. We have also determined that permanent conversion of 9.71 ac. of pine plantation to a developed land use, and operating and maintaining the cantonment area, *may affect, but is not likely to adversely affect* the NLEB and Indiana bat. We determined that the project may affect, but is not likely to adversely affect the gray bat. We have further determined that the proposed project will not affect any designated critical habitats. Additionally, we believe that in conjunction with the avoidance and minimization measures already taken, contribution to the TN IBCF for the 5.19 ac. of good quality NLEB and Indiana bat habitat will additionally provide a conservation benefit to these species and further ARNG G-9 responsibilities under ESA Section 7(a)(1).

TNARNG proposes it contribute to the TN IBCF to mitigate potential impacts to the NLEB and Indiana bat. The proposed site is in a Swarming 2 area and both clearing events will occur during the late summer/early fall (1 August – 14 November) timeframe, giving a multiplier of 1.0. The current per acre cost for bat habitat mitigation is $4,260. We propose contributing a total payment to the TN IBCF of 5.19 ac. X 1.0 multiplier X $4,260 per/ac. = $22,109.40.

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8.0 List of Preparers:

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Appendix A:

Official USFWS Species List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Tennessee Ecological Services Field Office
446 Neal Street
Cookeville, TN 38501-4027
Phone: (931) 528-6481 Fax: (931) 528-7075

In Reply Refer To: June 22, 2022
Project Code: 2022-0015159
Project Name: VTS-Tullahoma Cantonment Area Expansion and Tree Clearing

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

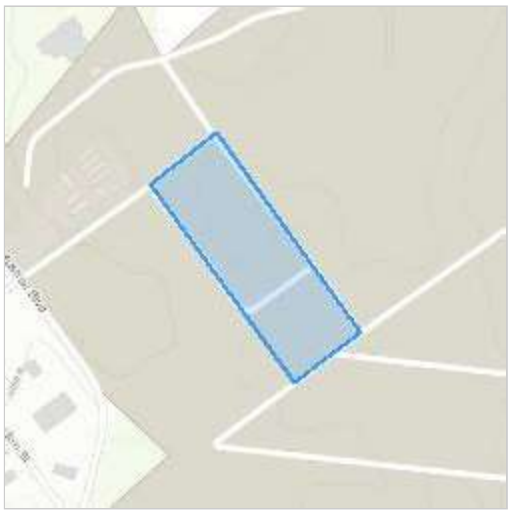
Tennessee Ecological Services Field Office
446 Neal Street
Cookeville, TN 38501-4027
(931) 528-6481

Project Summary

Project Code: 2022-0015159
Event Code: None
Project Name: VTS-Tullahoma Cantonment Area Expansion and Tree Clearing
Project Type: Military Development
Project Description: Tennessee Army National Guard needs to increase the size of its cantonment area on VTS-Tullahoma to remedy extensive shortfalls in the available bed space, dining facilities, and administration buildings for the number of soldiers assigned to train on the installation. VTS-Tullahoma is located just outside the city of Tullahoma, TN on Arnold Airforce Base, in Coffee and Franklin Counties, TN. A joint agency Environmental Assessment with the National guard bureau and Arnold Air Force Base is being conducted at this time. The project will require clearing trees from the entire approximate 16 ac. footprint of the expansion area. Infrastructure (electrical, sewers lines, parking lots, sidewalks, etc.) will be installed, and 20 barracks, 5 mess halls, and 5 administration buildings constructed over the next approximate 20 years as funds become available, with the first barracks already funded and construction set to begin in September 2022. The initial tree removal from the northern 5 ac. of the site is expected to be conducted during August 1 - November 14, 2022. The remaining trees are scheduled to be removed during August 1 - November 14, 2023.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.368366050000006,-86.1761267838929,14z



Counties: Coffee County, Tennessee

Endangered Species Act Species

There is a total of 8 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Gray Bat *Myotis grisescens* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6329	Endangered
Indiana Bat *Myotis sodalis* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Clams

NAME	STATUS
Pale Lilliput (pearlymussel) *Toxolasma cylindrellus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3118	Endangered
Slabside Pearlymussel *Pleuronaia dolabelloides* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/1518	Endangered
Snuffbox Mussel *Epioblasma triquetra* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4135	Endangered
Turgid Blossom (pearlymussel) *Epioblasma turgidula* Population: Wherever found; Except where listed as Experimental Populations No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7659	Endangered

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Kentucky Warbler *Oporornis formosus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20

NAME	BREEDING SEASON
Prairie Warbler *Dendroica discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12

(0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

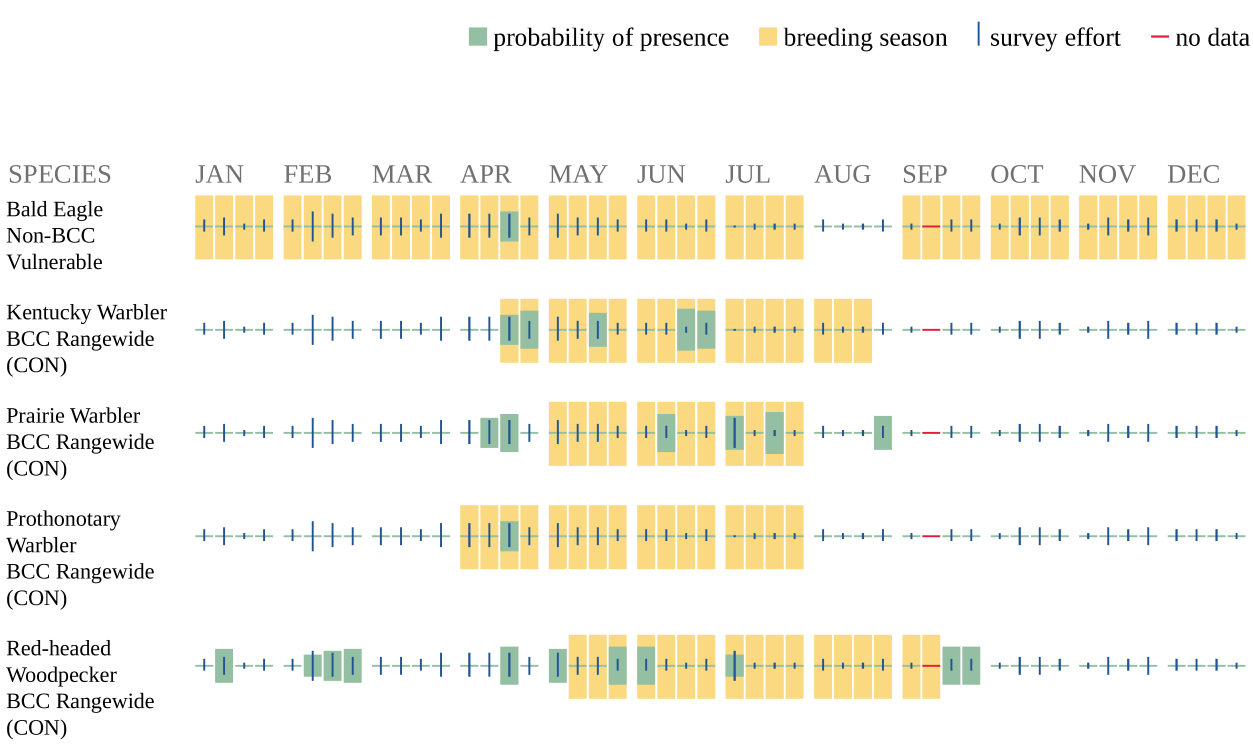
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

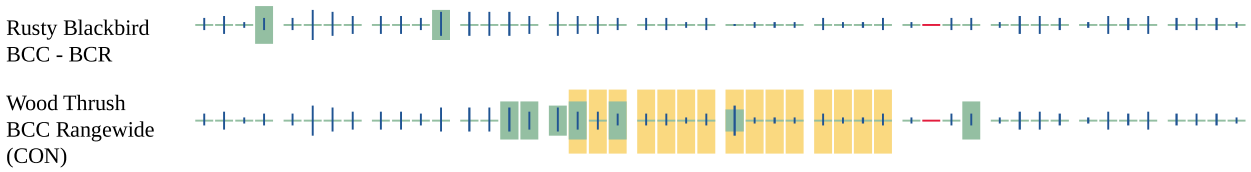
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

THERE ARE NO WETLANDS WITHIN YOUR PROJECT AREA.

IPaC User Contact Information

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State: TN
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Email brian.e.knapp.nfg@army.mil
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Appendix B:

Potential Roost Tree and Snag Data for Hardwood Block

Table of Snags and trees with potential as roost trees for NLEB and Indiana bats on Tullahoma Cantonment Area expansion site Hardwood block

Tree/Snag	DBH (inch)	Approx. Height	Comments
T	20	40	Sloughing Bark on dead branch at approx. 30'
T	20	50	Some broken branches with loose bark at approx. 15-25'
S	10	20	Sloughing bark from 8-15 ft, otherwise bare stem
S	3	10	Sloughing bark
T	40	55	Dead branche with sloughing bark at approx. 30'
S	8	25	Some patches of loose bark remain
S	18	35	Some loose bark at appro. 25'
S	30	40	Sloughing bark at approx. 25-35'
T	24	40	Large hole at base that boes way up
S	8	15	Loose bark
S	8	15	Loose bark
T	16	35	Hole
T	24	45	Dead branch with loose bark
S	10	30	
T	18	40	Dead branch with loose bark
S	28	45	Fungal infestation with a little loose bark up high
T	35	55	Dead branch with loose bark
S	18	35	Loose bark
T	18	35	Dead branch with loose bark and hole in base
S	12	20	Loose bark
S	18	25	Loose bark
S	20	35	Loose bark
S	28	25	Holes and loose bark
S	15	10	Loose bark no branches
T	25	60	Dead branch, with loose bark strip going up 25'
S	16	30	Loose bare with hollows in top
S	7	25	Loose bark
T	20	45	Dead brach with loose bark
S	5	15	Loose Bark
T	36	50	Dead branches with loose bark at approx 35'
T	8	35	Holes and loose bark in top
S	10	20	Loose bark
S	28	15	Loose bark with hole in center
S	24	15	Hole
S	15	40	Some loose bark at bottom 10', otherwise bare
T	10	25	Pealing bark
S	24	35	Holes and sloughing bark
S	18	45	Holes and sloughing bark
S	20	35	Hole up high but bare

Appendix C:

Tricolored Bat Species and Habitat Description and Status

4.4 Tricolored Bat

4.4.1 Tricolored Bat Background

The tricolored bat was petitioned for listing and critical habitat designation under the ESA, as amended, on 14 June 2016 (Center for Biological Diversity and Defenders of Wildlife, 2016). The Service published their 90-day finding that the petition presents substantial scientific or commercial information indicating that the tricolored bat may warrant listing under the Act, based on Factors A (present or threatened destruction, modification, or curtailment of its habitat or range), C (disease or predation), and E (other natural or manmade factors affecting its continued existence) on 20 December 2017 (82 FR 60363 – 60366). The Service is currently conducting its 12-month review and anticipates publishing a final rule in Fiscal Year (FY) 2022.

4.4.1.1 Threats

Tricolored bats are threatened by WNS, wind energy developments, loss of habitat through modification of hibernacula, development, logging, and mining, environmental contaminants, and climate change. Ingersoll et al. (2016) indicates that while WNS is the greatest threat to the species, impacts of the disease seem to be exacerbated by the other factors. WNS, a fungal disease that infects hibernating bats, causes them to arouse more often and burn unavailable calories, resulting in mortality through starvation. Their tendency to hibernate for longer periods than other bats coupled with their preference for hibernating at sites within the optimal WNS temperature range may increase its vulnerability to WNS (Vincent and Whitaker 2007). The species incurs substantial mortality from turbines at wind energy developments (Kunz et al. 2007, Arnett et al. 2008). Fraser et al. (2012) report that within its range, the species is among the most frequently killed species around wind turbines and may account for up to 25 percent of total bat mortality. In their listing petition, Center for Biological Diversity and Defenders of Wildlife (2016) present substantial evidence that many factors threaten the habitat of the tricolored bat including land conversion through development, logging, and various forms of energy development (coal mining, oil and gas, and wind). Tricolored bats are highly susceptible to the accumulation of heavy metals, pesticides, and other pollutants found in their environment (WIDNR 2013) due to the relatively long lifespan of bats (Secord et al. 2015), being entirely insectivorous (Secord et al. 2015; O'Shea and Clark 2002), depending on deposition and extensive use of fat for hibernation (Clark and Shore 2001; Secord et al. 2015), and their high metabolism (Secord et al. 2015). Loss or alteration of hibernacula due to mining, improper cave/mine closures, and disturbance from commercial development and recreation present threats to bats as well (USFWS 2013). Climate change may be a threat to bats in the temperate zone as prey availability, reproductive cycles, hibernation patterns, and migrations are closely linked to temperature and climate (Racey 1982, Humphries et al. 2004, Jones et al. 2009).

4.4.2 Tricolored Bat Life History and Associated Habitats

4.4.2.1 Description

The tricolored bat is relatively small among North American bats, weighing 4 - 8 grams (g) (0.14- to 0.28-oz), measuring 77-88 mm in length (Fujita and Kunz 1984), and having a wingspan of 220-225 mm (Quinn and Broders 2007). Females are larger than males and store significantly

larger fat deposits (Fujita and Kunz 1984). It is the smallest bat in the eastern and midwestern US (Amelon 2006). Its pelage appears yellowish-brown, with individual hairs being brown at the tip, yellow in the middle, and dark at the base, "tricolored" (Fujita and Kunz 1984). Forearm skin is reddish. When folded forward, its oblong ears reach just beyond the tip of the nostrils (Quinn and Broders 2007). The tragus is short and blunt (Long 2008). The lower third of the tail membrane is lightly furred (Chapman and Williams 2010). The species is a slow flier, with an erratic or fluttery foraging flight pattern, and is among the first species seen feeding in the evening (Fujita and Kunz 1984). The species' typical lifespan in the wild is four to eight years, with the greatest recorded age of 14.8 (Nowak 1991, Whitaker and Hamilton 1998). Davis (1966) found high mortality rates between the first and second year, likely during winter. Juveniles have the highest mortality rate, with the early flight period as high as 50 percent (Hoying and Kunz 1998)

4.4.2.2 Diet

The tricolored bat has a diverse diet with the most common species including leafhoppers, treehoppers, beetles, and flies, and to a lesser extent, moths, butterflies, wasps, bees, and ants (Whitaker 2004). However dietary composition may differ geographically and seasonally based on differing study findings. For example, Amelon (2006) found moths and butterflies were consumed more than their availability would predict, and beetles, leafhoppers, and treehoppers less than available, while Feldhamer et al. (2009) found that caddisflies dominated, followed by beetles, wasps, bees, and ants. Feldhamer et al. (2009) concluded that like myotids, tricolored bats favor soft-bodied prey compared to larger bat species.

4.4.2.2.1 Foraging Habitat

Tricolored bats tend to forage in more open conditions than other forest dwelling bats. Their wing morphology, slow erratic flight patterns, and higher intensity lower frequency calls are adapted to more open conditions (Saunders and Barclay 1992, Quinn and Broders 2007). They tend to forage over water (Quinn and Broders 2007, Fujita and Kunz 1984), or in more open woods along water (Ellis et al. 2002, Ford et al. 2005, Menzel et al. 2005, Arroyo-cabrales et al. 2008). Yates and Muzika (2006) noted that they found the highest probability of tricolored bat use in forests with more open understory, except at the lowest levels. This corresponds with reports of other investigators that the species tends to use older forest (Perry and Thill 2007, Farrow and Broders 2011) with higher canopy heights (Ford et al. 2005). There is some debate in the literature as to their use of open areas. Loeb and O'Keefe 2006 found that they were most likely to be acoustically detected in areas with sparse vegetation and early successional habitat. Farrow and Broders (2011) found them negatively associated with non-forested land, and Barbour and Davis (1969) indicated they did not occur over forests or fields. However, it has also been reported that the species is not found in deep forest but is known to forage above the forest canopy (Saunders and Barclay 1992, Quinn and Broders 2007). Fujita and Kunz (1984) indicated say they forage near trees, including forest perimeters.

4.4.2.3 Staging, Spring Migration and Summer Roosting

In a short period referred to as staging, tricolored bats gradually emerge from hibernation before migrating to summer habitat. They typically emerge from hibernation later than other

bat species they share hibernacula with (Vincent and Whitaker 2007). Females arrive at summer roosting areas in late April in the southern portion of their range, and through late May in northern portions (Amelon 2006).

Tricolored bats typically occupy summer roosting habitat from late-May through mid-August (Dzal et al. 2009, Thorne 2014). Tricolored bat females exhibit a relatively high degree of roost fidelity (Veilleux and Veilleux 2004b), returning to the same small roosting area within a single summer and across successive years. There is some evidence that female tricolored bats are faithful to their natal roost habitat, as well (Veilleux and Veilleux 2004b). Information on home range size is limited. Harvey et al. (2011) indicates that their foraging area is relatively small, and Veilluex et al. (2003) indicates that the maximum distance females traveled from roosts to foraging areas was 4.3 km (2.7 mi). Roosting area of individual bats appears to be relatively small (≤2.3 ha) (Veilleux and Veilleux 2004), and of maternity colonies averaging 22.8 (1.6 – 77.4) in Nova Scotia (Poissant 2009). Roosting areas in Nova Scotia contain an average of 22.8 roosts (Poissant 2009). However, tricolored females may switch specific roost sites frequently during the maternity period, both with and without volant offspring (Whitaker 1998, Amelon 2006). In Indiana, reproductive females remained at roost trees for an average 6 days before moving to new roosts and traveled 19-139 meters between roost trees (Veilleux et al. 2003). In Arkansas, males used the same foliage roost for up to 33 consecutive days (Perry and Thill 2007). Movement of all colony members is common (Poissant 2009, Whitaker 1998).

Maternity colonies are relatively small, averaging 3.7 (Veilleux and Veilleux 2004) to 15 individuals, with a maximum of 29 (Whitaker 1998). Parturition takes place in spring to mid-summer, with gestation lasting approximately 44 days (Wimsatt 1945). Females typically give birth to two pups (Wimsatt 1945, Hoying and Kunz 1998), between June and July (Wimsatt 1945). Juveniles are usually volant at three weeks and can replicate adult flight and foraging capabilities about one week later (Fujita and Kunz 1984). Young are independent at five weeks. Sexual maturity is reached anywhere between 3 and 11 months (Hamlin 2012) and may vary by location within the species' range (Fujita and Kunz 1984).

4.4.2.3.1 Summer Roosting Habitat

Tricolored bats prefer roosting in dead and live clusters of tree leaves during summer (Perry and Thill 2007, Poissant et al. 2010, Harvey et al. 2011, Veilleux and Veilleux 2004). In Indiana, the roosts of all females were in live or dead deciduous tree foliage (Veilleux et al. 2004). However, tree cavities (Menzel 1996), buildings (Fujita and Kunz 1984), caves and crevices (Carter et al. 1999), squirrel nests (Veilleux et al. 2003), Spanish moss (Menzel et al. 1999), conifers (Quinn and Broders 2007), and other lichens (Poissant 2009) are used. They exhibit a preference for live trees over dead trees, but dead leaves over live leaves (Veilluex et al. 2003).

In many locations tricolored bats prefer oak trees over other species (Veilluex et al. 2003), possibly due to dead oak leaves remaining on the trees longer. Dead-leaf roosts are shaped like umbrellas, with a "roof" and hollow core, while live-leaf roosts are generally dense. Dead leaf clusters used for roosting can range from a single dead leaf to clusters >30 cm (12 in) in diameter, and large dead limbs containing multiple clusters of dead leaves have been

documented as maternity colonies (Perry and Thill 2007). Some bats may also roost on branches with only a few leaves for shelter (Veilleux et al. 2003). They also use other tree species including yaupon holly (*Ilex vomitoria*), sparkleberry bush (*Vaccinium arboreum*), redbay (*Persea borbonia*), pine species (*Pinus* spp.), and other conifers. Perry and Thill 2007 found 43 percent of maternity colonies in dead needle clusters of large, live pines. In Nova Scotia, they utilize conifers preferentially to deciduous trees, usually roosting in bearded lichen (*Usnea* spp.) (Quinn and Broders 2007).

In a study of night roosting activity of bats in the central Appalachians, tricolored bats were found to use caves for roosting between bouts of nocturnal foraging activity (Agosta et al. 2005). Adult males were most prevalent in the night roost caves, and numbers for all demographic groups peaked in mid to late August. All the night roosting caves were also used by one or more bat species for winter hibernation.

Males and non-reproductive females exhibit different roosting behavior than reproductive females. Males roost alone on dead leaves of deciduous trees, and while they can remain at the same roost for extended periods, typically change roosts more frequently than females. Some males and non-reproductive females may roost in their winter hibernacula (Carter et al. 1999). Perry and Thill (2007b) found female roosts were larger than random trees, while male roost trees did not differ from random. Reproductive condition impacts roost selection, with reproductively active females roosting at lower levels in the canopy, closer to permanent water sources, and farther from the nearest forest/field edge than non-reproductive females (Veilleux et al. 2004). Females seek roosts that are warmer and have minimal temperature flux compared to those used by males (Quinn and Broders 2007), though roosts with a southern exposure may be avoided (Veilleux et al. 2003).

Veilleux et al. (2003) found upland and riparian habitats were used more often for roosting than random selection would predict. O'Keefe (2009) found non-reproductive tricolored bats selected roosts in forest stands older than 72 years, at lower elevations, and closer to non-linear openings and water than expected by random chance. Other researchers have found that at the stand level or greater, they roost selectively in more mature forest within riparian buffers or corridors (Perry and Thill 2007, O'Keefe 2009), within a diversity of patch types, and farther than expected from roads (Perry et al. 2008).

4.4.2.4 Fall Migration, Swarming, Mating and Hibernation

Tricolored bats typically leave their summer roosts and begin migrating to hibernacula in mid-August (Dzal et al. 2009, Thorne 2014). Generally, hibernacula occur within approximately 100 km of summer roosting areas (Griffin 1940), with banding recoveries up to 136 km (Barbour and Davis 1969). However, Fraser et al. (2012) analyzed stable hydrogen isotopes in fur samples from museum specimens and found that 33 percent of males and 16 percent of females had undertaken latitudinal migrations, and that the migratory tendency varied with latitude and sex. Most migrants were collected at the northern and southern extents of the species' range. The authors suggest that this species' hibernation ecology makes it particularly vulnerable to long winters, making migration from the northern extent of the species' range to more

southern hibernacula preferable for some individuals, and that sex-biased differences in migration may be the result of differences in reproductive pressures. These results would account for the high mortality of the species at wind energy facilities compared to other regionally migratory hibernating bat species.

Swarming fills the time between migration and hibernation, typically mid-August to mid-October. During this time, females' mate with multiple males in swarms around cave openings (Whitaker and Hamilton 1998), though copulation also occurs in hibernacula in late winter (Vincent and Whitaker 2007) and upon emergence (Guthrie 1933, Fujita and Kunz 1984, Dodd and Johnson 2012). Females store sperm in their uteri over the winter, until ovulation occurs in late spring. Males have a shorter period of sexual dormancy than other bats, which may be linked to the capacity for spring mating. Spring mating may provide tricolored females an opportunity for re-insemination if sperm are lost during hibernation (Dodd and Johnson 2012).

In the Midwestern US, tricolored bats enter hibernacula from late-September through mid-October (Damm and Geluso 2008). They enter a state of torpor, where their body temperature falls to within 1-2^{0}C of ambient temperature (Geiser 2004), reducing metabolic rate, immune function, and subsequently energy consumption by approximately 95% (Geiser 2004, Dunbar and Tomasi 2006). They periodically break torpor during the winter and may become active within or rarely outside of the hibernaculum. Commonly suggested reasons for breaking torpor include switching hibernacula, feeding, drinking, copulating, and/or enhancing immune function (Speakman and Racey 1989, Thomas and Geiser 1997, Boyles et al. 2006, Luis and Hudson 2006). The energetic cost of these arousals represents up to 75 percent of winter energy expenditures (Thomas et al. 1990), with males loosing approximately 39% of body mass, and females roughly 29% (Fitch 1966, Vincent and Whitaker 2007). While the species can be quite active during hibernation (Vincent and Whitaker 2007), other investigators have found the species remains in torpor longer between arousal bouts than other bats, up to 111 days (Brack and Twente 1985). The species hibernates even in Florida and Central America, where temperatures and prey resources would allow year-round activity (Fujita and Kunz 1984, Briggler and Prather 2003, Broders and Quinn 2007), possibly indicating a physiological requirement for a long period of torpor (Vincent and Whitaker 2007).

The species usually hang singly, rather than in groups or clusters like other cave hibernating bats and may occupy the same precise spot from one winter to the next, though individuals may also have several spots among which they move over the course of a winter (Harvey 2003, Brack 2007). However, groups of two or three have been observed in Texas caves (Sandel et al. 2001). Relatively few individuals occur in any given hibernacula (Vincent and Whitaker 2007). Disproportionate sex ratios have been observed in hibernacula, with greater numbers of males than females (Davis 1959, Fujita and Kunz 1984), which may indicate males are longer lived.

4.4.2.4.1 Winter Hibernation Habitat

Tricolored bats are sensitive to overwintering habitat conditions. While they hibernate in many of the same sites as other bats, such as little brown (*Myotis lucifugus*) and northern long-eared (*Myotis septentrionalis*), they occupy the deepest parts of caves, where temperatures are

highest and least variable, the walls are warmer, and humidity is higher (Fujita and Kunz 1984, Raesly and Gates 1987, Briggler and Prather 2003, and Brack 2007). Hibernacula temperatures range from -6 to 14° C (Barbour and Davis 1969, McNab 1974, Sandel et al. 2001, Amelon 2006). This temperature range is among the greatest recorded for eastern forest hibernating bat species (Rabinowitz 1981). Females may prefer sites with slightly higher humidity than males (64.2% versus 61.5%) (Menzel et al. 1999). It is thought the warmer pockets in hibernacula, along with more stable temperatures, allow the species to remain in torpor for longer periods of time (Vincent and Whitaker 2007). Caves and mines are primarily used for hibernacula (Quinn and Broders 2007), though they also hibernate in buildings (Sandel et al. 2001). While they appear to prefer larger hibernacula overall, they use caves of many sizes. Briggler and Prather (2003) determined they prefer larger hibernacula with east-facing openings and high thermal stability, though Dixon (2011) found them preferring vertical entrances, which may be due to the correlation of sinkhole entrances with larger caves. They were the most common species encountered in a survey of small Iowa caves ($\leq$ 50 m in length), and occupied 68 percent of the caves, holding an average of 1.2 tricolored bats per cave (Dixon 2011)

4.4.3 Tricolored Bat Regional Status and Distribution

Prior to WNS, the tricolored bat was generally believed to be common and secure throughout most of its eastern US range. Historically, little research and monitoring of this species were conducted, but an analysis of survey data suggests that even prior to WNS, the tricolored bat was in a state of gradual decline (Ingersoll et al. 2013). Ingersoll et al. (2013) found that from 1999 to 2011, (i.e., both pre and post-WNS), the tricolored bat declined by 34 percent in the multi-state study area (New York, Pennsylvania, West Virginia, and Tennessee). Further, while WNS has been assumed to be the sole driver of their population decline, new research indicates that many factors are likely acting synergistically (Ingersoll et al. 2016). The advent of WNS has precipitated a dramatic drop in populations throughout much of the species' range. Reduced capture rates of WNS susceptible species, including the tricolored bat, have been documented regionally in West Virginia (Francl et al. 2012), Indiana (Pettit and O'Keefe 2017), and the Great Smoky Mountains National Park (O'Keefe et al. 2019). Declines in the number of tricolored bats encountered during cave surveys throughout the karst regions of Tennessee between 2010 and 2019 have also been documented (Campbell 2019). The fungal infection has caused mortality of up to 98 percent in affected hibernacula. Currently, NatureServe (2014) ranks the tricolored bat as: critically imperiled in Pennsylvania, Nebraska, Nova Scotia, and Quebec; imperiled in Michigan and New Brunswick; and vulnerable in Alabama, Massachusetts, Minnesota, New Mexico, New York, North Carolina, Virginia, and Ontario. In Vermont, the tricolored bat's status ranges from vulnerable to imperiled, and in Wisconsin, between vulnerable to critically imperiled. The Service is in the process of conducting the species' 12-month review, and it holds no federal status currently. Consequently, no recovery plan for the tricolored bat exists and no recovery criteria have been developed.

Tricolored bats range across most of eastern North America and into eastern Central America and occur over much of the midwestern United States (Fujita and Kunz 1984). It is known to range from southwest Nova Scotia (Quinn and Broders 2007) to northeastern Honduras (Fujita

(Kunz 1984, Arroyo-Cabrales et al. 2008). It has been documented in Ontario, Nebraska, Kansas, Oklahoma, and central Texas (Fujita and Kunz 1984, NatureServe 2014) on the west side of its range. It appears to be expanding its range in the West as it has been found in west Texas, New Mexico, Colorado, and South Dakota (Geluso et al. 2005, Ammerman 2005, Armstrong et al. 2006, White et al. 2006, Valdez et al. 2009). Range expansion has also been documented in the northeastern and midwestern US, with DeGraaf and Yamasaki (2001) reporting it throughout Vermont and New Hampshire, though absent in northern Maine, and Kurta et al. (2007) reporting range expansion in the Great Lakes region since the 1980s.

4.4.4 Tricolored Bat Status in the Action Area

Nearly annual bat surveys conducted by Arnold AFB since 2000 have documented the presence of the tricolored bat on the base. Bat surveys have captured the species at 27 locations on base since 1998 and detected it acoustically at all five monitoring locations used since 2015 (Lamb 2022, unpublished data). The nearest capture and acoustic detection sites to the proposed project footprint are approximately 4.7 km (2.9 mi) and 5.2 km (3.2 mi) respectively. It is approximately 9.7 km (6 mi) to the nearest known hibernacula, which it shares with NLEB, gray, little brown, and Indiana bats. It is important to note that the project site is in a Swarming 2 area for Indiana bats and NLEB. We assume the tricolored bat, since present in the same hibernacula, could be using the area during swarming as well. Lamb (2020) used linear regression to determine that, while somewhat variable, tricolored bat capture rates on Arnold AFB were stable prior to the arrival of WNS but have shown a significant declining trend since. Lamb (2020) also used linear regression with acoustic detection rates on Arnold AFB to determine tricolored bat activity levels have remained stable with no apparent trend from 2015 through 2020 but noted several limitations of acoustic data for this method. See Lamb 2020 or 2021 for a discussion of the limitations of acoustic data associated with this technique.

5.4 Tricolored Bat Effects Analysis

The tricolored bat was not considered when the project area was inspected by USFWS, Arnold AFB, and TNARNG personnel on 2 February 2022. While tricolored bats will use dead pine needle clusters as roosts, they are described as occurring in large live pines (Perry and Thill 2007b). The young pine plantation blocks to be cleared do not have large pines. Additionally, the species prefers roosting in older forest with more open understory (Yates and Muzika 2006). Futher, they are known to forage in more open forest conditions than other forest dwelling bats (Saunders and Barclay 1992, Quinn and Broders 2007, Ellis et al 2002, Ford et al. 2005, Menzel et al. 2005, and Arroyo-cabrales et al. 2008). The thick pine plantation bocks with dense understories to be cleared do not suit these habitat conditions as well. We therefore determined that the two pine blocks are unsuitable as tricolored bat habitat. However, the 5.19 ac. hardwood block on the south end of the site is more open, has the leaf clusters tricolored bats prefer for roosts, and also contains a small ephemeral pool (approximately 9m X 9m). Tricolored bats are known to prefer foraging over water or in more open woods along water (Ellis et al. 2002, Ford et al. 2005, Menzel et al. 2005, and Arroyo-cabrales et al. 2008). We have therefore determined the hardwood block to be cleared is good quality tricolored bat habitat. The project will require clearing all trees and snags from all 14.9 ac., and 5.19 ac. of

good quality tricolored bat habitat will be permanently eliminated. All tree clearing will occur from 1 August – 14 November, when juveniles are volant and all bats are able to escape clearing operations, minimizing mortality but still having the potential for disturbance. There is still however some potential for clearing operations to cause direct injury or mortality, injuries that affect a bat's flying and foraging ability, and for some predation on escaping bats. For example, some bats in an occupied tree may not have time to escape before the tree is felled or impacted by another tree and could be injured or killed. Additionally, fleeing bats may be more susceptible to predation during the daylight hours and could use limited energy reserves, stressing the bat. Work will be conducted during daylight hours. The site is located within a Swarming 2 area. Tricolored bats share the nearest known hibernacula with Indiana bats and NLEB, and we therefore assume they could also be using this area during swarming.

Tricolored bats roosting in trees up to 0.25 mi. outside the project footprint could be susceptible to noise and vibration effects. Methods used to determine the 0.25 mi. distance are described in Section 2.2. Loud noise produced by chainsaws or logging equipment, as well as construction equipment could disturb roosting bats, causing them to flush from or abandon roosts. Calahan 1993 noted bats abandoning a primary roost when a bulldozer cleared brush adjacent to the tree. Bennett and Braun 2004 indicated that noise from a logging unit could cause Indiana bats to suffer harm or harassment, alter their normal behavior, and cause them to flush from the roost during daylight to escape, possibly causing them to suffer higher than normal predation. Bennett and Braun 2004 also however pointed out that it is believed that this presents a very minimal risk to female and male Indiana bats. We assume the same risks apply to tricolored bats. Garner and Gardener 1992 indicate that disturbance would have to be severe to cause roost abandonment. Gardner et al. (1991) had evidence that Indiana bats continued to roost and forage in an area with active timber harvest, and we assume tricolored bats would respond similarly. It is reasonable to assume that noise from initial timber clearing and construction activities would be novel to bats in this quieter part of the base, potentially causing them to flush from or temporarily abandon roosts. However, they would likely become habituated to this noise over time and return to using roosts in adjacent forest stands if any already exist. While initial timber clearing would occur only between 1 August and 15 November of 2022 and 2023, when all bats would be volant, and the initial barracks construction would likely be completed during the fall and winter, future building construction projects could occur at any time throughout the year over the next 20 years. It is however likely that bats using the surrounding forest will have become habituated to such noise before those projects begin, which would limit or prevent previously described potential impacts as well as the stress of additional energy expenditures experienced by lactating females during the breeding season. It is likely that noise impacts other than mortalities associated with predation on fleeing bats would be temporary in nature.

Operation and maintenance of the expanded cantonment area has some potential to affect the tricolored bat through artificial light induced alteration of foraging and commuting behavior, and increased risk of predation. These potential impacts will be minimized through incorporation of bat friendly lighting in the site lighting plan, as described in section 3.1. Use of pesticides also has the potential to impact bat insect forage species in the vicinity of the project

site and nearby waterbodies. This will be minimized or prevented by using application methods that minimize drift and integrated pest management principals as described in Section 3.1. Noise from increased human activity and grounds maintenance, such as mowing, could become common after buildings are constructed. In addition, noise from tractors with bushhogs and skid-stere mounted forestry grinders used for maintaining undeveloped portions of the project footprint in an early successional condition will become more common. It is expected that bats remaining in the area will be habituated to machine noise by that time. The project site is approximately 174 m (570 ft) through pine and riparian bottomland forest from Bobo Creek, and the soil surface will be extensively disturbed. Water quality protection measures and BMPs, to be identified in the SWPPP (see Section 3.0) required by TDEC, will prevent sediment and contaminants from entering Bobo Creek. This will prevent potential impacts to aquatic insects that can serve as bat forage species.

Given this information, TNARNG has determined that clearing the 9.7 ac. of pine forest, and operating and maintaining the cantonment area, *may affect, but is unlikely to adversely affect*, and clearing the 5.2 ac. hardwood block and constructing the cantonment area buildings is *likely to adversely affect* the tricolored bat. TNARNG would therefore like to include the tricolored bat through conference. To the greatest extent possible, TNARNG has implemented avoidance and minimization measures described in Section 3.1, and believes the same contribution to the TN IBCF will have adequately mitigated all remaining potential adverse effects to the tricolored bat should the species become listed.

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Appendix D:

Little Brown Bat Species and Habitat Description and Status

4.5 Little Brown Bat

4.5.1 Little Brown Bat Background

The little brown bat is not a federally listed, proposed, or candidate species, but it is currently undergoing a Discretionary Status Review on the Service's National Listing Workplan. The Service anticipates completion of a species status assessment in 2022 and expects to determine if the species warrants listing under the ESA in 2023 (USFWS 2022). Currently, no federal critical habitat, conservation plans, or recovery plans exist for this species.

4.5.1.1 Threats

Little brown bats are threatened by WNS, wind energy developments, land development/conversion, logging, and mining, environmental contaminants, and climate change. WNS is the primary and greatest threat to the species, which was considered stable prior to the introduction of the disease (Kunz and Reichard 2010). Using the best available scientific evidence, Frick et al. (2010b) determined the species has a 99 percent chance of being extinct in its core range (i.e. northeastern US) by or during 2026. WNS, is a fungal disease that infects hibernating bats, causes them to arouse more often than normal, and burn unavailable calories, resulting in mortality through starvation. Little brown bat mortality in WNS infected caves has ranged from 73 to 99 percent within the first to several years of infection (Frick et al. 2010b). The species incurs substantial mortality through collisions and barotrauma from turbines at wind energy developments (Arnett et al. 2008; Baerwald et al. 2008; Cryan and Barclay 2009; Kunz et al. 2007). Kunz and Reichard (2010) indicate that many factors threaten the habitat of the little brown bat including land conversion through development, deforestation (Parker 1996, Parker et al. 1996), and oil, gas, and mineral extraction (Kunz and Reichard 2010), and destruction of caves and shafts (Agosta 2002). Little brown bats are susceptible to the accumulation of heavy metals, pesticides, and other environmental contaminants found in their environment deposited through pesticide spraying (Anthony and Kunz 1977, Clark et al. 1978, Fenton and Barclay 1980, Kunz et al. 1977), dumping of non-source pollutants (Fenton and Barclay 1980), and dumping of chemicals and industrial byproducts (Driscoll et al. 2007). Climate change is a threat to the species, as prey availability and reproductive success are closely linked to temperature and rainfall (Adams and Hayes 2008; Frick et al. 2010a), and traditional water sources used as foraging grounds may dry up and be lost (Adams and Hayes 2008).

4.5.2 Little Brown Bat Life History and Associated Habitats

4.5.2.1 Description

The little brown bat is relatively small, weighing 7 - 9 grams (g) (Kalcounis and Brigham 1995; Kunz et al. 1998), having a head and body length of 54 - 57 mm (Williams and Findley 1979), a tail length of 36 - 42 mm (Kalcounis and Brigham 1995), and having a wingspan of 250-270 mm (Kalcounis and Brigham 1995). Its forearm length ranges from 31 – 41 mm (Kalcounis and Brigham 1995). It is distinguished from similar sympatric species, by the length of ears and tragus, pelage length and sheen, lack of a keeled calcar, and ear color (Barbour and Davis 1969). While both sexes are similar in appearance, adult males are often smaller than adult females (Kalcounis and Brigham 1995). Its pelage coloration ranges from pale to dark brown dorsally

and pallid, to yellowish or olive brown ventrally (Fenton and Barclay 1980). The species' typical lifespan in the wild is ten or more years (Barbour and Davis 1969), with the greatest recorded age of 31 when last captured (Fenton and Barclay 1980). Adult survival rates calculated from 1993 – 2008 data were 63 – 90 percent, and first year survival of female little brown bats ranges from 23 - 46 percent, and is higher for young born earlier in the summer (Frick et al. 2010a).

4.5.2.2 Diet

The little brown bat primarily feeds on flying insects that are 3 – 10 mm long (Anthony and Kunz 1977). Their diet is comprised mostly of flies (Diptera) including mosquitoes and midges, moths and butterflies (Lepidoptera), beetles (Coleoptera), caddisflies (Thrichoptera), mayflies (Ephemeroptera), hoppers (Hemiptera), and net winged insects (Neuroptera) in approximately the same proportions they are available in their foraging area (Anthony and Kunz 1977, Whitaker and Lawhead 1992).

4.5.2.2.1 Foraging Habitat

Little brown bats feed along forest and water body edges, over open water, and in forests near water (Barclay 1991; Belwood and Fenton 1976; Fenton and Bell 1979). Their foraging habitat preferences appear to vary with intraspecific competition and flying ability. Adults, with greater flying skill, often forage in more cluttered environments than juveniles, who prefer foraging in clearings or along forest roads (Crampton and Barclay 1998, Van Zyll De Jong 1985). Adults may prefer more open areas when bat population densities are high (Adams 1997).

They typically exhibit two or more feeding bouts during the night, occupying night roosts between feeding bouts (Anthony and Kunz 1977, Anthony et al. 1981, and Kunz 1980). Size of foraging area varies, with pregnant females using 30 or more hectares, and lactating females exhibiting smaller feeding areas, returning to day roosts to feed young between feeding bouts (Henry et al. 2002). Reproductive success depends on the availability of insect prey during summer months coinciding with energetic demands of pregnancy and lactation (Anthony and Kunz 1977; Anthony et al. 1981; Frick et al. 2010a; Jones et al. 2003). The mass of insects consumed varies with life-stage and energetic requirements. Lactating females are known to consume up to their own body mass in insects (approximately 7 g) each night (Kurta et al. 1989). Pregnant or lactating females in New Hampshire were found to consume 2.5g to 3.7 g during their first feeding bout, while juveniles consumed 1.8 g during the same period (Anthony and Kunz 1977).

4.5.2.3 Staging, Spring Migration and Summer Roosting

In a short period referred to as staging, little brown bats gradually emerge from hibernation before migrating to summer habitat. They migrate from short distances to more than 600 km between hibernacula and summer range (Fenton and Barclay 1980). Females arrive at summer roosting areas in early to mid-April in the south, and through mid-May in northern portions of their range (Fenton and Barclay 1980, Norquay et al. 2013).

Little brown bats typically occupy summer roosting habitat from April or May (Fenton and Barclay 1980, Norquay et al. 2013) through mid-August or September (Kunz et al. 1998) depending on how far north or south in their range they occur. Reproductive females exhibit high summer roost fidelity, normally occupying their natal roosts (Frick et al. 2010a; Reynolds 1998). Alternatively, Norquay et al. (2013) found them relocating from year to year. Female home ranges have been estimated to be approximately 30 ha during pregnancy and 17.6 ha during lactation (Henry et al. 2002).

In the summer, reproductive females form large maternity colonies, ranging from tens to hundreds in late April and early May (Crampton and Barclay 1998; Hitchcock and Davis 1965). Barbour and Davis (1969) noted that females are pregnant when they arrive at maternity roosts in
early- to mid-April, with individuals arriving throughout May and into June. Humphrey and Cope (1976) reported large maternity colonies historically ranging from 300-1200 individuals and the largest reaching 3,000. Males and nonreproductive females typically roost solitarily or in small groups (Fenton and Barclay 1980). Maternity colonies are often in barns, attics, tree cavities, and places that remain dark throughout the day (Crampton and Barclay 1998; Hitchcock and Davis 1965).

Females may be reproductively active during their first year of life, but males are not sexually mature until their second fall swarming period (Thomas et al. 1979). Females exhibit delayed fertilization, storing sperm during swarming and hibernation (Thomas et al. 1979). They ovulate within days of exiting hibernation (Buchanan 1987; Wimsatt and Kallen 1957) if they possess sufficient metabolizable fat reserves (Kunz et al. 1998). Historically, reproductive rates were very high, averaging 95% before the onset of white-nose syndrome (Frick et al. 2010a). Gestation occurs over 50-60 days (Barbour and Davis 1969; Wimsatt 1945). Parturition takes place in early May to early July, generally later in northern portions of their range. Females give birth to a single pup, though twins have been reported (Humphrey and Cope 1976). Young develop rapidly and become volant in 3-4 weeks (Humphrey and Cope 1976), or approximately 22 days (Burnett and Kunz 1982; Kunz and Anthony 1982; Powers et al. 1991). Pups are typically weened around 26 days ((Kurta et al. 1989). Maternity colonies begin to break up as soon as the young are weaned in July and few remain by September (Barbour and Davis 1969).

4.5.2.3.1 Summer Roosting Habitat

Little brown bats appear to prefer buildings or similar man-made structures for day roosts in the spring and summer, but also roost in tree cavities, under sloughing bark, under rocks, and occasionally in caves (Humphrey and Cope 1976, Fenton and Barclay 1980). Males appear to prefer natural roosts, while females take greater advantage of manmade structures (Randall et al. 2014). Ambient temperature and amount of shelter are considered primary factors in roost selection. Proximity to water is also thought to be an important factor in roost selection due to the species' preference for foraging over open water with aquatic insects or in proximity to water bodies, and edge habitat (Fenton and Barclay 1980). They appear opportunistic in selecting roost sites with appropriate microclimates, and quickly locate and exploit new roosts"

(Fenton and Barclay 1980). This flexible behavior may have led to their overall success in exploiting fragmented agricultural landscapes (Henderson et al. 2009).

Males and females using trees both prefer old-growth and mature trees, presumably because they provide more crevices and cavities (Fenton and Barclay 1980, Crampton and Barclay 1998). In Illinois, maternity colonies of little brown bats may be found in natural roost sites such as oak and maple trees in both upland and bottomland hardwoods (Bergeson et al. 2012). These colonies are found in dead or dying trees about 8 m off the ground in crevices or hollows or rarely under loose bark (Bergeson 2012). They tend to choose old growth forest over younger stands presumably because the reduced understory clutter of the old growth forests makes prey easier to find and capture (Crampton and Barclay 1998).

Reproductive females roost in larger groups (tens to hundreds) in warmer more humid sites that accelerate gestation and growth of pups (Baptista et al. 2000, Davis and Hitchcock 1965, Humphrey and Cope 1976, Kunz and Anthony 1982). Maternity colony roost temperatures range from 23.3° C (73.94° F) to 34.4° C (93.92° F) (Burnett and August 1981) or as much as 8° C (46.4° F) to 10° C (50° F) above ambient temperature (Brittingham and Williams 2000).

Males and nonreproductive females use cooler roosts conducive to lower body temperatures in daily torpor (Fenton and Barclay 1980), and typically inhabit roosts individually or in small groups. Males may use tree crevices, buildings and occasionally caves and mines as day roosts (Fenton and Barclay 1980). Information about the roosting behavior of nonreproductive females and males during the active season is under-studied due to difficulties associated with finding and monitoring these widely dispersed individuals (Kunz and Reichard 2010).

4.5.2.4 Fall Migration, Swarming, Mating and Hibernation

Little brown bats typically leave their summer roosts and begin migration between mid-August and September, depending on individual age and location within their range (Kunz et al. 1998). Adult females often depart from maternity roosts to begin migrating to swarming sites once young are weaned, thus arriving at hibernacula earlier than yearlings (Kunz et al. 1998).

When they arrive at hibernacula, the bats congregate in what is referred to as fall swarming (Humphrey and Cope 1976). While swarming they build fat reserves and mate promiscuously before entering winter hibernation (Humphrey and Cope 1976, Thomas et al. 1979). The swarming bats copulate indiscriminately beginning in August. Males will sometimes mate with torpid females throughout hibernation period (Thomas et al. 1979). Some swarming bats relocate to other hibernacula prior to hibernation (Fenton 1969, Thomas et al. 1979), thus leading to genetic mixing among roosting or hibernating colonies (Carmody et al. 1971).

During swarming, the bats feed heavily to build fat reserves needed for hibernation (Humphrey and Cope 1976, Thomas et al. 1979). They rapidly increase their body mass by over 2 g (approximately 30% of pre-hibernation body mass) from mid-August through mid-October (Kunz et al. 1998). The amount of fat deposited varies with geographic range, sex, and age class (Ewing et al. 1970, Kunz et al. 1998). They enter hibernation when outside temperatures lower

and insects become scarce (Humphries et al. 2002), though bats with inadequate fat reserves may resist entering hibernation (Geiser 2004). Hibernation timing varies throughout the range of the species due to temperature differences and the length of the hibernation season (Humphries et al. 2002).

Male and female little brown bats group together in large clusters of tens to thousands of individuals during hibernation (Kunz and Reichard 2010). Duration of hibernation is largely dependent on the climate and length of hibernal period of the location (Kunz and Reichard 2010). Their body temperatures drop to within 1-2ºC of ambient cave temperatures (Geiser 2004), decreasing metabolic rates to 5% - 30% of basal levels, conserving energy stored as body fat (Geiser 2004, Boyles and Willis 2009). Bats periodically arouse from hibernation, raising body temperature to normal for reasons that are not entirely understood (Boyles and Willis 2009; Geiser 2004; Thomas et al. 1990). While arousal bouts typically make up less than 1% of the total duration of hibernation, bats consume 80% - 95% of stored energy reserves during these arousals (Boyles and Brack 2009, Dunbar and Tomasi 2006, Thomas et al. 1990). Commonly suggested reasons for breaking torpor include switching hibernacula, feeding, drinking, copulating, and/or enhancing immune function (Speakman and Racey 1989, Thomas and Geiser 1997, Boyles et al. 2006, Luis and Hudson 2006). They have been recorded flying outside a hibernation site periodically throughout the winter, especially in mild weather, though feeding did not begin until mid-March (Whitaker and Rissler 1992). They have also been recorded flying up to 219 km between hibernacula during the winter months (Linzey 1998, Griffin 1940). Healthy little brown bats arouse from torpor approximately every 12-15 days (Brack and Twente 1985, Twente et al. 1985). It is believed that bats have evolved to deposit precise fat reserves to survive hibernation with respect to specific environmental conditions within their specific geographic ranges. Fat reserves remaining at the end of hibernation are considered critical for successful ovulation and gestation (Krulin and Sealander 1972, Kunz et al. 1998, Polskey and Sealander 1979).

4.5.2.4.1 Winter Hibernation Habitat

Little brown bats typically hibernate in caves and mines (Barbour and Davis 1969, Humphrey and Cope 1976). Their hibernacula are characterized by high humidity and relatively cool stable temperatures above freezing, though hibernacula with ambient temperatures below freezing have been observed (Fenton and Barclay 1980). Temperatures within hibernacula normally range from 2ºC - 12ºC (35.6 º F – 53.6º F) (Boyles and Willis 2009; Humphries et al. 2002; Thomas et al. 1990). The species prefers hibernacula with humidity greater than 70% (Fenton and Barclay 1980). Manmade structures that simulate these conditions including tunnels, bunkers, food storage caves, and basements may also be used as hibernacula (Kunz and Reichard 2010). More research is needed to determine what characteristics make suitable caves and mines for little brown bat hibernation.

4.5.3 Little Brown Bat Regional Status and Distribution

Prior to WNS, the little brown bat was considered one of the most widespread and abundant bat species in North America. The northeastern US comprises the core of the species range based on abundance, with the mid-west also containing a large portion of the population (Kunz

and Reichard 2010). These two regions are within the area infected with WNS, where the population is in sharp decline. The disease is predicted to continue its rapid spread throughout the species range. Range-wide trend over the past 25-30 years is not precisely known, but abundance has drastically declined in the eastern portion of the range, where some local extirpations have already occurred (Frick et al. 2010a, Kunz and Reichard 2010). Population decreases at infected hibernacula range from 30% to 99% annually, with a Northeast regional average of 73% (Frick et al. 2010b). Based on these data, Frick et al. (2010) projected a 99% certainty of Northeastern regional extinction by 2026, and likely the species rangewide extinction (Kunz and Reichard 2010). A Pennsylvania study observed 99% declines in hibernacula surveys and 88.6% declines in mist net capture rates post WNS (Butchkoski and Bearer 2016). A Virginia survey of 13 hibernacula detected a 99% decline post WNS (Powers et al 2015). Surveys in Indiana have experienced 90% declines in hibernacula surveys and 80% declines in mist net capture rates (Pettit and O'Keefe 2017). Additionally, Russell et al. 2014 indicated that Midwest populations, believed to comprise most of the remaining eastern population, now faces mass mortality similar to the Notheast. Conversely, Langwig et al. (2017) reported that (as of 2010) sampled populations in New York, Vermont, Connecticut, and Massachusetts had stabilized at about 2-20 percent of the pre-WNS population size. Coleman (2014) reported a very few hibernacula having stable or increasing numbers, and indicated that counts may be confounded by movements of bats among different hibernacula. A study of a New York assemblage of maternity colonies totaling approximately 5,000 individuals, though affected by WNS, appeared to be stable, possibly due to adequate food resources for reproduction and pre-hibernation fat deposition and to an abundance of roosts (First 2011).

The little brown bat's range includes the majority of North America. It does not occur in the southern Great Plains, the majority of Florida, southern California, the coast of the Carolinas and Virginia, and northern Alaska and Canada (Fenton and Barclay 1980, Vanhof et al. 2015). The boarder of its range in the north extends from Alaska along the southern border of the Yukon Territory and east to Newfoundland and Labrador. Along the southern boundary of its range, the species occurs in northern Florida, Alabama, Mississippi, Arkansas, the eastern halves of Oklahoma and Kansas, small sections along the northern borders of Nebraska, Colorado, the northernmost portions of New Mexico and Arizona, and all of California except for the Sonoran desert and the South Coast (Fenton and Barclay 1980, Vonhof et al. 2015). The species distribution is believed to be limited by accessibility to suitable hibernacula (i.e. caves or mines) in addition to climatic conditions (Kunz and Reichard 2010). The northeastern and mid-western United States historically supported the largest known colonies and were thought to support higher densities than the rest of their range due to the prevalence of caves in the Appalachian Mountains and eastern Midwest (Kunz and Reichard 2010).

4.5.4 Little Brown Bat Status in the Action Area

Nearly annual bat surveys conducted by Arnold AFB since 2000 have documented the presence of the little brown bat on the base. Bat surveys have captured the species at 13 locations on base since 1998 and detected it acoustically at all five monitoring locations used since 2015 (Lamb 2022, unpublished data). The nearest capture and acoustic detection sites to the proposed project footprint are approximately 5.3 km (3.3 mi) and 5.2 km (3.2 mi) respectively.

It is approximately 9.7 km (6 mi) to the nearest known hibernacula, which it shares with NLEB, gray, tricolored, and Indiana bats. It is important to note that the project site is in a Swarming 2 area for Indiana bats and NLEB. We assume the little brown bat, since present in the same hibernacula, could be using the area during swarming as well. Lamb (2020) indicates that while capture rates have been highly variable on Arnold AFB since 1998, they have been at or near zero since 2014. Lamb (2020) also used linear regression with acoustic detection rates on Arnold AFB to determine that little brown bat activity levels have remained stable with no apparent trend from 2015 through 2020 but noted several limitations of acoustic data for this method. See Lamb 2020 or 2021 for a discussion of the limitations of acoustic data associated with this technique.

5.5 Little Brown Bat Effects Analysis

The little brown bat was not considered when the project area was inspected by USFWS, Arnold AFB, and TNARNG personnel on 2 February 2022. The species prefers roosting in buildings and other manmade structures, but also uses tree cavities and sloughing bark (Humphrey and Cope 1976, and Fenton and Barclay 1980). Those using trees prefer old growth and mature trees Fenton and Barclay 1980, and Crampton and Barclay 1998). The pine plantation blocks to be cleared are comprised of dense young trees that lack holes or sloughing bark. The species prefers feeding along forest and water body edges, over open water, and in forest near water (Barclay 1991, Belwood and Fenton 1976, and Fenton and Bell 1979). While adults will feed in more cluttered habitat than young, who prefer feeding in clearings and along forest roads (Crampton and Barclay 1998, Van Zyll De Jong 1985), the pine plantation blocks are too dense and have far too cluttered understories for foraging. We therefore determined that the two pine blocks are unsuitable as little brown bat habitat. However, the 5.19 ac. hardwood block on the south end of the site has a more open understory, numerous hardwood trees with cavities and sloughing bark, and contains a small ephemeral pool (approximately 9m X 9m), meeting both foraging and roosting habitat requirements. We have therefore determined the hardwood block to be cleared is good quality little brown bat habitat. The project will require clearing all trees and snags from all 14.9 ac., and 5.19 ac. of good quality little brown bat habitat will be permanently eliminated. All tree clearing will occur from 1 August – 14 November, when juveniles are volant and all bats are able to escape clearing operations, minimizing mortality but still having the potential for disturbance. There is still however some potential for clearing operations to cause direct injury or mortality, injuries that affect a bat's flying and foraging ability, and for some predation on escaping bats. For example, some bats in an occupied tree may not have time to escape before the tree is felled or impacted by another tree and could be injured or killed. Additionally, fleeing bats may be more susceptible to predation during the daylight hours and could use limited energy reserves, stressing the bat. Little brown bats appear opportunistic in selecting roost sites with appropriate microclimates, and quickly locate and exploit new roosts (Fenton and Barclay 1980), and this flexibility may have led to their overall success in fragmented environments (Henderson et al. 2009), making them better adapted to switching to new roost sites if any are destroyed by the tree removal. Work will be conducted during daylight hours. The site is located within a Swarming 2 area.

Little brown bats share the nearest known hibernacula with Indiana bats and NLEB, and we therefore assume little brown bats could also be using this area during swarming.

Little brown bats roosting in trees up to 0.25 mi. outside the project footprint could be susceptible to noise and vibration effects. Methods used to determine the 0.25 mi. distance are described in Section 2.2. Loud noise produced by chainsaws or logging equipment, as well as construction equipment could disturb roosting bats, causing them to flush from or abandon roosts. Calahan 1993 noted bats abandoning a primary roost when a bulldozer cleared brush adjacent to the tree. Bennett and Braun 2004 indicated that noise from a logging unit could cause Indiana bats to suffer harm or harassment, alter their normal behavior, and cause them to flush from the roost during daylight to escape, possibly causing them to suffer higher than normal predation. Bennett and Braun 2004 also however pointed out that it is believed that this presents a very minimal risk to female and male Indiana bats. We assume the same risks apply to little brown bats. Garner and Gardener 1992 indicate that disturbance would have to be severe to cause roost abandonment. Gardner et al. (1991) had evidence that Indiana bats continued to roost and forage in an area with active timber harvest, and we assume little brown bats would respond similarly. It is reasonable to assume that noise from initial timber clearing and construction activities would be novel to bats in this quieter part of the base, potentially causing them to flush from or temporarily abandon roosts. However, they would likely become habituated to this noise over time and return to using roosts in adjacent forest stands if any already exist. While initial timber clearing would occur only between 1 August and 15 November of 2022 and 2023, when all bats would be volant, and the initial barracks construction would likely be completed during the fall and winter, future building construction projects could occur at any time throughout the year over the next 20 years. It is however likely that bats using the surrounding forest will have become habituated to such noise before those projects begin, which would limit or prevent previously described potential impacts as well as the stress of additional energy expenditures experienced by lactating females during the breeding season. Little brown bats appear opportunistic in selecting roost sites with appropriate microclimates, and quickly locate and exploit new roosts (Fenton and Barclay 1980), and this flexibility may have led to their overall success in fragmented environments (Henderson et al. 2009). It is therefore likely that noise impacts other than mortalities associated with predation on fleeing bats would be temporary in nature.

Operation and maintenance of the expanded cantonment area has some potential to affect the little brown bat through artificial light induced alteration of foraging and commuting behavior, and increased risk of predation. These potential impacts will be minimized through incorporation of bat friendly lighting in the site lighting plan, as described in section 3.1. Use of pesticides also has the potential to impact bat insect forage species in the vicinity of the project site and nearby waterbodies. This will be minimized or prevented by using application methods that minimize drift and integrated pest management principals as described in Section 3.1. Noise from increased human activity and grounds maintenance, such as mowing, could become common after buildings are constructed. In addition, noise from tractors with bushhogs and skid-stere mounted forestry grinders used for maintaining undeveloped portions of the project footprint in an early successional condition will become more common. It is expected that bats

remaining in the area will be habituated to machine noise by that time. The project site is approximately 174 m (570 ft) through pine and riparian bottomland forest from Bobo Creek, and the soil surface will be extensively disturbed. Water quality protection measures and BMPs, to be identified in the SWPPP (see Section 3.0) required by TDEC, will prevent sediment and contaminants from entering Bobo Creek. This will prevent potential impacts to aquatic insects that can serve as bat forage species.

Given this information, TNARNG has determined that clearing the 9.7 ac. of pine forest, and operating and maintaining the cantonment area, ***may affect, but is unlikely to adversely affect***, and clearing the 5.2 ac. hardwood block and constructing the cantonment area buildings is ***likely to adversely affect*** the little brown bat. TNARNG would therefore like to include the little brown bat through conference. To the greatest extent possible, TNARNG has implemented avoidance and minimization measures described in Section 3.1, and believes the same contribution to the TN IBCF will have adequately mitigated all remaining potential adverse effects to the little brown bat should the species become listed.

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Appendix E:

2016 VTS-Tullahoma Pesticide Application Report

Table 1. VTS-Tullahoma 2016 Pesticide Application Report.

Date	Facilty Name	Applicator / Company	Facilty Location	Certification #	Pest Controlled	Pesticide Name	Active Ingredient	EPA Number	Concent. (%)	Amount Applied	Units	Active Ingredient PAI	PAI units	PAI Used	Additional Notes
6/29-30/2017	VTS-Tullahoma	Randy Vavis	Cantonment Barracks	94018	Grass/Weed	Pro-Max Round Up	Glyphosate	524-579	48.7	3	gal.	5.5075025	lb AI/gal p	16.52	Spot Spray
6/27-28/2017	VTS-Tullahoma	Randy Davis	Motor Pool	94018	Grass/Weed	Pro-Max Round Up	Glyphosate	524-579	48.7	10.5	gal.	5.5075025	lb AI/gal p	57.83	Spot Spray
6/1-2/2017	VTS-Tullahoma	SPC Clark	Barracks/Motorpool	94018	Poison Ivy	Garlon 4 Ultra	Triclopyr	62719-527	60.45	0.125	gal.	5.596	lb/gal	0.70	Spot Spray w/ Backpack Sprayer
5/1 - 8/20/2016	VTS-Tullahoma	Brandon Cannon	Front Fenceline	94442	Privet	Garlon 4 Ultra	Triclopyr	62719-527	60.45	2	gal.	5.596	lb/gal	11.19	Spot Spray w/ Backpack Sprayer
6/6-7/2016	VTS-Tullahoma	Brandon Cannon	MRF Range	94442	Grass/Weed	Cornerstone	Glyphosate	1381-192	41	10	gal.	4	lb/gal	40.00	Broadcast and spot spray
6/8/2016	VTS-Tullahoma	Brandon Cannon	Range Control/Zero/(	94442	Grass/Weed	Cornerstone	Glyphosate	1381-192	41	6	gal.	4	lb/gal	24.00	Spot Spray
6/9/2016	VTS-Tullahoma	Brandon Cannon	M203/CPQC/MP/MK-	94442	Grass/Weed	Cornerstone	Glyphosate	1381-192	41	4	gal.	4	lb/gal	16.00	Broadcast and spot spray
4/13/2016	VTS-Tullahoma	Joshua Rollins	Field	94018	Grass/Weed	Pro-Max Round Up	Glyphosate	524-579	48.7	10.5	gal.	5.5075025	lb AI/gal p	57.83	Spot Spray
5/2/2016	VTS-Tullahoma	Joshua Rollins	Old Armory	94018	Grass/Weed	Cornerstone	Glyphosate	1381-192	41	2	gal.	4	lb/gal	8.00	Spot Spray
5/2/2016	VTS-Tullahoma	Joshua Rollins	Barracks	94018	Grass/Weed	Cornerstone	Glyphosate	1381-192	41	3	gal.	4	lb/gal	12.00	Spot Spray
5/4 - 5/5/2016	VTS-Tullahoma	Joshua Rollins	Motor Pool	94018	Grass/Weed	Cornerstone	Glyphosate	1381-192	41	9	gal.	4	lb/gal	36.00	Spot Spray
5/19/2016	VTS-Tullahoma	Joshua Rollins	Tank Trail	94018	Grass/Weed	Cornerstone	Glyphosate	1381-192	41	3	gal.	4	lb/gal	12.00	Spot Spray
5/24/2016	VTS-Tullahoma	Joshua Rollins	TTB	94018	Grass/Weed	Cornerstone	Glyphosate	1381-192	41	1	gal.	4	lb/gal	4.00	Spot Spray
5/24/2016	VTS-Tullahoma	Joshua Rollins	UAC	94018	Grass/Weed	Cornerstone	Glyphosate	1381-192	41	1	gal.	4	lb/gal	4.00	Spot Spray