Draft
Environmental Assessment
Low-Level Route Altitude Modifications in Support of Laughlin Air Force Base, Texas

March 2022

Prepared for:
United States Air Force
47th Flying Training Wing

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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 to 1508), and 32 CFR Part 989, Environmental Impact Analysis Process (EIAP). The EIAP provides an opportunity for public input on Air Force decision-making, allows the public to offer inputs on alternative ways for the Air Force to accomplish what it is proposing, and solicits comments on the Air Force's analysis of environmental effects.

Public commenting allows the Air Force 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 Personal home addresses and phone numbers will not be published in the EA.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 that it does not exceed 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.

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COVER SHEET

DRAFT ENVIRONMENTAL ASSESSMENT FOR LOW-LEVEL ROUTE ALTITUDE MODIFICATIONS IN SUPPORT OF LAUGHLIN AIR FORCE BASE, TEXAS

a. *Responsible Agency*: United States Air Force (Air Force)

b. *Cooperating Agency*: None

c. *Proposals and Actions:* This Environmental Assessment (EA) analyzes the Proposed Action to adjust three existing Military Training Routes (MTRs), managed by the 47th Flying Training Wing (47 FTW) at Laughlin Air Force Base (AFB), to support low-level pilot training. Specialized Undergraduate Pilot Training (SUPT) students are required to complete low-level navigation, which should occur at 500 feet (ft) above ground level (AGL) to meet syllabi requirements and prepare aircrew for the transition to more advance low-level tactical flying. Laughlin AFB special use airspace offers a variety of terrain including mountainous areas providing a unique opportunity for student pilots to train in a challenging environment. The Visual Routes (VRs), a type of MTR, described in this EA allow students to train in environments common to those in deployed combat locations. The Proposed Action would lower the floor immediately outside the Big Bend National Park to a 500 ft AGL floor while adjusting the route ceiling to different heights depending on the segment and alternative to be consistent with current route altitudes and to permit aircraft to more safely maneuver and perform syllabi requirements.

d. *For Additional Information:* Contact Laughlin AFB Public Affairs at (830) 298-5262 or email 47FTWPA.Tasker@us.af.mil

e. *Designation:* Draft EA

f. *Abstract:* This EA been prepared pursuant to provisions of the *National Environmental Policy Act*, Title 42 United States Code §§ 4321 to 4347, implemented by Council on Environmental Quality Regulations, Title 40, Code of Federal Regulations (CFR) Parts 1500 to 1508, and 32 CFR Part 989, *Environmental Impact Analysis Process (EIAP),* and the updated September 2020 CEQ NEPA regulations (85 Federal Register 43304 through 43376). Potentially affected environmental resources were identified in coordination with local, state, and federal agencies. Specific environmental resources with the potential for environmental consequences include airspace management and use; noise; land use; air quality; biological resources; cultural resources; safety; and environmental justice and protection of children.

The purpose of the Proposed Action is to meet T-1A and T-38C training requirements by modifying existing available VRs with mountainous terrain located within fuel range to improve safety and vertical maneuverability, while maintaining commitments with the Big Bend National Park. The need for the Proposed Action is to support the mission of the 47 FTW to maximize T-1A and T-38C low-level flight and terrain-following training under varying conditions to meet training requirements to the maximum extent possible.

The analysis of the affected environment and environmental consequences of implementing the Proposed Action and alternatives, when considered with reasonably foreseeable future actions, concluded that by implementing standing environmental protection measures and Best Management Practices, there would be no significant adverse impacts from altering the altitudes of existing MTRs VR-1108, VR-1109, and VR-1117 on the following resources: airspace management and use; noise; land use; air quality; biological resources; cultural resources; safety; and environmental justice and protection of children.

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PROPOSED FINDING OF NO SIGNIFICANT IMPACT (FONSI)

LOW-LEVEL ROUTE MODIFICATIONS IN SUPPORT OF LAUGHLIN AIR FORCE BASE, TEXAS

Pursuant to provisions of the *National Environmental Policy Act* (NEPA), 42 United States Code §§ 4321 to 4370 Council on Environmental Quality (CEQ) Regulations, CEQ Update to the Regulations Implementing the Procedural Provisions of NEPA (16 July 2020), 40 Code of Federal Regulations (CFR) Parts 1500 to 1508; and 32 CFR Part 989, *Environmental Impact Analysis Process (EIAP),* the United States Air Force (Air Force) prepared the attached Draft Environmental Assessment (EA) to address the potential environmental consequences associated with the Low-Level Route Modifications in Support of Laughlin Air Force Base (AFB), Texas.

Purpose and Need

The purpose of the Proposed Action is to meet T-1A and T-38C aircraft training requirements by modifying established Military Training Routes (MTRs) with mountainous terrain located within fuel range to improve safety and vertical maneuverability, while maintaining commitments with the Big Bend National Park.

The need for the Proposed Action is to support the mission of the 47th Flying Training Wing (47 FTW) at Laughlin Air Force Base (AFB) to maximize T-1A and T-38C low-level flight and terrain-following training under varying conditions to meet training requirements to the maximum extent possible. Raising the route ceiling would allow room to maneuver and perform ridge crossings while meeting the 500-foot (ft) AGL syllabus requirement and improve safety of flight for ridge crossings. Lowering certain segments of these routes would improve vertical maneuverability and allow Air Education and Training Command (AETC) student pilots to complete low-level navigation. Additionally, more altitude would allow for the airdrop maneuver to be accomplished in any wind conditions and create a safety buffer for route abort procedures in the event of an emergency.

Description of Proposed Action and Alternatives

The Proposed Action would modify the altitudes along established MTRs to improve T-1A and T-38C aircrew low-level training capabilities. AETC student pilots at Laughlin AFB are required to complete low-level navigation with both T-1A and T-38C aircraft and currently utilize MTR Visual Routes (VRs) VR-1108, VR-1109, and VR-1117 to accomplish this training. The Proposed Action would improve vertical maneuverability along these routes by lowering floors to 500 ft AGL and raising the ceilings to different heights depending on the segment and alternative. No construction, demolition, or other ground disturbing activities would occur under the Proposed Action. There would be no changes to overall flight operations or patterns out of Laughlin AFB and no changes to flight training hours. Currently, supersonic operations and the use of defensive countermeasures (e.g., chaff and flare) or training ordnance do not occur as part of T-1A and T-38C training within the MTRs and would not be added under the Proposed Action. For analysis purposes, the Proposed Action is styled as Alternative 1 throughout this document and the EA. Aside from the No Action Alternative, there is only one alternative to the Proposed Action, Alternative 2, that is analyzed in detail in this document and the EA.

No Action Alternative

Under the No Action Alternative, modifications to the low-level training routes would not be made and aircrews at Laughlin AFB would continue to train using the existing military routes. The No Action Alternative is described for each resource in Chapter 3 as existing conditions. The No Action Alternative would not satisfy the purpose of or need for the Proposed Action; however, the alternative was retained to provide a comparative evaluation against the Proposed Action, as required under CEQ regulations (40 CFR § 1502.14).

In addition to the No Action, two additional alternatives (the Proposed Action, styled as Alternative 1, and one alternative, styled as Alternative 2) were considered in the EA and are described below.

Alternative 1

Under Alternative 1, the ceilings and floors would be modified. The proposed altitude changes for each of the three VRs are shown in **EA Figures 2-2** through **2-4**. The ceiling of all segments in VR-1108, VR-1109, and VR-1117 would be raised from 1,500 ft AGL to 2,000 ft AGL. The floors of some VR segments would be lowered from 1,000 ft AGL to 500 ft AGL. Floors would be lowered at a point to be established for VR-1108 and VR-1109 outside the boundary of BBNP to Point C. In addition, the floors would be lowered from Point D (for VR-1117) to a point to be established outside the boundary of BBNP. This alternative would create a new waypoint along the route to assist aircrew in identifying the boundaries of BBNP. While there would be no change in overall number of sorties or flight hours within the MTRs, this alternative would allow for an increase in the number of training maneuvers and time spent below 1,000 ft AGL as a result of modified airspace.

Alternative 2

Under Alternative 2, the ceilings and floors would be modified. The proposed altitude changes for each of the three VRs are shown in **EA Figures 2-2** through **2-4**. The ceiling of all segments in VR-1108, VR-1109, and VR-1117 would be raised from 1,500 ft AGL to between 4,000 and 7,800 ft MSL depending on the segment. The floors would be lowered from 1,000 ft AGL to 500 ft AGL from Point C for VR-1108 and VR -1109 to a point to be established outside the boundary of BBNP as well as from Point D for VR-1117 to a point to be established outside the boundary of BBNP.

Summary of Findings

Potentially affected environmental resources were identified through communications with state and federal agencies and review of past environmental documentation. Specific environmental resources with the potential for environmental consequences include airspace management and use; noise; land use; air quality; biological resources; cultural resources; safety; and environmental justice and protection of children.

Airspace Management and Use

Under Alternative 1, there would be minor changes in the vertical structure of the VR-1108, VR-1109, and VR-1117 from raising the ceiling and lowering the floors outside of BBNP; however, the VRs would still have the capacity, are in locations, and have the dimensions to support the sorties under Alternative 1. Therefore, negligible impacts would be expected on airspace, adjacent military training airspace or other local civil or military operations under Alternative 1.

Under Alternative 2, there would be moderate changes to the vertical structure of the VRs from raising the ceiling along the entire portions of VRs 1108, 1109, and 1117 and lowering floors (along portions of the VRs. There would be no change to flight operations and the VRs would still have the capacity, are in locations, and have the dimensions to support the sorties under Alternative 2. Therefore, negligible impacts would be expected on airspace, adjacent military training airspace or other local civil or military operations under Alternative 2.

Noise

With implementation of Alternative 1, single-event noise levels in MTR segment B-C would increase compared to the existing conditions, from a maximum of 89 dBA SEL to a maximum of 96 dBA SEL per event. Aircraft operational counts would remain the same as the existing conditions. Segment B-C would be expected to experience an increase in L_{dnmr} noise (onset-rate adjusted monthly day-night average sound level) of approximately 3 dBA as a result of lowering the MTR floor. However, this increase would be considered negligible because of the infrequency of overflights and short-term nature of individual flight events. There would be no significant impacts to the noise environment under Alternative 1. Impacts to the noise environment under Alternative 2 would be the same as described for Alternative 1.

Land Use

Land use beneath the proposed airspace is primarily rural with natural areas used for recreation and protection of wildlife. Under Alternative 1, there would be no change to land use patterns, land ownership, land management, or natural and sensitive areas under the MTRs. Negligible, short term increases to the noise environment would be anticipated under segment B-C with the proposed lowered floors. Within the area beneath segment B-C, developed land represents about 0.11% of the total area and there are no major population centers, so any negligible increases in noise or air emissions would not be experienced by a large population of people and would not cause land use incompatibility. Additionally, while the area under segment B-C includes portions of the Black Gap Wildlife Management Area, the increase in noise would be barely noticeable, infrequent, and would not result in incompatibilities with current land use. There would be no significant impacts on land use under Alternative 1. Impacts to land use under Alternative 2 would be the same as described for Alternative 1.

Air Quality

All counties in the region under the MTRs are designated attainment/unclassifiable for the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants. The Proposed Action under Alternative 1 would not increase flight operations and therefore, would result in zero net air emissions. In addition, the Proposed Action would not construct new facilities; therefore, no impacts from construction-related emissions would be expected. Operations within the Class I area would result in small amounts of emissions that would potentially have an effect on regional haze. However, lowering floors would occur within segments of the MTRs that would be outside of the Class I areas; therefore, impacts to regional haze would be negligible. Under Alternative 2, impacts on air quality and regional haze would be the same as described in Alternative 1.

Biological Resources

The Proposed Action under Alternative 1 does not include construction; therefore, adverse impacts to vegetation communities, domesticated animals, wildlife, federally designated Threatened or Endangered species, or critical habitats from ground disturbance would not be anticipated. There would be the potential for aircraft bird strikes along segments below 1,000 ft AGL. Overflight noise would potentially impact wildlife; however, due to the transient and short duration of aircraft overflight, most animals would habituate to aircraft sounds. No impacts to domesticated animals, wildlife, Threatened and Endangered species, or critical habitats would be expected from implementation of the Proposed Action under Alternative 1. Impacts under Alternative 2 would be the same as described in Alternative 1.

Cultural Resources

No ground disturbance is proposed as part of the Proposed Action under Alternative 1; therefore, no archaeological resources would be affected. No traditional cultural resources or sacred sites have been identified in the Area of Potential Effects (APE). There are no historic districts or individual historic properties eligible for inclusion in the National Register of Historic Places documented in the APE. Implementation of the Proposed Action would have negligible, short-term impacts on the noise environment under route legs of the established routes proposed for lowered altitude floors; however, the Proposed Action does not include lowering the altitude floors over BBNP. The Proposed Action under Alternative 1 would have no effect on, and therefore, no impact on cultural resources. The Proposed Action under Alternative 2 would be the same as described for Alternative 1.

Safety

The Proposed Action under Alternative 1 would potentially increase flight safety risk and the chance of a mishap overall for flights conducted under 1,000 ft AGL; however, adherence to Laughlin AFB Instruction 13-204 Airfield Operations and AFMAN 11-247 T-1A Flying Fundamentals would minimize the flight safety risks. Moreover, the increased space for maneuvering aircraft provided by the lowering the floors in some segments and raising the ceiling for all segments of the VRs would improve flight safety. Continued compliance to current safety procedures and preventive action when bird/wildlife aircraft strike hazard

(BASH) risk increases would result in no significant change to BASH impacts. T-38 and T-1 aircraft are not loaded with high-explosive ordnance. Explosive safety concerns would only include Cartridge Actuated Devices and Propellant Actuated Devices associated with egress and life-support systems. Continued adherence to Air Force procedures and safety standards would result in no significant impacts on munitions safety. Mountainous terrain west of MTRs represent a flight obstruction; avoidance of the mountainous terrain and protected parks would result from implementation of the Proposed Action.

Air mishaps under Alternative 2, would be similar to the potential for mishaps under Alternative 1, except with aircraft potentially flying at higher altitudes, the potential for mishaps would likely decrease. Use of established safety procedures would further minimize the potential for aircraft mishaps. BASH would be similar under Alternative 2 as described in Alternative 1. Continued adherence to current applicable procedures outlined in the Laughlin AFB BASH Plan, particularly when BASH risk increases, would result in no significant change in BASH impacts. Impacts to munitions safety would be the same as described in Alternative 1. Obstructions to flight under Alternative 2 would potentially be somewhat lower as compared to Alternative 2 with aircraft flying at higher altitudes in segments where the ceiling would be raised. Flight obstruction risk would be the same for Alternative 2 as described in Alternative 1.

Environmental Justice and Protection of Children

The Proposed Action under Alternative 1 would not be expected to have a disproportionate impact to minority or low-income populations. The slight increase in the noise and air quality impacts in segment B-C with proposed lower floors would be negligible and barely noticeable. There would be no impacts expected to the nearby Sanderson colonia. Additionally, there are no schools, childcare facilities, and no large youth populations within segment B-C; therefore, no disproportionate environmental health or safety risks are expected to children. Environmental justice impacts would be the same for Alternative 2 as described in Alternative 1.

Reasonably Foreseeable Future Trends

The EA considered the incremental impacts that could result from the Proposed Action and alternatives when added to reasonably foreseeable future actions. No potentially significant impacts were identified for proposed low-level route modifications in support of Laughlin AFB.

Mitigations

The analysis concluded that the Proposed Action would not result in significant environmental impacts; therefore, no mitigation measures would be required. Best management practices, standard operating procedures, and environmental commitments would continue where applicable.

Conclusion

Finding of No Significant Impact*.* After review of the EA prepared in accordance with the requirements of NEPA; CEQ regulations; and 32 CFR Part 989, *Environmental Impact Analysis Process (EIAP),* and which is hereby incorporated by reference, I have determined that the Proposed Action and Alternatives activities in support of the Low-Level Route Modifications in Support of Laughlin AFB, Texas, would not have a significant impact on the quality of the human or natural environment. Accordingly, an Environmental Impact Statement will not be prepared. This decision has been made after considering all submitted information, including a review of public and agency comments submitted during the 30-day public comment period, and considering a full range of practical alternatives that meet project requirements and are within the legal authority of the Air Force.

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CRAIG D. PRATHER, COLONEL, USAF **DATE**
Commander, 47th Flying Training Wing

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LIST OF ACRONYMS AND ABBREVIATIONS

47 FTW	47th Flying Training Wing
ac	acre(s)
ACAM	Air Conformity Applicability Model
AETC	Air Education and Training Command
AFB	Air Force Base
AFMAN	Air Force Manual
AGL	above ground level
Air Force	United States Air Force
APE	Area of Potential Effects
AQCR	Air Quality Control Region
BASH	Bird/Wildlife Aircraft Strike Hazard
BBNP	Big Bend National Park
BMP	Best Management Practices
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
dBA	A-weighted decibels
DOD	Department of Defense
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FLIP	Flight Information Publications
FONSI	Finding of No Significant Impact
ft	foot(feet)
GHG	greenhouse gas
IFR	Instrument Flight Rules
IR	instrument route
kn	knot(s)
L_{dnmr}	onset-rate adjusted monthly day-night average sound level
mm	millimeter
MOA	Military Operations Area
MSL	mean sea level
MTR	Military Training Route
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NPS	National Park Service
NRHP	National Register of Historic Places
O3	ozone
Pb	lead
$PM_{2.5}$	particulate matter with a diameter of less than 2.5 micrometers
PM_{10}	particulate matter with a diameter of less than 10 micrometers
PSD	Prevention of Significant Deterioration
ROI	Region of Influence
SEL	sound exposure level
SO2	sulfur dioxide
SR	slow-speed low-altitude routes
SUPT	Specialized Undergraduate Pilot Training
TCEQ	Texas Commission on Environmental Quality
TCP	Traditional Cultural Properties

TPWD	Texas Parks and Wildlife Department
tpy	tons per year
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
VFR	Visual Flight Rule
VR	visual route

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

Laughlin Air Force Base (AFB), located in the southeastern portion of Val Verde County, Texas, is a United States Air Force (Air Force) Air Education and Training Command (AETC) installation with the primary mission of Specialized Undergraduate Pilot Training (SUPT) with T-6, T-38, and T-1A aircraft, commanded by the 47th Flying Training Wing (47 FTW). As shown on **Figure 1-1**, the base is situated approximately 6 miles east of Del Rio, Texas, near the United States and Mexico international border. The main base covers just over 4,355 acres (ac) of land which is owned or leased by the Air Force. In addition to the main base, Laughlin AFB has noncontiguous facilities that include 400 ac at the Laughlin Auxiliary Airfield near Spofford, Texas, the 101 ac Southwinds Marina at Lake Amistad, 7 ac near the main base for the Instrument Landing System, and 2 ac for the Next Generation Radar site outside Brackettville, Texas.

Special use airspace consisting of three Military Operations Areas (MOAs) provide pilot training around Laughlin AFB. A MOA is designated airspace outside of class A airspace to separate or segregate certain nonhazardous military activities from Instrument Flight Rules (IFR) traffic. Activities in MOAs include, but are not limited to, air combat maneuvers, air intercepts, and low altitude tactics. The defined vertical and lateral limits vary for each MOA. The 47 FTW aircraft primarily use the Laughlin MOAs to perform SUPT training. The Laughlin 1 MOA, which lies 20 nautical miles northwest of Laughlin AFB is the MOA transited by the three MTRs where changes are proposed. Corridors called Military Training Routes (MTRs) are typically used to conduct low-level flying training and may provide ingress and egress to MOAs and other special use airspace. MTRs are further divided into instrument routes (IRs) and visual routes (VRs).

The Air Force is proposing to adjust the altitudes of three existing MTRs managed by the 47 FTW as depicted in **Figure 1-2.** Student pilots currently use MTRs VR-1108, VR-1109, and VR-1117 to primarily accomplish low-level training. These routes are located in the Big Bend region of southwestern Texas, along the Texas/Mexico Border, in Brewster, Pecos, Terrell, and Val Verde Counties. As shown on **Figure 1-2**, the VR-1108 and VR-1109 corridors overlap for most of the first three waypoints before separating and becoming individual routes. The VR-1117 and VR-1109 corridors follow the same route but are flown in opposite directions: VR-1117 is flown east to west, while VR-1109 is flown west to east.

The mission of the 47 FTW is to “build combat ready Airmen, leaders and pilots.” As one of three Air Force SUPT bases, Laughlin AFB graduates over 300 military pilots annually, historically having the highest number of graduating pilots. The SUPT program is approximately 1 year long and serves as the student pilots’ foundation for military flying.

SUPT students are required to complete low-level navigation, which should occur at 500 feet (ft) above ground level (AGL) to the maximum extent possible to meet syllabi requirements and prepare aircrew to transition to more advanced low-level tactical flying. Laughlin AFB special use airspace offers a variety of terrain including mountainous areas, providing a unique opportunity for student pilots to train in a challenging environment. For many students, this is the first opportunity for students to learn the fundamentals of low-level navigation with an instructor. The VRs described in this Environmental Assessment (EA) allow students to train in environments common to those in deployed combat locations.

1.2 PURPOSE OF AND NEED FOR THE ACTION

The purpose of the Proposed Action is to meet T-1A and T-38C aircraft training requirements by modifying established MTRs with mountainous terrain located within fuel range to improve safety and vertical maneuverability, while maintaining commitments with the Big Bend National Park (BBNP).

The need for the Proposed Action is to support the mission of the 47 FTW at Laughlin AFB to maximize T-1A and T-38C low-level flight and terrain-following training under varying conditions to meet training requirements to the maximum extent possible. Raising the route ceiling would allow room to maneuver and perform ridge crossings while meeting the 500-ft AGL syllabus requirement and improve safety of flight for ridge crossings. Lowering certain segments of these routes would improve vertical maneuverability and allow AETC student pilots to complete low-level navigation. Additionally, more altitude would allow for the airdrop maneuver to be accomplished in any wind conditions and create a safety buffer for route abort procedures in the event of an emergency.

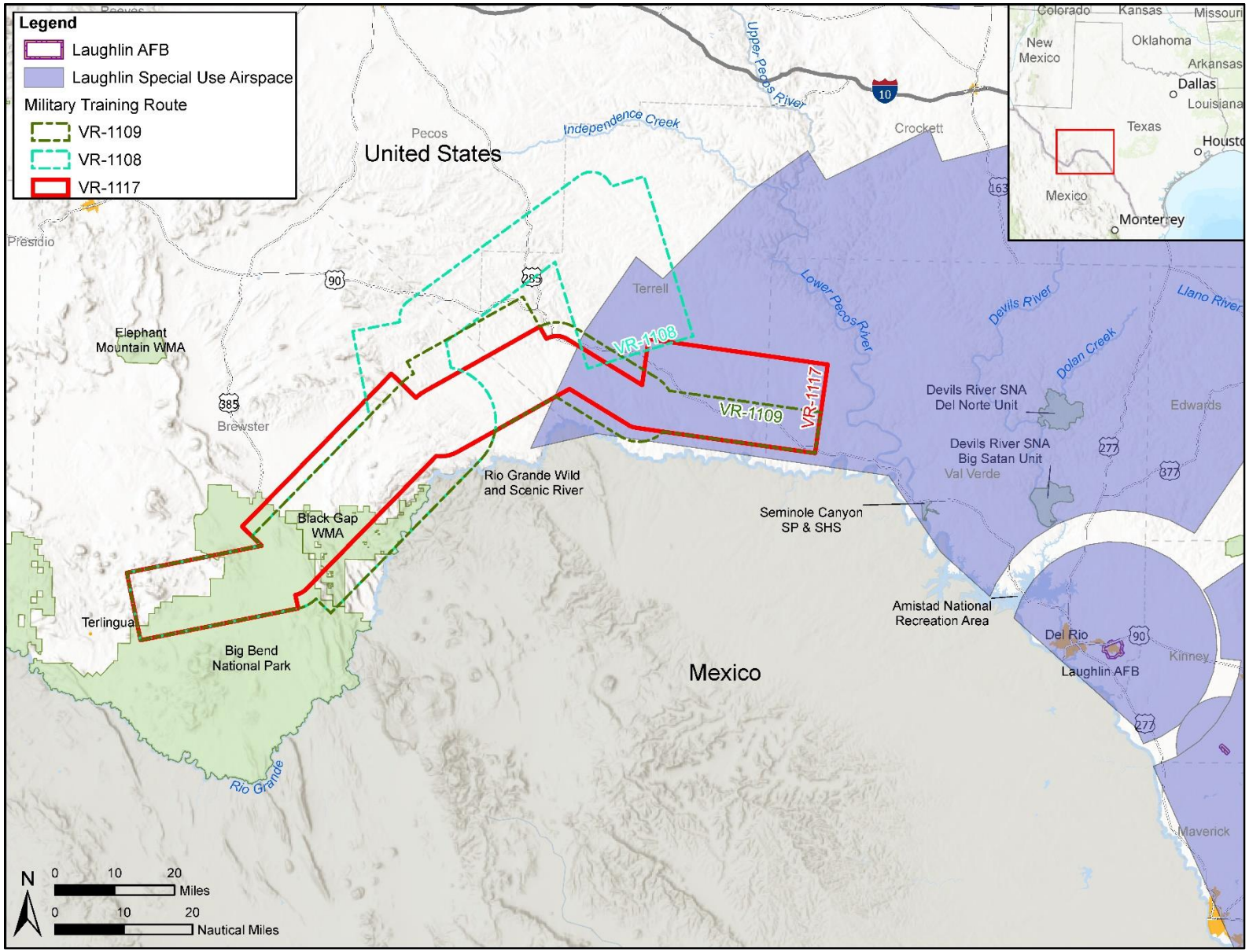

Figure 1-1. Project Location.

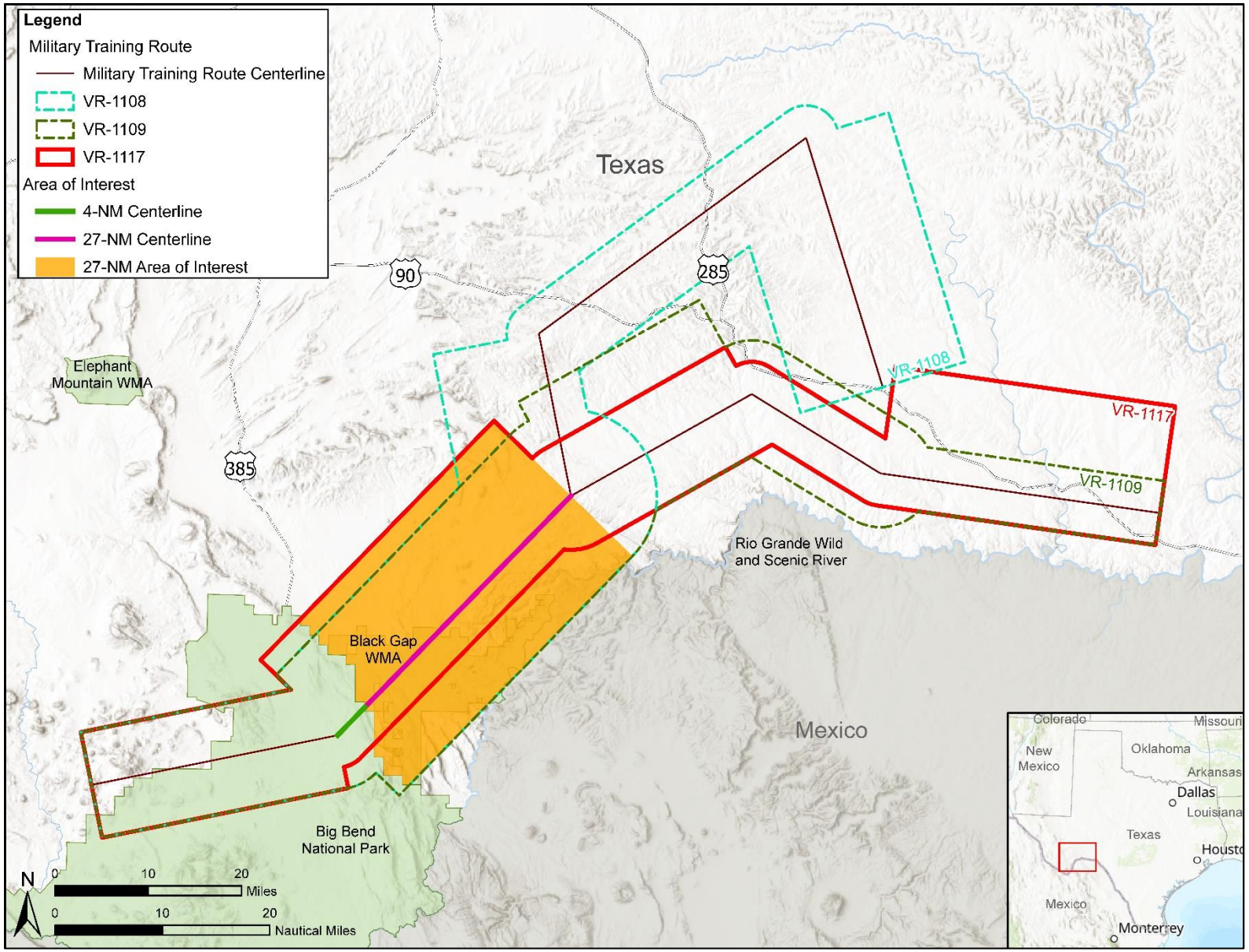

Figure 1-2. Location of the Three Existing Military Training Routes Where Altitude Changes are Proposed.

1.3 DECISION TO BE MADE

This EA evaluates the potential environmental consequences associated with implementation of the Proposed Action or alternatives to support the mission of the 47 FTW at Laughlin AFB. Based on the analysis in this EA, the Air Force will make one of three decisions regarding the Proposed Action:

1. Choose the alternative that best meets the purpose of and need for this project and sign a Finding of No Significant Impact (FONSI), allowing implementation of the selected alternative;
2. Initiate preparation of an Environmental Impact Statement (EIS) if it is determined that significant impacts would occur through implementation of the Proposed Action or alternatives; or
3. Select the No Action Alternative, whereby the Proposed Action would not be implemented.

As required by National Environmental Policy Act (NEPA) and its implementing regulations, preparation of an environmental document must precede final decisions regarding the proposed project and be available to inform decision-makers of the potential environmental impacts.

1.4 ORGANIZATION OF THIS DOCUMENT

NEPA is the basic national requirement for identifying environmental consequences of federal decisions. NEPA ensures that environmental information is available to the public, agencies, and the decision makers before decisions are made and actions are taken. The organization of this EA is consistent with Council on Environmental Quality (CEQ) regulations and includes the following chapters:

- Purpose and Need for the Proposed Action, which provides purpose and need statement, as well as an introduction, background description, location, scope of environmental analysis, decision to be made and a description of public and agency review of the EA.
- Description of the Proposed Action and Alternatives includes a description of the Proposed Action, No Action Alternative, selection standards, and a summary of potential environmental consequences.
- Affected Environment and Environmental Consequences that describes the natural and man-made environments that may be affected by the Proposed Action and No Action Alternative, as well as definitions and discussions of potential impacts.
- References contains references for studies, data, and other resources used in the preparation of the EA. Appendices are included to provide relevant correspondence, studies, modeling results, and a glossary of terms.

Potential impacts of the Proposed Action, alternative actions, and the No Action Alternative described in this document are analyzed in terms of their context, duration, and intensity. To help the public and decision makers understand the implications of impacts, they are described in the short and long term, in association with other reasonably foreseeable future actions with a close causal relationship to the Proposed Action.

1.5 APPLICABLE LAWS AND ENVIRONMENTAL REGULATIONS

Implementation of the Proposed Action would involve coordination with several organizations and agencies. Adherence to the requirements of specific laws, regulations, best management practices (BMPs), and necessary permits are described in detail in each resource section in **Chapter 3**.

1.5.1 National Environmental Policy Act

The NEPA requires that federal agencies consider potential environmental consequences of proposed actions. The law's intent is to protect, restore, or enhance the environment through well-informed federal decisions. The CEQ was established under NEPA for the purpose of implementing and overseeing federal policies as they relate to this process. In 1978, the CEQ issued Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] Parts 1500–1508 [CEQ 1978]). In 2020, CEQ updated implementing regulations; the 14 September 2020 version of CEQ NEPA regulations (85 Federal Register 43304 through 43376) are being used. These regulations specify that an EA be prepared to

- briefly provide sufficient analysis and evidence for determining whether to prepare an EIS or a FONSI;
- aid in an agency's compliance with NEPA when no EIS is necessary; and

- facilitate preparation of an EIS when one is necessary.

Further, to comply with other relevant environmental requirements (e.g., the Endangered Species Act [ESA] and National Historic Preservation Act [NHPA]) in addition to NEPA and to assess potential environmental impacts, the Environmental Impact Analysis Process (EIAP) and decision-making process for the Proposed Action and alternatives involves a thorough examination of environmental issues potentially affected by government actions subject to NEPA.

1.5.2 The Environmental Impact Analysis Process

The EIAP is the process by which the Air Force facilitates compliance with environmental statutes and regulations including NEPA (as implemented by the Air Force with 32 CFR Part 989), which is the primary legislation affecting the agency's decision-making process.

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2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The 47 FTW at Laughlin AFB, Texas, proposes to modify the altitudes along established MTRs (VR-1108, VR-1109, and VR-1117) to improve T-1A and T-38C aircrew low-level training capabilities. AETC student pilots at Laughlin AFB are required to complete low-level navigation with both T-1A and T-38C aircraft and currently utilize VR-1108, VR-1109, and VR-1117 to accomplish this training. The Proposed Action would improve vertical maneuverability along these routes by lowering the floors to 500 ft AGL and raising the ceilings up to 2,000 ft AGL for some segments of these routes where feasible. See **Tables 2-1** and **2-2** for details on which segments would remain the same and which have proposed changes.

No construction, demolition, or other ground-disturbing activities would occur under the Proposed Action. There would be no changes to overall flight operations or patterns out of Laughlin AFB and no changes to flight training hours. Currently, supersonic operations and the use of defensive countermeasures (e.g., chaff and flare) or training ordnance do not occur as part of T-1A and T-38C training within the MTRs and would not be added under the Proposed Action. Any future increases to the overall number or duration of operations within the MTRs would be analyzed in subsequent environmental analyses.

The MTR program is a joint venture between the Federal Aviation Administration (FAA) and the Department of Defense to facilitate military readiness by establishing and managing routes for conducting low-level, high-speed training while maintaining the highest level of flight safety practicable (FAA, 2021b). Typically, MTRs are established below 10,000 ft mean sea level (MSL) for military flight operations performed in excess of 250 knots (kn). An MTR may be comprised of multiple segments with designated floor and ceiling altitudes. Lateral boundaries are established to determine the geographic location of an MTR corridor. A graphical representation of an MTR is provided as **Figure 2-1**.

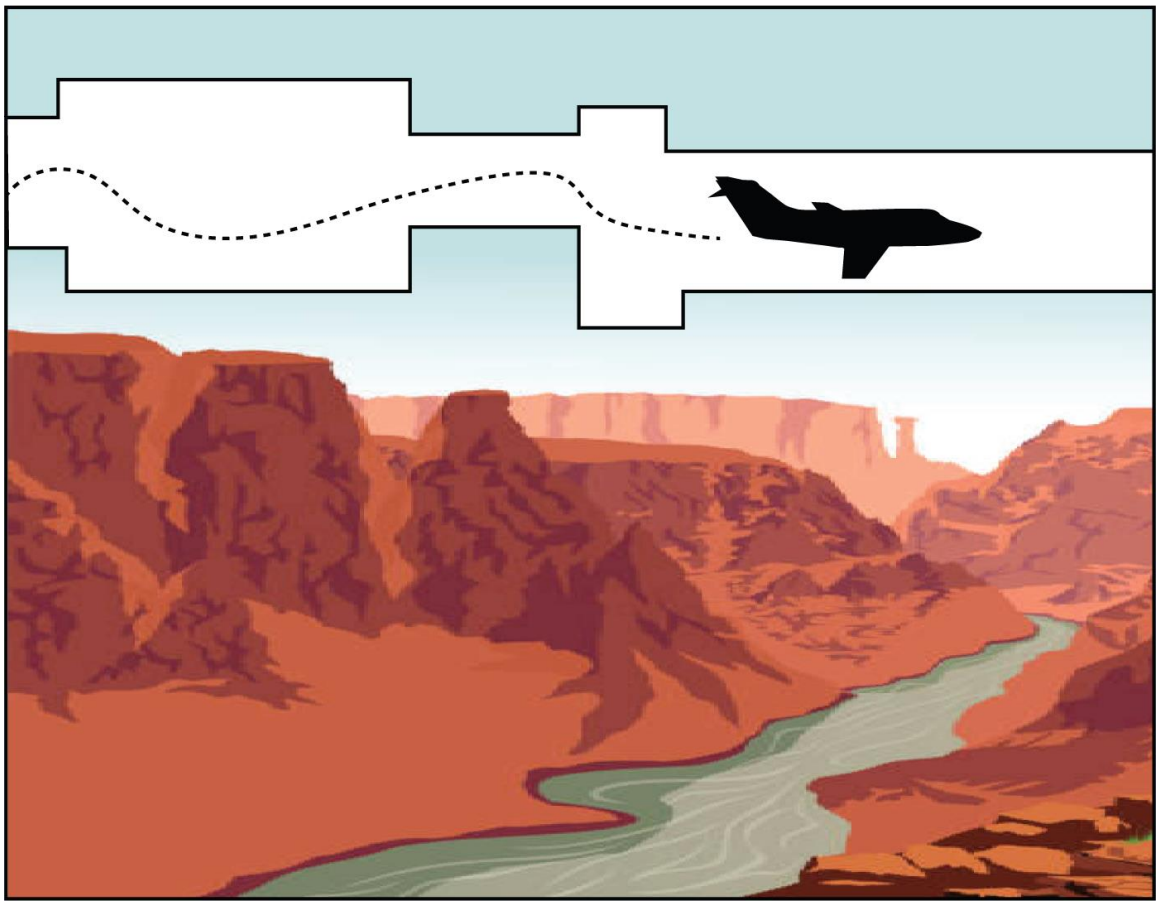

Figure 2-1. Graphical Representation of a Military Training Route.

Within the MTRs, T-38C and T-1A student pilots focus on navigation and basic low-level flying skills such as clearing, altitude control, and turn preparation. Student pilots must be able to demonstrate safe, low-level operations using basic and enhanced procedures and inflight computations. Other requirements for student pilots include procedural checklists, timing control to entry point, entry point identification, wind drift corrections, timing control techniques, basic map reading skills, and exit procedures. Under the Proposed Action, modifications to the routes are proposed primarily to increase safety in ridge crossings and airdrop maneuver training and to improve the overall training experience.

To meet requirements outlined in the T-38C syllabus, student pilots learn ridge crossings, a maneuver that involves going over the top of a ridge in a partial roll and pulling towards the ground to "hug" mountainous terrain. Safety of flight is increased within MTRs having floors of 500 ft AGL and ceilings of 2,000 ft AGL by allowing T-38s the room to maneuver and providing more altitude to perform ridge crossings, while meeting the 500 ft AGL intent of the syllabus. In addition, when MTRs occur over public use airports, flights within the MTR must occur at 1,500 ft AGL or above and at a distance of at least 3 NM. There is one public use airport under the MTRs proposed for modification, and the current 1,500 ft ceiling of the routes limits the altitude for student pilots to traverse these locations.

Airdrop maneuver training, required for T-1A student pilots, is accomplished by a pair of aircraft climbing 500 ft above the planned route altitude with a preferred route altitude of 500 ft AGL. Air Force Manual (AFMAN) 11-2T-1V3, *T-1A Operations Procedures*, requires airdrop training to occur at or above the existing route corridor's ceiling of 1,500 ft AGL although restricts T-1A low-level training in mountainous terrain to minimums of 1,000 ft AGL when winds are between 21 to 25 kn and 1,500 ft AGL when winds exceed 25 kn.

Under the Proposed Action, an increase of the route ceiling would allow for the airdrop maneuver to be accomplished in any wind conditions to meet the requirements of AFMAN 11-2T-1V3. In addition, raising the ceiling would create a safety buffer of 500 ft AGL for route abort procedures for aircraft in the case of emergencies when the wind speed is at 25 kn or above, which often occurs.

2.2 SELECTION STANDARDS

In accordance with 32 CFR § 989.8(c), selection standards were developed to establish a means for determining the reasonableness of an alternative and whether an alternative should be carried forward for further analysis in the EA. Consistent with 32 CFR § 989.8(c), the following selection standards were developed to meet the purpose of and need for the Proposed Action and were used to identify reasonable alternatives for analysis in the EA:

1. **Use existing low-level visual routes.** It is both difficult and time consuming to create new military routes that would meet the training needs of the T-1A and T-38C aircraft when there are existing routes that can be altered to meet these needs. Airspace is a finite resource, and the FAA encourages use of existing MTRs by the Air Force.
2. **Use routes owned/operated by Laughlin AFB to maximize training time.** MTRs need to be within the authority of Laughlin AFB to control scheduling and maximize training time. Further, in order to maximize flying range (i.e., fuel capacity) for aircraft training from Laughlin AFB, the distance to training routes from Laughlin AFB must be within a range that allows for transit to and from the training location and also allows for the requisite amount of time to accomplish training.
3. **Provide Laughlin AFB with operational flexibility for flight route planning.** Weather and other restrictions can make planning for training in low-level routes challenging. Each type of low-level route has different weather requirements. Laughlin AFB special use airspace is located within vastly different weather patterns throughout the state of Texas. Optimizing existing VRs provides a portfolio of training options.
4. **Provide optimized training experience.** VRs need to be sized and configured to permit low-level navigational and operational training opportunities while minimizing potential conflicts with civil aviation and other military users. VRs should allow for a 500-ft climb for airdrop maneuvers and allow for route abort procedures in the frequently occurring high-wind conditions. In addition, existing routes provide variable topography including unique mountainous terrain which allow for students to train in environments that are common in deployed combat locations.

5. **Avoid low-level flights within the Big Bend National Park.** To maintain existing commitments with the National Park Service (NPS) regarding overflights within the BBNP, alternatives should avoid modifications to the floors of VRs within the park to limit disturbance to visitors and noise-sensitive wildlife species.

2.3 ALTERNATIVES CONSIDERED

NEPA and CEQ regulations mandate the consideration of reasonable alternatives before undertaking any Proposed Action. "Reasonable alternatives" are those that could meet the purpose of and need for the Proposed Action. The following sections include a summary of possible alternatives considered.

2.3.1 Alternative 1 – Raise the Ceilings and Lower Floors

Under Alternative 1, the ceilings and floors would be modified. The proposed modifications are summarized in **Table 2-1**. The ceiling of all segments in VR-1108, VR-1109, and VR-1117 would be raised from 1,500 ft AGL to 2,000 ft AGL. The floors of some VR segments would be lowered from 1,000 ft AGL to 500 ft AGL from

- A point to be established (for VR-1108 and VR-1109) outside the boundary of BBNP to Point C.
- Point D (for VR-1117) to a point to be established outside the boundary of BBNP.

The proposed altitude changes for each of the three VRs are shown on **Figures 2-2** through **2-4**.

Table 2-1.
Alternative 1 Existing and Proposed Altitude Modifications

Route Legs (point to point)	VR-1108 (ft AGL)		VR-1109 (ft AGL)		VR-1117 (ft AGL)	
	Existing Floor/ Ceiling	Proposed Floor/ Ceiling	Existing Floor/ Ceiling	Proposed Floor/ Ceiling	Existing Floor/ Ceiling	Proposed Floor/ Ceiling
A-B	1,000/1,500	No change/2,000	1,000/1,500	No change/2,000	500/1,500	No change/2,000
B-C	1,000/1,500	500*/2,000	1,000/,1500	500*/,2000	500/1,500	No change/2,000
C-D	500/1,500	No change/2,000	500/1,500	No change/2,000	500/1,500	No change/2,000
D-E	500/1,500	No change/2,000	500/1,500	No change/2,000	1,000/1,500	500*/2,000
E-F	500/1,500	No change/2,000	500/1,500	No change/2,000	1,000/1,500	No change/2,000

* Beginning outside Big Bend National Park

AGL = above ground level; ft = feet

This alternative would create a new waypoint along the route to assist aircrew in identifying the boundaries of BBNP. While there would be no change in overall number of sorties or flight hours within the MTRs, this alternative would allow for an increase in the number of training maneuvers and time spent below 1,000 ft AGL as a result of modified airspace.

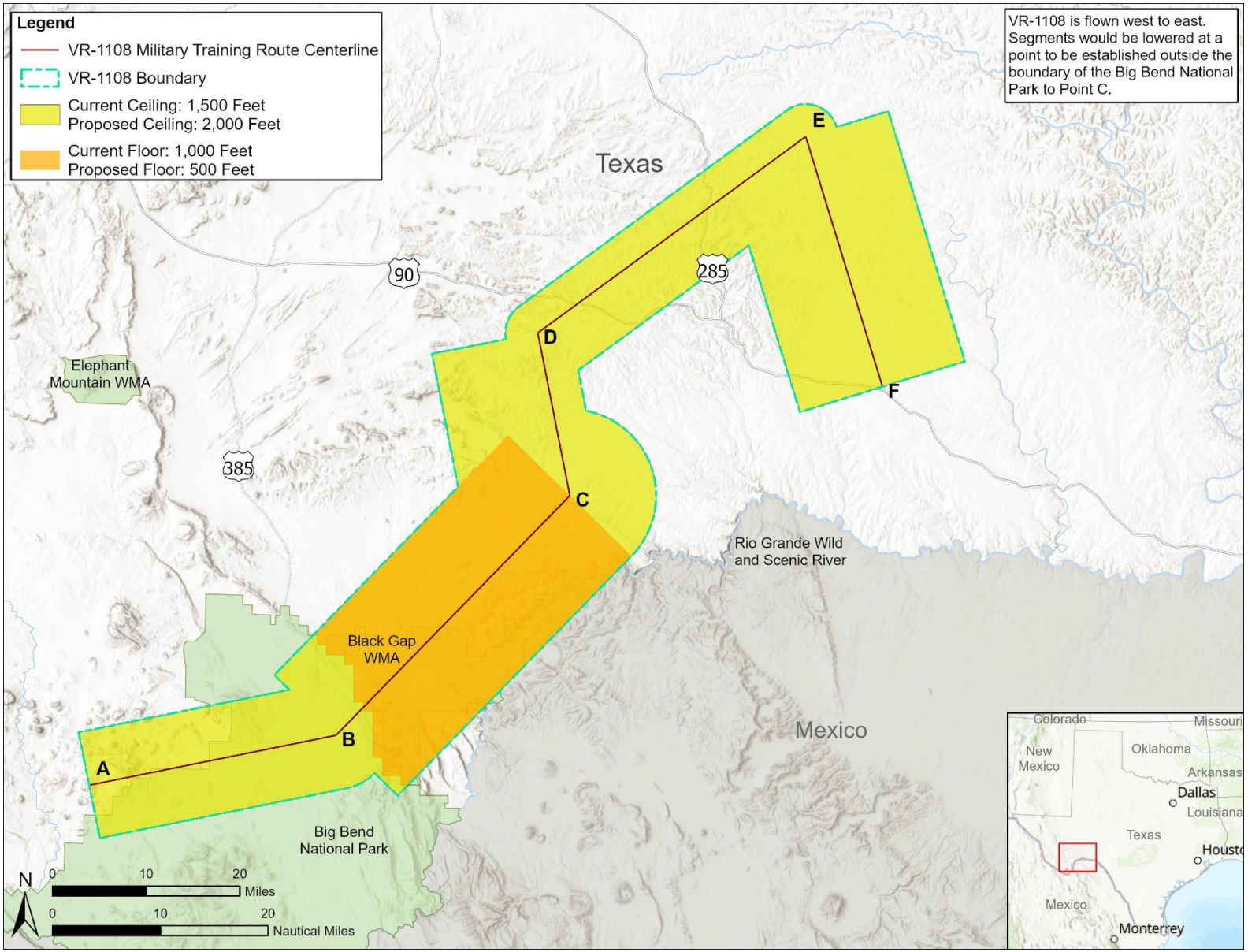

Figure 2-2. Location of Military Training Route VR-1108 Where Altitude Changes are Proposed.

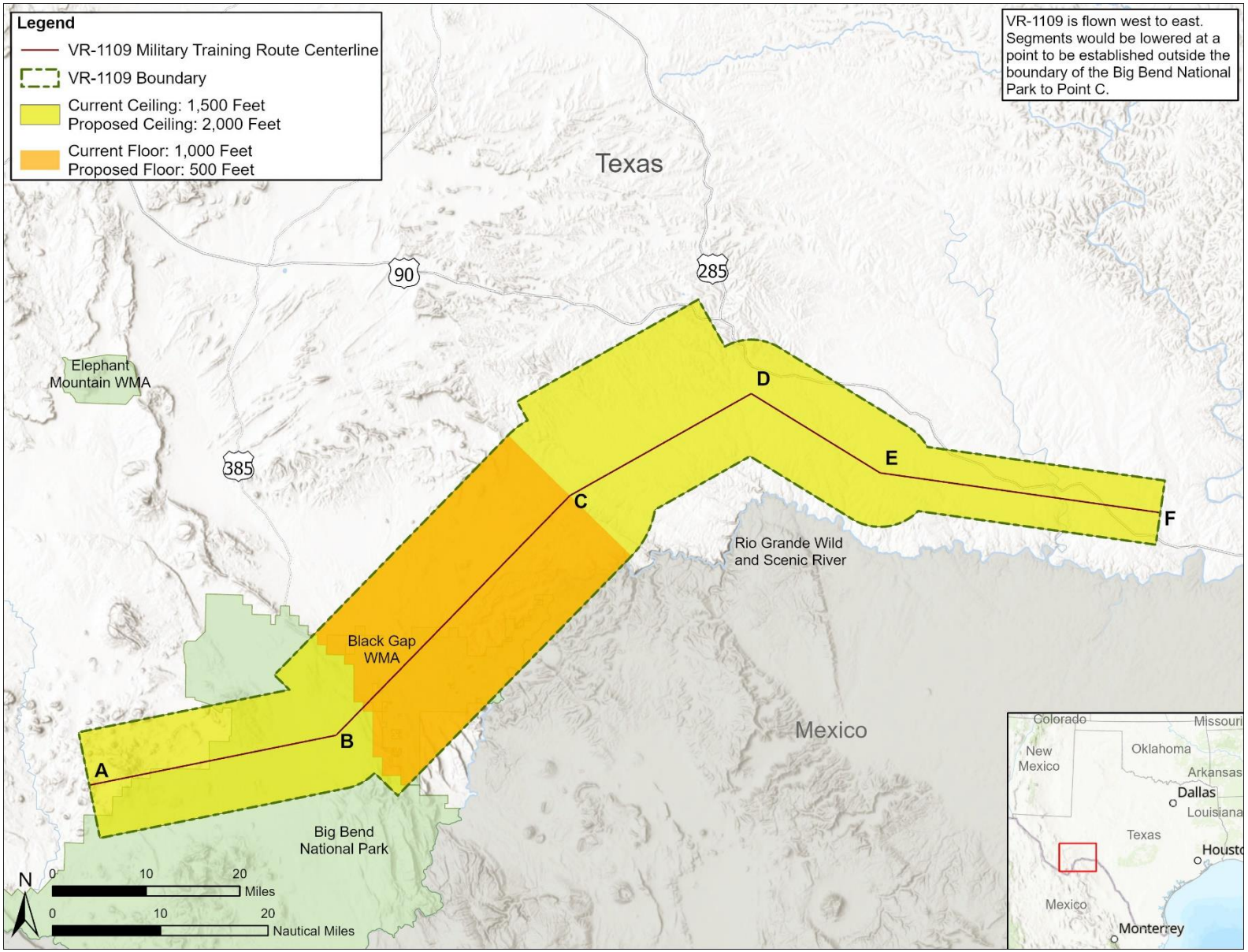

Figure 2-3. Location of Military Training Route VR-1109 Where Altitude Changes are Proposed.

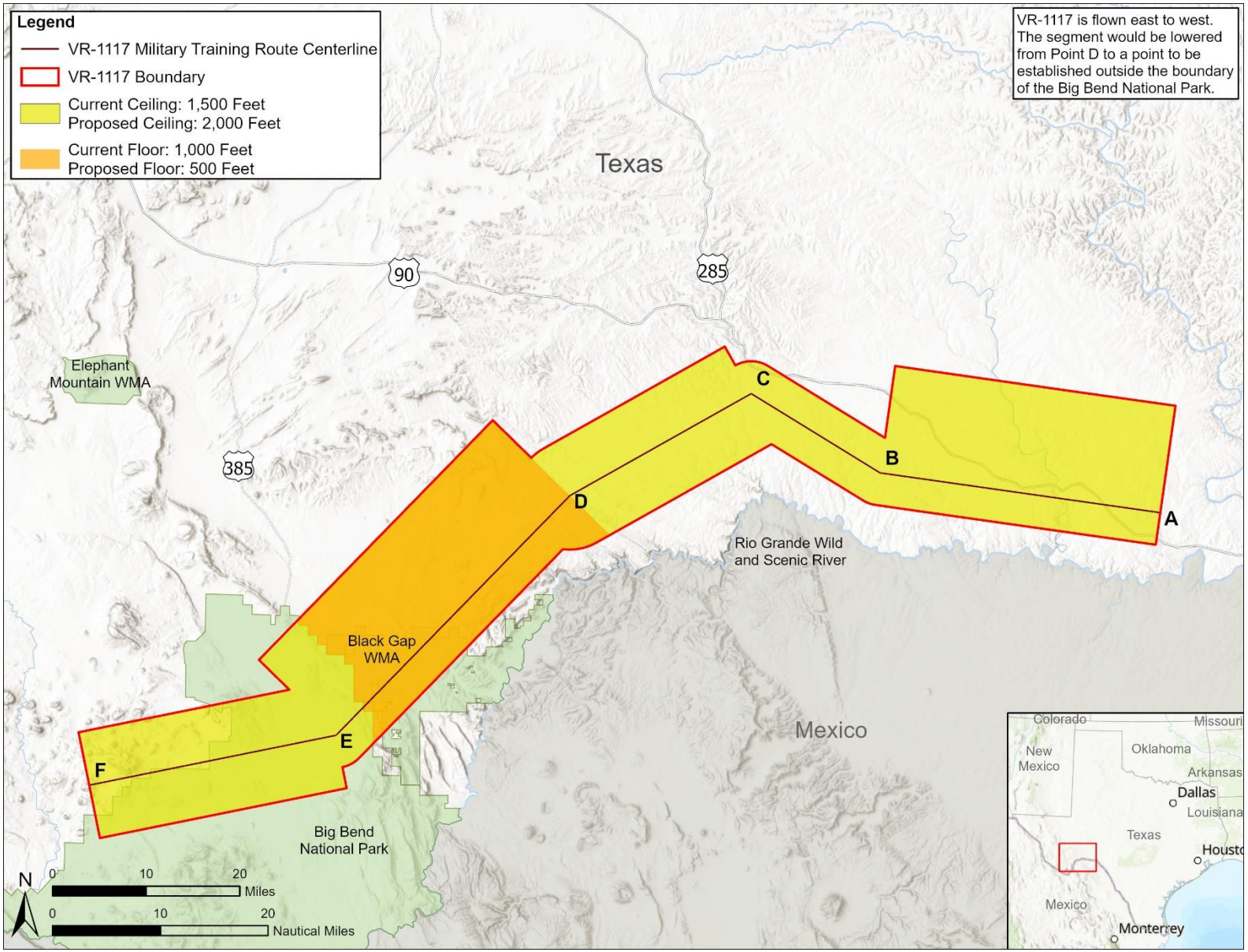

Figure 2-4. Location of Military Training Route VR-1117 Where Altitude Changes are Proposed.

2.3.2 Alternative 2 – Raise Ceilings above 5,000 ft MSL and Lower Floors

Under Alternative 2, the ceilings and floors would be modified. The ceiling of all segments in VR-1108, VR-1109, and VR-1117 would be raised from 1,500 ft AGL to between 5,000 and 7,800 ft MSL depending on the segment (**Table 2-2**). The floors of the following VR segments would be lowered from 1,000 ft AGL to 500 ft AGL:

- Point C (for VR-1108 and VR-1109) to a point to be established outside the boundary of BBNP and
- Point D (for VR-1117) to a point to be established outside the boundary of BBNP.

Table 2-2.
Alternative 2 Existing and Proposed Altitude Modifications

Route Legs (point to point)	VR-1108		VR-1109		VR-1117	
	Existing Floor/ Ceiling (ft AGL)	Proposed Floor (ft AGL)/ Ceiling (ft MSL)	Existing Floor/ Ceiling (ft AGL)	Proposed Floor (ft AGL)/ Ceiling (ft MSL)	Existing Floor/ Ceiling (ft AGL)	Proposed Floor (ft AGL)/ Ceiling (ft MSL)
A-B	1,000/1,500	No change/ 7,800	1,000/1,500	No change/ 7,800	500/1,500	No change/ 5,000
B-C	1,000/1,500	500*/7,600	1,000/1,500	500*/7,600	500/1,500	No change/ 5,000
C-D	500/1,500	No change/ 6,200	500/1,500	No change/ 6,200	500/1,500	No change/ 6,200
D-E	500/1,500	No change/ 6,000	500/1,500	No change/ 5,000	1000/1,500	500*/7,600
E-F	500/1,500	No change/ 5,000	500/1,500	No change/ 5,000	1000/1,500	No change/ 7,800

* Beginning outside Big Bend National Park

AGL = above ground level; ft = feet; MSL = mean sea level

2.3.3 Alternative 3 – Raise Ceilings and Seasonally Lower Floors

Under Alternative 3, the ceilings would be raised as described in Alternative 1. Floors would be lowered to 500 ft AGL on the portion of the routes that lie above BBNP during off-peak season for visitors, which lasts from May through September. During peak visitor season of October through April, the floor would remain at 1,000 ft AGL. It should be noted that the peak visitor season has expanded each year, which would necessitate annual coordination with BBNP and potential future adjustments to the seasonal floor altitude.

This alternative would raise the ceilings on the routes as described under Alternative 1 but would allow pilots to fly at 500 ft AGL within BBNP during off-peak seasons. Low-level training during the peak seasons would remain restricted to a 1,000 ft AGL floor over the geographical confines of BBNP, with training outside the confines of BBNP occurring at 500 ft AGL.

This alternative conflicts with existing commitments with the NPS regarding overflights within BBNP, which are in place to limit disturbance to visitors and noise-sensitive wildlife species, and has therefore been dismissed from detailed consideration in this EA.

2.3.4 Alternative 4 – Raise Ceilings and Lower Floors on Entire Routes

Under Alternative 4, the ceilings would be raised as described in Alternative 1. The floors would be lowered from 1,000 ft AGL to 500 ft AGL for the entire route of each VR. This alternative conflicts with existing commitments with the NPS regarding overflights within BBNP and has therefore been dismissed from further consideration.

2.3.5 Alternative 5 – Raise Ceilings Only

Under Alternative 5, the ceilings would be raised as described in Alternative 1. This alternative would maintain the current floors and raise the ceilings of VR-1108, VR-1109, and VR-1117 from 1,500 ft AGL to 2,000 ft AGL.

Training would continue to be conducted on VR-1108, VR-1109, and VR-1117 but at the current degraded state with this alternative. While the elevated ceilings would allow T-38s the room to maneuver and provide more altitude to perform ridge crossings as well as provide adequate clearance for overflights of airfields beneath MTRs, students would continue to not have the benefit of unique low-level training at 500 ft AGL through mountainous terrain. This alternative would not provide the low-level optimized airspace required and has therefore been dismissed from further consideration.

2.3.6 Alternative 6 – Use Different Military Training Routes to Accomplish Low-Level Training

This alternative considered use of other training routes and would lower floors of other MTRs to 500 ft AGL to provide the training routes that meet the purpose and need. VR-196 and VR-197 are the only accessible alternate MTRs that would satisfy the training objective to fly in mountainous terrain. VR-196 is too far west to be compatible with the fuel capabilities of the T-38C aircraft. Moreover, the additional enroute time for the T-1 to travel to and from these MTRs would double the low-level training sortie length. This alternative does not allow Laughlin AFB to maximize training time and has been eliminated from further consideration.

2.3.7 Alternative 7 – Modify Military Training Routes

This alternative would relocate portions of VR-1108, VR-1109, and VR-1117 corridors to be outside of BBNP. Due to the proximity to the US/Mexico border, the route cannot be moved farther to the South. Furthermore, IR-178, VR-196, and VR-197 are adjacent to the MTRs, and shifting VR-1108, VR-1109, and VR-1117 to the north would conflict with these routes. Moreover, the mountainous terrain does not extend north, extending instead west/southwest toward El Paso, and would not provide low-level training at 500 ft AGL through mountainous terrain. Therefore, this alternative has been eliminated from further consideration.

2.3.8 No Action Alternative

Analysis of the No Action Alternative provides a benchmark, enabling decision-makers to compare the magnitude of the potential environmental effects of the Proposed Action. NEPA requires an EA to analyze the No Action Alternative. No action means that an action would not take place at this time, and the resulting environmental effects from taking no action would be compared with the effects of allowing the proposed activity to go forward. No action for this EA reflects the status quo, where modifications to the low-level training routes are not made. Aircrews at Laughlin AFB would continue to train using existing MTRs.

2.4 SCREENING OF ALTERNATIVES

In addition to the No Action Alternative, only Alternatives 1 and 2 are carried forward for detailed evaluation. Five alternatives were considered and eliminated from detailed analysis because they would not meet the purpose of and need for the Proposed Action or the selection standards (refer to **Section 2.2**). A comparison of the alternatives considered is provided in **Table 2-3**.

Table 2-3.
Comparison of Alternatives

	Selection Standards					
	1. Existing Low-level Visual Routes	**2. Owned/ Operated by Laughlin Air Force Base**	**3. Scheduling**	**4. Training Experience**	**5. Maintain Commitments**	**Meets Purpose and Need**
Alternative 1	Yes	Yes	Yes	Yes	Yes	**Yes**
Alternative 2	Yes	Yes	Yes	Yes	Yes	**Yes**
Alternative 3	Yes	Yes	Yes	Yes	No	**No**
Alternative 4	Yes	Yes	Yes	Yes	No	**No**
Alternative 5	Yes	Yes	Yes	No	Yes	**No**
Alternative 6	Yes	No	Yes	Yes	Yes	**No**
Alternative 7	No	Yes	Yes	No	Yes	**No**

2.5 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES

The potential impacts associated with Proposed Action (styled as Alternative 1), Alternative 2, and the No Action Alternative are summarized in **Table 2-4**. The summary is based on information discussed in detail in **Chapter 3** of the EA and includes a concise definition of the issues addressed and the potential environmental impacts associated with each alternative.

Table 2-4
Summary of Potential Environmental Consequences

Alternative	Resource							
	Airspace Management and Use	**Noise**	**Land Use**	**Air Quality**	**Biological Resources**	**Cultural Resources**	**Safety**	**Environmental Justice and Protection of Children**
Alternative 1: Raise Ceilings (up to 2,000 ft AGL) and Lower Floors	Negligible impacts on airspace, including any adjacent military training airspace or other local civil or military operations.	Single-event noise levels in MTR segment B-C would increase compared to the existing conditions. One segment, B-C, would be expected to experience a negligible increase in onset-rate adjusted monthly day-night average sound level (L_{dnmr}).	No impacts on land use or land use compatibility	All counties beneath the MTRs are attainment for NAAQS for regulated pollutants; no increase in flight operations results in zero additional air emissions. Impacts to regional haze would be negligible.	There would be an increased potential for aircraft bird strikes along segments below 1,000 ft AGL, although impacts would be minimized through following Bird/Wildlife Aircraft Strike Hazard (BASH) procedures. Habituation to flight activity is anticipated and no direct or indirect, impacts to domesticated animals, wildlife, federally designated Threatened or Endangered species, or Critical Habitats are anticipated.	No traditional cultural resources or sacred sites have been identified in the APE. There are no historic districts or individual historic properties eligible for inclusion in the National Register of Historic Places documented in the APE. No impact on cultural resources.	Potential increase in flight safety risk and chances for aircraft mishaps for flights under 1,000 ft AGL. Increased space provided by lowering some floors and raising ceilings would improve flight safety. No significant change to BASH impacts. No significant impacts on munitions safety.	No disproportionate impact on minority or low-income populations. No disproportionate impacts on children.
Alternative 2: Raise Ceilings (up to 7,800 ft MSL) and Lower Floors	Negligible impacts on airspace, including any adjacent military training airspace or other local civil or military operations.	Single-event noise levels in MTR segment B-C would increase compared to the existing conditions. One segment, B-C, would be expected to experience a negligible increase in onset-rate adjusted L_{dnmr}.	No impacts on land use or land use compatibility.	All counties beneath the MTRs are attainment for NAAQS for regulated pollutants; no increase in flight operations results in zero additional air emissions. Impacts to regional haze would be negligible.	There would be the potential for aircraft bird strikes along segments below 1,000 ft AGL although impacts would be minimized through following BASH procedures. Habituation to flight activity is anticipated and no direct or indirect impacts to domesticated animals, wildlife, federally designated Threatened or Endangered species, or critical habitats are anticipated.	No traditional cultural resources or sacred sites have been identified in the APE. There are no historic districts or individual historic properties eligible for inclusion in the National Register of Historic Places documented in the APE. No impact on cultural resources.	Potential increase in flight safety risk and chances for aircraft mishaps for flights under 1,000 ft AGL. Increased space provided by lowering floors and raising ceilings would further improve flight safety. No significant change to BASH impacts. No significant impacts on munitions safety.	No disproportionate impact on minority or low-income populations. No disproportionate impacts on children.
No Action Alternative	No change.	No change.	No change.	No change.	No change.	No change.	No change.	No change.

Notes:

No, minor, or negligible impact Moderate impact but not significant Major, significant impact

AGL= Above Ground Level, APE = Area of Potential Effects, BASH = Bird/Wildlife Strike Hazard, MSL = Mean Sea Level, MTR = Military Training Route, NAAQS = National Ambient Air Quality Standards.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This EA analyzes potential impacts on existing environmental conditions associated with altitude modifications along established MTRs proposed to improve T-1A and T-38C aircrew low-level training capabilities at Laughlin AFB. The analysis considers the current (baseline) conditions of the affected environment and compares those to conditions that might occur should the Air Force implement either of the Proposed Action Alternatives or the No Action Alternative. Potentially affected environmental resources were identified in coordination with local, state, and federal agencies. Specific environmental resources considered in this chapter include airspace management and use; noise; land use; air quality; biological resources; cultural resources; safety; and environmental justice and protection of children. The Proposed Action is not expected to affect the following resources; therefore, they are not carried forward for detailed analysis:

- **Socioeconomics.** The Proposed Action does not involve the addition of aircraft, pilots, or other resources to Laughlin AFB. As such, it has no relationship to the economic or socioeconomic effects on the region's population, housing, or schools.
- **Infrastructure.** Infrastructure, utilities, and transportation are not addressed in this EA as the Proposed Action is limited to potential changes in existing airspace and does not include construction or modifications at Laughlin AFB.
- **Earth and Water Resources.** Water quality and protection of soils was considered when evaluating potential impacts of the Proposed Action. Under the Proposed Action, there would be no ground-disturbing activities. Water or earth resources are not carried forward for further detailed analysis in this EA.

3.1 DEFINITION OF RESOURCES AND EVALUATION CRITERIA

In this section, each resource is defined, and the geographic scope is identified. In some cases, additional details on the definitions of the resources are provided in **Appendix C**. The expected geographic scope of potential consequences is referred to as the region of influence (ROI). The ROI boundaries will vary depending on the nature of each resource. For example, the ROI for some resources, such as air quality, extends over a larger jurisdiction unique to the resource. The specific criteria for evaluating impacts and assumptions for the analyses are presented under each resource area. Evaluation criteria for most potential impacts were obtained from standard criteria; federal, state, or local agency guidelines and requirements; and/or legislative criteria.

Impacts are defined in general terms and are qualified as adverse or beneficial, and as short- or long-term. For the purposes of this EA, short-term impacts are generally considered those impacts that would have temporary effects. Long-term impacts are generally considered those impacts that would result in permanent effects. Impacts are defined as:

- negligible, the impact is localized and not measurable or at the lowest level of detection;
- minor, the impact is localized and slight but detectable;
- moderate, the impact is readily apparent and appreciable; or
- major, the impact is severely adverse or highly noticeable and considered to be significant.

Major impacts are considered significant and receive the greatest attention in the decision-making process. The significance of an impact is assessed based on the relationship between context and intensity. Major impacts require application of a mitigation measure to achieve a less than significant impact. Moderate impacts may not meet the criteria to be classified as significant, but the degree of change is noticeable and has the potential to become significant if not effectively mitigated. Minor impacts have little to no effect on the environment and are not easily detected; impacts defined as negligible are the lowest level of detection and generally not measurable. Beneficial impacts provide desirable situations or outcomes. Impacts and their significance, as well as the means (e.g., BMPs) for reducing potential adverse environmental impacts are also discussed for each resource, as applicable.

Reasonably foreseeable future actions that could result in an increased affect to environmental resources in conjunction with the Proposed Action are the Blue Hills Wind Development Project located near Laughlin

AFB and the Solstice-Sand Creek Transmission Line Project, portions of which are located in Pecos County, TX. These projects are summarized in **Appendix B** and discussed for each resource.

3.2 AIRSPACE MANAGEMENT AND USE

3.2.1 Definition of the Resource

Under Title 49, United States Code § 40103, Sovereignty and Use of Airspace and PL 103-272, the U.S. government has exclusive sovereignty over the nation's airspace. The FAA has the responsibility to plan, manage, and control the structure and use of all airspace over the U.S., including that associated with the Proposed Action. FAA rules govern the national airspace system, and FAA regulations establish how and where aircraft may fly. Collectively, the FAA uses these rules and regulations to make airspace use as safe, effective, and compatible as possible for all types of aircraft, from private propeller-driven planes to large, high-speed commercial and military jets.

Military airfields were established across Texas in the 1940's and military training has occurred over West Texas and the affected environment for over 80 years. These military training activities, including flight operations on MTRs, MOAs, and Ranges, have been compatible with a variety of civil aviation activities including business and leisure travel on commercial jet routes and local flights engaged in medical transport, crop dusting, pest control, aerial assessments for farming and wildlife management purposes, and other activities.

National security depends largely on the deterrent effect of our airborne military forces. To be proficient, the military services must train in a wide range of airborne tactics. One phase of this training involves "low level" combat tactics. Low-level navigation training is important because aircrews may be required to fly at low altitudes for many miles to avoid detection in combat conditions. The required maneuvers and high speeds are such that they may occasionally make the see-and-avoid aspect of Visual Flight Rule (VFR) flight more difficult without increased vigilance in areas containing such operations. In an effort to ensure the greatest practical level of safety for all flight operations, the MTR program was conceived as a joint venture by the FAA and the Department of Defense (DOD) for use by the military for the purpose of conducting low-altitude, high-speed training (FAA, 2021b). MTRs are aerial corridors in which military aircraft generally operate below 10,000 ft MSL at airspeeds exceeding 250 kn, the airspeed limit for other aircraft flying below 10,000 ft MSL. MTRs are divided into three sub-types: visual routes (VRs), instrument routes (IRs), and slow-speed low-altitude routes (SRs). Operations on VRs are conducted only when the weather is at or above VFR minimums of five miles or more visibility and a weather ceiling of 3,000 ft or more. Operations on IRs are flown under IFR conditions where pilots use instruments without the aid of ground-based visual cues and may fly during periods of reduced visibility.

Aircraft use different kinds of airspace according to the specific rules and procedures defined by the FAA for each type of airspace. For the existing condition, the type of airspace used include three VRs which provide corridors for military low-altitude navigation and training as well as other local civil aviation flight activities. The FAA requires publication of the hours of operation for any MTR so that all pilots, both military and civilian, are aware of when other aircraft could be in the airspace. Normally, a minimum of two hours' notice is required to ensure civilian and other military users are notified of MTR activation. Although the FAA designates MTRs for military use, other pilots may transit the airspace. Pilots flying VFR should contact the nearest Flight Service Station for MTR schedule information and must use "see and avoid" techniques to prevent conflicts with military aircraft using the MTR. Pilots flying IFR must follow essentially the same procedures, navigate based on instruments and communications with air traffic control during their flight.

FAA avoidance rules specify that aircraft must avoid congested areas of a city, town, settlement, or any open-air assembly of persons by 1,000 ft above the highest obstacle within a horizontal radius of 2,000 ft of the aircraft. Outside of congested areas, aircraft must avoid any person, vessel, vehicle, or structure by 500 ft. Bases may establish additional avoidance restrictions under MTRs. The ROI for airspace management includes the lateral and vertical boundaries of Visual Routes VR-1108, VR-1109, and VR-1117, including alternate entry and exit points (See **Figures 2-2** through **2-4**).

3.2.2 Existing Conditions – Military Training Routes

3.1.1.1 Military Aircraft Operations

MTRs are not flown unless properly scheduled through the designated originating/scheduling activity listed for that MTR. Laughlin AFB manages and schedules VR-1108, VR-1109, and VR-1117. Flying units from Laughlin AFB, as well as other military units schedule appropriate blocks of time for their use to prevent conflicts including aircraft simultaneously flying on the same route segment or intersection point. When scheduling an MTR, FSS within approximately 100 NM of the scheduled MTR are notified to provide information to civilian pilots affording the opportunity to avoid the scheduled MTR. Similarly, military pilots can benefit from this information by contacting the servicing FSS to view routes that have been activated and avoid conflicts.

MTR information used for this analysis was obtained from the DOD Flight Information Publications (FLIP) AP/1B (DOD, 2021) which includes a Route Description (geographic locations of the route segment end points and altitudes and widths of each route segment) and Special Operating Procedures. The Special Operating Procedures provide information about flight safety considerations including route crossings and flight obstructions, Primary and Alternate Entry and Exit Points, avoidance criteria for airfields, towns and populated areas, and noise-sensitive areas within the VR-1108, VR-1109, and VR-1117 environs. To estimate the existing condition on VR-1108, VR-1109, and VR-1117, Laughlin AFB analyzed records from January 2020 to December 2020. Existing conditions on VR-1008 are estimated to include about 76 annual sorties by T-1A (2 sorties) and T-38C (74 sorties) aircraft. Existing conditions on VR-1009 are estimated to include 376 annual sorties by T-1A (161 sorties) and T-38C (215 sorties) aircraft and no sorties by these aircraft on VR-1117. The actual number of sorties flown may vary from those authorized due to changes in scheduled training due to inclement weather, mechanical issues, or other changes to training requirements.

VR-1108

FLIP AP/1B (DOD, 2021) lists multiple noise-sensitive or avoidance areas that require avoidance, typically by 500 ft vertically and 1 NM horizontally. These avoidance areas include towns, parks, and private airports along the route. As shown in **Figure 1-2**, VR-1108 conflicts with (is identical to) VR-1109 and VR-1117 from segments A to C. VR-1117 is the reverse routing of VR-1108 from A to C (westward) and is weekend use only. **Figure 3-1** identifies avoidance areas in FLIP AP/1B as of February 2021; however, these are subject to change over the years.

VR-1109

Along VR-1109, towns, noise-sensitive areas, wildlife refuges, and military and civilian helicopter training areas are identified as avoidance areas. VR-1109 conflicts with (is identical to) VR-1108 and VR-1117 from segments A to C. VR-1117 is the reverse routing of VR-1109 from A to C (westward) and is weekend use only.

VR-1117

For environmental reasons, VR-1117 may only be flown by T-1A and T-38C aircraft and T-6 for Annual Flight Evaluations (DOD, 2021). Avoidance areas include airports; pilots must avoid flights within 1,500 ft or 3 NM of an airport when practicable. VR-1117 is the reverse routing of VR-1109; deconfliction with VR-1109 and VR-1108 is required.

3.1.1.2 Civilian Aircraft Operations

Numerous civil aviation airways and local airports are within the affected environment and local VFR pilots may operate at altitudes defined for MTRs. **Figure 3-1** identifies the airports, airfields, and avoidance areas within the affected environment for VR-1108, VR-1109, and VR-1117. During establishment, MTRs are planned to be located away from busy airports and the Special Operating Procedures provide avoidance criteria for smaller airports. These design aspects, along with pilot awareness and compliance with flight safety procedures, makes MTR use compatible with civil aviation activities.

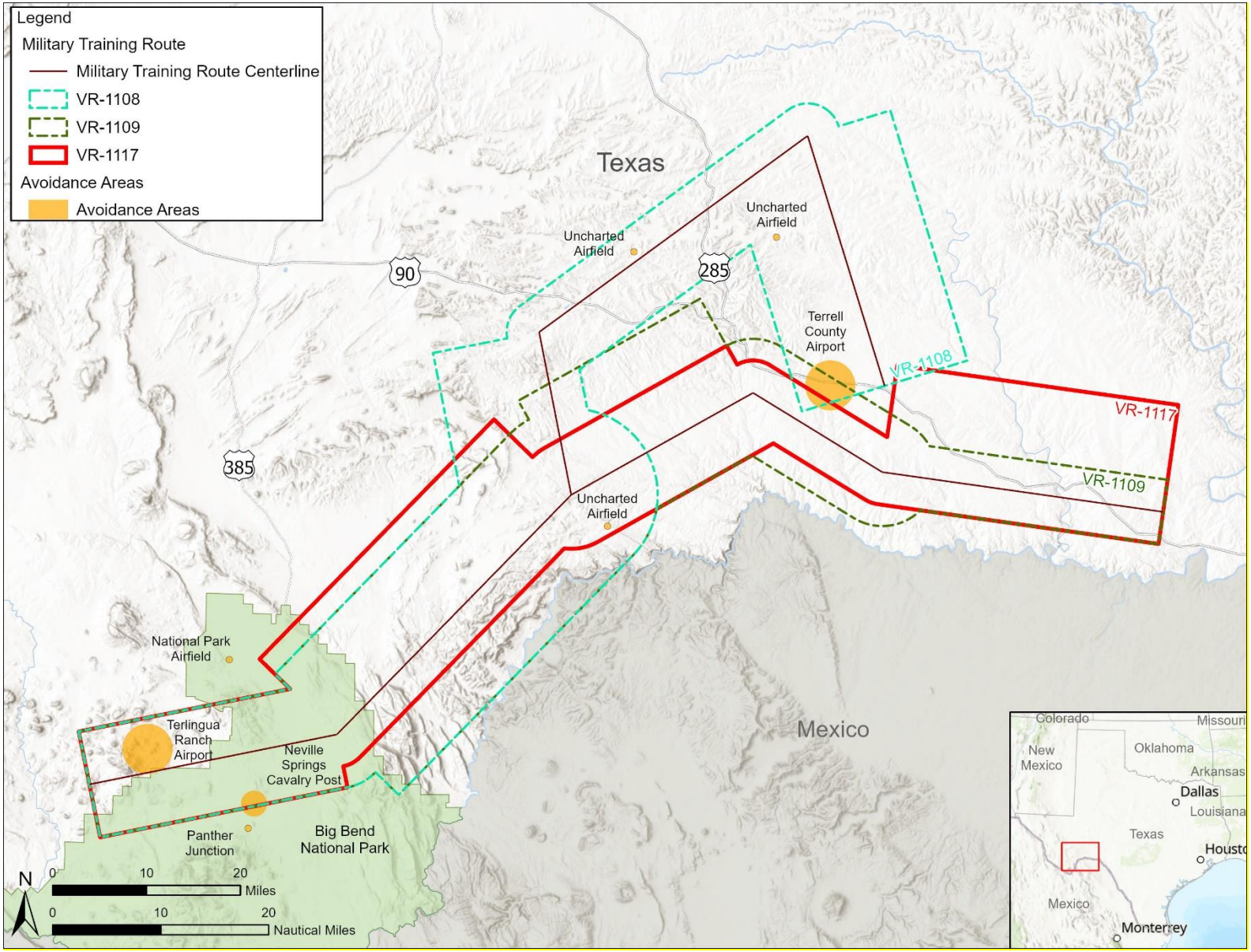

Figure 3-1. Location of Avoidance Areas Within and Adjacent to Military Training Routes VR-1108, 1109, and 1117.

3.2.3 Environmental Consequences Evaluation Criteria

This assessment analyzes the capability of affected airspace elements to accommodate existing and proposed military and civil flight activities and determining whether the Proposed Action would have any adverse impacts on overall airspace use in the area. Also included are considerations of such factors as the interaction of the proposed use of the VRs with adjacent military training airspace, potential impacts to other non-participating civil and military aircraft operations, and potential impacts to civil airports located in the vicinity of the VRs involved in the proposal. Adverse impacts associated with the VRs might include modifications to floor, ceiling, or lateral (width) extents or significantly increasing flight operations within the VRs as a result of the Proposed Action and alternatives. For the purposes of this EA, an impact is considered significant if it modifies the VR locations, dimensions that have the potential to interfere with civil airspace, or aircraft operational capacity.

3.2.4 Environmental Consequences – Alternative 1

There would be minor differences in the vertical structure of the VRs if the 47 FTW raises the ceiling along the entire portions of VR-1108, VR-1109, and VR-1117 from 1,500 ft AGL to 2,000 ft AGL and lowers the floors from 1,000 ft AGL to 500 ft AGL, from Points C (for VR-1108 and VR-1109) and D (for VR-1117) to a point to be established outside the confines of BBNP (See **Table 2-1**). However, no changes to T-1A and T-38 C flight operations would result. These VRs would still have the capacity, are in locations, and have the dimensions necessary to support the sorties associated with Alternative 1. Negligible impacts on airspace, including any adjacent military training airspace or other local civil or military operations, are expected from the implementation of Alternative 1.

3.2.5 Environmental Consequences – Alternative 2

There would be moderate differences in the vertical structure of the VRs if the ceiling is raised along the entire portions of VR-1108, VR-1109, and VR-1117 from 1,500 ft AGL to between 5,000 and 7,800 ft MSL depending on the segment (see **Table 2-2**). The floors of the following VR segments would be lowered from 1,000 ft AGL to 500 ft AGL:

- Point C (for VR-1108 and VR-1109) to a point to be established outside the boundary of BBNP and
- Point D (for VR-1117) to a point to be established outside the boundary of BBNP.

However, no changes to T-1A and T-38 C flight operations would result. These VRs would still have the capacity, are in locations, and have the dimensions necessary to support the sorties associated with Alternative 2. Negligible impacts on airspace, including any adjacent military training airspace or other local civil or military operations, are expected from the implementation of Alternative 2.

3.2.6 Environmental Consequences – No Action Alternative

Under the No Action Alternative, the 47 FTW would not raise the airspace ceiling or lower the floor along any parts of VR-1108, VR-1109, VR-1117, and existing T-1A and T-38C sorties would remain unchanged. No significant impacts would result from this alternative and the VRs would maintain the capacity to support these training activities. However, the shortfalls in airdrop, low-level training, safety of flight for ridge crossings, and need for safety buffers for route aborts, would remain.

3.2.7 Reasonably Foreseeable Future Actions and Other Environmental Considerations

As airspace demand in the region increases, the Air Force, in conjunction with other managing agencies, would continue coordination to limit and reduce potential impacts. Potential effects on airspace management and use from implementation of the Proposed Action, when added to reasonably foreseeable future actions would be expected to be negligible.

3.3 NOISE

3.3.1 Definition of the Resource

Noise metrics are used to quantify military aircraft noise in a standard way. There are several metrics that can be used to describe a range of situations, from a particular individual flight event to the cumulative effect of all flight events over a long time. For the purposes of this analysis, noise is expressed using several metrics including: A-weighted decibels (dBA), sound exposure level (SEL), and onset-rate adjusted monthly day-night average sound level (L_{dnmr}). These noise metrics are calculated using the NOISEMAP and MR_NMAP software.

See **Appendix C.1** for a more detailed description of noise metrics, noise models, and other acoustic principles.

The ROI for noise includes the MTRs depicted in **Figures 2-2 through 2-4**. Noise analysis was conducted to analyze noise levels within the MTRs to reflect the most recent and accurate aircraft operations and flying conditions.

3.3.2 Existing Conditions – Military Training Routes

The primary driver of noise within the MTRs is aircraft operations. **Table 3-1** presents SEL values at representative altitudes for the aircraft currently using VR-1108, VR-1109, and VR-1117. These SEL values were calculated using the NOISEMAP software and represent level flight, constant speed, and consistent power settings. The NOISEMAP-modeled speeds and power settings are consistent with speeds and power settings used by the T-1A and T-38C within the MTRs.

Table 3-1
Sound Exposure Levels for Aircraft Overflights at Various Altitudes

Aircraft	SEL (dBA)		
	500 ft AGL	1,000 ft AGL	1,500 ft AGL
T-1A	91	84	80
T-38C	96	89	86

dBA = A-weighted decibels; SEL = sound exposure level; AGL = above ground level

As indicated in **Table 3-2**, the T-38C aircraft perform the majority of the operations in the MTRs. All aircraft operations occur during the daytime period (7:00 a.m. to 10:00 p.m.). Also, no aircraft operations currently occur in VR-1117.

Table 3-2.
Existing Annual Aircraft Operations

Aircraft	MTR		
	VR-1108	VR-1109	VR-1117
T-1A	2	161	0
T-38C	74	215	0

MTR = Military Training Route; VR = Visual Route

When the aircraft flight tracks are not well defined and are distributed over a wide area, such as in MTRs with wide corridors, noise is assessed using the MR_NMAP program (Lucas and Calamia, 1997). MR_NMAP is a distributed flight track and area model that allows for entry of airspace information, the distribution of operations, flight profiles (average power settings, altitude distributions, and speeds), and numbers of sorties.

In this study, results below 45 dBA L_{dnmr} are reported in order to show the magnitude of any changes to the MTR noise environment due to changes in aircraft operating conditions; however, in calculating time-average sound levels for airspace, the reliability of the results varies at sound levels below 45 dBA L_{dnmr}. Time-averaged outdoor sound levels less than 45 dBA are well below any currently accepted guidelines for aircraft noise compatibility.

Table 3-3 displays the L_{dnmr} noise results from MR_NMAP analysis of the existing conditions in the MTRs due to T-1A and T-38C aircraft operations. As the T-38C contributes the majority of the operations and is also the loudest of the two aircraft that operate in the MTRs, the cumulative noise environment is dominated by T-38C operations. VR-1117 does not currently experience any aircraft operations and therefore has not been included in **Table 3-3**.

Table 3-3.
Existing Noise Levels from Aircraft Operations in Military Training Routes

Segment	L_{dnmr} (dBA)	
	VR-1108	VR-1109
A-B	23	28
B-C	21	26
C-D	25	30
D-E	27	32
E-F	24	34

dBA = A-weighted decibels; L_{dnmr} = onset-rate adjusted monthly day-night average sound level; VR = Visual Route

3.3.3 Environmental Consequences Evaluation Criteria

Noise analysis typically evaluates potential changes to existing noise environments that would result from implementation of the Proposed Action and alternatives. Potential changes in the noise environment can be beneficial (i.e., if they reduce the number of sensitive receptors exposed to unacceptable noise levels), negligible (i.e., if the total area exposed to unacceptable noise levels is essentially unchanged), or adverse (i.e., if they result in increased noise exposure to unacceptable noise levels). Projected noise impacts were evaluated for Alternatives 1 and 2.

3.3.4 Environmental Consequences – Alternative 1

With implementation of Alternative 1, single-event noise levels in MTR segment B-C would increase compared to the existing conditions, from a maximum of 89 dBA SEL to a maximum of 96 dBA SEL per event (see **Table 3-1**). Aircraft operational counts would remain the same as the existing conditions (see **Table 3-2**).

Using the methodology described in **Section 3.3.3**, MR_NMAP was used to compute the potential noise exposure for the MTRs under Alternative 1. These results are presented in **Table 3-4**. Only one segment, segment B-C, would be expected to experience an increase in noise. This increase of 3 dBA L_{dnmr} is likely negligible due to the overall low L_{dnmr} levels generated in the MTRs. Observers below segment B-C may experience higher overflight SEL levels (see **Table 3-1**) due to the lower MTR floor under Alternative 1; however, these increased noise levels are likely negligible due to the infrequency of overflights and the short-term nature of individual flight events. There would be no significant impacts to the noise environment under Alternative 1.

Table 3-4.
Alternative 1 Noise Levels from Aircraft Operations in Military Training Routes

Segment	L_{dnmr} (dBA)					
	Existing		Alternative 1		Increase	
	VR-1108	VR-1109	VR-1108	VR-1109	VR-1108	VR-1109
A-B	23	28	23	28	0	0
B-C	21	26	24	29	3	3
C-D	25	30	25	30	0	0
D-E	27	32	27	32	0	0
E-F	24	34	24	34	0	0

dBA = A-weighted decibels; L_{dnmr} = onset-rate adjusted monthly day-night average sound level; VR = Visual Route

3.3.5 Environmental Consequences – Alternative 2

Under Alternative 2, the noise environment would be identical to the noise environment under Alternative 1 (**Section 3.3.4**). There would be no significant impacts to the noise environment under Alternative 2.

3.3.6 Environmental Consequences – No Action Alternative

Under the No Action Alternative, there would be no changes to MTRs and no change to the noise environment. There would be no significant impacts to the noise environment under the No Action Alternative.

3.3.7 Reasonably Foreseeable Future Actions and Other Environmental Considerations

The Proposed Action, in addition to reasonably foreseeable future actions within the MTRs, would result in a potentially long-term negligible increase to the noise environment within the MTRs.

3.4 LAND USE

3.4.1 Definition of the Resource

The term “land use” generally refers to real property classifications that indicate either natural conditions or the types of human activity occurring on a parcel. In many cases, land use descriptions are codified in local zoning laws; however, no nationally recognized convention or uniform terminology has been adopted for describing land use categories. As a result, the meanings of various land use descriptions, labels, and definitions vary among jurisdictions. Lands designated as special management areas are also considered in the evaluation. Lands with special designation include those intended to preserve natural or cultural resources, contain recreational opportunities and public access, or provide for the management of public lands.

For this EA, the National Land Cover Database (USGS, 2016) was used to approximate land use beneath the proposed MTRs. Land cover describes the characteristics of the land surface based on thematic class (such as developed, forest, and cropland), whereas land use is focused on human uses of a certain area. When specific land use data is not available, as is often the case for rural areas with no major municipalities, land cover data is appropriate to use to approximate land use. Land ownership data from the Texas Natural Resources Information System was also used in this analysis.

The ROI for land use includes the land beneath the MTRs included in the Proposed Action, VR-1108, VR-1109, and VR-1117 (**see Figures 2-2 through 2-4**).

3.4.2 Existing Conditions – Military Training Routes

Land cover beneath the airspace varies and includes mostly rural and natural areas that provide recreational uses and protection for wildlife. Shrubland is the primarily land cover beneath the MTRs, comprising approximately 1.9 million ac, or 99.7% of the total land cover **(Table 3-5)**. Developed areas, where people tend to reside or work, represent only about 0.16% of the total area beneath the MTRs. In terms of land ownership, the land below the MTRs is primarily privately owned land, which accounts for 80.4% of the total land. The NPS manages 8.4% of the land under the MTRs, followed by Texas Parks and Wildlife (TPWD) at 5.7%, unknown owners at 5.2%, and the Texas Veterans Land Board at 0.2%.

There are no major metropolitan areas beneath the MTRs (**Figure 3-2**). Only MTR routes VR-1108 and VR-1109 have associated population centers. VR-1108 includes Cedar Station and Pumpville, both incorporated communities in Terrell County, Texas. VR-1109 also includes incorporated Cedar Station, and a very small portion of a US Census-designated colonias community called Sanderson, in Terrell County, Texas (refer also to **Section 3.9**).

Land designated as special management areas beneath the MTRs includes portions of BBNP, the Black Gap Wildlife Management Area (WMA) and the Rio Grande Wild and Scenic River **(Figure 3-3)**. BBNP is managed by the NPS with approximately 188,000 ac of land beneath the MTRs. The Black Gap WMA is managed by TPWD and borders BBNP on the northwestern boundary with approximately 104,000 ac of land beneath MTRs. Portions of the Rio Grande Wild and Scenic River, a unit of the National Park System, flow beneath the MTRs in both BBNP and the Black Gap WMA.

Table 3-5. Land Cover by Acreage

Land Cover Type	Beneath the MTR	Percent Beneath MTRs
Barren Land	1,281.1	0.07%
Deciduous Forest	0.5	<0.01%
Developed/High Intensity[1]	5.5	<0.01%
Developed/Medium Intensity[2]	87.7	<0.01%
Developed/Low Intensity[3]	795.7	0.04%
Developed – Open Space[4]	1,995.8	0.11%
TOTAL DEVELOPED	**2,884.70**	**.15%**
Evergreen Forest	189.1	0.01%
Fallow/Idle Cropland	1.4	<0.01%
Grassland/Pasture	1.6	<0.01%
Herbaceous Wetlands	1.2	<0.01%
Open Water	1.9	<0.01%
Shrubland	1,864,999.0	99.70%
Woody Wetlands	414.7	0.02%
TOTAL AREA	**1,869,775.20**	**100%**

MTR = Military Training Route

Notes:

[1] Developed High Intensity: highly developed areas where people reside/work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover.

[2] Developed Medium Intensity: areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units.

[3] Developed Low Intensity: areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover. These areas most commonly include single-family housing units.

[4] Developed Open Space: areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in

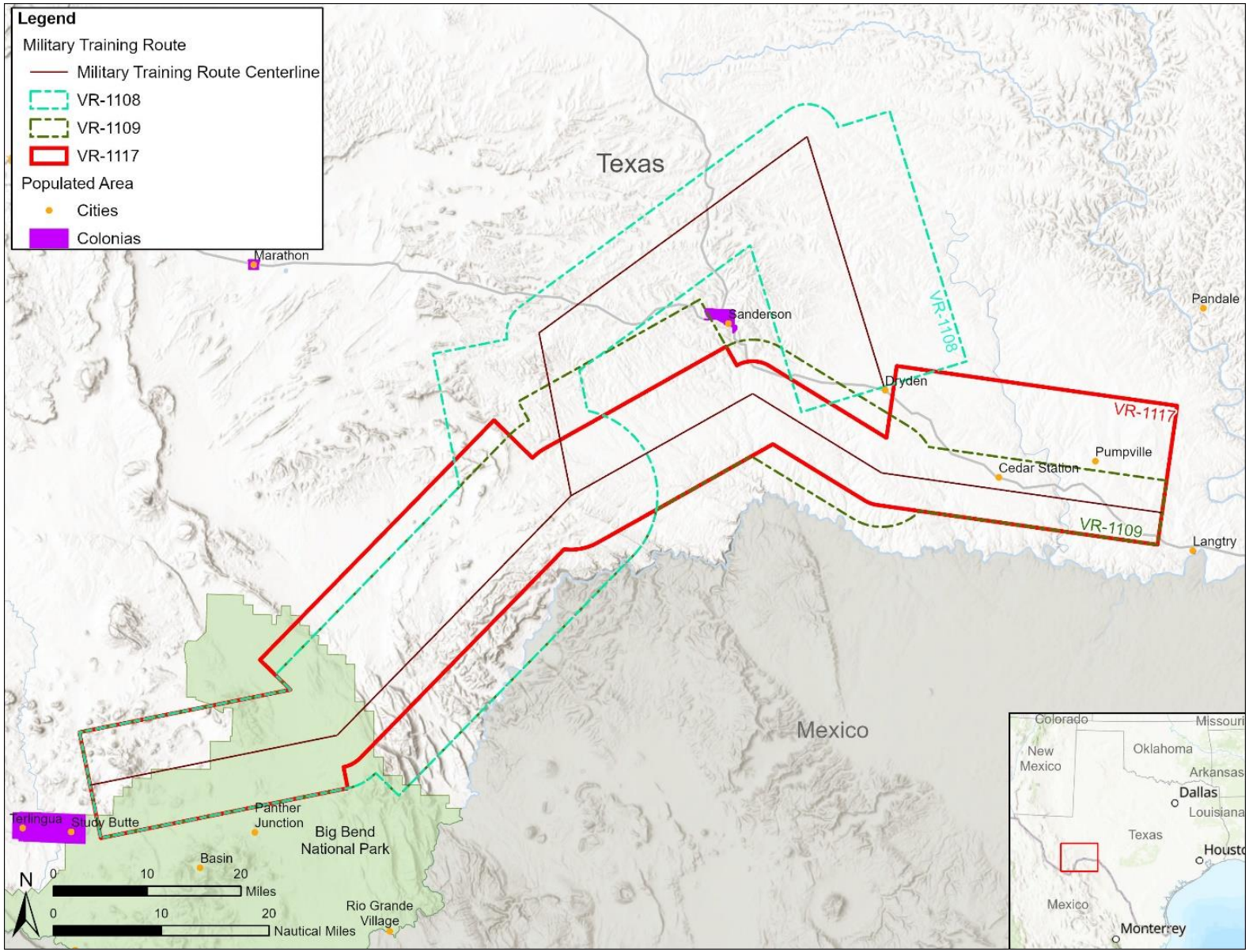

Figure 3-2. Population Centers within Proposed Military Training Routes.

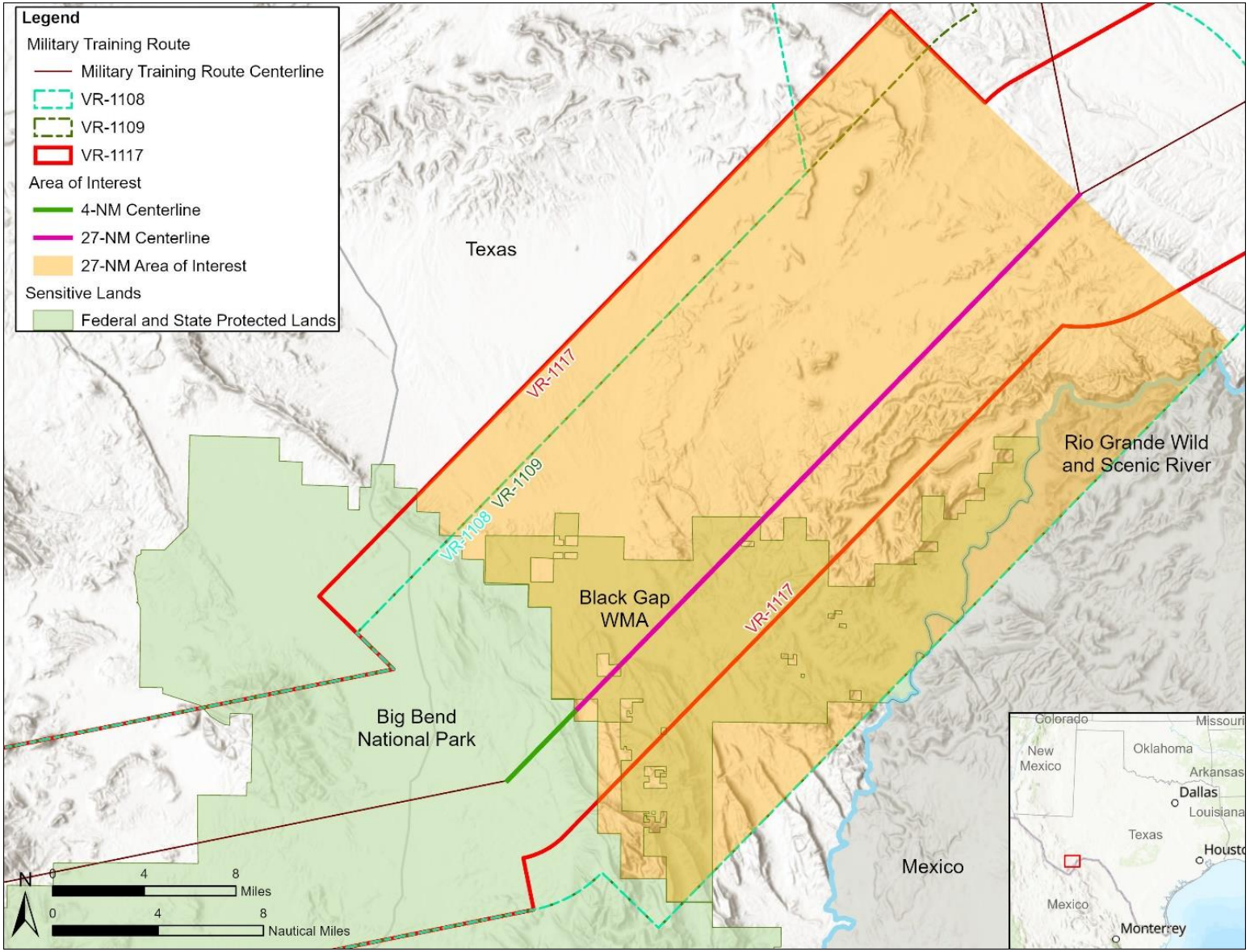

Figure 3-3. Sensitive Land Beneath Proposed Lowered Floors.

3.4.3 Environmental Consequences Evaluation Criteria

Potential impacts on land use are based on the level of land use sensitivity in areas potentially affected by the Proposed Action and alternatives as well as compatibility of those actions with existing conditions. In general, a land use impact would be adverse if it met one of the following criteria:

- inconsistency or noncompliance with existing land use plans or policies
- precluded the viability of existing land use
- precluded continued use or occupation of an area
- incompatibility with adjacent land use to the extent that public health or safety is threatened
- conflict with planning criteria established to ensure the safety and protection of human life and property

3.4.4 Environmental Consequences – Alternative 1 (Raise Ceilings and Lower Floors)

There would be no change to land use patterns, land ownership, land management, or natural and sensitive areas in the ROI as a result of implementation of the Proposed Action under Alternative 1. Single-event noise levels in all MTR segments would remain at or below the existing conditions. Negligible, short term increases in L_{dnmr} noise (onset-rate adjusted monthly day-night average sound level) would be anticipated under route segment B-C with proposed lowered floors. Additionally, the quantity of air emissions that would occur at a lower altitude because of lowered floors would have a negligible impact on the air quality at ground level and on regional haze. The area beneath route leg B-C consists of approximately 400,000 ac of land of which 99.8% is shrubland. Within this area, developed land represents about 0.11% of the total area and there are no major population centers, so any negligible increases in noise or air emissions would not be experienced by a large population of people and would not cause land use incompatibility. Additionally, while segment B-C includes portions of the Black Gap WMA, the increase in noise and potential air emissions would be barely noticeable, infrequent, and would not result in incompatibilities with current land use. Therefore, there would be no significant impacts on land use under Alternative 1.

3.4.5 Environmental Consequences – Alternative 2 (Raise Ceilings above 5,000 ft MSL and Lower Floors)

Under Alternative 2, the impacts on land use would be the same as described in Alternative 1.

3.4.6 Environmental Consequences – No Action Alternative

Under the No Action Alternative, there would be no alterations to floor or ceiling height in existing MTRs and training within the MTRs would remain the same; therefore, no changes would occur on the existing land use.

3.4.7 Reasonably Foreseeable Future Actions and Other Environmental Considerations

The Proposed Action under Alternatives 1 and 2, in addition to reasonably foreseeable future actions, would not result in significant incremental impacts on land use.

3.5 AIR QUALITY

3.5.1 Definition of the Resource

Air quality in various areas of the country is affected by pollutants emitted by numerous sources, including natural and man-made sources. To manage pollutant emission levels in ambient air, the US Environmental Protection Agency (USEPA) was mandated under the Clean Air Act to set air quality standards for select pollutants that are known to affect human health and the environment. The USEPA has divided the country into geographical regions known as Air Quality Control Regions (AQCRs) to evaluate compliance with the National Ambient Air Quality Standards (NAAQS) (40 CFR §50). NAAQS are currently established for six criteria air pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter including particulates equal to or less than 10 microns in diameter (PM_{10}) and

particulates equal to or less than 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb). Each AQCR has regulatory areas that are designated as an attainment area or nonattainment area for each of the criteria pollutants depending on whether it meets or exceeds the NAAQS. Attainment areas that were reclassified from a previous nonattainment status to attainment are called maintenance areas and are required to prepare a maintenance plan for air quality.

Federal actions in NAAQS nonattainment and maintenance areas are also required to comply with USEPA's General Conformity Rule (40 CFR Part 93). These regulations are designed to ensure that federal actions do not impede local efforts to achieve or maintain attainment with the NAAQS. Federal actions are evaluated to determine if the total indirect and direct net emissions from the project are below *de minimis* levels for each of the pollutants as specified in 40 CFR § 93.153. If *de minimis* levels are not exceeded for any of the pollutants, no further evaluation is required. However, if net emissions from the project exceed the *de minimis* thresholds for one or more of the specified pollutants, a demonstration of conformity, as prescribed in the General Conformity Rule, is required.

Greenhouse gases (GHGs) are gases, occurring from natural processes and human activities, that trap heat in the atmosphere. The accumulation of GHGs in the atmosphere helps regulate the earth's temperature and are believed to contribute to global climate change. USEPA regulates GHG emissions via permitting and reporting requirements that are applicable mainly to large stationary sources of emissions.

See **Appendix C.2** for a more detailed discussion air quality regulations, general conformity, and requirements for GHGs**.**

The ROI for this Proposed Action consists of Brewster, Pecos, Terrell, and Val Verde Counties. Brewster County is in the El Paso-Las Cruces-Alamogordo Interstate AQCR (40 CFR § 81.82). Pecos and Terrell Counties are in the Midland-Odessa-San Angelo Intrastate AQCR (40 CFR § 81.137). Val Verde County is in the Metropolitan San Antonio Intrastate AQCR (40 CFR § 81.40). The ROI is in attainment with the NAAQS for all criteria pollutants.

3.5.2 Existing Conditions – Military Training Routes

3.5.2.1 Regional Climate

The regional climate of Brewster County (closest Weatherbase location to the MTR is La Linda, TX), is classified as Mid-Latitude Steppe and Desert Climate, which is characterized by extremely variable temperature conditions, with annual means decreasing and annual ranges increasing poleward, and relatively little precipitation. The average temperature for the year in this part of Brewster County is 67.3°F (19.6°C). The warmest month, on average, is July with an average temperature of 85.6°F (29.8°C). The coolest month on average is January, with an average temperature of 47.1°F (8.4°C). The average amount of precipitation for the year in this part of Brewster County is 10.2" (259.1 millimeter (mm)). The month with the most precipitation on average is October with 1.6" (40.6 mm) of precipitation. The month with the least precipitation on average is February with an average of 0.3" (7.6 mm). (Weatherbase, 2021a).

The regional climate of Pecos and Terrell Counties (closest Weatherbase location to the MTR is Sanderson, TX), is classified as Mid-Latitude Steppe and Desert Climate, which is characterized by extremely variable temperature conditions, with annual means decreasing and annual ranges increasing poleward, and relatively little precipitation. The average temperature for the year in this part of Pecos and Terrell Counties is 64.6°F (18.1°C). The warmest month, on average, is July with an average temperature of 81.0°F (27.2°C). The coolest month on average is January, with an average temperature of 46.0°F (7.8°C). The average amount of precipitation for the year in this part of Pecos and Terrell Counties is 13.3" (337.8 mm). The month with the most precipitation on average is September with 2.2" (55.9 mm) of precipitation. The month with the least precipitation on average is March with an average of 0.4" (10.2 mm). (Weatherbase, 2021b).

The regional climate of Val Verde County (closest Weatherbase location to the MTR is Langtry, TX), is classified as Mid-Latitude Steppe and Desert Climate, which is characterized by extremely variable temperature conditions, with annual means decreasing and annual ranges increasing poleward, and relatively little precipitation. The average temperature for the year in this part of Val Verde County is 69.2°F

(20.7°C). The warmest month, on average, is July with an average temperature of 86.4°F (30.2°C). The coolest month on average is January, with an average temperature of 48.8°F (9.3°C). The average amount of precipitation for the year in this part of Val Verde County is 14.7" (373.4 mm). The month with the most precipitation on average is September with 2.2" (55.9 mm) of precipitation. The month with the least precipitation on average is March with an average of 0.5" (12.7 mm). (Weatherbase, 2021c).

3.5.2.2 Regional Air Quality and Current Operational Emissions

The MTRs, located in Brewster, Pecos, Terrell, and Val Verde Counties, are part of the El Paso-Las Cruces-Alamogordo Interstate, Midland-Odessa-San Angelo Interstate, and Metropolitan San Antonio Intrastate AQCRs. Per the Air Force's Air Conformity Applicability Model (ACAM), all these counties have been designated attainment for all NAAQS. As a result, General Conformity is not applicable in the ROI. No air quality permits are needed for the MTR airspace required. Emissions generated by current operations of T-1A and T-38C aircraft sorties in the MTR (VR-1108, VR-1109, and VR-1117) were estimated using ACAM and are shown in **Table 3-6.**

Table 3-6.
Current Operational Emissions (Tons per Year)

Aircraft	MTR	Emissions (tpy)[a]					
		VOC	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
T-1A	VR-1108	0.002	0.014	0.002	0.002	0.000	0.000
	VR-1109	0.156	1.055	0.120	0.112	0.024	0.021
	VR-1117	0	0	0	0	0	0
T-38C	VR-1108	0.043	0.109	1.765	0.061	0.064	0.002
	VR-1109	0.022	0.492	6.139	0.200	0.210	0.008
	VR-1117	0	0	0	0	0	0

Source: Air Conformity Applicability Model output (refer to Appendix C.2)

[a] Estimated using ACAM

Notes:
CO = carbon monoxide; NO_x = nitrogen oxide; $PM_{2.5}$ = particulate matter with a diameter of less than 2.5 micrometers; PM_{10} = particulate matter with a diameter of less than 10 micrometers; SO_2 = sulfur dioxide; tpy = tons per year; VOC = volatile organic compound

3.5.3 Environmental Consequences Evaluation Criteria

The ROI is designated as attainment (or unclassified) for criteria pollutants. Because the Proposed Action would occur within areas designated attainment/unclassified, an air analysis would be performed without considering General Conformity.

Based on guidance in Chapter 4 of the *Air Force Air Quality EIAP Guide*, *Volume II - Advanced Assessments* (Air Force, 2020), project criteria pollutant emissions were compared against the insignificance indicator of 250 tons per year (tpy) for Prevention of Significant Deterioration (PSD) major source permitting threshold for actions occurring in areas that are in attainment for all criteria pollutants (25 tpy for Pb). These "Insignificance Indicators" were used in the analysis to provide an indication of the significance of potential impacts to air quality based on current ambient air quality relative to the NAAQSs. These insignificance indicators do not define a significant impact; however, they do provide a threshold to identify actions that are insignificant. Any action with net emissions below the insignificance indicators for a criteria pollutant is considered so insignificant that the action would not cause or contribute to an exceedance of one or more NAAQSs. Although PSD and Title V are not applicable to mobile sources, the PSD major source thresholds provide a benchmark to compare air emissions against and to determine project impacts.

The ACAM v5.0.17b was used to estimate criteria and precursor pollutant emissions for flight operations in the MTRs. There are no stationary sources associated with this action, nor would chaff and flares be used.

Trim tests and Auxiliary Power Unit activity defaults in ACAM were set to zero. This is because these activities are normally associated with ground-support flight operations and not for operations that take place exclusively in airspaces. By default, ACAM only accounts for emissions occurring at or below 3,000 ft (within the mixing layer) and emissions are evaluated using this default and aircraft emissions released above 3,000 ft were not included in analysis for the ROIs. Assumptions of the model are discussed in **Appendix C.2.** The air quality analysis focused on emissions associated with sorties in the MTR. ACAM documentation in the form of a Record of Air Analysis for Proposed Action alternatives are provided in **Appendix C.2**.

A part of VR-1108 extends into BBNP and at least some of that MTR is within 6.25 miles (10 kilometer) of the park, a Class I area. Class I areas include wilderness areas greater than 5,000 ac or national parks greater than 6,000 ac. AFCEC/CZTQ has consulted with the Texas Commission on Environmental Quality (TCEQ), and they concur that the regional haze regulatory requirements do not pertain to flight operations; therefore, regional haze was only qualitatively addressed (AFCEC, 2020).

A qualitative assessment of regional haze was performed by using estimated aircraft emissions of existing and proposed operations for the affected MTR to assess the potential for exceedances of the NAAQS. The methodology followed is outlined in NPS guidance for NEPA analysis (NPS, 2011). The NPS guidance recommends determining the level of air quality analysis necessary based on the type and amount of project emissions, distance of project to the park, current air quality conditions in the park, and other relevant information. The guidance then suggests obtaining air quality information from appropriate data sources, such as USEPA's guidance on criteria pollutants and the NAAQS (USEPA, 2021a), USEPA's guidance on visibility and regional haze (USEPA, 2021b), and USEPA's AP-42 Emissions Factors (USEPA, 2009). Finally, the guidance advises that impacts in the NEPA context are assessed.

3.5.4 Environmental Consequences – Alternative 1

3.5.4.1 Emissions Estimation

Air emissions generated from the Proposed Action would be strictly the result of aircraft operations within the MTRs. Under the Proposed Action, there would be no construction. Analyses were performed for aircraft operations in VR-1108 and 1109. No emissions from VR-1117 are estimated as there are no sorties indicated for this MTR.

Emissions were estimated for the Proposed Action beginning in January 2022, with 2023 and beyond being considered "steady state". **Table 3-7** presents total increases in annual operational emissions for the proposed alternative. No construction emissions are anticipated and only those emissions associated with aircraft operations in the MTRs were evaluated. The methodologies, emission factors, and assumptions used for the emission estimates are outlined in **Appendix C-2.2**. The estimated emissions are compared against the 250 tpy indicator of insignificance for criteria pollutants in attainment areas.

Table 3-7.
Net Change in Emissions for Alternative 1 (ton/year)

	Emissions (tpy)								
	VOC	**NO_x**	**CO**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2e**	**Pb**	**NH_3**
Current Operations	0.22	1.67	8.03	0.37	0.30	0.03	1,130	0.00	0.00
Alternative 1	0.22	1.67	8.03	0.37	0.30	0.03	1,130	0.00	0.00
Net Change in Emissions[1]	0	0	0	0	0	0	0	0	0
Insignificance Indicator	250	250	250	250	250	250	N/A	25	N/A
Exceeds Indicator Level	No	No	No	No	No	No	N/A	No	N/A

Source: Air Conformity Applicability Model output (refer to Appendix C.2)

Notes:

1. The reason that net emissions for each pollutant are zero is that the Proposed Action would not increase the operational aspects of the flights, such as number of sorties and engine power level. Accordingly, the same quantity of emissions would occur after the Proposed Action is implemented as the baseline

NO_x = nitrogen oxides; CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NH_3 = ammonia; Pb = lead; $PM_{2.5}$ = particulate matter less than 2.5 microns; PM_{10} = particulate matter less than 10 microns; SO_x = sulfur oxides; VOC = volatile organic compound; N/A = not applicable.

3.5.4.2 Regional Haze

The Proposed Action would not result in increased emissions. Rather, for some of the segments within the MTRs the emissions would occur at a lower altitude (500 ft AGL instead of 1,000 ft AGL). The operations within the Class I area and up to 6.25 miles (10 kilometer) away currently result in relatively small amounts of emissions. Moreover, the lowering of the floor is being proposed only in the segments of each MTR that are outside the Class I area. As such, the quantity of emissions that would occur at a lower altitude because of the Proposed Action would have a negligible impact on the air quality at ground level and on regional haze in and around the vicinity of the Class I area.

3.5.5 Environmental Consequences – Alternative 2

3.5.5.1 Emissions Estimation

Air emissions generated from the Proposed Action would be strictly the result of aircraft operations within the MTRs. Under the Proposed Action, there would be no construction. Analyses were performed for aircraft operations in VR-1108, 1109, and 1117.

Emissions were estimated for each year of the Proposed Action beginning in January 2022, with 2023 and beyond being considered “steady state”. **Table 3-8** presents total increases in annual operational emissions for the proposed alternative. No construction emissions are anticipated and only those emissions associated with aircraft operations in the MTRs were evaluated. The methodologies, emission factors, and assumptions used for the emission estimates are outlined in **Appendix C.2.2**. The estimated emissions are compared against the 250 tpy indicator of insignificance for criteria pollutants in attainment areas.

Table 3-8.
Net Change in Emissions for Alternative 2 (ton/year)

	Emissions (tpy)								
	VOC	**NO_x**	**CO**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2e**	**Pb**	**NH_3**
Current Operations	0.22	1.67	8.03	0.37	0.30	0.03	1,130	0.00	0.00
Alternative 2	0.22	1.67	8.03	0.37	0.30	0.03	1,130	0.00	0.00
Net Change in Emissions[1]	0	0	0	0	0	0	0	0	0
Insignificance Indicator	250	250	250	250	250	250	N/A	25	N/A
Exceeds Indicator Level	No	No	No	No	No	No	N/A	No	N/A

Source: Air Conformity Applicability Model output (refer to Appendix C.2.4)

Notes:

1. The reason that net emissions for each pollutant are zero is that the Proposed Action would not increase the operational aspects of the flights, such as number of sorties and engine power level. Accordingly, the same quantity of emissions would occur after the Proposed Action is implemented as the baseline.

NO_x = nitrogen oxides; CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NH_3 = ammonia; Pb = lead; $PM_{2.5}$ = particulate matter less than 2.5 microns; PM_{10} = particulate matter less than 10 microns; SO_x = sulfur oxides; VOC = volatile organic compound; N/A = not applicable

3.5.5.2 Regional Haze

Under Alternative 2, the impacts associated with regional haze would be the same as described in Alternative 1.

3.5.6 Environmental Consequences – No Action Alternative

Under the No Action Alternative, there would be no changes to the existing MTRs. Current emissions, which are reflected as baseline emissions in **Table 3-6**, would remain unchanged.

3.5.7 Reasonably Foreseeable Future Actions and Other Environmental Considerations

Reasonably Foreseeable Future Actions

The Proposed Action, in addition to reasonably foreseeable future actions within the MTRs, would result in less than significant cumulative impacts on air quality.

Climate Change Considerations

To serve as a reference point, projected GHG emissions were compared against State of Texas' net GHG emissions from various sectors, and to the Title V and PSD major source thresholds for CO_2e applicable to stationary sources (**Table 3-9**). Based on the relative magnitude of the project's GHG emissions, a general inference can be drawn regarding whether the Proposed Action is meaningful with respect to the discussion regarding climate change.

As **Table 3-9** demonstrates, GHG emissions increases for each alternative are zero and the regulatory thresholds for stationary source permitting do not apply. The state's GHG emissions are the result of mainly fossil fuel combustion. Based on this analysis, the incremental GHG emissions from the Proposed Action are not considered significant.

Table 3-9.
Metrics for Greenhouse Gas Emission Impacts

Projected CO_2e Emissions Increases (tpy)[1, 2]	CO_2e Regulatory Thresholds (tpy)		Texas 2019 Net GHG Emissions ($MMTCO_2e$)[3,4]	Proposed Action % of Texas GHG Emissions
	Title V Permit	PSD New/ Modified Source		
0	100,000	100,000/ 75,000	380.5	0

Notes:
[5] CO_2e = carbon dioxide equivalent from Air Conformity Applicability Model
[6] Estimated emissions increases from MTR sorties
[7] Represents millions of metric tons of CO_2e ($MMTCO_2e$) from transportation, electricity generation, industry, residential and commercial. Also, includes projected emissions from waste, agriculture, and Land Use, Land Use Change and Forestry
[8] Source: USEPA, 2021c

GHG = greenhouse gas; PSD = Prevention of Significant Deterioration; tpy = ton(s) per year

3.6 BIOLOGICAL RESOURCES

3.6.1 Definition of the Resource

Biological resources include native or naturalized living plant and animal species and the habitats within which they occur. For purposes of this EA, these resources are divided into three major categories: wildlife, domestic animals, migratory flyways, and special status species. See **Appendix C.3** for a more detailed description of biological resources and applicable federal laws.

The ROI includes the areas underlying VR-1108, VR-1109, and VR-1117, which are located primarily in the trans-Pecos and Edwards Plateau ecoregions of Texas (Gould et al., 1960), supporting both the Southwest Plateau and Plains Dry Steppe and Shrub and the Chihuahuan Semi-Desert Provinces (Ecoregions 315 & 321, respectively) in West Texas (McNab and Avers, 1994). Because no ground disturbance is associated with the Proposed Action, no further analysis was done on vegetation, wetlands, or invasive species.

3.6.2 Wildlife

The Southwest Plateau and Plains Dry Steppe and Shrub Province supports many of the same species found within the Chihuahuan Desert Province, but typically associated with grassland areas. Common mammals include the swift fox (*Vulpes velox*), pronghorn (*Antilocapra americana*), ringtail (*Bassariscus astutus*), Mexican ground squirrel (*Spermophilus mexicanus*), and Mexican freetail bat (*Tadarida brasiliensis*). Amphibians include the Texas toad (*Bufo speciosus*) and Couch's spadefoot toad (*Schaphiopus couchii*). Reptiles common to the area include the plains hognose snake (*Heterodon nasicus nasicus*), and Texas horned lizard (*Phrynosoma cornutum*) (McNab and Avers, 1994). Wild turkey (*Meleagris gallopavo*), mourning dove (*Zenaida macroura*), scaled quail (*Callipepla squamata*), and bobwhite (*Colinus virginianus*) are common game birds, and several species of hawks and owls are present in this province.

Species typical of the Chihuahuan Desert Province include mammals such as pronghorn (*Antilocapra americana*), desert mule deer (*Odocoileus hemionus crooki*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), and Merriam's kangaroo rat (*Dipodymys merriami*). Amphibians include Mexican mud turtle (*Kinosternon integrum*) and Great Plains toad (*Bufo cognatus*). Reptiles include Texas-Pecos ratsnake (*Elaphe subcularis*), Texas banded gecko (*Coleonyx brevis*), canyon lizard (*Sceloporus merriami*), and Mohave rattlesnake (*Crotalus scutulatus*). Common birds are the scaled quail (*Callipepla squamata*), white-necked raven (*Corvus cryptoleucus*), cactus wren (*Campylorhynchus brunneicapillus*), golden eagle (*Aquila chrysaetos*), and great horned owl (*Bubo virginianus*) (McNab and Avers, 1994).

Additionally, big and exotic game hunting ranches are found in West Texas and offer hunting opportunities for mule deer, whitetail deer, aoudad, axis, blackbuck, sika, javelin, quail, dove, duck, and predators (West Texas Hunt Organization, 2021).

3.6.3 Domestic Animals

Much of the area underlying VR-1108, VR-1109 supports ranching and agriculture. Domestic livestock supported in the region include cattle, horses, sheep, goats, pigs, and poultry.

3.6.4 Migratory Flyways

The Trans-Pecos region supports a large number of migratory birds due to its varied habitat (desert to mountains) and location within the Central Flyway, a bird migration route. According to the USFWS's database, there are at least seven migratory birds of conservation concern that could occur in areas underlying VR-1108, VR-1109, and VR-1117 (USFWS, 2021a). The 47 FTW adheres to a Bird/Wildlife Aircraft Strike Hazard (BASH) program whereby information and assistance is freely shared between pilots, the operations and civil engineering staffs, and local air traffic controllers to identify risks and minimize BASH potential.

3.6.5 Threatened and Endangered Species and/or Species of Concern

Special status species are those species listed as threatened or endangered under the ESA; species afforded federal protection under the Migratory Bird Treaty Act; and the Bald and Golden Eagle Protection Act.

There are 19 animal and 11 plant species listed under the ESA as either threatened or endangered species known to occur, or that may occur within the 4 counties that underlie the MTR as reported by the U.S. Fish and Wildlife Service (USFWS) (USFWS, 2021a) and the Texas Parks and Wildlife Department (TWPD, 2021). The species with the potential to be impacted by aircraft include seven bird and one mammal federally listed species. **Appendix C.3** provides additional information on these species. No candidate species were identified. Additionally, the Texas Parks and Wildlife Department protects state-listed plant and animal species through state environmental conservation administrative codes. Listed plant, fish, and invertebrate species were excluded from analysis due to the absence of construction or ground disturbance associated with the Proposed Action.

Federally listed Threatened species identified within the ROI include red knot (*Calidris canutus rufa*), piping plover (*Charadrius melodus*), western yellow-billed cuckoo (*Coccyzus americanus*), and Mexican spotted owl (*Strix occidentalis lucida*); listed Endangered species include golden-cheeked warbler (*Dendroica chrysoparia*), southwestern willow flycatcher (*Empidonax traillii extimus*), northern aplomado falcon (*Falco femoralis septentrionalis*), and Mexican long-nosed bat (*Leptonycteris nivalis*). Federally protected species include the bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*). A discussion of the potential for occurrence and preferred habitat for each species is presented in **Appendix C.3.**

Critical Habitat for Threatened and Endangered Species

No critical habitat for any Federally designated Threatened and Endangered mammal or bird species has been identified beneath VR-1108, VR-1109, and VR-1117. Proposed critical habitat for the Texas hornshell (*Popenaias popeii*), a Federally listed endangered species, has been designated within the Rio Grande, Pecos, and Devil's Rivers (USFWS, 2021b). Proposed critical habitat within the Rio Grande River for this freshwater mussel underlies the B-C legs of VR 1108 and VR 1109 (**Appendix C.3**).

3.6.6 Environmental Consequences Evaluation Criteria

The level of impact on biological resources is based on the:

- importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource;
- proportion of the resource that would be affected relative to its occurrence in the region;
- sensitivity of the resource to the proposed activities; and
- duration of potential ecological ramifications.

The impacts on biological resources are adverse if species or habitats of high concern (i.e., federally and state listed threatened and endangered species and designated critical habitat) are negatively affected. Impacts are also considered adverse if disturbances cause reductions in population size or distribution of a species of high concern.

As a requirement under the ESA, federal agencies must provide documentation that ensures that agency actions do not adversely affect the existence of any threatened or endangered species. The ESA requires that all federal agencies avoid unauthorized "take" of federally threatened or endangered species or adverse modification of designated critical habitat. The ESA Section 7 consultation process would result in either a concurrence on the Air Force's determination of "effect, but no adverse effect" on listed species, or a biological opinion with either an Incidental Take Statement that authorizes a specified amount of "take" (or adverse modification of designated critical habitat) or a jeopardy determination.

3.6.7 Environmental Consequences – Alternative 1

Several factors, including direct strikes and visual effects associated with approaching aircraft potentially impact wildlife in areas underlying the MTRs. BASH considerations are discussed in **Section 3.8.5.** Any impacts from visual sightings of approaching aircraft most likely occur along MTR segments below 1,000 ft AGL, the altitude accounting for most reactions to visual stimuli by wildlife (Bowles, 1995). The proposed altitude changes would set the floor elevations at 500 ft AGL with the exceptions of the A-B legs for VR-1108 and VR-1109 and the E-F leg for VR-1117. Studies investigating the effects of overflight noise on wildlife suggest that impacts vary depending on the species as well as a variety of other factors such as type of aircraft, duration of overflight, frequency of overflights, and aircraft speed. In addition, natural factors that affect impacts include age and sex, reproductive condition, group size, season, terrain, weather, and temperament (Bowles, 1995). Responses to aircraft noise include no response, increased heart rate, turning toward stimuli, or fleeing (mammals) and flushing (birds) (NPS, 1994).

Studies on the effects of noise on wildlife have been predominantly conducted on mammals and birds. Studies of subsonic aircraft disturbances on ungulates (e.g., pronghorn, bighorn sheep, elk, and mule deer), in both laboratory and field conditions, have shown that effects are transient and of short duration, and suggest that the animals habituate to the sounds (Bowles, 1995; Larkin 1994; Weisenberger et al., 1996; Gladwin and Manci, 1988).

Noise that is close, loud, and sudden and is combined with a visual stimulus produce the most intense reactions in animals. Rotary-wing aircraft (helicopters) generally induce the startle effect more frequently than fixed-wing aircraft (Manci et al., 1988). Some species habituate to repetitive noises, especially noise associated with overflight of fixed-wing aircraft, better than other species (Krausman et al., 1999). Physiological and behavioral reactions to aircraft overflights are indications of temporary stress upon wildlife and domestic animals; however, the long-term implications to individuals have not been studied extensively.

Much of the area underlying VR-1108 and VR-1109 supports ranching and agriculture. The effects of aircraft overflights and their accompanying noise on domestic livestock (such as cattle and horses) have been the subject of numerous studies since the late 1950s (Gladwin et al., 1988; United States Forest Service [USFS], 1992). These studies have examined the effects on a wide range of livestock including poultry, cattle, sheep, pigs, goats, and mink. Exposure to multiple overflights at all altitudes provided the basis for testing the animal's response. Several general conclusions are drawn from these studies:

- Overflights do not increase death rates and abortion rates or reduce productivity rates (e.g., birth rates and weights) and do not lower milk production among domestic livestock.
- Animals take care not to damage themselves and do not run into obstructions, unless confined or traversing dangerous ground at a high rate if overflown by aircraft 163 to 325 ft AGL (USFS, 1992).
- Domestic livestock habituate to overflights and other noise. Although they may look or startle at a sudden onset of aircraft noise, they resume normal behavior within 2 minutes after the disturbance.

Inconclusive results have been obtained in some cases because the effect observed is no different than any other disturbance livestock experience on a daily basis, such as from vehicles or blowing vegetation. Historical interactions between the cattle and numerous overflights have not indicated a problem. For

example, cattle have grazed under heavily used military airspace at Avon Park Range in Florida, Saylor Creek and Juniper Butte Ranges in Idaho, and Smoky Hill Air National Guard Range in Kansas for decades. At these training ranges, grazing cattle have been subject to upwards of 100 overflights per day, many as low as 100 ft AGL. No evidence exists that the health or well-being of the cattle have been threatened. The animals, including calves, show all indications of habituating to the noise and overflights.

The effects of fixed-wing aircraft flying below 1,000 ft AGL upon flight capable wildlife due to visual approach and noise are largely dependent upon species demeanor, time of day, migration cycle, and behavioral activity. These are largely BASH considerations accommodated by flight scheduling. Because no ground disturbance is associated with the Proposed Action, habituation to flight activity is anticipated and no direct or indirect, immediate, or cumulative impacts to vegetation communities, wildlife, or domesticated animals.

Under the Proposed Action, the Air Force made a no effect determination for the listed plants, aquatic species (e.g., fish, mollusks, and crustaceans with the potential to be located beneath the MTRs (**Appendix C.3**). The Air Force has made a may affect, but not likely to adversely affect determination on the federally listed birds and bat with the potential to be located beneath the MTRs (**Appendix C.3**) due to the same reasons discussed above for wildlife. While lowering the floors in the VR segments from 1,000 ft AGL to 500 ft AGL may increase the potential for bird strikes, given the large area where the training would occur and that most training would occur during daytime hours, the likelihood for birds to encounter aircraft during training operations would remain low. Over the last 12 years, only 4 bird strikes have been reported for Laughlin AFB flight operations on MTRs. Moreover, as outlined in **Section 3.8.4.2**, when BASH risk increases, additional avoidance procedures would be followed during low-altitude training. Because there is no designated critical habitat beneath the sections of the MTRs proposed to be adjusted, the Air Force has made a no effect determination to designated critical habitat. A letter requesting concurrence with a may affect, but not likely to adversely affect determination was sent to the USFWS (**Appendix A**).

3.6.8 Environmental Consequences – Alternative 2

Potential impacts to biological resources under Alternative 2 are the same as those identified under Alternative 1.

3.6.9 Environmental Consequences – No Action Alternative

Under the No Action Alternative, no direct or indirect, immediate, or cumulative impacts to wildlife, domesticated animals, migratory flyways, federally designated Threatened or Endangered species, or critical habitats have been identified.

3.6.10 Reasonably Foreseeable Future Actions and Other Environmental Considerations

The Proposed Action, in addition to reasonably foreseeable future actions beneath the airspace, are not anticipated to result in incremental impacts to biological resources.

3.7 CULTURAL RESOURCES

3.7.1 Definition of the Resource

Cultural resources are any prehistoric or historic district, site, building, structure, or object considered important to a culture or community for scientific, traditional, religious, or other purposes. These resources are protected and identified under several federal laws and Executive Orders.

Cultural Resources include the following subcategories:

- Archaeological (i.e., prehistoric or historic sites where human activity has left physical evidence of that activity, but no structures remain standing);

- Architectural (i.e., buildings or other structures or groups of structures, or designed landscapes that are of historic or aesthetic significance); and
- Traditional Cultural Properties (TCPs - resources of traditional, religious, or cultural significance to Native American tribes and other communities).

Historic properties are cultural resources that have been listed in or determined eligible for listing in the National Register of Historic Places (NRHP). To be eligible for the NRHP, properties must be 50 years old and have national, state, or local significance in American history, architecture, archaeology, engineering, or culture. They must possess sufficient integrity of location, design, setting, materials, workmanship, feeling, and association to convey their historical significance, and meet at least one of four criteria (NPS, 2002):

- Associated with events that have made a significant contribution to the broad patterns of our history (Criterion A);
- Associated with the lives of persons significant in our past (Criterion B);
- Embody distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction (Criterion C); and/or
- Have yielded or be likely to yield information important in prehistory or history (Criterion D)

Properties that are less than 50 years old can be considered eligible for the NRHP under Criterion Consideration G if they possess exceptional historical importance. Those properties must also retain historic integrity and meet at least one of the four NRHP Criteria for Evaluation (Criterion A, B, C, or D). The term “Historic Property” refers to National Historic Landmarks, NRHP-listed, and NRHP-eligible cultural resources.

Federal laws protecting cultural resources include the Archaeological and Historic Preservation Act of 1960 as amended, the American Indian Religious Freedom Act of 1978, the Archaeological Resources Protection Act of 1979, the Native American Graves Protection and Repatriation Act of 1990, and the NHPA, as amended through 2016, and associated regulations (36 CFR Part 800). The NHPA requires federal agencies to consider effects of federal undertakings on historic properties prior to making a decision or taking an action and to integrate historic preservation values into their decision-making process. Federal agencies fulfill this requirement by completing the Section 106 consultation process, as set forth in 36 CFR Part 800. Section 106 of the NHPA also requires agencies to consult with federally recognized Native Hawaiian organizations or Indian tribes with a vested interest in the undertaking.

Section 106 of the NHPA requires all federal agencies to seek to avoid, minimize, or mitigate adverse effects on historic properties (36 CFR § 800.1[a]). For cultural resource analysis, the Area of Potential Effects (APE) is used as the ROI. APE is defined as the “geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist,” (36 CFR § 800.16[d]) and thereby diminish their historic integrity. The APE for this EA includes all the lands under the three existing MTRs (**see Figure 1-2**).

3.7.2 Existing Conditions – Military Training Routes

The Laughlin MTRs included in the Proposed Action span southern portions of the Great Plains and Basin and Range physiographic regions and cross BBNP.

3.7.2.1 Archaeological and Traditional Cultural Properties and Tribal Lands

Native peoples have lived in and/or passed through this area for thousands of years. Archaeological evidence of non-Indian groups utilizing the area generally only covers the past 150 years. Archaeological research in BBNP is imperfect as an archaeological survey of the entire park has never been attempted. Early archaeological surveys sampled only a portion of the park recording a total of 628 sites. Extrapolating from this early work, and with reference to more recent data, it is estimated more than 20,000 as of yet unrecorded archaeological sites are likely to exist in the park (NPS, 2020). There are two archaeological

sites in the park that the public is encouraged to visit (the Hot Springs and Chimneys pictograph sites), and neither site is within the APE.

An archaeological site files search of the APE conducted for this EA by the Texas Archaeological Research Laboratory identified 994 sites within the APE. These include resources such as pictograph and petroglyph sites, remains of pueblos, pithouse villages, resource extraction camps, knapping and quarry sites, burned rock middens, rock cairns, ranches, early homesteads, wax camps, military outposts, and mining operations.

Seven federally recognized tribes were contacted regarding their knowledge of traditional cultural resources and sacred sites within the APE including the Apache Tribe of Oklahoma, Comanche Nation, Oklahoma, Kickapoo Traditional Tribe of Texas, Mescalero Apache Tribe of the Mescalero Reservation, New Mexico, Tonkawa Tribe of Indians of Oklahoma, Wichita and Affiliated Tribes (Wichita, Keechi, Waco & Tawakonie), Oklahoma, and the Ysleta Del Sur Pueblo.

No known TCPs have been identified in the APE. There are no tribal lands, defined for the EA as reservations of federally recognized tribes, included under the MTRs.

3.7.2.2 National Register of Historic Places Listed Resources

There are no NRHP-listed resources under the airspace. While there are eight National Register historic sites or districts in BBNP, including the Castolon Historic District, Hot Springs Historic District, the Mariscal Mining District, the Homer Wilson Ranch Site, Rancho Estelle, and Luna's Jacal, all of these resources are located south of the APE.

3.7.3 Environmental Consequences Evaluation Criteria

Adverse impacts to cultural resources might include physically altering, damaging, or destroying all or part of a resource or altering characteristics of the resource that make it eligible for listing in the NRHP. Those effects can include introducing visual or audible elements that are out of character with the property or its setting; neglecting the resource to the extent that it deteriorates or is destroyed; or the sale, transfer, or lease of the property out of agency ownership (or control) without adequate enforceable restrictions or conditions to ensure preservation of the property's historic significance. For the purposes of this EA, an effect is considered adverse if it alters the integrity of a NRHP-listed or eligible resource or if it has the potential to adversely affect TCPs and the practices associated with the property.

3.7.4 Environmental Consequences – Alternative 1

Noise analysis completed for this EA indicate that only one segment of the MTRs, specifically segment B-C of VR-1108 and VR-1109, would be expected to experience any increase in noise. Proposed altitude changes for this segment include lowering the floor from 1,000 ft AGL to 500 ft AGL. Even with a small 3 dBA increase, the noise levels under this segment would remain below 30 dBA, resulting in a negligible increase to the noise environment. In addition, the Proposed Action does not include lowering the altitude floors above BBNP.

No ground disturbance would take place as part of the Proposed Action; therefore, no archaeological resources (surface or subsurface) would be disturbed or otherwise affected. No traditional cultural resources or sacred sites have been identified in the APE. There are no historic districts or individual historic structures eligible for inclusion in the NRHP documented in the APE. Therefore, per guidance set forth in 36 CFR 800.4(d)(1), it has been determined that no historic properties would be affected by implementation of the Proposed Action under Alternative 1. Implementation of Alternative 1 would have no adverse effect on historic properties.

3.7.5 Environmental Consequences – Alternative 2

Potential impacts to cultural resources under Alternative 2 are the same as those identified under Alternative 1.

3.7.6 Environmental Consequences – No Action Alternative

Under the No Action Alternative, there would be no changes to MTRs and there would be no impacts on cultural resources.

3.7.7 Reasonably Foreseeable Future Actions and Other Environmental Considerations

The Proposed Action and reasonably foreseeable future actions on and/or adjacent to the APE are not anticipated to result in incremental impacts to cultural resources, including archaeological resources, architectural resources, or Native American TCPs.

3.8 SAFETY

3.8.1 Definition of the Resource

Safe, effective, and disciplined flying training operations is a critical priority of the 47 FTW. Safety concerns associated with MTR flight activities are considered in this section and address issues related to the health and well-being of both military personnel operating in and civilians living under or near VR-1108, VR-1109, and VR-1117. Specifically, this EA provides information on hazards associated with aircraft mishaps, BASH, munitions, and obstructions to flight.

The primary flight safety concern is the potential for aircraft accidents that are assessed in this section. Such mishaps could occur because of mid-air collisions, collisions with terrain or manmade structures, BASH, weather-related accidents, mechanical failure, or pilot error. Flight risks apply to civilian and military aircraft. Analysis of flight risks correlates mishap rates (**Section 3.8.2.1**) and BASH (**Section 3.8.2.2**) with airspace utilization.

This section is organized by aircraft mishaps, BASH, munitions safety, and obstructions to flight. In addition, **Appendix C.4** includes more information on safety. The ROI includes VR-1108, VR-1109, VR-1117, and areas under or near these MTRs (See **Figures 2-2** through **2-4**).

3.8.2 Existing Conditions – Military Training Routes

3.8.2.1 MTR Operating Procedures

Aircraft flight operations on MTRs are governed by standard rules of flight. Additionally, information and Special Operating Procedures applicable to each MTR, including VR-1108, VR-1109, and VR-1117, are contained in FLIP AP/1B (DOD, 2021). Units that schedule flight training activities on MTRs must ensure that information and procedures listed in FLIP AP/1B are complete and accurate for the safe and efficient operation of aircraft on their respective MTRs. At a minimum, Special Operating Procedures or Remarks (Department of the Air Force Manual [DAFMAN] 13-201, *Airspace Management* [10 Dec 20]*)* shall include the following:

- Potential hazards during entry, exit and flying of the route. Include listing all Class B, C, and D airspace within 5 NM of the route.
- Unpublished/uncharted obstruction data pending publishing/charting.
- Route deconfliction procedures.
- Possible bird attractant areas and migratory routes.
- Noise and low-level flight sensitive areas.
- Uncharted airports.
- Other potential flight safety hazards.

Basic airmanship procedures also exist for handling any deviations to air traffic control procedures due to an in-flight emergency; these procedures are defined in AFMAN 11-202 Volume 3, *Flight Operations* (10

JUN 2020) and established aircraft flight manuals. The Flight Crew Information File is a safety resource for aircrew day-to-day operations which includes flight operation rules and procedures.

3.8.2.2 Aircraft Mishaps

Aircraft mishaps and their prevention represent a prime concern of the Air Force and the 47 FTW. A mishap is an unplanned occurrence or series of occurrences, that result in damage or injury and meets Class A, B, C, D, and Class E event reporting criteria as defined in AFMAN 91-224, *Ground Safety Investigation and Hazard Reporting* (28 Mar 2019). Class A mishaps are the most severe with total property damage of $2 million or more or a fatality and/or permanent total disability. **Table 3-10** provides the mishap classes and how they are defined.

Table 3-10.
Aircraft Class Mishaps

Mishap Class	Mishap Criteria[1]
A	1. Direct mishap cost totaling $2,000,000 or more. 2. A fatality or permanent total disability. 3. Destruction of a DOD aircraft. 4. Permanent loss of primary mission capability of a space vehicle.
B	1. Direct mishap cost totaling $500,000 or more but less than $2,000,000. 2. A permanent partial disability. 3. Inpatient hospitalization of three or more personnel. This does not include individuals hospitalized for observation, diagnostic, or administrative purposes that were treated and released. 4. Permanent degradation of primary or secondary mission capability of a space vehicle or the permanent loss of secondary mission capability of a space vehicle.
C	1. Direct mishap cost totaling $50,000 or more but less than $500,000. 2. Any injury or occupational illness that causes loss of one or more days away from work not including the day or shift it occurred. 3. An occupational injury or illness resulting in permanent change of job. 4. Permanent loss or degradation of tertiary mission capability of a space vehicle.
D	On-duty mishap resulting in one or more of the following: 1. Direct mishap cost totaling $20,000 or more but less than $50,000. 2. A recordable injury cost or illness not otherwise classified as a Class A, B, or C mishap. 3. Any work-related mishap resulting in a recordable injury or illness not otherwise classified as a Class A, B, or C mishap.
E	A work-related mishap that falls below Class D criteria. Most Class E mishap reporting is voluntary; however, see discipline-specific safety manuals for a list of events requiring mandatory reporting.

Note: 1. Mishap criteria defined as resulting in one or more item listed by Class.

Based on historical data on mishaps at all installations, and under all conditions of flight, the military services calculate mishap rates per 100,000 flying hours for each type of aircraft in the inventory. Over the last decade, the Air Force Safety Center reports of Class A mishaps for all manned aviation have ranged from 12 in 2014 (rate of 0.72 per 100K flight hours) to 27 in 2018 (rate of 1.58 per 100K flight hours) (HQ AFSEC, 2021). In comparison, from 2009 through 2019, T-1 aircraft have had zero Class A mishaps and two Class B mishaps (rate of 0.23 per 100K flight hours) (Air Force Safety Center, 2019) and T-38 aircraft have had eight Class A mishaps (rate of 0.72 per 100K flight hours) and 12 Class B mishaps (rate of 1.08 per 100K flight hours) (Air Force Safety Center, 2019).

The AETC 47 FTW Safety Annual Program Management Review for fiscal year 2020 (AETC, 2020) lists as a primary flight safety goal to have zero Class A or B mishaps. As such, this EA focuses on Class A and B

mishaps which are the two categories with the most severe results in terms of property damage, including destroyed aircraft, and fatalities and injuries. Laughlin AFB reports there were no Class A flight mishaps in FY 2020 or in FY 2015 through FY 2017, and 1 Class A flight mishap in each of FY 2018 and FY 2019 (rate of about 1.4 per 100K flight hours). Similarly, Laughlin AFB reports no Class B flight mishaps during the period of FY 2015 through FY 2020. These flight mishaps reported by Laughlin AFB include all flight activities, however, none are associated with 47 FTW operations in MTRs.

The 47 FTW publishes the Laughlin AFB Mishap Response Plan (HQ 47 FTW, 2020b) which outlines procedures for time-critical response of tasked agencies to mishaps requiring safety investigation and reporting. Upon initial notification of a possible Class A or B mishap within the Laughlin AFB Area of Responsibility, the Wing Flight Safety Officer on duty with the safety radio would respond to the mishap in accordance with the Mishap Response Plan. Additional Wing Safety Officers would begin execution of the Mishap Response Plan. VR-1108, VR-1109, and VR-1117 are included in the Laughlin AFB Area of Responsibility.

3.8.2.3 Bird/Wildlife Aircraft Strike Hazard

BASH presents a safety concern for aircraft operations because of the potential for damage to aircraft or injury to aircrews or local populations if a crash should occur. Aircraft can encounter birds at nearly all altitudes up to 30,000 ft MSL; however, most birds fly close to the ground. According to the Air Force Safety Center, BASH statistics, about 52 percent of strikes occur from birds flying below 400 ft and 88 percent occur at less than 2,000 ft AGL (Air Force Safety Center, 2020).

The Air Force BASH program was established to minimize the risk for collisions of birds/wildlife with aircraft and the subsequent loss of life and property. In accordance with Air Force Instruction 91-202, *The US Air Force Mishap Prevention Program*, each flying unit in the Air Force is required to develop a BASH plan to reduce hazardous bird/wildlife activity relative to airport flight operations. The intent of each plan is to reduce BASH issues at the airfield by creating an integrated hazard abatement program through monitoring, avoidance, and actively controlling bird and animal population movements. Laughlin AFB is located on the western edge of the Central Migratory Bird Flyway, resulting in the increased potential for in-flight encounters with birds during migration. The Laughlin AFB BASH Plan (HQ 47 FTW, 2020a) provides an installation program designed to minimize local and transient aircraft exposure to potentially hazardous bird/wildlife strikes at or near Laughlin AFB but does not include hazard abatement measures for MTRs. However, BASH incidents that occur on MTRs and other special use airspace are reported and included in each installation's BASH statistics. Four bird strikes have been reported for Laughlin AFB flight operations on MTRs over the last twelve years, including a T-38 on IR-169 (December 2015, Class C), T-38 on VR-1109 (October 2011, Class E), T-1 on VR-1108 (March 2010, Class E), and T-1 on VR-1108 (October 2009, Class E)[1].

3.8.2.4 Munitions Safety

Aircraft munitions include ammunition, propellants (solid and liquid), pyrotechnics, warheads, explosive devices, and chemical agent substances and associated components that present real or potential hazards to life, property, or the environment. Defense Explosives Safety Regulation 6055.09 AFMAN 91-201, *Explosives Safety Standards*, defines the guidance and procedures dealing with munition storage and handling. T-38 and T-1 aircraft are not loaded with high-explosive ordnance. Explosive safety concerns for these aircraft only include Cartridge Actuated Devices and Propellant Actuated Devices associated with egress and life-support systems.

[1] Captain Stefan Edmiston, 47 FTW/SEF email to Kevin Bradley, environmental contractor team, 3 August 2021.

3.8.2.5 Obstructions to Flight

A flight obstruction is any obstruction in navigable airspace that apply to existing and proposed man-made objects, objects of natural growth, and terrain.

Enroute VFR flight operations begin and end outside the airport traffic pattern airspace area or Class B, C, and D airspace areas. FAA considerations/guidance for evaluating obstructions to enroute VFR flight operations (FAA, *Procedures for Handling Airspace Matters, Section 3. Identifying/Evaluating Aeronautical Effect*) include:

- A structure would have an adverse effect upon VFR air navigation if its height is greater than 500 ft above the surface at its site, and within 2 statute miles of any regularly used VFR route.
- Evaluation of obstructions located within VFR routes must recognize that pilots may, and sometimes do, operate below the floor of controlled airspace during low ceilings and 1-mile flight visibility. When operating in these weather conditions and using pilotage navigation, these flights must remain within 1 mile of the identifiable landmark to maintain visual reference. Even if made more conspicuous by the installation of high intensity white obstruction lights, a structure placed in this location could be a hazard to air navigation because after sighting it, the pilot may not have the opportunity to safely circumnavigate or overfly the structure.
- VFR Military Training Routes (VR) - Operations on VRs provide military aircrews low altitude, high speed navigation and tactics training, and are a basic requirement for combat readiness (see FAAO JO 7610.4, Special Operations). Surface structures have their greatest impact on VFR operations when ceiling and visibility conditions are at or near basic VFR minimums. Accordingly, the guidelines for a finding of substantial adverse effect on enroute VFR operations are based on consideration for those operations conducted under Part 91 that permits flight clear of clouds with one mile flight visibility outside controlled airspace. In contrast, flight along VRs can be conducted only when weather conditions equal or exceed 3,000 ft ceiling and 5 miles visibility. A proposed structure's location on a VR is not a basis for determining it to be a hazard to air navigation; however, in recognition of the military's requirement to conduct low altitude training, the Air Force would disseminate Part 77 notices and aeronautical study information to military representatives. Additionally, attempt to persuade the sponsor to lower or relocate a proposed structure that exceeds obstruction standards and has been identified by the military as detrimental to its training requirement.

Mountainous terrain, part of the Chisos mountain range, in areas west of VR-1108, VR-1109, and VR-1117 is a notable flight obstruction. Commercial wind power generation from wind turbines and windmills is prevalent throughout the western and central states including Texas. However, presently there are no flight safety concerns associated with wind turbines and windmills in the areas surrounding VR-1108, VR-1109, and VR-1117.

3.8.3 Environmental Consequences Evaluation Criteria

Impacts from implementation of the Proposed Action are assessed according to the potential to increase or decrease safety risks to personnel, the public, property, or the environment. Adverse impacts on safety might include implementing new flight procedures on VR-1108, VR-1109, and VR-1117 that result in greater flight safety risk. For the purposes of this EA, an impact is considered significant if the proposed safety measures are not consistent with Air Force Office of Safety and Health and Occupational Safety and Health Administration standards resulting in unacceptable safety risks. When the changes in risk due to the proposed action are considered individually and collectively, the need for new or modified procedures and requirements can be assessed.

Safety concerns associated with VFR flight activities are considered in this section. Analysis of aircraft flight safety risks correlates projected Class A mishaps and BASH with current airspace use to consider the magnitude of the change in risk associated with the Proposed Action. The Proposed Action would not change any aspects of ground safety, which considers the safety of personnel and facilities on the ground and would not be placed at risk from flight operations on VR-1108, VR-1109, and VR-1117. Explosives

safety relates to the management and safe use of munitions. T-1 and T-38 pilots would follow Air Force safety procedures and aircraft specific emergency procedures based on the aircraft design. Basic airmanship procedures also exist for handling any deviations to air traffic control procedures due to an in-flight emergency; these procedures are defined in AFMAN 11-202 (Volume 3) and established aircraft flight manuals. The Flight Crew Information File is a safety resource for aircrew day-to-day operations which is composed of air and ground operation rules and procedures.

3.8.4 Environmental Consequences – Alternative 1

Under the Proposed Action, the 47 FTW would raise the ceiling along the entire portions of VR-1108, VR-1109, and VR-1117 from 1,500 ft AGL to 2,000 ft AGL. The Proposed Action also includes lowering the floors from 1,000 ft AGL to 500 ft AGL, from Points C (for VR-1108 and 1109) and D (for VR-1117) to a point to be established outside the confines of BBNP (see **Figures 2-2** through **2-4**). Flight safety hazards associated with aircraft mishaps, bird/wildlife-aircraft strikes, munitions, and obstructions to flight associated with implementation of the Proposed Action are described in the following sections.

3.8.4.1 Aircraft Mishaps

Under the Proposed Action, the 47 FTW would continue to overfly the terrain found under VR-1108, VR-1109, and VR-1117; however potentially at different altitudes (as described in Section 3.8.2). Lowering the floors from 1,000 ft AGL to 500 ft AGL for the segments noted would increase flight safety risk and the chance of a mishap overall for flights conducted under 1,000 ft AGL. Lowering the floors in VRs as described above and raising the ceilings of all segments of the VRs to 2,000 ft AGL would increase the space for vertical maneuverability and improve flight safety. It is noted that flying in low level MTRs, down to 500 ft AGL or lower, is common military training practice. To ensure flight safety, aircrews would continue to adhere to specific procedures for operating in the MTRs contained in Laughlin AFB Instruction 13-204 *Airfield Operations*. Laughlin AFB aircraft have used VR-1108, VR-1109, and VR-1117 for years and no change would occur to impact civilian air traffic near those routes. While the FLIP AP/1B specifies that flight within 1,500 ft AGL or 3 NM of airports should be avoided when practical, there are no civil airfields within the MTRs proposed to have the floors lowered (**Figure 3-4**). In addition, AFMAN 11-247 T-1A *Flying Fundamentals* direct that within mountainous terrain airdrop maneuvers are conducted at 1,000 ft AGL or 500 ft above the planned route altitude, whichever is higher. Moreover, AFMAN 11-2T1v3, 47OGSUP 47th Operations Group Supplement to T-1A *Operations Procedures*, restricts T-1 low-level training in mountainous terrain to no lower than 1,000 ft AGL when winds are between 21-25 kn, and no lower than 1,500 ft AGL when winds exceed 25 kn. Raising the ceiling to 2,000 ft AGL would also allow for airdrop training to occur when wind conditions dictate.

The limited amount of time an aircraft is over any specific location, combined with sparsely populated areas under the affected VRs, minimizes the probability that an aircraft mishap would occur over a populated area. All MTR flight operations would continue to be conducted in accordance with procedures established in the applicable Air Force regulations and orders with the safety of its pilots and people in the surrounding communities as the primary concern. No significant impacts on flight safety are anticipated to occur under this alternative provided strict control and use of established safety procedures continue.

3.8.4.2 Bird/Wildlife-Aircraft Strike Hazards

The areas of VR-1108, VR-1109, and VR-1117 in West Texas proposed for use by the 47 FTW are classified by the Avian Hazard Advisory System as having generally low bird-strike risk during the night, and moderate risk during the day, throughout most of the spring and summer months. From October through February, the risk increases to moderate-to-severe during the morning hours. T-1 and T-38 aircrews operating within VR-1108, VR-1109, and VR-1117 would continue to follow applicable procedures outlined in the Laughlin AFB BASH Plan. Flight safety risk in general and BASH risk should be assessed for flights lower than 1,000 ft AGL. When risk increases, additional avoidance procedures outlined in the Laughlin AFB BASH plan would be followed during low-altitude training. Continued adherence to current safety procedures, and taking preventive action when BASH risk increases, would result in no significant change in BASH impacts under the Proposed Action.

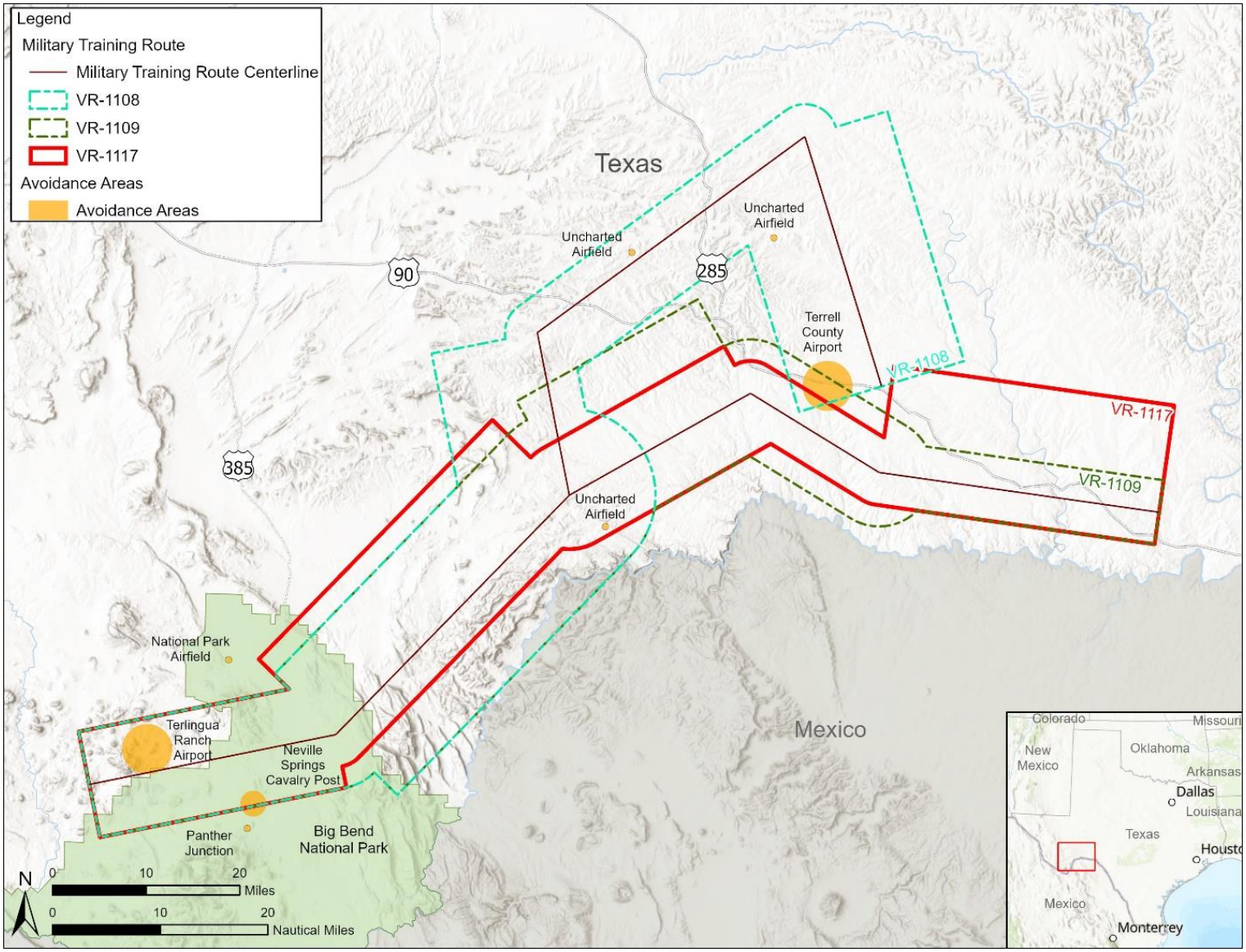

Figure 3-4. Avoidance Areas Beneath the Military Training Routes

3.8.4.3 Munitions Safety

T-38 and T-1 aircraft are not loaded with high-explosive ordnance. Explosive safety concerns for these aircraft only include Cartridge Actuated Devices and Propellant Actuated Devices associated with egress and life-support systems. Defense Explosives Safety Regulation 6055.09_AFMAN 91-201, *Explosives Safety Standards*, and Air Force approved technical orders define the guidance and procedures for munitions storage and handling. Continued adherence to these procedures would result in no significant impacts to munitions safety under the Proposed Action.

3.8.4.4 Obstructions to Flight

Due to their elevation, the mountainous terrain to the west of VR-1108, VR-1109, and VR-1117 are the most notable flight obstruction with the implementation of the Proposed Action. Under this alternative, this mountainous terrain, along the protected parks, would be avoided and, therefore, there would be no impacts from potential flight obstructions.

3.8.5 Environmental Consequences – Alternative 2

Under Alternative 2, the ceiling of all segments in VR-1108, VR 1109, and VR-1117 would be raised from 1,500 ft AGL to between 5,000 and 7,800 ft MSL depending on the segment and floors would be lowered from 1,000 ft AGL to 500 ft AGL, from Points C (for VR-1108 and 1109) and D (for VR-1117) to a point to be established outside the confines of BBNP (see **Figures 2-2** through **2-4**).

3.8.5.1 Aircraft Mishaps

The potential for aircraft mishaps under Alternative 2 is similar to the potential for mishaps under Alternative 1 (**Section 3.8.4.1**). All MTR flight operations would continue to be conducted in accordance with procedures established in the applicable Air Force regulations and orders with the safety of its pilots and people in the surrounding communities as the primary concern. Strict control and use of established safety procedures would minimize the potential for aircraft mishaps and safety risks in general.

3.8.5.2 Bird/Wildlife Aircraft Strike Hazard

The potential for BASH under Alternative 2 is similar to the potential for these strike hazards under Alternative 1 (**Section 3.8.4**). T-1 and T-38 aircrews operating within VR-1108, VR-1109, and VR-1117 would continue to follow applicable procedures outlined in the Laughlin AFB BASH Plan. Flight safety risk in general and BASH risk should be assessed for flights lower than 1,000 ft AGL. Although, for aircraft flying at higher altitudes under Alternative 2, mishaps may be less likely to occur than at lower altitudes since bird strikes generally occur more frequently at lower altitudes; over 90 percent of the reported bird strikes occur at or below 3,000 feet AGL, though strikes at higher altitudes are common during migration (Federal Aviation Administration, 2021a). When risk increases, additional avoidance procedures outlined in the Laughlin AFB BASH plan would be followed during low-altitude training. Continued adherence to current safety procedures, and taking preventive action when BASH risk increases, would result in no significant change in BASH impacts under the Proposed Action.

3.8.5.3 Munitions Safety

As with Alternative 1, there would be no change to the use of munitions from the implementation of this Alternative. Adherence to Air Force guidance would result in in no significant impacts to munitions safety under Alternative 2.

3.8.5.4 Obstructions to Flight

Obstructions to flight under Alternative 2 would potentially be somewhat lower, compared with Alternative 1, for aircraft flying at higher altitudes on the route segments where the ceiling would be raised from 1,500 ft AGL to between 5,000 and 7,800 ft MSL. Due to their elevation, the mountainous terrain to the west of VR-1108, VR-1109, and VR-1117 are the most notable flight obstruction with the implementation of the

Proposed Action. Under this alternative, this mountainous terrain, along the protected parks, would be avoided and, therefore, there would be no impacts from potential flight obstructions.

3.8.6 Environmental Consequences – No Action Alternative

Under the No Action Alternative, the 47 FTW would not modify VR-1108, VR-1109, and VR-1117 and would maintain their current use in an east-to-west direction. While the 47 FTW experienced four bird strikes associated with operations on MTRs including VR-1108 and VR-1109, none resulted in a Class A or B aircraft mishap. The safety conditions involving the 47 FTW described in **Section 3.8** would remain unchanged. Under the No Action Alternative, there would be no significant impacts to safety.

3.8.7 Reasonably Foreseeable Future Actions and Other Environmental Considerations

No reasonably foreseeable future projects were identified for VR-1108, VR-1109, or VR-1117 or from local flying activities that would interact with aircraft training operations.

3.9 ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

3.9.1 Definition of the Resource

Federal agencies, through Executive Orders (EOs), are required to address disproportionate environmental and human health effects in minority and low-income communities and to identify and assess environmental health and safety risks to children. For the purposes of this analysis, minority populations are defined as Alaska Natives and American Indians, Asians, Blacks or African Americans, Native Hawaiians, and Pacific Islanders or persons of Hispanic origin (of any race); low-income populations include persons living below the poverty threshold as determined by the US Census Bureau; and youth populations are children under the age of 18 years.

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, pertains to environmental justice issues and relates to various socioeconomic groups and disproportionate impacts that could be imposed on them. This EO requires that federal agencies' actions substantially affecting human health, or the environment do not exclude persons, deny persons benefits, or subject persons to discrimination because of their race, color, or national origin. EO 12898 was enacted to ensure the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Consideration of environmental justice concerns includes race, ethnicity, and the poverty status of populations in the vicinity of a Proposed Action.

EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, states that each federal agency "(a) shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children; and (b) shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks."

The ROI for this environmental justice analysis is the following counties in Texas: Val Verde, Terrell, Pecos, and Brewster.

3.9.2 Existing Conditions – Military Training Routes

Per CEQ guidance (CEQ, 1997), minority populations are identified where either the minority population of the affected area exceeds 50 percent, or the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis (CEQ, 1997). Low-income populations are persons below the poverty level as defined by the U.S. Census Bureau. Following the Office of Management and Budget's Statistical Policy Directive 14, the Census Bureau uses a set of money income thresholds that vary by family size and composition to determine who is in poverty. If a family's total income is less than the family's threshold, then that family and every individual in it is considered in poverty.

In order to determine if minority, low-income, and youth populations exist in the project area, the ROI must be compared to a larger regional area that includes the affected area and serves as a Community of Comparison. The State of Texas is the Community of Comparison in this EA. Communities living in Val Verde, Terrell, Pecos, and Brewster Counties beneath the airspace associated with the Proposed Action constitute the ROI.

Data on minority populations, persons in poverty, and youth populations are presented in **Table 3-11**. As of 2019, an average of 62 percent of the ROI population was of Hispanic or Latino origin, which is much higher than the State of Texas and the rest of the United States (U.S. Census Bureau, 2021). The percentage of persons with a race of Alaska Natives and American Indians, Asians, Blacks or African Americans, Native Hawaiians, and Pacific Islanders is lower than the state of Texas and the rest of the United States (U.S. Census Bureau, 2021). The average poverty rate of 17.5 percent for ROI residents is higher than the Texas poverty rate of 13.6 percent and the national poverty rate of 10.5 percent (U.S. Census Bureau, 2021). There is no substantial difference between the percent of the 2019 population that were children in the ROI (22.5 percent), the state of Texas (25.5 percent), and the United States (22.3 percent) (US Census Bureau, 2021). The population within the ROI has a higher proportion of both Hispanic and low-income persons than both the state and the rest of the U.S, so there are Environmental Justice communities in the ROI.

Table 3-11. Minority, Low-income, and Youth Populations

Location	Percent Hispanic or Latino Origin, 2019	Percent Minority Race, 2019	Persons in Poverty, 2019	Persons Under 18 Years, 2019
Val Verde County, TX	82.3%	4.2%	20.8%	28.4%
Terrell County, TX	51.4%	6.5%	17.5%	18.8%
Pecos County, TX	69.0%	7.3%	18.7%	24.5%
Brewster County, TX	45.2%	5.3%	13.1%	18.3%
Average of ROI	**62.0%**	**5.8%**	**17.5%**	**22.5%**
State of Texas	39.7%	19.2%	13.6%	25.5%
United States of America	18.5%	20.8%	10.5%	22.3%

Source: US Census Bureau 2021

ROI = Region of Influence

A small portion of VR-1109 overlies the colonia of Sanderson in Terrell County. In Spanish, colonia means neighborhood or community. According the TCEQ, colonias are “residential subdivisions, usually in unincorporated areas of a county, lacking all or some of the basic services, such as water and sewer, paved roads, electricity, drainage, etc” (TCEQ, 2021). In general, the majority of colonias exist in counties along the border with Mexico and tend to be largely Hispanic and economically depressed (TCEQ, 2021). The location of the Sanderson colonia is shown on **Figure 3-5**.

3.9.3 Environmental Consequences Evaluation Criteria

Potential effects on environmental justice and protection of children from a Proposed Action were determined by evaluating whether the proposed changes in VR altitudes would result in disproportionate human health or environmental effects on minority or low-income populations, and whether the proximity and risk of exposure to environmental hazards would be greater than that of the general population; and whether the action would result in disproportionate environmental health or safety risks to children.

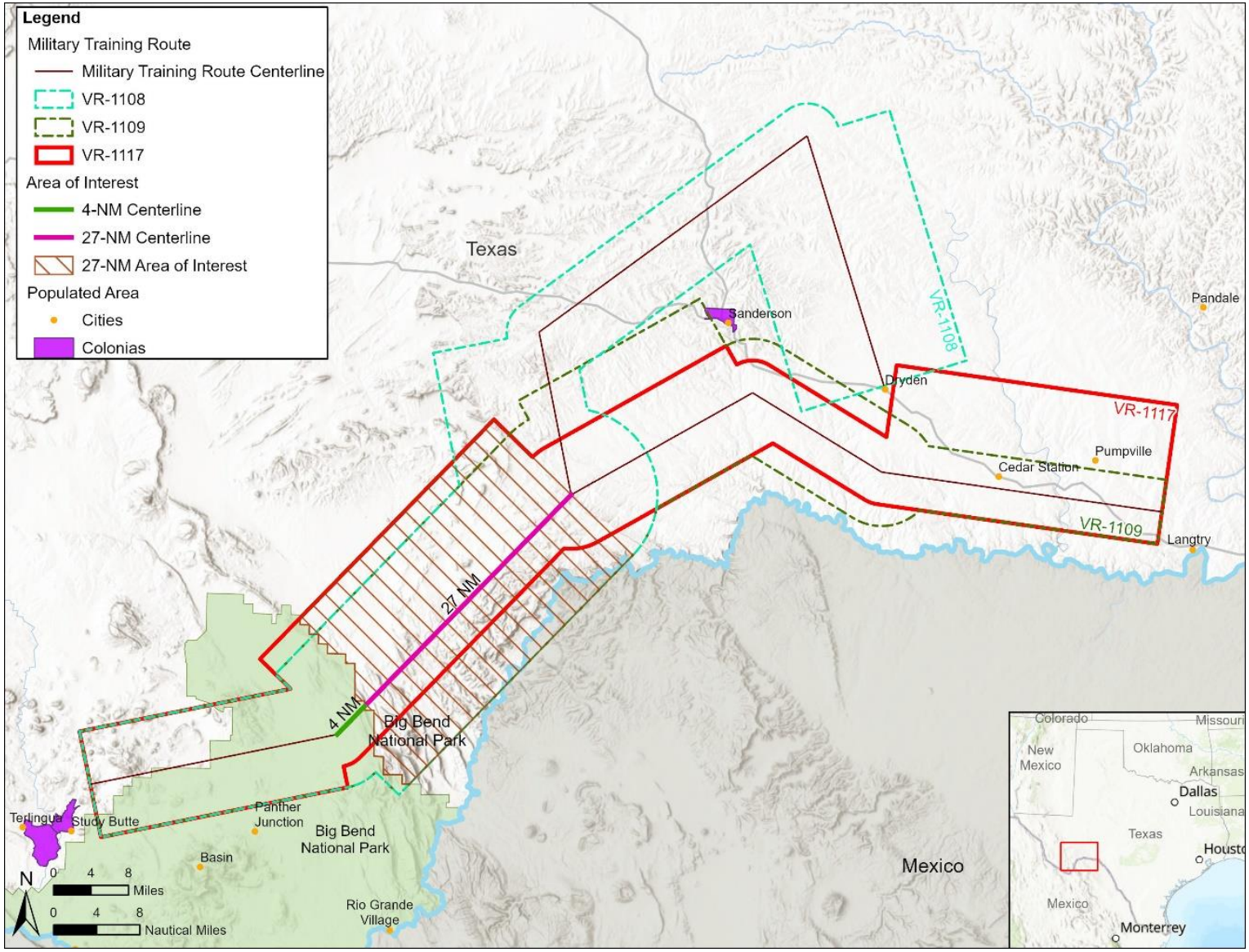

Figure 3-5. Location of Colonias, MTRs, and Area of Proposed Floor Lowering

3.9.4 Environmental Consequences – Alternative 1

Based on the analysis conducted in this EA, Alternative 1 would not result in any significant adverse environmental impacts. Under Alternative 1, there would be a negligible increase in noise levels and negligible impacts on air quality below segment B-C in which the floor is proposed to be lowered to 500 ft AGL. There are no population centers, schools, or childcare facilities located below segment B-C and the Sanderson colonia is about 20 miles away from segment B-C. There are no known colonias or emerging colonias located underneath segment B-C. Therefore, this alternative would not result in disproportionate environmental and human health or safety risks to minority, low-income, or youth populations.

3.9.5 Environmental Consequences – Alternative 2

Under Alternative 2, the impacts on environmental justice would be the same as described in Alternative 1.

3.9.6 Environmental Consequences – No Action Alternative

Under the No Action Alternative, there would be no changes to MTRs so implementation of this alternative would not result in disproportionate adverse environmental or health effects on low-income or minority populations, or children. The No Action Alternative would not substantially affect populations covered by EO 12898 or 13405 by excluding persons, denying persons benefits, or subjecting persons to discrimination or disproportionate environmental or human health risks.

3.9.7 Reasonably Foreseeable Future Actions and Other Environmental Considerations

Alternatives 1 and 2 would not result in significant long-term increases in any environmental impact within the MTRs and would not disproportionately affect low-income, minority populations, or children. Any environmental impacts from the alternatives are negligible on their own and when added to other reasonably foreseeable future actions.

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APPENDICES

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TABLE OF CONTENTS

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APPENDIX A
INTERGOVERNMENTAL AND STAKEHOLDER COORDINATION

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A.1 INTRODUCTION

The Environmental Impact Analysis Process, in compliance with National Environmental Policy Act (NEPA) guidance, includes public and agency review of information pertinent to the Proposed Action and alternatives. Scoping is an early and open process for developing the breadth of issues to be addressed in an environmental assessment (EA) and for identifying significant concerns related to a proposed action. Per the requirements of the Intergovernmental Cooperation Act of 1968 (42 United States Code § 4231[a]) and Executive Order (EO) 12372, *Intergovernmental Review of Federal Programs*, federal, state, and local agencies with jurisdiction that could potentially be affected by the Proposed Action and alternatives were notified during the development of this EA.

The Intergovernmental Coordination Act and EO 12372 require federal agencies to cooperate with and consider state and local views in implementing a federal proposal. Through the coordination process, the 47th Fighter Training Wing (47 FTW) sent letters to potentially interested and affected government agencies, government representatives, elected officials, and interested parties potentially affected by the Proposed Action. The recipient mailing list and agency and intergovernmental coordination letters and responses are included in this Appendix.

A.1.1 Agency Consultations

Implementation of the Proposed Action involves coordination with several organizations and agencies. Compliance with Section 7 of the Endangered Species Act and implementing regulations (50 Code of Federal Regulations [CFR] Part 402), requires communication with the United States Fish and Wildlife Service in cases where a federal action could affect listed threatened or endangered species, species proposed for listing, or candidates for listing. The primary focus of this coordination is to request a determination of whether any of these species occur in the proposal area. If any protected species is present, a determination would be made of any potential adverse effects on the species. Should no species protected by the Endangered Species Act be affected by the Proposed Action or alternatives, no additional consultation is required. Letters will be sent to the appropriate United States Fish and Wildlife Service offices as well as relevant state agencies informing them of the proposal, requesting data regarding applicable protected species, and subsequently requesting concurrence with the Air Force's determination of no effect to any federally listed species.

The Federal Aviation Administration (FAA) and the National Park Service (NPS) have agreed to serve as participating agencies in the development of this EA. The FAA has the responsibility to plan, manage, and control the structure and use of all airspace over the United States. The Air Force coordinated early with the FAA, which has agreed to participate in the development of this EA, provide contact information, and share baseline information to support the environmental analysis but will not act as a Cooperating Agency. The NPS has a mandate to conserve the scenery, natural and cultural resources, and other values of parks in a way that will leave them unimpaired for the enjoyment of future generations. The NPS has agreed to participate in project development and document review.

The Air Force coordinated with appropriate Texas state government agencies and planning districts to develop this Draft EA. Compliance with Section 106 of the NHPA and implementing regulations (36 CFR Part 800) was accomplished through the State Historic Preservation Officer. Similarly, the Texas Commission on Environmental Quality was contacted for air and water quality and the Texas Parks and Wildlife Department was contacted on habitat and species of concern. All agency correspondence is included herein.

A.1.2 Government-to-Government Consultations

NHPA Section 106 and its regulations at 36 CFR Part 800 require federal agencies to consult with Native American tribes to determine whether there are any properties of cultural and religious significance present and resolve adverse effects. To comply with legal mandates, federally recognized tribes that are affiliated historically with the geographic region were 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 consultation or the Interagency/Intergovernmental Coordination for Environmental Planning processes and requires separate notification of all relevant tribes. The timelines for tribal consultation are also distinct from those of intergovernmental consultations. The point-of-contact for Native American tribes is the Laughlin Air Force Base Installation Commander. The point-of-contact for consultation with the Tribal Historic Preservation Officer and the Advisory Council on Historic Preservation is the Cultural Resources Manager.

A.2 PUBLIC AND AGENCY REVIEW OF ENVIRONMENTAL ASSESSMENT

A Notice of Availability of the Draft EA and Proposed Finding of No Significant Impact (FONSI) inviting the public to review and comment on the Draft EA during the 30-day review period was published in local newspapers and the documents are available in local libraries. Copies of the Draft EA and Proposed FONSI are also available for review on the Laughlin AFB website at **https://www.laughlin.af.mil/.** Those who were unable to access these documents online are asked to call Laughlin AFB Public Affairs at (830) 298-5262, or email 47FTWPA.Tasker@us.af.mil to arrange alternate access.

A.3 INTERGOVERNMENTAL AND STAKEHOLDER COORDINATION

Sample Non-governmental Organization Stakeholder Letter

DEPARTMENT OF THE AIR FORCE
47TH FLYING TRAINING WING (AETC)

16 November 2021

Laura Frerich
Environmental Section Chief
47 Civil Engineer Squadron
251 Fourth St, Building 100
Laughlin AFB, TX 78843

Fred Bayler
Big Bend Natural History Association
PO Box 196
Big Bend National Park, TX 79834

Dear Executive Director Bayler,

The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) under the National Environmental Policy Act (NEPA) to evaluate potential environmental impacts associated with the proposed airspace modifications at three Military Training Routes at Laughlin Air Force Base (AFB), near Del Rio, Val Verde County, Texas. This action is needed to support the mission of the 47th Flying Training Wing to maximize T-1 and T-38 training within operational requirements for low-level flight and terrain-following training under varying conditions. The Air Force is working closely with the National Park Service as a participating agency to develop the Proposed Action and ensure concerns of the Big Bend National Park are addressed.

As part of the Proposed Action for this EA, is evaluating two alternatives to raise the ceiling of all segments in visual routes (VR) at VR-1108, VR-1109, and VR-1117 and lower the floors for some VR segments from 1,000 to 500 feet above ground level outside the boundary of the Big Bend National Park (see **Attachment 1**). There would be no changes to overall flight operations or patterns out of Laughlin AFB and no changes to flight training hours. Supersonic operations would not occur and defensive countermeasures (e.g., chaff and flare) would not be used under the Proposed Action. Under the Proposed Action, no construction, demolition, or other ground-disturbing activities would occur.

As part of the Air Force's Environmental Impact Analysis Process, we request your input in identifying general or specific issues or areas of concern you feel should be addressed in the environmental analysis.

To ensure the Air Force has sufficient time to consider your input in the preparation of the Draft EA, please forward your written comments or requests for additional information to me at AFCEC/CZN, 2261 Hughes Avenue, Suite 155, JBSA Lackland, Texas 78236 or by email to helen.kellogg.ctr@us.af.mil. We request your comments within 30 days of receipt of this letter to ensure we can address them during the environmental impact analysis process. Thank you for your assistance.

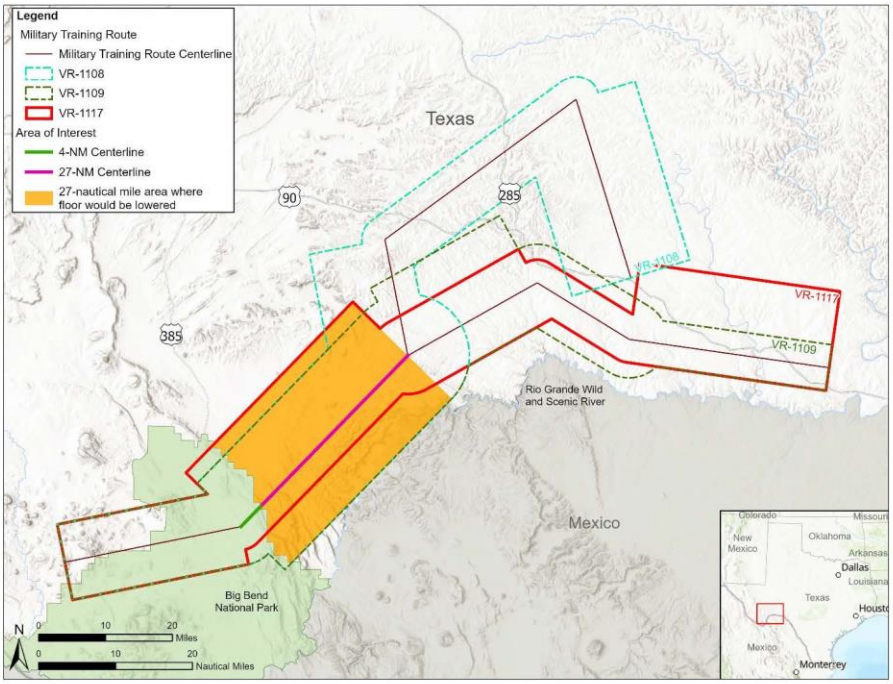
Sincerely,

MEYER FRERICH.LAURA.E.1403703547 Digitally signed by MEYER FRERICH.LAURA.E.1403703547 Date: 2021.10.13 13:40:33 -05'00'

LAURA M. FRERICH, GS-12, DAF
Section Chief, 47th Civil Engineer Squadron

Attachments:
Attach 1: Location of the Three Existing Military Training Routes Where Altitude Changes are Proposed

Attachment 1:
Location of the Three Existing Military Training Routes Where Altitude Changes are Proposed



Sample Government to Government Stakeholder Letter

DEPARTMENT OF THE AIR FORCE
47TH FLYING TRAINING WING (AETC)

16 November 2021

Colonel Craig D. Prather
47 FTW Wing Commander
561 Liberty Drive, Suite 1
Laughlin AFB, TX 78843

John Johnson, Governor
Absentee-Shawnee Tribe of Indians of Oklahoma
2025 South Gordon Cooper Drive
Shawnee, OK 74801

Dear Governor Johnson,

The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the proposed airspace modifications at three Military Training Routes at Laughlin Air Force Base (AFB), near Del Rio, Val Verde County, Texas. Per Section 306108 of the National Historic Preservation Act (NHPA) of 1966, as amended, and 36 Code of Federal Regulations Part 800, *Protection of Historic Properties*, the Air Force is engaging early with tribal governments as it formulates the undertaking.

As part of the proposed undertaking, the installation proposes to improve vertical maneuverability along these routes by lowering the altitudes down to 500 feet (ft) above ground level (AGL) and raising the ceiling up to 2,000 ft AGL where feasible. This action is needed to support the mission of the 47th Flying Training Wing to maximize T-1 and T-38 training within operational requirements for low-level flight and terrain-following training under varying conditions.

To define the Area of Potential Effect (APE) for this undertaking, the Air Force is considering two alternatives to raise the ceiling of all segments in visual routes (VR) at VR-1108, VR-1109, and VR-1117 and lower the floors for some VR segments from 1,000 to 500 ft AGL outside the boundary of the Big Bend National Park (see **Attachment 1**). There would be no changes to overall flight operations or patterns out of Laughlin AFB and no changes to flight training hours. Supersonic operations would not occur and defensive countermeasures (e.g., chaff and flare) would not be used under the Proposed Action. Under the Proposed Action, no construction, demolition, or other ground-disturbing activities would occur.

NHPA requires that federal agencies consult with tribes when an agency action might affect historic properties of religious and cultural significance to the tribes. In order to help us fulfill that obligation, I ask for your assistance in identifying any such properties within the project's APE that are of significance. Historic properties include archeological sites, burial grounds, sacred landscapes or features, ceremonial areas, traditional cultural properties and landscapes, plant and animal communities, and buildings and structures with significant tribal association.

While the Air Force is working closely with the National Park Service as a participating agency to develop the project's Proposed Action, Laughlin AFB does not know of any historic properties of religious and cultural significance within the project's APE. Nevertheless, we ask for your assistance

identifying any historic properties of which we may be unaware, particularly those which may be affected by the proposed undertaking described above.

Please indicate below (see **Attachment 2**) whether you will be providing information or would like to consult on this undertaking. Your choice applies only to providing information and consultations under the NHPA. It will not affect the handling or disposition of human remains, funerary objects, sacred objects, or objects of cultural patrimony under the Native American Graves Protection and Repatriation Act. In the event such items are discovered, we will contact you regarding their handling and disposition.

If you have any questions, please contact Ms. Laura Meyer Frerich, Air Force 47 CES/CEIE, 251 4th Street, Building 100, Laughlin AFB, Texas 78843, by email to laura.meyer_frerich@us.af.mil, or by phone at (830) 298-5694. Thank you in advance for your assistance in this effort.

Sincerely,

X

CRAIG D. PRATHER, Colonel, USAF
Commander, 47th Flying Training Wing
Signed by: d77c27fe-d628-4867-9aab-5b49847c30b6

Attachments:
Attach 1: Location of the Three Existing Military Training Routes Where Altitude Changes are Proposed
Attach 2: Letter Response

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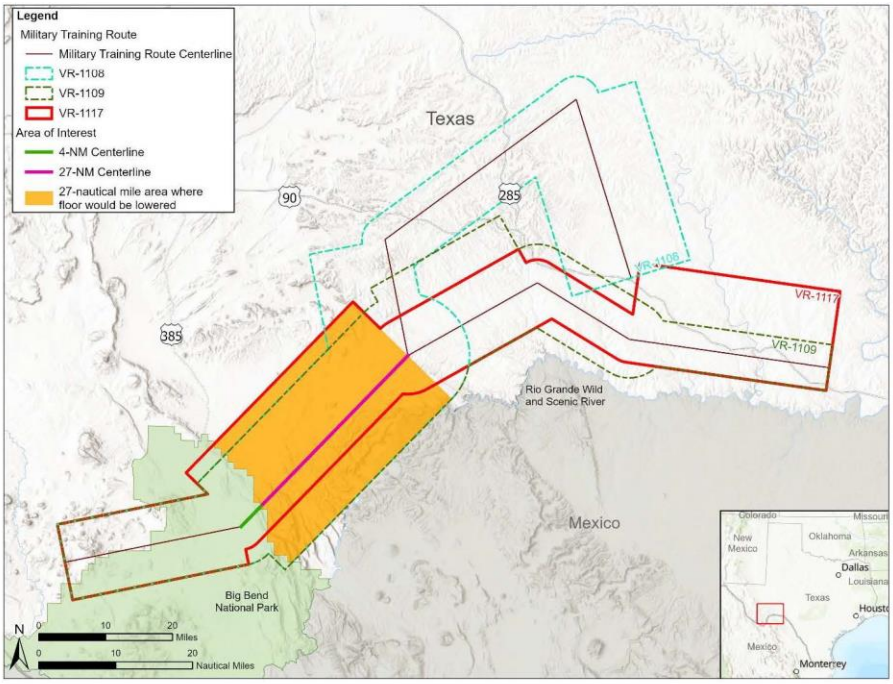
Location of the Three Existing Military Training Routes Where Altitude Changes are Proposed



Attachment 2:
Letter Response

The Absentee-Shawnee Tribe of Indians of Oklahoma has determined that:

- ☐ Historic properties of religious and cultural significance to the Absentee-Shawnee Tribe of Indians of Oklahoma are not present within the project's APE, and therefore consultation is not required at this time.
- ☐ Historic properties of religious and cultural significance to the Absentee-Shawnee Tribe of Indians of Oklahoma are present within the project's APE, but consultation is not required at this time because the properties will not be affected by the proposed undertaking.
- ☐ Historic properties of religious and cultural significance to the Absentee-Shawnee Tribe of Indians of Oklahoma are present on within the project's APE, and the tribe desires to consult on these and future projects.
- ☐ Other: _____
  _____
  _____

_____
Signature

_____
Position

Sample General Stakeholder Letter

DEPARTMENT OF THE AIR FORCE
47TH FLYING TRAINING WING (AETC)

16 November 2021

Colonel Craig D. Prather
47 FTW Wing Commander
561 Liberty Drive, Suite 1
Laughlin AFB, TX 78843

Robert Houston
Staff Director
USEPA, Region VI (NEPA Office of Planning and Coordination)
1201 Elm Street
Suite 500
Dallas, TX 75270

Dear Staff Director Houston,

The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the proposed airspace modifications at three Military Training Routes at Laughlin AFB, near Del Rio, Val Verde County, Texas. This action is needed to support the mission of the 47th Flying Training Wing to maximize T-1 and T-38 training within operational requirements for low-level flight and terrain-following training under varying conditions. The Air Force is working closely with the National Park Service as a participating agency to develop the Proposed Action and ensure concerns of the Big Bend National Park are addressed.

As part of the Proposed Action for this EA, is evaluating two alternatives to raise the ceiling of all segments in visual routes (VR) at VR-1108, VR-1109, and VR-1117 and lower the floors for some VR segments from 1,000 to 500 feet above ground level outside the boundary of the Big Bend National Park (see **Attachment 1**). There would be no changes to overall flight operations or patterns out of Laughlin AFB and no changes to flight training hours. Supersonic operations would not occur and defensive countermeasures (e.g., chaff and flare) would not be used under the Proposed Action. Under the Proposed Action, no construction, demolition, or other ground-disturbing activities would occur.

As part of the Air Force's Environmental Impact Analysis Process, we request your input in identifying general or specific issues or areas of concern you feel should be addressed in the environmental analysis.

To ensure the Air Force has sufficient time to consider your input in the preparation of the Draft EA, please forward your written comments or requests for additional information to Ms. Laura Meyer Frerich, Air Force 47 CES/CEIE, 251 4th Street, Building 100, Laughlin AFB, Texas 78843, by email to laura.meyer_frerich@us.af.mil, or by phone at (830) 298-5694. We request your comments within 30 days of receipt of this letter to ensure we can address them during the environmental impact analysis process. Thank you for your assistance.

Sincerely,

X

CRAIG D. PRATHER, Colonel, USAF
Commander, 47th Flying Training Wing
Signed by: d77c27fe-d628-4867-9aab-5b49847c30b6

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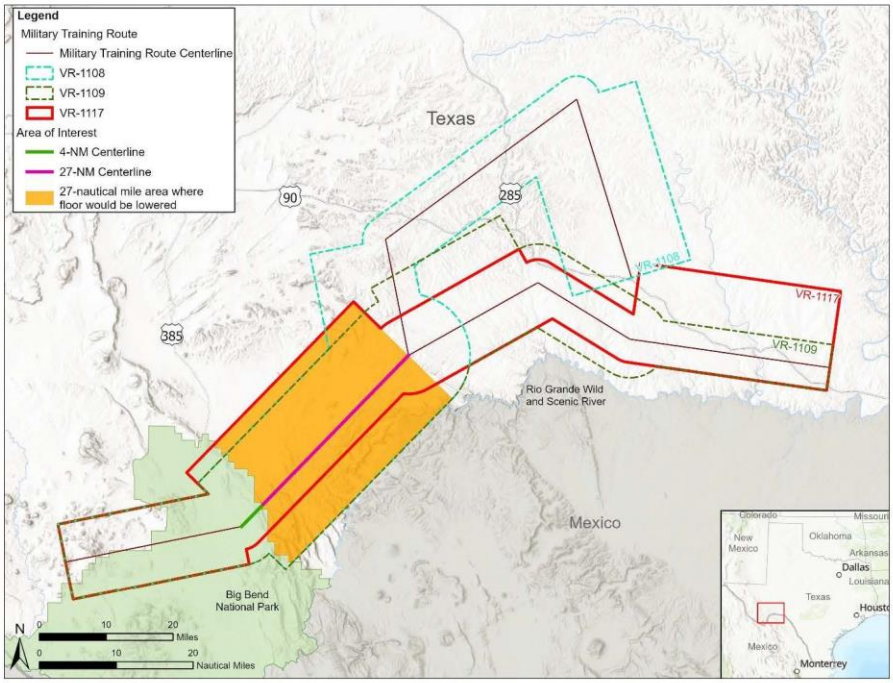

State Historic Preservation Office Letter

DEPARTMENT OF THE AIR FORCE
47TH FLYING TRAINING WING (AETC)

16 November 2021

Lt Col Marc E. Johansen
47th Civil Engineer Squadron Commander
251 Fourth Street, Building 100
Laughlin AFB, TX 78843-5230

Mark S. Wolfe
Texas State Historic Preservation Office
Texas Historical Commission
PO Box 12276
Austin, TX 78711-2276

Dear Mr. Wolfe,

The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) to evaluate potential environmental impacts associated with the proposed airspace modifications at three Military Training Routes at Laughlin Air Force Base (AFB), near Del Rio, Val Verde County, Texas. This action is needed to support the mission of the 47th Flying Training Wing to maximize T-1 and T-38 training within operational requirements for low-level flight and terrain-following training under varying conditions. The Air Force is working closely with the National Park Service as a participating agency to develop the Proposed Action and ensure concerns of the Big Bend National Park are addressed.

The Air Force is considering two alternatives to raise the ceiling of all segments in visual routes (VR) at VR-1108, VR-1109, and VR-1117 and lower the floors for some VR segments from 1,000 to 500 feet above ground level outside the boundary of the Big Bend National Park (see attached figure). There would be no changes to overall flight operations or patterns out of Laughlin AFB and no changes to flight training hours. Supersonic operations would not occur, and defensive countermeasures (e.g., chaff and flare) would not be used under the Proposed Action. Under the Proposed Action, no construction, demolition, or other ground-disturbing activities would occur.

Pursuant to Title 36 of the Code of Federal Regulations Part 800, implementing Section 106 of the National Historic Preservation Act (NHPA), we request your assistance in defining the Area of Potential Effect (APE) and identifying any concerns you may have regarding the potential presence of significant cultural resources in the affected area. The proposed APE currently encompasses the special use airspace where military training operations would occur (see **Attachment 1**).

To ensure the Air Force has sufficient time to consider your input in the preparation of the Draft EA, and for compliance with Section 106 of the NHPA, please forward your written comments or requests for additional information to Ms. Laura Meyer Frerich, Air Force 47 CES/CEIE, 251 4th Street, Building 100, Laughlin AFB, Texas 78843, by email to laura.meyer_frerich@us.af.mil, or by phone at (830) 298-5694. We request your comments within 30 days of receipt of this letter to ensure we can address them during the environmental impact analysis process. Thank you for your assistance.

Sincerely,

MARC E. JOHANSEN, Lt Col, USAF
Commander, 47th Civil Engineer Squadron

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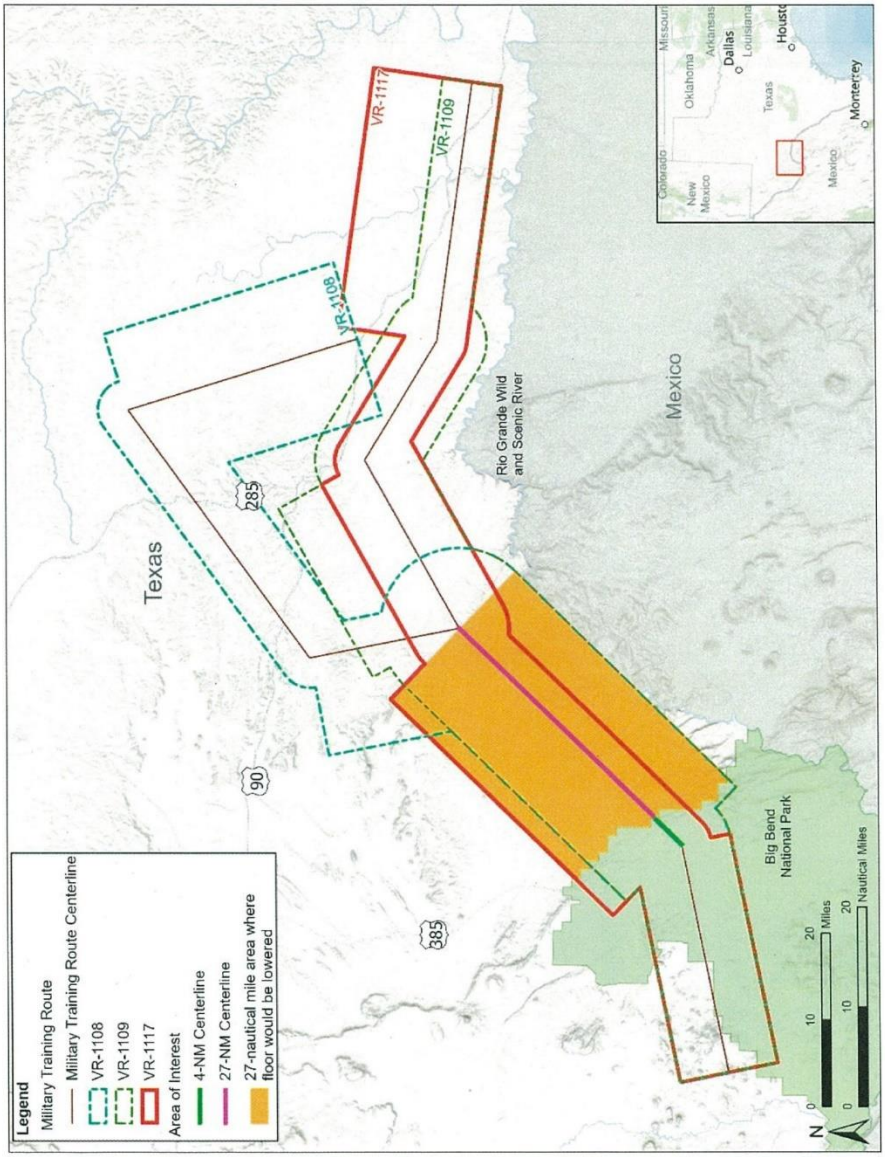

US Fish and Wildlife Service Letter

DEPARTMENT OF THE AIR FORCE
47TH FLYING TRAINING WING (AETC)

16 November 2021

Lt Col Marc E. Johansen
47th Civil Engineer Squadron Commander
251 Fourth Street, Building 100
Laughlin AFB, TX 78843-5230

Amy Leuders
Regional Director
U.S. Fish and Wildlife Service, Southwest Region
P.O. Box 1306
Albuquerque, NM 87103-1306

Dear Ms. Leuders,

The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) to evaluate potential environmental impacts associated with the proposed airspace modifications at three Military Training Routes at Laughlin AFB, near Del Rio, Val Verde County, Texas. This action is needed to support the mission of the 47th Flying Training Wing to maximize T-1 and T-38 training within operational requirements for low-level flight and terrain-following training under varying conditions. The Air Force is working closely with the National Park Service as a participating agency to develop the Proposed Action and ensure concerns of the Big Bend National Park are addressed.

The Air Force is considering two alternatives to raise the ceiling of all segments in visual routes (VR) at VR-1108, VR-1109, and VR-1117 and lower the floors for some VR segments from 1,000 to 500 feet above ground level outside the boundary of the Big Bend National Park (see **Attachment 1**). There would be no changes to overall flight operations or patterns out of Laughlin AFB and no changes to flight training hours. Supersonic operations would not occur, and defensive countermeasures (e.g., chaff and flare) would not be used under the Proposed Action. Under the Proposed Action, no construction, demolition, or other ground-disturbing activities would occur.

As the scope of environmental review is still under development, and pursuant to Section 7 of the Endangered Species Act (ESA) of 1973 (16 USC 1531-1544), the Air Force requests additional information on what listed, proposed, and candidate species or designated or proposed critical habitats may be in the action area. This information and your comments on the Proposed Action will help us develop the scope of our environmental review.

To ensure the Air Force has sufficient time to consider your input in the preparation of the Draft EA, and for compliance with Section 7 of the ESA, please forward your written comments or requests for additional information to Ms. Laura Meyer Frerich, Air Force 47 CES/CEIE, 251 4th Street, Building 100, Laughlin AFB, Texas 78843, by email to laura.meyer_frerich@us.af.mil, or by phone at (830) 298-5694. We request your comments within 30 days of receipt of this letter to ensure we can address them during the environmental impact analysis process. Thank you for your assistance.

Sincerely,

MARC E. JOHANSEN, Lt Col, USAF
Commander, 47th Civil Engineer Squadron

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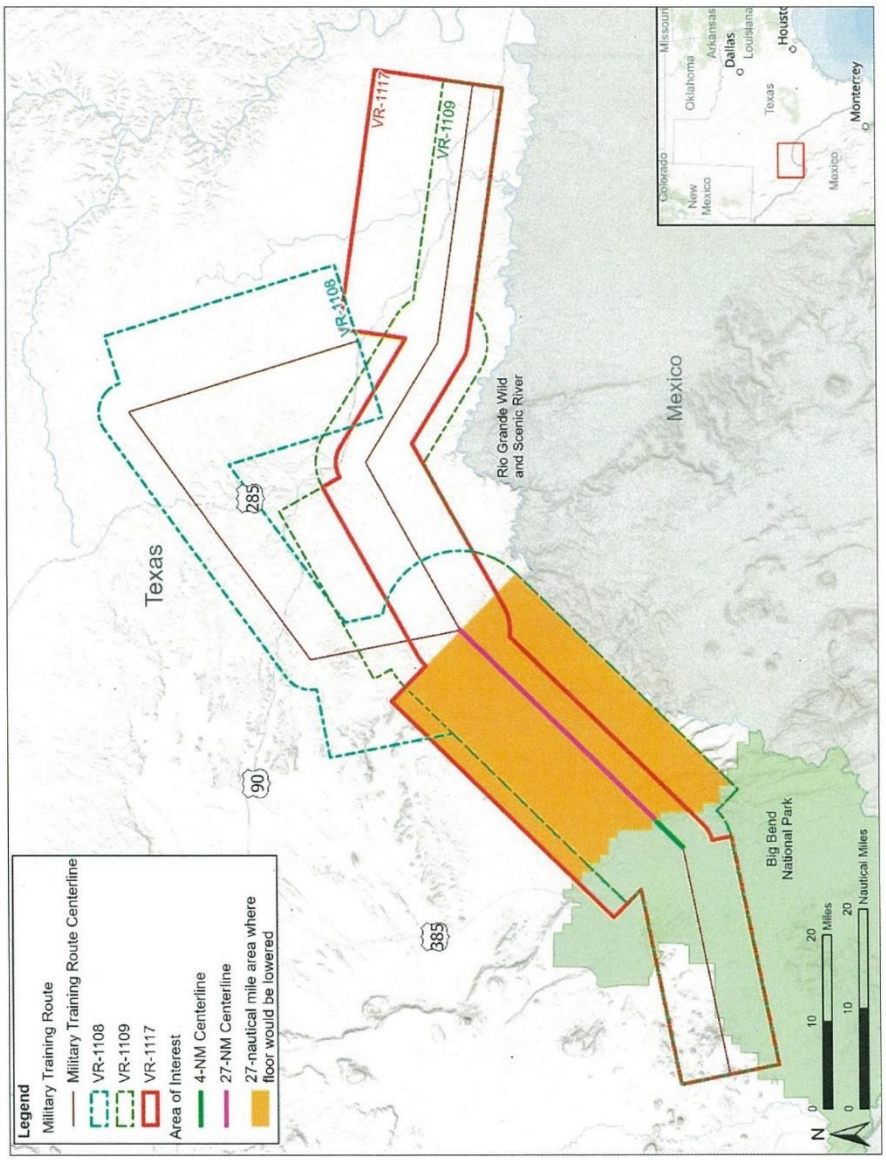

Scoping Letters Received

TEXAS PARKS & WILDLIFE

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December 29, 2021

Laura Meyer Frerich
Air Force 47 CES/CEIE
251 4th Street, Building 100
Laughlin AFB, TX 78843

RE: Draft Environmental Assessment evaluating proposed airspace modifications at three Military Training Routes at Laughlin Air Force Base Del Rio, Val Verde County, Texas

Dear Ms. Meyer Frerich:

This letter is in response to your request for scoping comments regarding the proposed project referenced above. The U.S. Air Force (USAF) is preparing a draft Environmental Assessment (EA) to evaluate potential environmental impacts associated with the proposed project.

Project Description

In order to support the mission of the 47th Flying Training Wing to maximize T-1 and T-38 training within operational requirements for low-level flight and terrain-following training, the USAF is evaluating alternatives to modify the airspace of three training routes. The draft EA will evaluate alternatives to raise the ceiling of all segments of visual routes (VR) at VR-1108, VR-1109, and VR-1117 and lower the floor for some segments from 1,000 feet above ground level to 500 feet above ground level. Lowering the floor would only occur outside the boundary of Big Bend National Park. Supersonic operations would not occur and defensive countermeasures (e.g., chaff and flare) would not be used under the Proposed Action.

TPWD has reviewed the information provided and offers the following comments and recommendations.

State Regulations

Parks and Wildlife Code, Section 26 - Protection of Public Parks and Recreational Lands

Chapter 26 of the Parks and Wildlife Code requires that before a state agency can approve any project that will result in the use or taking of public land designated and used as a park, public recreation area, scientific area, wildlife refuge, or historic site, that state agency must provide certain notices to the public, conduct a hearing, and render a finding that there is no feasible and prudent alternative and that the project includes all reasonable planning to minimize harm to the property. Chapter 26 is modeled on a federal statute known as "section 4(f)" and codified at 49 U.S.C. §303.

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512.389.4800
www.tpwd.texas.gov

If a proposed project would affect a TPWD property, approval from the Parks and Wildlife Commission may be required.

TPWD maintains a statewide inventory of Land and Water Resources Conservation and Recreation Plan (LWRCRP) data depicting conservation and recreation lands in Texas, which can be found at http://tpwd.texas.gov/gis/. The Black Gap Wildlife Management Area (WMA) is located within the study area and is immediately adjacent to the northeast boundary of Big Bend National Park. Impacts to Black Gap WMA may be subject to Chapter 26.

Black Gap WMA, the second largest WMA in Texas, was acquired for the specific purpose of desert bighorn sheep restoration. This species is particularly sensitive to disturbance. Exposure to disturbance, including helicopter overflights, have been demonstrated to cause physiological reaction in bighorn sheep including increase heart rate and adrenal gland enlargement. Reacting to disturbance can also negatively affect foraging time which can lead to depleted energy reserves.

TPWD has concerns that lowering the floor of flight activities to 500 feet above ground level over Black Gap WMA could negatively affect the success of TPWD's desert bighorn sheep restoration efforts. Specifically, TPWD has concerns of the potential for the Proposed Action to impact desert bighorn sheep during lambing season.

> **Recommendation:** As proposed, the floor of the training airspace would not be lowered over Big Bend National Park. TPWD recommends the proposed airspace modifications also exclude lands owned or managed for conservation or recreation by the state, specifically Black Gap WMA.

I appreciate the opportunity to review and provide comments on this project. Please contact me [redacted] if you have any questions concerning our comments.

Sincerely,

Russell Hooten

Russell Hooten
Wildlife Habitat Assessment Program
Wildlife Division

/rh 47848

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

December 10, 2021

Laura M. Frerich
Air Force 47 CES/CEIE
Air Force 47th Flying Training Wing
251 4th Street, Building 100
Laughlin AFB, Texas 78843

Via: **E-mail**

Re: **TCEQ NEPA Request #2021-222. Laughlin AFB Airspace Modifications. Val Verde County.**

Dear Ms. Frerich,

The Texas Commission on Environmental Quality (TCEQ) has reviewed the above-referenced project and offers the following comments:

In accordance with the general conformity regulations in 40 CFR Part 93, this proposed action was reviewed for air quality impact. The proposed action is located in Val Verde County, which is currently designated as attainment/unclassified for the National Ambient Air Quality Standards for all six criteria air pollutants. General conformity requirements do not apply.

We recommend the environmental assessment address actions that will be taken to prevent surface and groundwater contamination.

Any debris or waste disposal should be at an appropriately authorized disposal facility.

Thank you for the opportunity to review this project. If you have any questions, please contact the agency NEPA coordinator at [redacted] or NEPA@tceq.texas.gov

Sincerely,

Ryan Vise,
Division Director
External Relations

Received from Tribal Admin 12/02/21 VN
Entered 12/07/21 VN (date)
Scanned 12/07/21 VN (date)

SAN CARLOS APACHE TRIBE
Historic Preservation & Archaeology Department
P.O. Box 0
San Carlos Arizona 85550
[redacted]

Tribal Consultation Response Letter

Date: December 2, 2021
Contact Name: Craig D. Prather [redacted]
Company: Department of the Air Force
Address: 561 Liberty Dr. Suite 1 Laughlin AFB, TX 78843
Project Name/#: Three Military Training Routes at Laughlin Air Force Base

Dear Sir or Madam:

Under Section 106 and 110 of the National Historic Preservation Act, we are replying to the above referenced project. Please see the appropriate marked circle, including the signatures of Vernelda Grant, Tribal Historic Preservation Officer (THPO), and the concurrence of the Chairman of the San Carlos Apache Tribe:

- ○ **NO INTEREST/NO FURTHER CONSULTATION/NO FUTURE UPDATES**
  We defer to the Tribe located nearest to the project area.
- ⊗ **CONCURRENCE WITH REPORT FINDINGS & THANK YOU** – We would be concerned about springs/waterways and wild + scenic river areas being affected.
- ⊗ **REQUEST ADDITIONAL INFORMATION**
  I require additional information in order to provide a finding of effect for this proposed undertaking, i.e.
  Project description ___ Map ___ Photos X Other We defer to the Mescalero Apache Tribe and the Ft. Sill Apache.
- ○ **NO EFFECT**
  I have determined that there are no properties of religious and cultural significance to the San Carlos Apache Tribe that are listed on the National Register within the area of potential effect or that the proposed project will have no effect on any such properties that may be present.
- ○ **NO ADVERSE EFFECT**
  Properties of cultural and religious significance within the area of effect have been identified that are eligible for listing in the National Register for which there would be no adverse effect as a result of the proposed project.
- ○ **ADVERSE EFFECT**
  I have identified properties of cultural and religious significance within the area of potential effect that are eligible for listing in the National Register. I believe the proposed project would cause an adverse effect on these properties. Please contact the THPO for further discussion.

We were taught traditionally not to disturb the natural world in a significant way, and that to do so may cause harm to oneself or one's family. Apache resources can be best protected by managing the land to be as natural as it was in pre-1870s settlement times. Please contact the THPO, if there is a change in any portion of the project, especially if Apache cultural resources are found at any phase of planning and construction. Thank you for contacting the San Carlos Apache Tribe, your time and effort is greatly appreciated.

DIRECTOR/THPO: V J Grant 12/03/21
Vernelda J. Grant, Tribal Historic Preservation Officer — Date

CONCURRENCE: Terry Rambler 12/5/21
Terry Rambler, Tribal Chairman — Date

a facility of the Chihuahuan Desert Research Institute, Est. 1974

December 10, 2021

Laura Frerich
Environmental Section Chief
47 Civil Engineer Squadron
251 Fourth St., Building 100
Laughlin AFB, TX 78843

Dear Environmental Section Chief Frerich,

This letter is in response to your correspondence dated November 16, 2021, in which you've stated that "The United States Air Force is preparing an Environmental Assessment (EA) under the National Environmental Policy Act (NEPA) to evaluate potential environmental impacts associated with the proposed airspace modifications at three Military Training Routes at Laughlin Air Force Base (AFB), near Del Rio, Val Verde County, Texas." Thank you for reaching out to us at the Chihuahuan Desert Research Institute (CDRI).

As stated in your letter, you are "working closely with the National Park Service as a participating agency to develop the Proposed Action and ensure concerns of the Big Bend National Park are addressed."

Not having been in those discussions, I would venture to guess that "concerns" involve the detrimental effect on tourism and possible harm to wildlife. Of course, these are also our concerns.

Chihuahuan Desert Research Institute • Chihuahuan Desert Nature Center
• 432-364-2499 • www.cdri.org • P.O. Box 905 or 43869 ST HWY 118 • Fort Davis, TX 79734 •

The Chihuahuan Desert Research Institute (CDRI), also known as the Chihuahuan Desert Nature Center & Botanical Gardens, is a 507-acre nature center open to the public. CDRI is located 4 miles SE of Fort Davis, Texas, off of St. Hwy 118. We are a nonprofit organized in December 1973. Since purchasing the land in 1979, we have been at this site with the current Visitor Center built in 1999. We welcome ~14,000 visitors annually and ~3,000 school children, with those numbers projected to continue to increase. With limited public hiking trails in Texas, visitors come to CDRI to experience nature, hike, learn about flora and fauna of the Chihuahuan Desert, and enjoy the serenity of the desert. They come here to get away from the noise and the things that make up their day-to-day lives in the city.

We were already aware that low-altitude aircraft maneuvers were taking place because the noise from the aircraft over our site has been unavoidably loud and intrusive. The planes fly so low that I can hear them from inside my office at the Visitor Center.

Of course, our visitors have commented and questioned the invasiveness of the aircraft.

Our concern is that the continued practice of flying the existing pattern at a low altitude over our nature center will have an ongoing and continuous ill-effect on our business. Your flights are disrupting the peaceful calm of our nature center.

As vast and undeveloped as defines this region, we suggest that the Air Force seek areas to fly over that are undeveloped. For example, ranchland abounds, and your flyovers would not affect it. Yet, oddly, your routes have chosen to fly over our nature center.

We will be happy to work with you in helping you come up with a better route or a better plan. Please advise.

Sincerely,

Lisa Fargason Gordon
Executive Director

original sent to:
AFCEC/CZN
2261 Hughes Avenue, Suite 155
JBSA Lackland, TX 78236

cc. email to:
[redacted]

Chihuahuan Desert Research Institute • Chihuahuan Desert Nature Center
• 432-364-2499 • www.cdri.org • P.O. Box 905 or 43869 ST HWY 118 • Fort Davis, TX 79734 •

DEPARTMENT OF THE AIR FORCE
47TH FLYING TRAINING WING (AETC)

16 November 2021

Colonel Craig D. Prather
47 FTW Wing Commander
561 Liberty Drive, Suite 1
Laughlin AFB, TX 78843

RECEIVED
NOV 23 2021
BY: RG
FWD J. Loera

E. Michael Silvas, Governor
Ysleta Del Sur Pueblo
119 S. Old Pueblo Road
El Paso, TX 79917

Dear Governor Silvas,

The United States Air Force (Air Force) is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the proposed airspace modifications at three Military Training Routes at Laughlin Air Force Base (AFB), near Del Rio, Val Verde County, Texas. Per Section 306108 of the National Historic Preservation Act (NHPA) of 1966, as amended, and 36 Code of Federal Regulations Part 800, *Protection of Historic Properties*, the Air Force is engaging early with tribal governments as it formulates the undertaking.

As part of the proposed undertaking, the installation proposes to improve vertical maneuverability along these routes by lowering the altitudes down to 500 feet (ft) above ground level (AGL) and raising the ceiling up to 2,000 ft AGL where feasible. This action is needed to support the mission of the 47th Flying Training Wing to maximize T-1 and T-38 training within operational requirements for low-level flight and terrain-following training under varying conditions.

To define the Area of Potential Effect (APE) for this undertaking, the Air Force is considering two alternatives to raise the ceiling of all segments in visual routes (VR) at VR-1108, VR-1109, and VR-1117 and lower the floors for some VR segments from 1,000 to 500 ft AGL outside the boundary of the Big Bend National Park (see **Attachment 1**). There would be no changes to overall flight operations or patterns out of Laughlin AFB and no changes to flight training hours. Supersonic operations would not occur and defensive countermeasures (e.g., chaff and flare) would not be used under the Proposed Action. Under the Proposed Action, no construction, demolition, or other ground-disturbing activities would occur.

NHPA requires that federal agencies consult with tribes when an agency action might affect historic properties of religious and cultural significance to the tribes. In order to help us fulfill that obligation, I ask for your assistance in identifying any such properties within the project's APE that are of significance. Historic properties include archeological sites, burial grounds, sacred landscapes or features, ceremonial areas, traditional cultural properties and landscapes, plant and animal communities, and buildings and structures with significant tribal association.

While the Air Force is working closely with the National Park Service as a participating agency to develop the project's Proposed Action, Laughlin AFB does not know of any historic properties of religious and cultural significance within the project's APE. Nevertheless, we ask for your assistance

identifying any historic properties of which we may be unaware, particularly those which may be affected by the proposed undertaking described above.

Please indicate below (see **Attachment 2**) whether you will be providing information or would like to consult on this undertaking. Your choice applies only to providing information and consultations under the NHPA. It will not affect the handling or disposition of human remains, funerary objects, sacred objects, or objects of cultural patrimony under the Native American Graves Protection and Repatriation Act. In the event such items are discovered, we will contact you regarding their handling and disposition.

If you have any questions, please contact Ms. Laura Meyer Frerich, [redacted] 251 4th Street, Building 100, Laughlin AFB, Texas 78843, by email [redacted] or by phone [redacted]. Thank you in advance for your assistance in this effort.

Sincerely,

X [signature]

CRAIG D. PRATHER, Colonel, USAF
Commander, 47th Flying Training Wing
Signed by: d77c27fe-d628-4867-9aab-5b49847c30b6

Attachments:
Attach 1: Location of the Three Existing Military Training Routes Where Altitude Changes are Proposed
Attach 2: Letter Response

Attachment 2:
Letter Response

The Ysleta Del Sur Pueblo has determined that:

☑ Historic properties of religious and cultural significance to the Ysleta Del Sur Pueblo are not present within the project's APE, and therefore consultation is not required at this time.

☐ Historic properties of religious and cultural significance to the Ysleta Del Sur Pueblo are present within the project's APE, but consultation is not required at this time because the properties will not be affected by the proposed undertaking.

☐ Historic properties of religious and cultural significance to the Ysleta Del Sur Pueblo are present on within the project's APE, and the tribe desires to consult on these and future projects.

☐ Other: _____

Signature

Position

From: Lisa Gordon [redacted]
Sent: Tuesday, January 25, 2022 2:29 PM
To: KELLOGG, HELEN L GS-13 USAF AFMC AFCEC/CZN [redacted]
Cc: [redacted]
Subject: [URL Verdict: Neutral]Re: [Non-DoD Source] EA - Proposed Airspace Modifications - Laughlin AFB

Dear Ms. Kellogg,

Thank you for your email. We appreciate your response and that you have inquired of other departments about possible flight routes coming from Laughlin AFB. The attached map is much more detailed and defined than what we had received previously.

The flights that were consistently coming across our site appear to have stopped by late December, for which we are grateful.

Thank you, and best regards,

Lisa Gordon

On Tue, Jan 25, 2022 at 2:04 PM KELLOGG, HELEN L GS-13 USAF AFMC AFCEC/CZN [redacted] wrote:

Ms. Gordon,

We have received your scoping letter dated December 10, 2021. Thank you for your inquiry. We would like to clarify that the proposed routes are not located over the CDRI, see enclosed map for the routes associated with this proposal. We have forwarded your inquiry to base public affairs for analysis whether other routes that Laughlin AFB aircraft use are the routes in question. Since other routes are not within the scope of this NEPA proposal, any such discussions would not be within the context of this environmental assessment.

I am cc'ing Mr. Bob Krumenaker from the National Park Service for his awareness on your inquiry.

Sincerely,
Helen Kellogg
She/Her
Environmental Program Manager
Air Force Civil Engineer Center, NEPA Division

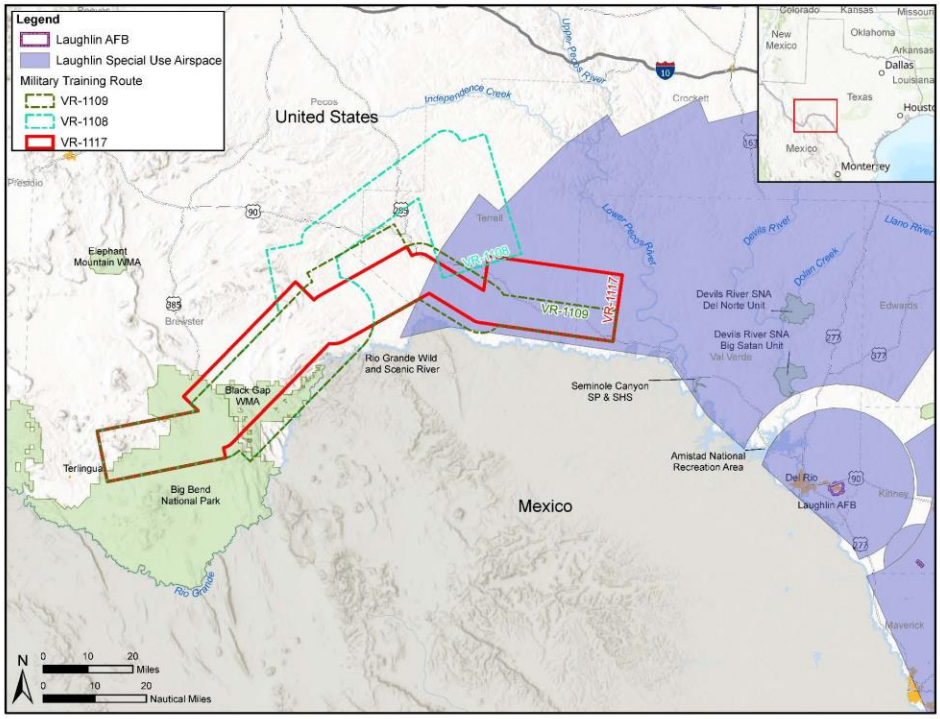

Figure 1-1. Project Location.

From: Lisa Gordon [redacted]
Sent: Friday, December 10, 2021 4:46 PM
To: KELLOGG, HELEN L CTR USAF AFMC AFCEC/CZN [redacted]
Subject: [Non-DoD Source] EA - Proposed Airspace Modifications - Laughlin AFB

To Whom It May Concern,

In regard to correspondence received from Environmental Section Chief Laura Frerich regarding the Environmental Assessment of the Military Training Routes at Laughlin AFB, I've attached a letter on behalf of the Chihuahuan Desert Research Institute (CDRI), Fort Davis, Texas. I have also mailed a letter via USPS.

Thank you very much for contacting us, and for inviting CDRI into the conversation.

Please feel free to reach out to me for any additional information you may require.

Sincerely,

Lisa Gordon
Executive Director
Chihuahuan Desert Research Institute (CDRI)
Chihuahuan Desert Nature Center & Botanical Gardens
43869 State Hwy 118, P.O. Box 905
Fort Davis, Texas 79734
(432) 364-2499
www.cdri.org

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APPENDIX B
REASONABLY FORESEEABLE FUTURE ACTIONS

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B.1 REASONABLY FORESEEABLE PROJECTS

Table B-1. Reasonably Foreseeable Projects Summary

Project	Project Summary	Implementation Date	Relevance to Proposed Action
Blue Hills Wind Development Project	Wind Development Project located southeast of Del Rio in Val Verde County, Texas. Project includes 46 turbines and 5 meteorological towers. Project has received regulatory approval and in July 2021, the Department of Defense granted a mitigation agreement that would reduce the potential for the development to interfere with the military training routes (MTRs). The project would connect with Texas' Electric Reliability Council of Texas (ERCOT) power grid.	Anticipated 2023	Located near Laughlin AFB; existing mitigation agreement reduces the potential to interfere with MTRs.
Solstice – Sand Creek Transmission Line Project	AEP (American Electric Power) Texas and Oncor are proposing and awaiting Public Utility Commission of Texas approval for the construction 40 miles of new, 345 kV transmission line, portions of which would be located in Pecos County, Texas.	Unknown	Potential to interfere with low-altitude flying if final siting located beneath training MTRs.

B.2 REFERENCES

AEP Transmission. 2021. *Projects*. <https://www.aeptransmission.com/texas/Solstice-SandLake>/. Accessed 7 October 2021.

Devil's River Conservancy. 2021. *Devil's River News.* <https://www.devilsriverconservancy.org/drc-news>. Accessed 7 October 2021.

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APPENDIX C
DEFINITION OF RESOURCES AREAS ANALYZED, METHODOLOGIES, AND MODELING

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C.1 NOISE

C.1.1 Introduction

This appendix discusses sound and noise and their potential effects on the human and natural environment. **Section C.1.2** provides an overview of the basics of sound and noise. **Section C.1.3** defines and describes the different metrics used to describe noise. The largest section, **Section C.1.4**, reviews the potential effects of noise, focusing on effects on humans but also addressing effects on property values, terrain, structures, and animals. **Section C.2.3** contains the list of references cited. **Section D.2.2** contains data used in the noise modeling process. A number of noise metrics are defined and described in this appendix. Some metrics are included for the sake of completeness when discussing each metric and to provide a comparison of cumulative noise metrics.

C.1.2 Basics of Sound

C.1.2.1 Sound Waves and Decibels

Sound consists of minute vibrations in the air that travel through the air and are sensed by the human ear. **Figure C-1** is a sketch of sound waves from a tuning fork. The waves move outward as a series of crests where the air is compressed and troughs where the air is expanded. The height of the crests and the depth of the troughs are the amplitude or sound pressure of the wave. The pressure determines its energy or intensity. The number of crests or troughs that pass a given point each second is called the frequency of the sound wave.

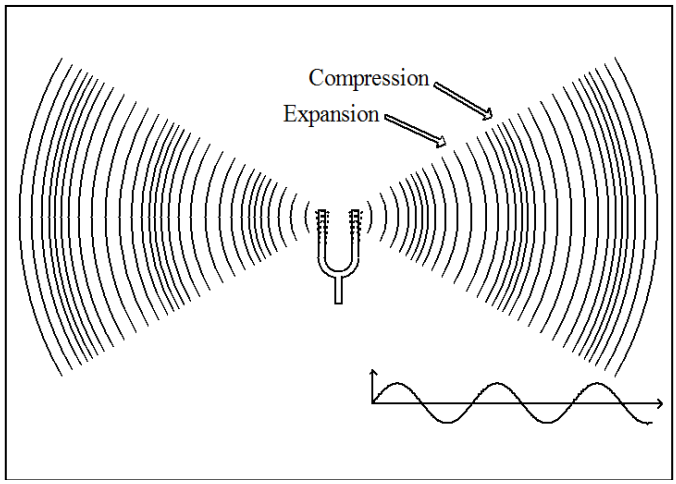


Figure C-1. Sound Waves from a Vibrating Tuning Fork.

The measurement and human perception of sound involves three basic physical characteristics: intensity, frequency, and duration.

- Intensity is a measure of the acoustic energy of the sound and related to sound pressure. The greater the sound pressure, the more energy carried by the sound and the louder the perception of that sound.
- Frequency determines how the pitch of the sound is perceived. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches.
- Duration or the length of time the sound can be detected.

The loudest sounds that can be comfortably heard by the human ear have intensities a trillion times higher than those of sounds barely heard. Because of this vast range, it is unwieldy to use a linear scale to represent the intensity of sound. As a result, a logarithmic unit known as the decibel (abbreviated dB) is used to represent the intensity of a sound. Such a representation is called a sound level. A sound level of

0 dB is approximately the threshold of human hearing and barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above 120 dB begin to be felt inside the human ear as discomfort. Sound levels between 130 and 140 dB are felt as pain (Berglund and Lindvall, 1995).

As shown on **Figure C-1**, the sound from a tuning fork spreads out uniformly as it travels from the source. The spreading causes the sound's intensity to decrease with increasing distance from the source. For a source such as an aircraft in flight, the sound level will decrease by about 6 dB for every doubling of the distance. For a busy highway, the sound level will decrease by 3 to 4.5 dB for every doubling of distance.

As sound travels from the source, it also is absorbed by the air. The amount of absorption depends on the frequency composition of the sound, temperature, and humidity conditions. Sound with high frequency content gets absorbed by the air more than sound with low frequency content. More sound is absorbed in colder and drier conditions than in hot and wet conditions. Sound is also affected by wind and temperature gradients, terrain (elevation and ground cover), and structures.

Because of the logarithmic nature of the decibel unit, sound levels cannot simply be added or subtracted and are somewhat cumbersome to handle mathematically; however, some simple rules are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. For example:

60 dB + 60 dB = 63 dB, and
80 dB + 80 dB = 83 dB.

Second, the total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

60.0 dB + 70.0 dB = 70.4 dB.

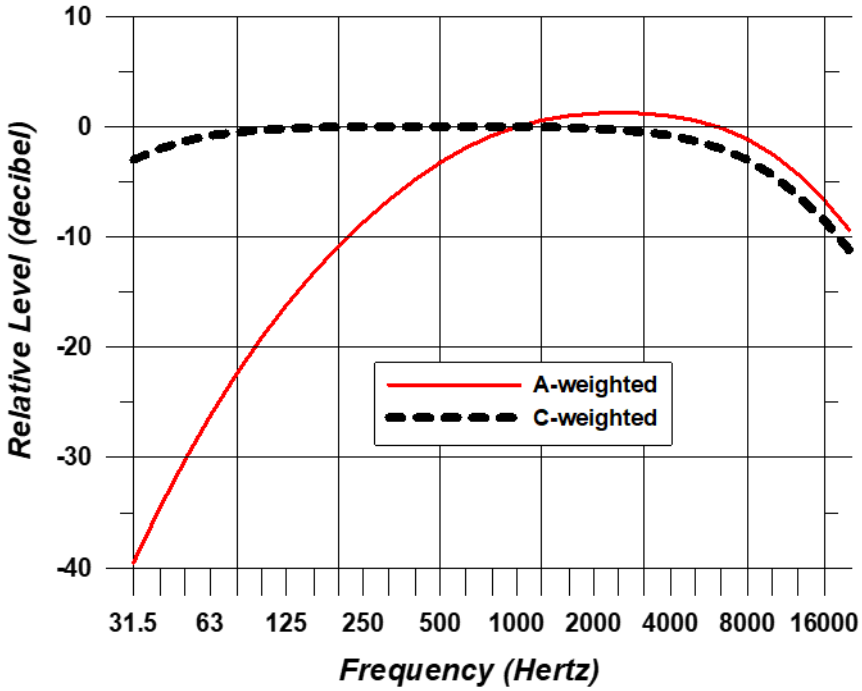
Because the addition of sound levels is different than that of ordinary numbers, this process is often referred to as "decibel addition."

The minimum change in the sound level of individual events that an average human ear can detect is about 3 dB. On average, a person perceives a change in sound level of about 10 dB as a doubling (or halving) of the sound's loudness. This relation holds true for loud and quiet sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound intensity but only a 50 percent decrease in perceived loudness because the human ear does not respond linearly.

Sound frequency is measured in terms of cycles per second or hertz (Hz). The normal ear of a young person can detect sounds that range in frequency from about 20 to 20,000 Hz. As we get older, we lose the ability to hear high frequency sounds. Not all sounds in this wide range of frequencies are heard equally. Human hearing is most sensitive to frequencies in the 1,000 to 4,000 Hz range. The notes on a piano range from just over 27 to 4,186 Hz, with middle C equal to 261.6 Hz. Most sounds (including a single note on a piano) are not simple pure tones like the tuning fork on **Figure C-1** but contain a mix, or spectrum, of many frequencies.

Sounds with different spectra are perceived differently even if the sound levels are the same. Weighting curves have been developed to correspond to the sensitivity and perception of different types of sound. A-weighting and C-weighting are the two most common weightings. These two curves, shown on **Figure C-2**, are adequate to quantify most environmental noises. A-weighting puts emphasis on the 1,000- to 4,000-Hz range where human hearing is most sensitive.

Very loud or impulsive sounds, such as explosions or sonic booms, can sometimes be felt and cause secondary effects, such as shaking of a structure or rattling of windows. These types of sounds can add to annoyance and are best measured by C-weighted sound levels, denoted dBC. C-weighting is nearly flat throughout the audible frequency range and includes low frequencies that may not be heard but cause shaking or rattling. C-weighting approximates the human ear's sensitivity to higher intensity sounds.



Source: ANSI S1.4A -1985 "Specification of Sound Level Meters"

Figure C-2. Frequency Characteristics of A- and C-Weighting.

C.1.2.2 Sound Levels and Types of Sounds

Most environmental sounds are measured using A-weighting. They are called A-weighted sound levels and sometimes use the unit dBA or dB(A) rather than dB. When the use of A-weighting is understood, the term "A-weighted" is often omitted and the unit dB is used. Unless otherwise stated, dB units refer to A-weighted sound levels.

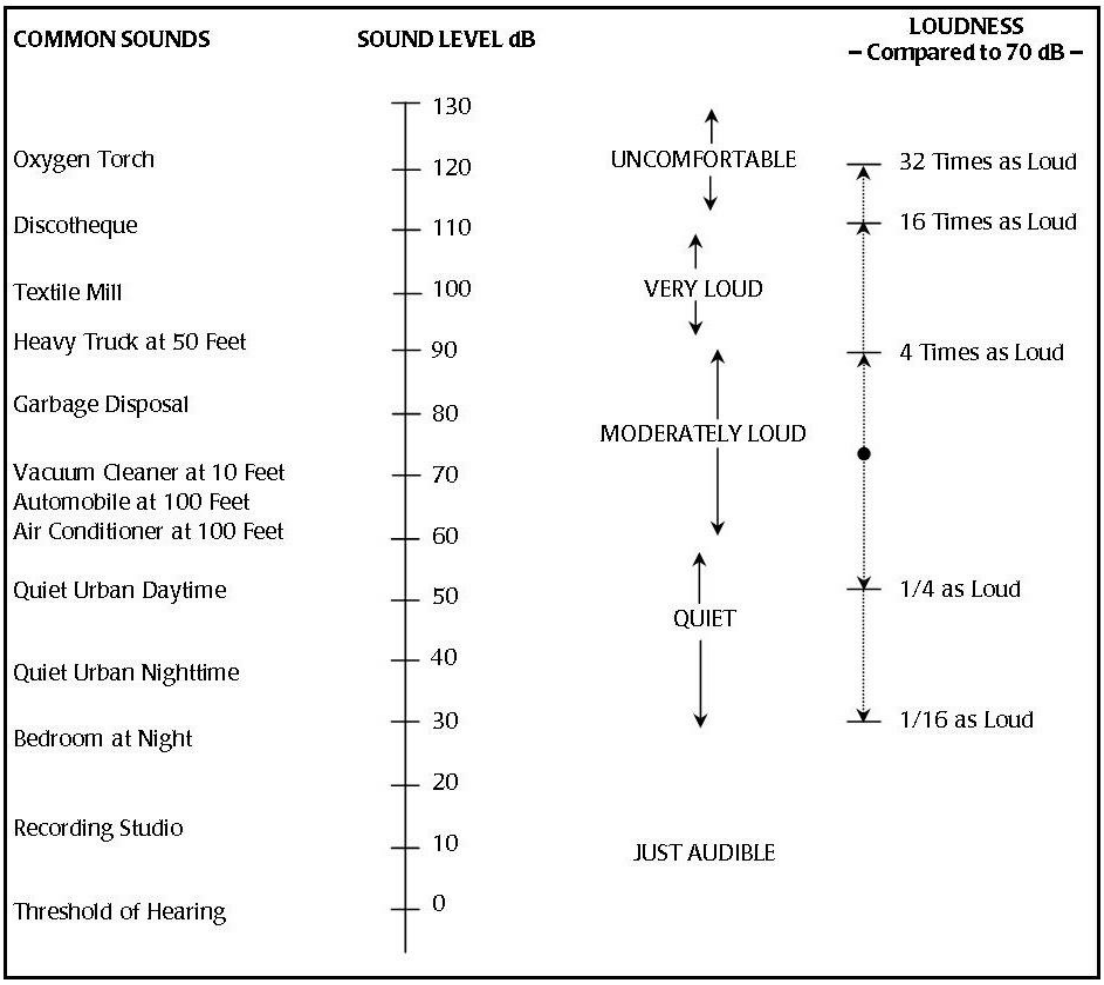
Sound becomes noise when it is unwelcome and interferes with normal activities, such as sleep or conversation. Noise is unwanted sound. Noise can become an issue when its level exceeds the ambient or background sound level. Ambient noise in urban areas typically varies from 60 to 70 dB but can be as high as 80 dB in the center of a large city. Quiet suburban neighborhoods experience ambient noise levels around 45 to 50 dB (United States [US] Environmental Protection Agency [USEPA], 1978).

Figure C-3 shows A-weighted sound levels from common sources. Some sources, like the air conditioner and vacuum cleaner, are continuous sounds whose levels are constant for some time. Some sources, like the automobile and heavy truck, are the maximum sound during an intermittent event like a vehicle pass-by. Some sources like "urban daytime" and "urban nighttime" are averages over extended periods. A variety of noise metrics have been developed to describe noise over different time periods. These are discussed in detail in **Section C.1.3**.

Aircraft noise consists of two major types of sound events: flight (including takeoffs, landings, and flyovers) and stationary, such as engine maintenance run-ups. The former is intermittent and the latter primarily continuous. Noise from aircraft overflights typically occurs beneath main approach and departure paths, in local air traffic patterns around the airfield, and in areas near aircraft parking ramps and staging areas. As aircraft climb, the noise received on the ground drops to lower levels, eventually fading into the background or ambient levels.

Impulsive noises are generally short, loud events. Their single-event duration is usually less than 1 second. Examples of impulsive noises are small-arms gunfire, hammering, pile driving, metal impacts during rail-

yard shunting operations, and riveting. Examples of high-energy impulsive sounds are quarry/mining explosions, sonic booms, demolition, and industrial processes that use high explosives, military ordnance (e.g., armor, artillery and mortar fire, and bombs), explosive ignition of rockets and missiles, and any other explosive source where the equivalent mass of dynamite exceeds 25 grams (American National Standards Institute [ANSI], 1996).



Source: Harris, 1979

Figure C-3. Typical A-weighted Sound Levels of Common Sounds.

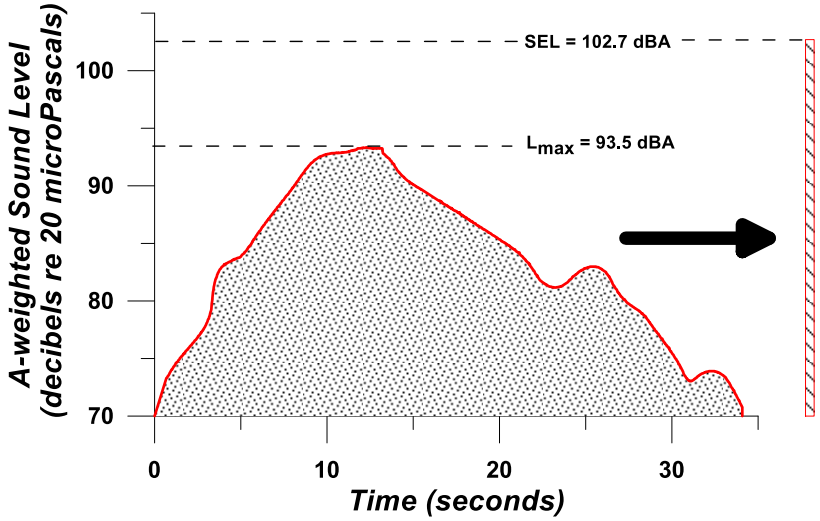
C.1.3 Noise Metrics

Noise metrics quantify sounds so they can be compared with each other and with their effects, in a standard way. There are a number of metrics that can be used to describe a range of situations, from a particular individual event to the cumulative effect of all noise events over a long time. This section describes the metrics relevant to environmental noise analysis.

C.1.3.1 Single Events

Maximum Sound Level

The highest A-weighted sound level measured during a single event in which the sound changes with time is called the maximum A-weighted sound level or Maximum Sound Level and is abbreviated L_{max}. The L_{max} is depicted for a sample event in **Figure C-4**.



Source: Wyle Laboratories

Figure C-4. Example Time History of Aircraft Noise Flyover.

L_{max} is the maximum level that occurs over a fraction of a second. For aircraft noise, the "fraction of a second" is one-eighth of a second, denoted as "fast" response on a sound level measuring meter (ANSI, 1988) (Figure D-4). Slowly varying or steady sounds are generally measured over 1 second, denoted as "slow" response. L_{max} is important in judging if a noise event will interfere with conversation, television or radio listening, or other common activities. Although it provides some measure of the event, it does not fully describe the noise because it does not account for how long the sound is heard.

Peak Sound Pressure Level

The Peak Sound Pressure Level (L_{pk}) is the highest instantaneous level measured by a sound level measurement meter. L_{pk} is typically measured every 20 microseconds and usually based on unweighted or linear response of the meter. It is used to describe individual impulsive events such as blast noise. Because blast noise varies from shot to shot and varies with meteorological (weather) conditions, the US Department of Defense (DOD) usually characterizes L_{pk} by the metric PK 15(met), which is the L_{pk} exceeded 15 percent of the time. The "met" notation refers to the metric accounting for varied meteorological or weather conditions.

Sound Exposure Level

Sound Exposure Level (SEL) combines both the intensity of a sound and its duration. For an aircraft flyover, SEL includes the maximum and all lower noise levels produced as part of the overflight, together with how long each part lasts. It represents the total sound energy in the event. **Figure C-4** indicates the SEL for an example event, representing it as if all the sound energy were contained within 1 second.

Aircraft noise varies with time. During an aircraft overflight, noise starts at the background level, rises to a maximum level as the aircraft flies close to the observer, then returns to the background as the aircraft recedes into the distance. This is sketched on **Figure C-4**, which also indicates two metrics (L_{max} and SEL) that are described above. Over time there can be a number of events, not all the same. Because aircraft

noise events last more than a few seconds, the SEL value is larger than L_{max}. It does not directly represent the sound level heard at any given time but rather the entire event. SEL provides a much better measure of aircraft flyover noise exposure than L_{max} alone.

Overpressure

The single event metrics commonly used to assess supersonic noise are overpressure in pounds per square foot and C-Weighted Sound Exposure Level (CSEL). Overpressure is the peak pressure at any location within the sonic boom footprint.

C-Weighted Sound Exposure Level

CSEL is SEL computed with C frequency weighting, which is similar to A-Weighting (discussed in **Section C.1.2.2**) except that C weighting places more emphasis on low frequencies below 1,000 hertz.

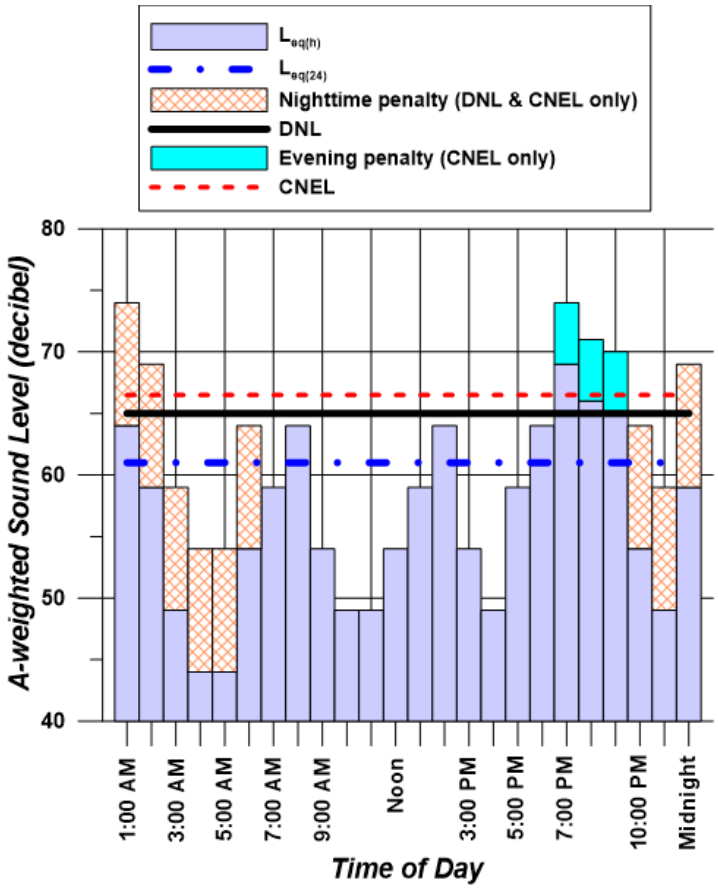
C.2.3.2 Cumulative Events

Equivalent Sound Level

Equivalent Sound Level (L_{eq}) is a "cumulative" metric that combines a series of noise events over a period of time. L_{eq} is the sound level that represents the decibel average SEL of all sounds in the time period. Just as SEL has proven to be a good measure of a single event, L_{eq} has proven to be a good measure of series of events during a given time period.

The time period of an L_{eq} measurement is usually related to some activity and is given along with the value. The time period is often shown in parenthesis (e.g., L_{eq}[24] for 24 hours). The L_{eq} from 7:00 a.m. to 3:00 p.m. may give exposure of noise for a school day.

Figure C-5 gives an example of L_{eq}(24) using notional hourly average noise levels (L_{eq}[h]) for each hour of the day as an example. The L_{eq}(24) for this example is 61 dB.



Source: Wyle Laboratories

Figure C-5. Example of Cumulative Noise Exposure from All Events Over a Full 24 Hours, Day-Night Average Sound Level and C-Weighted Sound Exposure Level Computed from Hourly Equivalent Sound Levels.

Day-Night Average Sound Level and Community Noise Equivalent Level

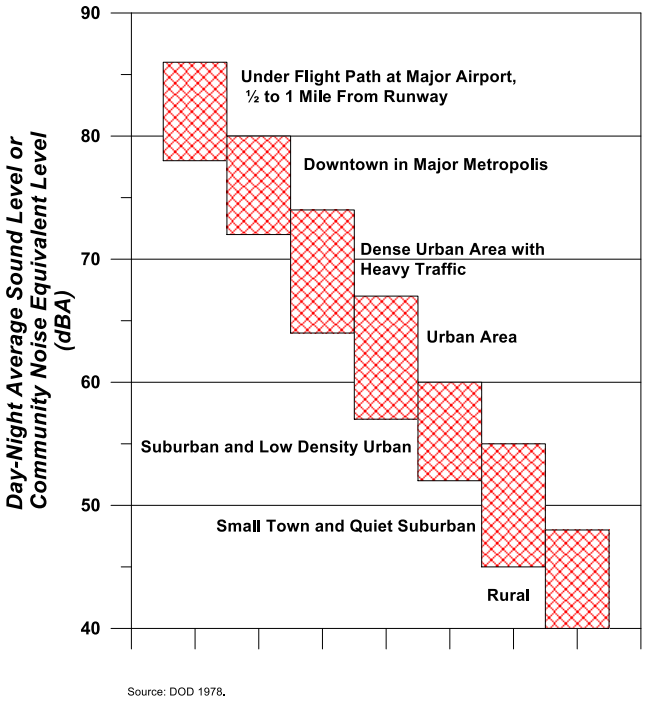
Day-Night Average Sound Level (DNL or L_{dn}) is a cumulative metric that accounts for all noise events in a 24-hour period; however, unlike $L_{eq}(24)$, DNL contains a nighttime noise penalty. To account for our increased sensitivity to noise at night, DNL applies a 10-dB penalty to events during the nighttime period, defined as 10:00 p.m. to 7:00 a.m. The notations DNL and L_{dn} are both used for Day-Night Average Sound Level and are equivalent.

Community Noise Equivalent Level (CNEL) is a variation of DNL specified by law in California (California Code of Regulations Title 21, Public Works) (Wyle Laboratories, 1970). CNEL has the 10-dB nighttime penalty for events between 10:00 p.m. and 7:00 a.m. but also includes a 4.8-dB penalty for events during the evening period of 7:00 p.m. to 10:00 p.m. The evening penalty in CNEL accounts for the added intrusiveness of sounds during that period. For airports and military airfields, DNL and CNEL represent the average sound level for annual average daily aircraft events.

Figure C-5 gives an example of DNL and CNEL using notional hourly average noise levels ($L_{eq}[h]$) for each hour of the day as an example. Note the $L_{eq}(h)$ for the hours between 10:00 p.m. and 7:00 a.m. have a 10-dB penalty assigned. For CNEL, the hours between 7:00 p.m. and 10:00 p.m. have a 4.8-dB penalty assigned. The DNL for this example is 65 dB. The CNEL for this example is 66 dB.

Figure C-6 shows the ranges of DNL or CNEL that occur in various types of communities. Under a flight path at a major airport the DNL may exceed 80 dB while rural areas may experience DNL less than 45 dB.

The decibel summation nature of these metrics causes the noise levels of the loudest events to control the 24-hour average. As a simple example, consider a case in which only one aircraft overflight occurs during the daytime over a 24-hour period, creating a sound level of 100 dB for 30 seconds. During the remaining 23 hours, 59 minutes, and 30 seconds of the day, the ambient sound level is 50 dB. The DNL for this 24-hour period is 65.9 dB. Assume, as a second example that 10 such 30-second overflights occur during daytime hours during the next 24-hour period, with the same ambient sound level of 50 dB during the remaining 23 hours and 55 minutes of the day. The DNL for this 24-hour period is 75.5 dB. Clearly, the averaging of noise over a 24-hour period does not ignore the louder single events and tends to emphasize both the sound levels and number of those events.



Source: DOD 1978.

Figure C-6. Typical Day-Night Average Sound Level or Community Noise Equivalent Level Ranges in Various Types of Communities.

A feature of the DNL metric is that a given DNL value could result from a very few noisy events or a large number of quieter events. For example, one overflight at 90 dB creates the same DNL as 10 overflights at 80 dB.

DNL or CNEL does not represent a level heard at any given time but represent long-term exposure. Scientific studies have found good correlation between the percentages of groups of people highly annoyed and the level of average noise exposure measured in DNL (Schultz, 1978; USEPA, 1978).

Onset-Rate Adjusted Monthly Day-Night Average Sound Level and Onset-Rate Adjusted Monthly Community Noise Equivalent Level

Military aircraft utilizing Special Use Airspace (SUA) such as Military Training Routes, Military Operations Areas, and restricted areas generate a noise environment that is somewhat different from that around airfields. Rather than regularly occurring operations like at airfields, activity in SUA is highly sporadic. It is often seasonal, ranging from 10 per hour to less than 1 per week. Individual military overflight events also differ from typical community noise events in that noise from a low-altitude, high-airspeed flyover can have a rather sudden onset, with rates of up to 150 dB per second.

The cumulative daily noise metric devised to account for the "surprise" effect of the sudden onset of aircraft noise events on humans and the sporadic nature of SUA activity is the Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}). Onset rates between 15 and 150 dB per second require an adjustment

of 0 to 11 dB to the event's SEL while onset rates below 15 dB per second require no adjustment to the event's SEL (Stusnick et al., 1992). The term 'monthly' in L_{dnmr} refers to the noise assessment being conducted for the month with the most operations or sorties -- the so-called busiest month.

In California, a variant of the L_{dnmr} includes a penalty for evening operations (7:00 p.m. to 10:00 p.m.) and is denoted Onset-Rate Adjusted Monthly Community Noise Equivalent Level ($CNEL_{mr}$).

C.2.3.3 Supplemental Metrics

Number-of-Events Above a Threshold Level

The Number-of-Events Above (NA) metric gives the total number of events that exceed a noise level threshold (L) during a specified period of time. Combined with the selected threshold, the metric is denoted NAL. The threshold can be either SEL or L_{max}, and it is important that this selection is shown in the nomenclature. When labeling a contour line or point of interest, NAL is followed by the number of events in parentheses. For example, where 10 events exceed an SEL of 90 dB over a given period of time, the nomenclature would be NA90SEL(10). Similarly, for L_{max} it would be NA90L_{max}(10). The period of time can be an average 24-hour day, daytime, nighttime, school day, or any other time period appropriate to the nature and application of the analysis.

NA is a supplemental metric. It is not supported by the amount of science behind DNL/CNEL, but it is valuable in helping to describe noise to the community. A threshold level and metric are selected that best meet the need for each situation. An L_{max} threshold is normally selected to analyze speech interference, while an SEL threshold is normally selected for analysis of sleep disturbance.

The NA metric is the only supplemental metric that combines single-event noise levels with the number of aircraft operations. In essence, it answers the question of how many aircraft (or range of aircraft) fly over a given location or area at or above a selected threshold noise level.

Time Above a Specified Level

The Time Above (TA) metric is the total time, in minutes, that the A-weighted noise level is at or above a threshold. Combined with the threshold level (L), it is denoted TAL. TA can be calculated over a full 24-hour annual average day, the 15-hour daytime and 9-hour nighttime periods, a school day, or any other time period of interest, provided there is operational data for that time.

TA is a supplemental metric, used to help understand noise exposure. It is useful for describing the noise environment in schools, particularly when assessing classroom or other noise sensitive areas for various scenarios. TA can be shown as contours on a map similar to the way DNL contours are drawn.

TA helps describe the noise exposure of an individual event or many events occurring over a given time period. When computed for a full day, the TA can be compared alongside the DNL in order to determine the sound levels and total duration of events that contribute to the DNL. TA analysis is usually conducted along with NA analysis, so the results show not only how many events occur, but also the total duration of those events above the threshold.

C.1.4 Noise Effects

Noise is of concern because of potential adverse effects. The following subsections describe how noise can affect communities and the environment and how those effects are quantified. The specific topics discussed are

- annoyance;
- speech interference;
- sleep disturbance;
- noise effects on children; and
- noise effects on domestic animals and wildlife.

C.1.4.1 Annoyance

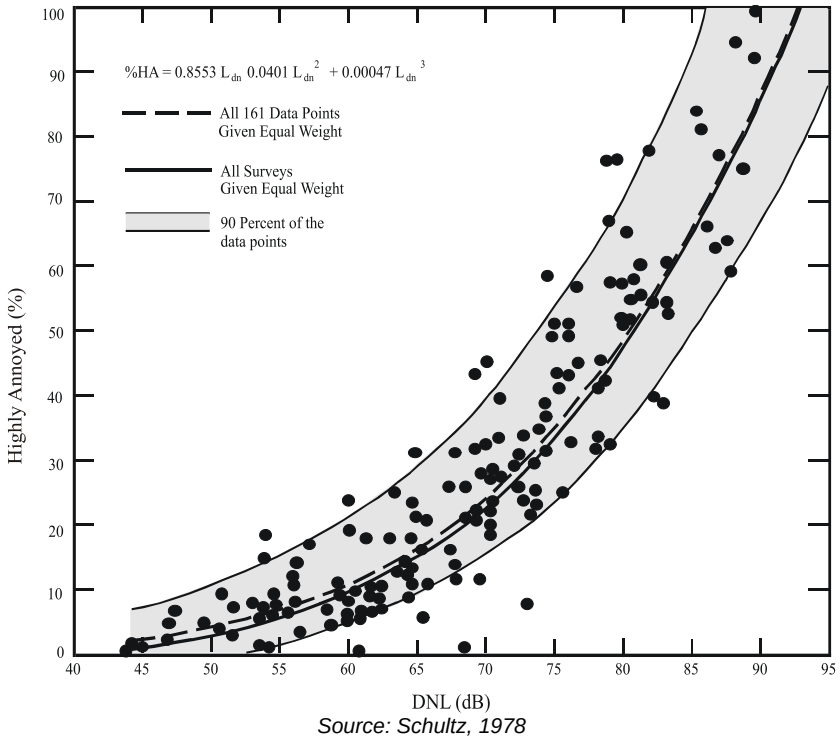
With the introduction of jet aircraft in the 1950s, it became clear that aircraft noise annoyed people and was a significant problem around airports. Early studies, such as those of Rosenblith et al. (1953) and Stevens et al. (1953) showed that effects depended on the quality of the sound, its level, and the number of flights. Over the next 20 years considerable research was performed refining this understanding and setting guidelines for noise exposure. In the early 1970s, the USEPA published its "Levels Document" (USEPA, 1974) that reviewed the factors that affected communities. DNL (still known as L_{dn} at the time) was identified as an appropriate noise metric, and threshold criteria were recommended.

Threshold criteria for annoyance were identified from social surveys, where people exposed to noise were asked how noise affects them. Surveys provide direct real-world data on how noise affects actual residents.

Surveys in the early years had a range of designs and formats and needed some interpretation to find common ground. In 1978, Schultz showed that the common ground was the number of people "highly annoyed," defined as the upper 28 percent range of whatever response scale a survey used (Schultz, 1978). With that definition, he was able to show a remarkable consistency among the majority of the surveys for which data were available. **Figure C-7** shows the result of his study relating DNL to individual annoyance measured by percent highly annoyed (%HA).

Schultz's original synthesis included 161 data points. **Figure C-8** shows a comparison of the predicted response of the Schultz data set with an expanded set of 400 data points collected through 1989 (Finegold et al., 1994). The new form is the preferred form in the United States, endorsed by the Federal Interagency Committee on Aviation Noise (FICAN, 1997). Other forms have been proposed, such as that of Fidell and Silvati (2004) but have not gained widespread acceptance.

When the goodness of fit of the Schultz curve is examined, the correlation between groups of people is high, in the range of 85 to 90 percent; however, the correlation between individuals is much lower, at 50 percent or less. This is not surprising, given the personal differences between individuals. The surveys underlying the Schultz curve include results that show that annoyance to noise is also affected by nonacoustical factors. Newman and Beattie (1985) divided the nonacoustic factors into the emotional and physical variables shown in **Table C-1**.



Source: Schultz, 1978

Figure C-7. Schultz Curve Relating Noise Annoyance to Day-Night Average Sound Level

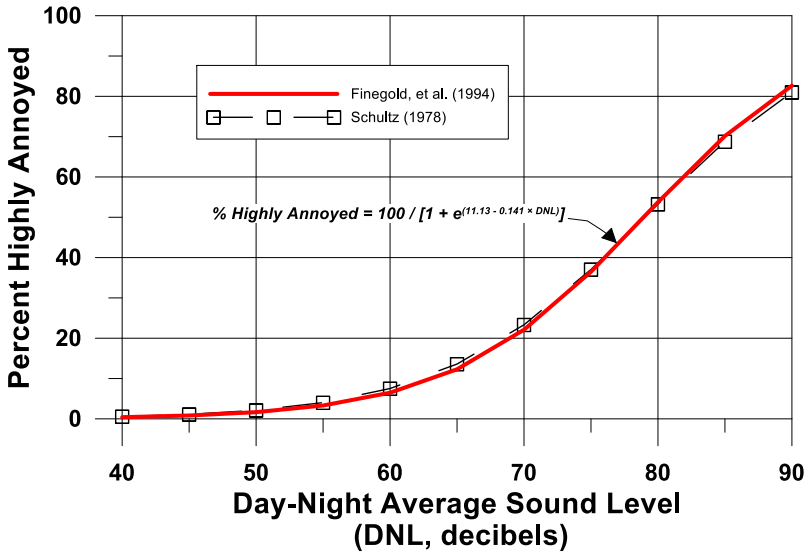


Figure C-8. Response of Communities to Noise; Comparison of Original Schultz (1978) with Finegold et al. (1994).

Table C-1
Nonacoustic Variables Influencing Aircraft Noise Annoyance

Emotional Variables	Physical Variables
Feeling about the necessity or preventability of the noise	Type of neighborhood
	Time of day
Judgement of the importance and value of the activity that is producing the noise	Season
	Predictability of the noise
Activity at the time an individual hears the noise	Control over the noise source
Attitude about the environment	Length of time individual is exposed to a noise.
General sensitivity to noise	
Belief about the effect of noise on health	
Feeling of fear associated with the noise	

Schreckenberg and Schuemer (2010) examined the importance of some of these factors on short term annoyance. Attitudinal factors were identified as having an effect on annoyance. In formal regression analysis, however, sound level (L_{eq}) was found to be more important than attitude. A series of studies at three European airports showed that less than 20 percent of the variance in annoyance can be explained by noise alone (Márki, 2013).

A study by Plotkin et al. (2011) examined updating DNL to account for these factors. It was concluded that the data requirements for a general analysis were much greater than are available from most existing studies. It was noted that the most significant issue with DNL is that it is not readily understood by the public and that supplemental metrics such as TA and NA were valuable in addressing attitude when communicating noise analysis to communities (DOD, 2009a).

A factor that is partially nonacoustical is the source of the noise. Miedema and Vos (1998) presented synthesis curves for the relationship between DNL and percentage "Annoyed" and percentage "Highly Annoyed" for three transportation noise sources. Different curves were found for aircraft, road traffic, and railway noise. **Table C-2** summarizes their results. Comparing the updated Schultz curve suggests that the percentage of people highly annoyed by aircraft noise may be higher than previously thought. Miedema and Oudshoorn (2001) authors supplemented that investigation with further derivation of percent of population highly annoyed as a function of either DNL or DENL along with the corresponding 95 percent confidence intervals with similar results.

Table C-2
Percent Highly Annoyed for Different Transportation Noise Sources

Day-Night Average Sound Level (decibels)	Percent Highly Annoyed (%HA)			
	Miedema and Vos			Schultz Combined
	Air	Road	Rail	
55	12	7	4	3
60	19	12	7	6
65	28	18	11	12
70	37	29	16	22
75	48	40	22	36

Source: Miedema and Vos, 1998

As noted by the World Health Organization (WHO), however, even though aircraft noise seems to produce a stronger annoyance response than road traffic, caution should be exercised when interpreting synthesized data from different studies (WHO, 1999).

Consistent with WHO's recommendations, the Federal Interagency Committee on Noise (FICON, 1992) considered the Schultz curve to be the best source of dose information to predict community response to noise but recommended further research to investigate the differences in perception of noise from different sources.

The International Standard Organization (ISO 1996:1-2016) update introduced the concept of Community Tolerance Level (L_{ct}) as the day-night sound level at which 50 percent of the people in a particular community are predicted to be highly annoyed by noise exposure. L_{ct} accounts for differences between sources and/or communities when predicting the percentage highly annoyed by noise exposure. ISO also recommended a change to the adjustment range used when comparing aircraft noise to road noise. The previous edition suggested +3 to +6 dB for aircraft noise relative to road noise while the latest editions recommend an adjustment range of +5 to +8 dB. This adjustment range allows DNL to be correlated to consistent annoyance rates when originating from different noise sources (i.e., road traffic, aircraft, or railroad). This change to the adjustment range would increase the calculated percent highly annoyed at the 65-dBA DNL by approximately 2 to 5 percent greater than the previous ISO definition. **Figure C-9** depicts the estimated percentage of people highly annoyed for a given DNL using both the ISO 1996-1 estimation and the older FICON 1992 method. The results suggest that the percentage of people highly annoyed may be greater than previous thought and reliance solely on DNL for impact analysis may be insufficient if utilizing the FICON 1992 method.

The US Federal Aviation Administration (FAA) is currently conducting a major airport community noise survey at approximately 20 US airports in order to update the relationship between aircraft noise and annoyance. Results from this study have not yet been released.

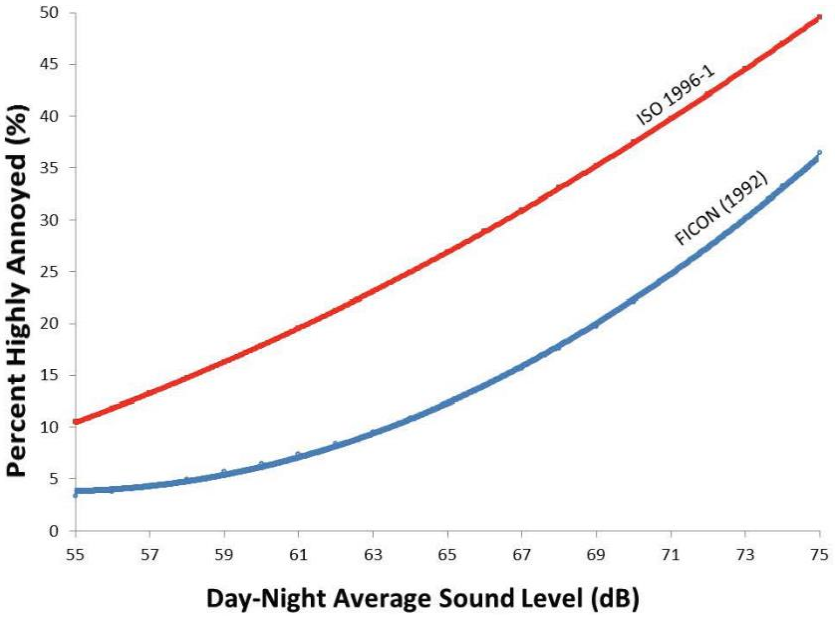


Figure C-9. Percent Highly Annoyed Comparison of International Standard Organization 1996-1 to Federal Interagency Committee on Noise (1992).

C.1.4.2 Speech Interference

Speech interference from noise is a primary cause of annoyance for communities. Disruption of routine activities such as radio or television listening, telephone use, or conversation leads to frustration and annoyance. The quality of speech communication is important in classrooms and offices. In the workplace, speech interference from noise can cause fatigue and vocal strain in those who attempt to talk over the noise. In schools it can impair learning.

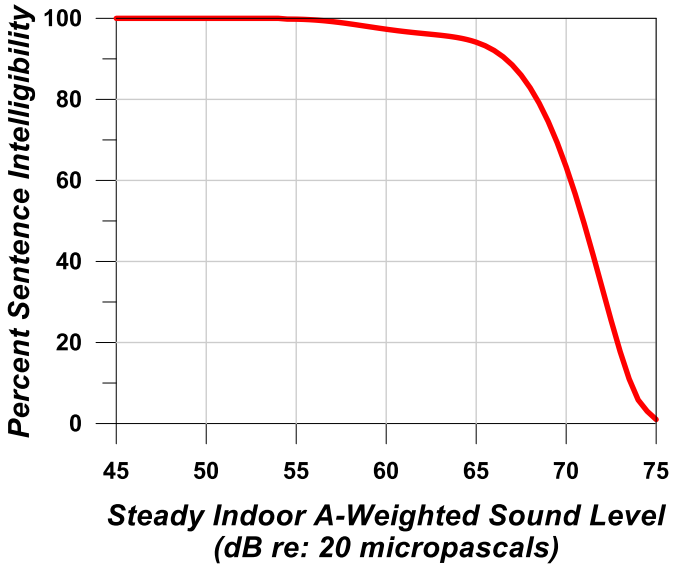
There are two measures of speech comprehension:

1. Word Intelligibility – the percent of words spoken and understood. This might be important for students in the lower grades who are learning the English language and particularly for students who have English as a Second Language.
2. Sentence Intelligibility – the percent of sentences spoken and understood. This might be important for high-school students and adults who are familiar with the language and who do not necessarily have to understand each word in order to understand sentences.

United States Federal Criteria for Interior Noise

In 1974, the USEPA identified a goal of an indoor $L_{eq}(24)$ of 45 dB to minimize speech interference based on sentence intelligibility and the presence of steady noise (USEPA, 1974). **Figure C-10** shows the effect of steady indoor background sound levels on sentence intelligibility. For an average adult with normal hearing and fluency in the language, steady background indoor sound levels of less than the 45-dB L_{eq} are expected to allow 100 percent sentence intelligibility.

The curve on **Figure C-10** shows 99 percent intelligibility at L_{eq} below 54 dB and less than 10 percent above 73 dB. Recalling that L_{eq} is dominated by louder noise events, the USEPA $L_{eq}(24)$ goal of 45 dB generally ensures that sentence intelligibility will be high most of the time.



Source: Digitized from United States Environmental Protection Agency, 1974

Figure C-10. Speech Intelligibility Curve.

Classroom Criteria

For teachers to be understood, their regular voice must be clear and uninterrupted. Background noise has to be below the teacher's voice level. Intermittent noise events that momentarily drown out the teacher's voice need to be kept to a minimum. It is therefore important to evaluate the steady background level, level of voice communication, and single-event level due to aircraft overflights that might interfere with speech.

Lazarus (1990) found that for listeners with normal hearing and fluency in the language, complete sentence intelligibility can be achieved when the signal-to-noise ratio (i.e., a comparison of the level of the sound to the level of background noise) is in the range of 15 to 18 dB. The initial ANSI (2002) classroom noise standard and American Speech-Language-Hearing Association (2005) guidelines concur, recommending at least a 15-dB signal-to-noise ratio in classrooms. If the teacher's voice level is at least 50 dB, the background noise level must not exceed an average of 35 dB. The National Research Council of Canada (Bradley, 1993) and WHO (1999) agree with this criterion for background noise.

For eligibility for noise insulation funding, the FAA guidelines state that the design objective for a classroom environment is the 45-dB L_{eq} during normal school hours (FAA, 1985).

Most aircraft noise is not continuous. It consists of individual events like the one sketched on **Figure C-4**. Since speech interference in the presence of aircraft noise is caused by individual aircraft flyover events, a time-averaged metric alone, such as L_{eq}, is not necessarily appropriate. In addition to the background level criteria described above, single-event criteria that account for those noisy events are also needed.

A 1984 study by Wyle for the Port Authority of New York and New Jersey recommended using Speech Interference Level (SIL) for classroom noise criteria (Sharp and Plotkin, 1984). SIL is based on the maximum sound levels in the frequency range that most affects speech communication (500 to 2,000 Hz). The study identified an SIL of 45 dB as the goal. This would provide 90 percent word intelligibility for the short time periods during aircraft overflights. While SIL is technically the best metric for speech interference, it can be approximated by an L_{max} value. An SIL of 45 dB is equivalent to an A-weighted L_{max} of 50 dB for aircraft noise (Wesler, 1986).

Lind et al. (1998) also concluded that an L_{max} criterion of 50 dB would result in 90 percent word intelligibility. Bradley (1985) recommends SEL as a better indicator. His work indicates that 95 percent word intelligibility would be achieved when indoor SEL did not exceed 60 dB. For typical flyover noise, this corresponds to an L_{max} of 50 dB. While WHO (1999) only specifies a background L_{max} criterion, they also note the SIL frequencies and that interference can begin at around 50 dB.

The United Kingdom Department for Education and Skills (UKDfES) established in its classroom acoustics guide a 30-minute time-averaged metric of L_{eq}(30min) for background levels and the metric of LA1,30min for intermittent noises, at thresholds of 30 to 35 dB and 55 dB, respectively. LA1,30min represents the A-weighted sound level that is exceeded 1 percent of the time (in this case, during a 30-minute teaching session) and is generally equivalent to the L_{max} metric (UKDfES, 2003).

Table C-3 summarizes the criteria discussed. Other than the FAA (1985) 45 dB L_{max} criterion, they are consistent with a limit on indoor background noise of 35 to 40 dB L_{eq} and a single event limit of 50 dB L_{max}. It should be noted that these limits were set based on students with normal hearing and no special needs. At-risk students may be adversely affected at lower sound levels.

Table C-3
Indoor Noise Level Criteria Based on Speech Intelligibility

Source	Metric/Level (dB)	Effects and Notes
Federal Aviation Administration (1985)	$L_{eq(during\ school\ hours)}$ = 45 dB	Federal assistance criteria for school sound insulation; supplemental single-event criteria may be used.
Lind et al. (1998), Sharp and Plotkin (1984), Wesler (1986)	L_{max} = 50 dB / Speech Interference Level 45	Single event level permissible in the classroom.
World Health Organization (1999)	L_{eq} = 35 dB L_{max} = 50 dB	Assumes average speech level of 50 dB and recommends signal to noise ratio of 15 dB.
American National Standards Institute (2010)	L_{eq} = 35 dB, based on Room Volume (e.g., cubic feet)	Acceptable background level for continuous and intermittent noise.
United Kingdom Department for Education and Skills (2003)	$L_{eq(30min)}$ = 30-35 dB L_{max} = 55 dB	Minimum acceptable in classroom and most other learning environs.

dB = decibel(s); L_{eq} = Equivalent Sound Level; L_{max} = Maximum Sound Level

C.1.4.3 Sleep Disturbance

Sleep disturbance is a major concern for communities exposed to aircraft noise at night. A number of studies have attempted to quantify the effects of noise on sleep. This section provides an overview of the major noise-induced sleep disturbance studies. Emphasis is on studies that have influenced US federal noise policy. The studies have been separated into two groups:

1. Initial studies performed in the 1960s and 1970s, where the research was focused on sleep observations performed under laboratory conditions.
2. Later studies performed in the 1990s up to the present, where the research was focused on field observations.

Initial Studies

The relation between noise and sleep disturbance is complex and not fully understood. The disturbance depends not only on the depth of sleep and the noise level but also on the nonacoustic factors cited for annoyance. The easiest effect on measure is the number of arousals or awakenings from noise events. Much of the literature has therefore focused on predicting the percentage of the population that will be awakened at various noise levels.

FICON's 1992 review of airport noise issues (FICON, 1992) included an overview of relevant research conducted through the 1970s. Literature reviews and analyses were conducted from 1978 through 1989 using existing data (Griefahn, 1978; Lukas, 1978; Pearsons et. al., 1989). Because of large variability in the data, FICON did not endorse the reliability of those results.

FICON did, however, recommend an interim dose-response curve, awaiting future research. That curve predicted the percent of the population expected to be awakened as a function of the exposure to SEL. This curve was based on research conducted for the US Air Force (Air Force; Finegold, 1994). The data included most of the research performed up to that point and predicted a 10 percent probability of awakening when exposed to an interior SEL of 58 dB. The data used to derive this curve were primarily from controlled laboratory studies.

Recent Sleep Disturbance Research – Field and Laboratory Studies

It was noted that early sleep laboratory studies did not account for some important factors. These included habituation to the laboratory, previous exposure to noise, and awakenings from noise other than aircraft. In the early 1990s, field studies in people's homes were conducted to validate the earlier laboratory work conducted in the 1960s and 1970s. The field studies of the 1990s (e.g., Horne, 1994) found that 80 to 90 percent of sleep disturbances were not related to outdoor noise events but rather to indoor noises and nonnoise factors. The results showed that, in real life conditions, there was less of an effect of noise on sleep than had been previously reported from laboratory studies. Laboratory sleep studies tend to show more sleep disturbance than field studies because people who sleep in their own homes are used to their environment and, therefore, do not wake up as easily (FICAN, 1997).

FICAN

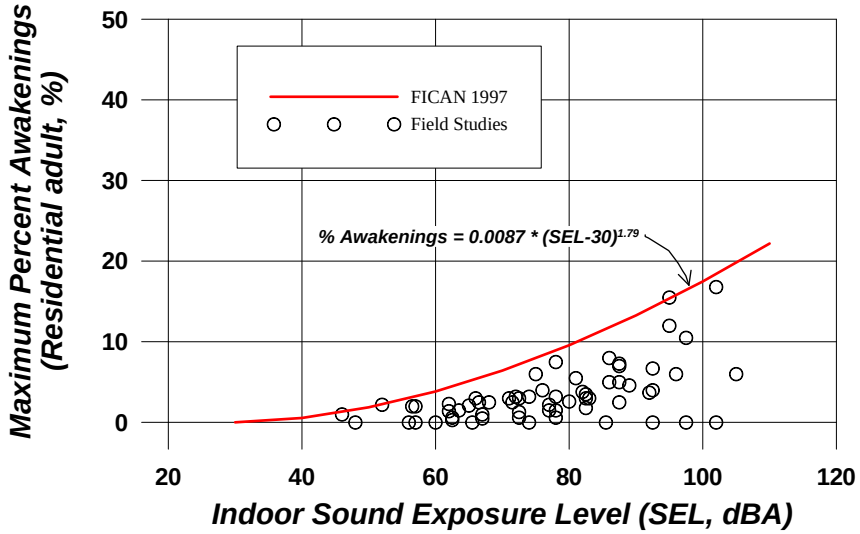
Based on this new information, in 1997 FICAN recommended a dose-response curve to use instead of the earlier 1992 FICON curve (FICAN, 1997). **Figure C-11** shows FICAN's curve, the red line, which is based on the results of three field studies shown in the figure (Ollerhead et al., 1992; Fidell et al., 1994, 1995a, 1995b), along with the data from six previous field studies.

The 1997 FICAN curve represents the upper envelope of the latest field data. It predicts the maximum percent awakened for a given residential population. According to this curve, a maximum of 3 percent of people would be awakened at an indoor SEL of 58 dB. An indoor SEL of 58 dB is equivalent to an outdoor SEL of about 83 dB, with the windows closed (73 dB with windows open).

Number of Events and Awakenings

It is reasonable to expect that sleep disturbance is affected by the number of events. The German Aerospace Center (DLR Laboratory) conducted an extensive study focused on the effects of nighttime aircraft noise on sleep and related factors (Basner, 2004). The DLR Laboratory study was one of the largest studies to examine the link between aircraft noise and sleep disturbance. It involved both laboratory and in-home field research phases. The DLR Laboratory investigators developed a dose-response curve that predicts the number of aircraft events at various values of L_{max} expected to produce one additional awakening over the course of a night. The dose-effect curve was based on the relationships found in the field studies.

Later studies by DLR Laboratory conducted in the laboratory comparing the probability of awakenings from different modes of transportation showed that aircraft noise lead to significantly lower awakening probabilities than either road or rail noise (Basner et al., 2011). Furthermore, it was noted that the probability of awakening, per noise event, decreased as the number of noise events increased. The authors concluded that by far the majority of awakenings from noise events merely replaced awakenings that would have occurred spontaneously anyway.



Source: FICAN 1997

Figure C-11. Federal Interagency Committee on Aviation Noise (1997) Recommended Sleep Disturbance Dose-Response Relationship.

A different approach was taken by an ANSI standards committee (ANSI, 2008). The committee used the average of the data shown on **Figure C-10** rather than the upper envelope, to predict average awakening from one event. Probability theory is then used to project the awakening from multiple noise events.

Currently, there are no established criteria for evaluating sleep disturbance from aircraft noise although recent studies have suggested a benchmark of an outdoor SEL of 90 dB as an appropriate tentative criterion when comparing the effects of different operational alternatives. The corresponding indoor SEL would be approximately 25 dB lower (at 65 dB) with doors and windows closed, and approximately 15 dB lower (at 75 dB) with doors or windows open. According to the ANSI (2008) standard, the probability of awakening from a single aircraft event at this level is between 1 and 2 percent for people habituated to the noise sleeping in bedrooms with windows closed, and between 2 to 3 percent with windows open. The probability of the exposed population awakening at least once from multiple aircraft events at the 90-dB SEL is shown in **Table C-4**.

Table C-4
Probability of Awakening from Aircraft Events Exceeding a Sound Exposure Level of 90 Decibels over a 9-Hour Period

Number of Aircraft Events at the 90-Decibel Sound Exposure Level for Average 9-Hour Night	Minimum Probability of Awakening at Least Once	
	Windows Closed	Windows Open
1	1%	2%
3	4%	6%
5	7%	10%
9 (1 per hour)	12%	18%
18 (2 per hour)	22%	33%
27 (3 per hour)	32%	45%

Source: DOD, 2009b

In December 2008, FICAN recommended the use of this new standard. FICAN also recognized that more research is underway by various organizations, and that work may result in changes to FICAN's position. Until that time, FICAN recommends the use of the ANSI (2008) standard (FICAN, 2008).

Summary

Sleep disturbance research still lacks the details to accurately estimate the population awakened for a given noise exposure. The procedure described in the ANSI (2008) Standard and endorsed by FICAN is based on probability calculations that have not yet been scientifically validated. While this procedure certainly provides a much better method for evaluating sleep awakenings from multiple aircraft noise events, the estimated probability of awakenings can only be considered approximate.

C.1.4.4 Noise Effects on Children

Recent studies on school children indicate a potential link between aircraft noise and both reading comprehension and learning motivation. The effects may be small but may be of particular concern for children who are already scholastically challenged.

Effects on Learning and Cognitive Abilities

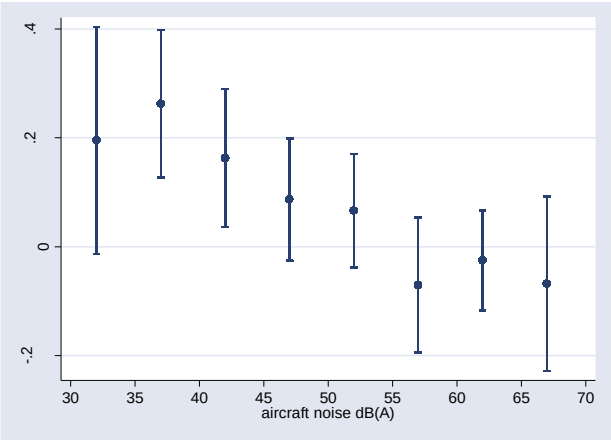
Early studies in several countries (Cohen et al., 1973, 1980, 1981; Bronzaft and McCarthy, 1975; Green et al., 1982; Evans et al., 1998; Haines et al., 2002; Lercher et al., 2003) showed lower reading scores for children living or attending school in noisy areas than for children away from those areas. In some studies noise exposed children were less likely to solve difficult puzzles or more likely to give up.

A longitudinal study reported by Evans et al. (1998), conducted prior to relocation of the old Munich airport in 1992, reported that high noise exposure was associated with deficits in long-term memory and reading comprehension in children with a mean age of 10.8 years. Two years after the closure of the airport, these deficits disappeared, indicating that noise effects on cognition may be reversible if exposure to the noise ceases. Most convincing was the finding that deficits in memory and reading comprehension developed over the 2-year follow-up for children who became newly noise exposed near the new airport; deficits were also observed in speech perception for the newly noise-exposed children.

More recently, the Road Traffic and Aircraft Noise Exposure and Children's Cognition and Health (RANCH) study (Stansfeld et al., 2005; Clark et al., 2006) compared the effect of aircraft and road traffic noise on over 2,000 children in three countries. This was the first study to derive exposure-effect associations for a range of cognitive and health effects and was the first to compare effects across countries.

The study found a linear relation between chronic aircraft noise exposure and impaired reading comprehension and recognition memory. No associations were found between chronic road traffic noise exposure and cognition. Conceptual recall and information recall surprisingly showed better performance in high road traffic noise areas. Neither aircraft noise nor road traffic noise affected attention or working memory (Stansfeld et al., 2005; Clark et al., 2005).

Figure C-12 shows RANCH's result relating noise to reading comprehension. It shows that reading falls below average (a z-score of 0) at Leq greater than 55 dB. Because the relationship is linear, reducing exposure at any level should lead to improvements in reading comprehension.



Sources: Stansfeld et al. 2005; Clark et al. 2006

Figure C-12. Road Traffic and Aircraft Noise Exposure and Children's Cognition and Health Study Reading Scores Varying with Equivalent Sound Level.

An observation of the RANCH study was that children may be exposed to aircraft noise for many of their childhood years and the consequences of long-term noise exposure were unknown. A follow-up study of the children in the RANCH project is being analyzed to examine the long-term effects on children's reading comprehension (Clark et al., 2009). Preliminary analysis indicated a trend for reading comprehension to be poorer at 15 to 16 years of age for children who attended noise-exposed primary schools. An additional study utilizing the same data set (Clark et al., 2012) investigated the effects of traffic-related air pollution and found little evidence that air pollution moderated the association of noise exposure on children's cognition.

There was also a trend for reading comprehension to be poorer in aircraft noise exposed secondary schools. Significant differences in reading scores were found between primary school children in the two different classrooms at the same school (Bronzaft and McCarthy, 1975). One classroom was exposed to high levels of railway noise while the other classroom was quiet. The mean reading age of the noise-exposed children was 3 to 4 months behind that of the control children. Studies suggest that the evidence of the effects of noise on children's cognition has grown stronger over recent years (Stansfeld and Clark, 2015), but further analysis adjusting for confounding factors is ongoing and needed to confirm these initial conclusions.

Studies identified a range of linguistic and cognitive factors to be responsible for children´s unique difficulties with speech perception in noise. Children have lower stored phonological knowledge to reconstruct degraded speech reducing the probability of successfully matching incomplete speech input when compared with adults. Additionally, young children are less able than older children and adults to make use of contextual cues to reconstruct noise-masked words presented in sentential context (Klatte et al., 2013).

FICAN funded a pilot study to assess the relationship between aircraft noise reduction and standardized test scores (Eagan et al., 2004; FICAN, 2007). The study evaluated whether abrupt aircraft noise reduction within classrooms, from either airport closure or sound insulation, was associated with improvements in

test scores. Data were collected in 35 public schools near three airports in Illinois and Texas. The study used several noise metrics. These were, however, all computed indoor levels, which makes it hard to compare with the outdoor levels used in most other studies.

The FICAN study found a significant association between noise reduction and a decrease in failure rates for high school students but not middle or elementary school students. There were some weaker associations between noise reduction and an increase in failure rates for middle and elementary schools. Overall, the study found that the associations observed were similar for children with or without learning difficulties, and between verbal and math/science tests. As a pilot study, it was not expected to obtain final answers but provided useful indications (FICAN, 2007).

A recent study of the effect of aircraft noise on student learning (Sharp et al., 2013) examined student test scores at a total of 6,198 US elementary schools, 917 of which were exposed to aircraft noise at 46 airports with noise exposures exceeding the 55-dBA DNL. The study found small but statistically significant associations between airport noise and student mathematics and reading test scores, after taking demographic and school factors into account. Associations were also observed for ambient noise and total noise on student mathematics and reading test scores, suggesting that noise levels per se, as well as from aircraft, might play a role in student achievement.

As part of the Noise-Related Annoyance, Cognition and Health study conducted at Frankfurt airport, reading tests were conducted on 1,209 school children at 29 primary schools. It was found that there was a small decrease in reading performance that corresponded to a 1-month reading delay; however, a recent study observing children at 11 schools surrounding Los Angeles International Airport found that the majority of distractions to elementary age students were other students followed by themselves, which includes playing with various items and daydreaming. Less than 1 percent of distractions were caused by traffic noise.

While there are many factors that can contribute to learning deficits in school-aged children, there is increasing awareness that chronic exposure to high aircraft noise levels may impair learning. This awareness has led WHO and a North Atlantic Treaty Organization (NATO) working group to conclude that daycare centers and schools should not be located near major sources of noise, such as highways, airports, and industrial sites (NATO, 2000; WHO, 1999). The awareness has also led to the classroom noise standard discussed earlier (ANSI, 2002).

C.1.4.5 Noise Effects on Animals and Wildlife

Hearing is critical to an animal's ability to react, compete, reproduce, hunt, forage, and survive in its environment. While the existing literature does include studies on possible effects of jet aircraft noise and sonic booms on wildlife, there appears to have been little concerted effort in developing quantitative comparisons of aircraft noise effects on normal auditory characteristics. Behavioral effects have been relatively well described, but the larger ecological context issues, and the potential for drawing conclusions regarding effects on populations, have not been well developed.

The relationships between potential auditory/physiological effects and species interactions with their environments are not well understood. Manci et al. (1988) assert that the consequences that physiological effects may have on behavioral patterns are vital to understanding the long-term effects of noise on wildlife. Questions regarding the effects (if any) on predator-prey interactions, reproductive success, and intraspecific behavior patterns remain.

The following discussion provides an overview of the existing literature on noise effects (particularly jet aircraft noise) on animal species. The literature reviewed here involves those studies that have focused on the observations of the behavioral effects that jet aircraft and sonic booms have on animals.

A great deal of research was conducted in the 1960s and 1970s on the effects of aircraft noise on the public and the potential for adverse ecological impacts. These studies were largely completed in response to the increase in air travel and as a result of the introduction of supersonic jet aircraft. According to Manci et al. (1988), the foundation of information created from that focus does not necessarily correlate or provide

information specific to the impacts on wildlife in areas overflown by aircraft at supersonic speed or at low altitudes.

The abilities to hear sounds and noise and to communicate assist wildlife in maintaining group cohesiveness and survivorship. Social species communicate by transmitting calls of warning, introduction, and other types that are subsequently related to an individual's or group's responsiveness.

Animal species differ greatly in their responses to noise. Noise effects on domestic animals and wildlife are classified as primary, secondary, and tertiary. Primary effects are direct, physiological changes to the auditory system and most likely include the masking of auditory signals. Masking is defined as the inability of an individual to hear important environmental signals that may arise from mates, predators, or prey. There is some potential that noise could disrupt a species' ability to communicate or could interfere with behavioral patterns (Manci et al., 1988). Although the effects are likely temporal, aircraft noise may cause masking of auditory signals within exposed faunal communities. Animals rely on hearing to avoid predators, obtain food, and communicate with, and attract, other members of their species. Aircraft noise may mask or interfere with these functions. Other primary effects, such as ear drum rupture or temporary and permanent hearing threshold shifts, are not as likely given the subsonic noise levels produced by aircraft overflights.

Secondary effects may include nonauditory effects such as stress and hypertension; behavioral modifications; interference with mating or reproduction; and impaired ability to obtain adequate food, cover, or water. Tertiary effects are the direct result of primary and secondary effects and include population decline and habitat loss. Most of the effects of noise are mild enough that they may never be detectable as variables of change in population size or population growth against the background of normal variation (Bowles, 1995). Other environmental variables (e.g., predators, weather, changing prey base, ground-based disturbance) also influence secondary and tertiary effects and confound the ability to identify the ultimate factor in limiting productivity of a certain nest, area, or region (Smith et al., 1988). Overall, the literature suggests that species differ in their response to various types, durations, and sources of noise (Manci et al., 1988).

Many scientific studies have investigated the effects of aircraft noise on wildlife, and some have focused on wildlife "flight" due to noise. Animal responses to aircraft are influenced by many variables, including size, speed, proximity (both height above the ground and lateral distance), engine noise, color, flight profile, and radiated noise. The type of aircraft (e.g., fixed wing versus rotor-wing [helicopter]) and type of flight mission may also produce different levels of disturbance, with varying animal responses (Smith et al., 1988). Consequently, it is difficult to generalize animal responses to noise disturbances across species.

One result of the Manci et al. (1988) literature review was the conclusion that, while behavioral observation studies were relatively limited, a general behavioral reaction in animals from exposure to aircraft noise is the startle response. The intensity and duration of the startle response appears to be dependent on which species is exposed, whether there is a group or an individual, and whether there have been some previous exposures. Responses range from flight, trampling, stampeding, jumping, or running, to movement of the head in the apparent direction of the noise source. Manci et al. (1988) reported that the literature indicated that avian species may be more sensitive to aircraft noise than mammals.

Domestic Animals

Although some studies report that the effects of aircraft noise on domestic animals is inconclusive, a majority of the literature reviewed indicates that domestic animals exhibit some behavioral responses to military overflights but generally seem to habituate to the disturbances over a period of time. Mammals in particular appear to react to noise at sound levels higher than 90 dB, with responses including the startle response, freezing (i.e., becoming temporarily stationary), and fleeing from the sound source. Many studies on domestic animals suggest that some species appear to acclimate to some forms of sound disturbance (Manci et al., 1988). Some studies have reported such primary and secondary effects as reduced milk production and rate of milk release, increased glucose concentrations, decreased levels of hemoglobin, increased heart rate, and a reduction in thyroid activity. These latter effects appear to represent a small percentage of the findings occurring in the existing literature.

Some reviewers have indicated that earlier studies and claims by farmers linking adverse effects of aircraft noise on livestock, did not necessarily provide clear-cut evidence of cause and effect (Cottereau, 1978). In contrast, many studies conclude that there is no evidence that aircraft overflights affect feed intake, growth, or production rates in domestic animals.

Wildlife

Studies on the effects of overflights and sonic booms on wildlife have been focused mostly on avian species and ungulates such as caribou and bighorn sheep. Few studies have been conducted on marine mammals, small terrestrial mammals, reptiles, amphibians, and carnivorous mammals. Generally, species that live entirely below the surface of the water have also been ignored due to the fact they do not experience the same level of sound as terrestrial species (National Park Service, 1994). Wild ungulates appear to be much more sensitive to noise disturbance than domestic livestock. This may be due to previous exposure to disturbances. One common factor appears to be that low-altitude flyovers seem to be more disruptive in terrain where there is little cover (Manci et al., 1988).

Some physiological/behavioral responses such as increased hormonal production, increased heart rate, and reduction in milk production have been described in a small percentage of studies. A majority of the studies focusing on these types of effects have reported short-term or no effects.

The relationships between physiological effects and how species interact with their environments have not been thoroughly studied; therefore, the larger ecological context issues regarding physiological effects of jet aircraft noise (if any) and resulting behavioral pattern changes are not well understood.

Animal species exhibit a wide variety of responses to noise. It is therefore difficult to generalize animal responses to noise disturbances or to draw inferences across species, as reactions to jet aircraft noise appear to be species-specific. Consequently, some animal species may be more sensitive than other species and/or may exhibit different forms or intensities of behavioral responses. For instance, wood ducks appear to be more sensitive and more resistant to acclimation to jet aircraft noise than Canada geese in one study. Similarly, wild ungulates seem to be more easily disturbed than domestic animals.

The literature does suggest that common responses include the “startle” or “fright” response and, ultimately, habituation. It has been reported that the intensities and durations of the startle response decrease with the numbers and frequencies of exposures, suggesting no long-term adverse effects. The majority of the literature suggests that domestic animal species (e.g., cows, horses, chickens) and wildlife species exhibit adaptation, acclimation, and habituation after repeated exposure to jet aircraft noise and sonic booms.

Animal responses to aircraft noise appear to be somewhat dependent on, or influenced by, the size, shape, speed, proximity (vertical and horizontal), engine noise, color, and flight profile of planes. Helicopters also appear to induce greater intensities and durations of disturbance behavior as compared to fixed-wing aircraft. Some studies showed that animals that had been previously exposed to jet aircraft noise exhibited greater degrees of alarm and disturbance to other objects creating noise, such as boats, people, and objects blowing across the landscape. Other factors influencing response to jet aircraft noise may include wind direction, speed, and local air turbulence; landscape structures (i.e., amount and type of vegetative cover); and, in the case of bird species, whether the animals are in the incubation/nesting phase.

C.1.5 Noise Model Operational Data Documentation

C.1.5.1 Introduction

The following sections describe the data collected and noise modeling performed for an Environmental Assessment (EA) analyzing the implementation of proposed changes to the floor and ceiling altitudes for Military Training Routes (MTRs) VR-1108, VR-1109, and VR-1117. This dataset was developed in coordination with Air Force personnel over a series of virtual data collection efforts in spring/summer 2021.

The following analysis tools were used to calculate the potential noise levels associated with the examined alternatives.

C.1.5.2 NOISEMAP

Analyses of aircraft noise exposure and compatible land uses around DOD airfield-like facilities are normally accomplished using a group of computer-based programs, collectively called NOISEMAP (Czech and Plotkin, 1998; Wasmer and Maunsell, 2006a, 2006b). The core computational program of the NOISEMAP suite is NMAP. In this report, NMAP Version 7.3 was used to analyze aircraft overflight noise levels at various altitudes.

C.1.5.3 MR_NMAP

When the aircraft flight tracks are not well defined and are distributed over a wide area, such as in Military Training Routes with wide corridors, the Air Force uses the DOD-approved MR_NMAP program (Lucas and Calamia, 1996). In this report, MR_NMAP was used to model subsonic aircraft noise in MTRs. In this study, results below 45 dBA L_{dnmr} are reported in order to show the magnitude of any changes to the MTR noise environment due to changes in aircraft operating conditions; however, in calculating time-average sound levels for airspace, the reliability of the results varies at sound levels below 45 dBA L_{dnmr}. Time-averaged outdoor sound levels less than 45 dBA are well below any currently accepted guidelines for aircraft noise compatibility.

C.1.5.4 Flight Operating Conditions

Tables C-5 through **C-10** detail the existing operating conditions for T-1A and T-38C aircraft within the VR-1108, VR-1109, and VR-1117 MTRs. These operations were developed from interviews with Air Force personnel, including T-1A and T-38C pilots.

Table C-5

VR-1108 - Existing T-1A Operations

VR-1108			T-1A					
Segment	Existing (ft AGL)		Annual Operations			Average Speed	Average Power	Altitude Utilization
	Floor	Ceiling	Day (0700-2200)	Night (2200-0700)	Total			
A-B	1000	1500	2	0	2	240 kts	90% N2	As low as possible - with altitude restrictions based on wind conditions
B-C	1000	1500						
C-D	500	1500						
D-E	500	1500						
E-F	500	1500						

Table C-6

VR-1109 - Existing T-1A Operations

VR-1109			T-1A					
Segment	Existing (ft AGL)		Annual Operations			Average Speed	Average Power	Altitude Utilization
	Floor	Ceiling	Day (0700-2200)	Night (2200-0700)	Total			
A-B	1000	1500	161	0	161	240 kts	90% N2	As low as possible - with altitude restrictions based on wind conditions
B-C	1000	1500						
C-D	500	1500						
D-E	500	1500						
E-F	500	1500						

Table C-7

VR-1117 - Existing T-1A Operations

VR-1117			T-1A					
Segment	Existing (ft AGL)		Annual Operations			Average Speed	Average Power	Altitude Utilization
	Floor	Ceiling	Day (0700-2200)	Night (2200-0700)	Total			
A-B	500	1500	0	0	0	N/A	N/A	N/A
B-C	500	1500						
C-D	500	1500						
D-E	1000	1500						
E-F	1000	1500						

Table C-8

VR-1108 - Existing T-38C Operations

VR-1108			T-38C					
Segment	Existing (ft AGL)		Annual Operations			Average Speed	Average Power	Altitude Utilization
	Floor	Ceiling	Day (0700-2200)	Night (2200-0700)	Total			
A-B	1000	1500	74	0	74	360 kts	92% RPM	As low as possible - no altitude restrictions based on wind conditions
B-C	1000	1500						
C-D	500	1500						
D-E	500	1500						
E-F	500	1500						

Table C-9

VR-1109 - Existing T-38C Operations

VR-1109			T-38C T-1A					
Segment	Existing (ft AGL)		Annual Operations			Average Speed	Average Power	Altitude Utilization
	Floor	Ceiling	Day (0700-2200)	Night (2200-0700)	Total			
A-B	1000	1500	215	0	215	360 kts	92% RPM	As low as possible - no altitude restrictions based on wind conditions
B-C	1000	1500						
C-D	500	1500						
D-E	500	1500						
E-F	500	1500						

Table C-10

VR-1117 - Existing T-38C Operations

VR-1117			T-38C					
Segment	Existing (ft AGL)		Annual Operations			Average Speed	Average Power	Altitude Utilization
	Floor	Ceiling	Day (0700-2200)	Night (2200-0700)	Total			
A-B	500	1500	0	0	0	N/A	N/A	N/A
B-C	500	1500						
C-D	500	1500						
D-E	1000	1500						
E-F	1000	1500						

C.2.3 References

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C.2 AIR QUALITY

This appendix presents an overview of the Clean Air Act (CAA) and the relevant state of Texas air quality regulations/standards. It also presents calculations, including the assumptions used for the air quality analyses presented in the Air Quality sections of this EA.

C.2.1 Definition of the Resource

The United States Environmental Protection Agency (USEPA) has divided the country into geographical regions known as Air Quality Control Regions (AQCRs) to evaluate compliance with the National Ambient Air Quality Standards (NAAQS). NAAQS are currently established for six criteria air pollutants: ozone (O3), carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), respirable particulate matter (including particulates equal to or less than 10 microns in diameter (PM10) and particulates equal to or less than 2.5 microns in diameter (PM2.5), and lead (Pb). The Texas Commission on Environmental Quality (TCEQ) oversees the state's air pollution control program under the authority of the federal CAA and Amendments, federal regulations, and state laws. Texas has adopted the federal NAAQS (TAC Title 30 §101.21). Each AQCR has regulatory areas that are designated as an attainment area or nonattainment area for each of the criteria pollutants depending on whether it meets or exceeds the NAAQS. Federal actions in NAAQS nonattainment areas also required to comply with USEPA's General Conformity Rule. These regulations are designed to ensure that federal actions do not impede local efforts to achieve or maintain attainment with the NAAQS. Greenhouse gases (GHGs) are gases, occurring from natural processes and human activities, that trap heat in the atmosphere. The accumulation of GHGs in the atmosphere helps regulate the earth's temperature and are believed to contribute to global climate change. USEPA regulates GHG emissions via permitting and reporting requirements that are applicable mainly to large stationary sources of emissions.

The proposed MTRs overlay four counties, covering three AQCRs. Brewster County is in the El Paso-Las Cruces-Alamogordo Interstate AQCR. Pecos and Terrell Counties are in the Midland-Odessa-San Angelo Intrastate AQCR. Val Verde County is in the Metropolitan San Antonio Intrastate AQCR.

For consideration of potential air quality impacts, it is the volume of air extending up to the mixing height (3,000 ft AGL) and coinciding with the spatial distribution of the ROIs that is considered. Because the Proposed Action is intended entirely in MTRs, and not at airfields, this impact analysis does not include landing and takeoff (LTO) and touch and go (TGO) cycles. Also not considered in the air quality analysis are the ground support and fueling activities that take place at the airfield, or personnel commutes.

For the MTRs, after applying the 3,000-ft criteria, there are several areas that are identified for air quality impact analysis. These areas, their underlying counties, and AQCRs are listed in Table C-11. The underlying land areas for these portions have relatively good air quality (not in nonattainment or maintenance areas for any criteria pollutants).

Table C-11
Airspace Region of Influence Subject to Air Quality Impact Analysis

Airspace with Operations ≤3,000 feet AGL	County	AQCRs
VR-1108	Texas Brewster, Pecos, Terrell	El Paso-Las Cruces-Alamogordo Interstate (40 CFR § 81.82) Midland-Odessa-San Angelo Intrastate Air Quality Control Region (40 CFR § 81.137)
VR-1109	Texas Brewster, Terrell, Val Verde	El Paso-Las Cruces-Alamogordo Interstate (40 CFR § 81.82) Midland-Odessa-San Angelo Intrastate Air Quality Control Region (40 CFR § 81.137) Metropolitan San Antonio Intrastate Air Quality Control Region (40 CFR § 81.40)
VR-1117	Texas Brewster, Terrell, Val Verde	El Paso-Las Cruces-Alamogordo Interstate (40 CFR § 81.82) Midland-Odessa-San Angelo Intrastate Air Quality Control Region (40 CFR § 81.137) Metropolitan San Antonio Intrastate Air Quality Control Region (40 CFR § 81.40)

Source: 40 CFR Part 81 Subpart B

Notes:
Airspace listed is applicable to training staged from Laughlin AFB
A very small area of VR-1109 lies over Pecos County, but this has not been considered here
AQCR = Air Quality Control Region; CFR = Code of Federal Regulations;

C.2.1.1 Criteria Pollutants

In accordance with CAA requirements, the air quality in each region or area is measured by the concentration of various pollutants in the atmosphere. Measurements of these "criteria pollutants" in ambient air are expressed in units of parts per million or in units of micrograms per cubic meter. Regional air quality is a result of the types and quantities of atmospheric pollutants and pollutant sources in an area as well as surface topography, the size of the "air basin," and prevailing meteorological conditions.

The CAA directed the USEPA to develop, implement, and enforce strong environmental regulations that would ensure clean and healthy ambient air quality. To protect public health and welfare, the USEPA developed numerical concentration-based standards, NAAQS, for pollutants that have been determined to impact human health and the environment and established both primary and secondary NAAQS under the provisions of the CAA. NAAQS are currently established for six criteria air pollutants: O_3, CO, NO_2, SO_2, respirable particulate matter (including PM_{10} and $PM_{2.5}$), and Pb. The primary NAAQS represent maximum levels of background air pollution that are considered safe, with an adequate margin of safety to protect public health. Secondary NAAQS represent the maximum pollutant concentration necessary to protect vegetation, crops, and other public resources in addition to maintaining visibility standards. The primary and secondary NAAQS are presented in **Table C-12**.

The criteria pollutant O_3 is not usually emitted directly into the air but is formed in the atmosphere by photochemical reactions involving sunlight and previously emitted pollutants, or "O_3 precursors." These O_3 precursors consist primarily of nitrogen oxides and volatile organic compounds that are directly emitted from a wide range of emissions sources. For this reason, regulatory agencies limit atmospheric O_3 concentrations by controlling VOC pollutants (also identified as reactive organic gases) and NO_x.

The USEPA has recognized that particulate matter emissions can have different health affects depending on particle size and, therefore, developed separate NAAQS for coarse particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$). The pollutant $PM_{2.5}$ can be emitted from emission sources directly as very fine dust and/or liquid mist or formed secondarily in the atmosphere as condensable particulate matter, typically forming nitrate and sulfate compounds. Secondary (indirect) emissions vary by region depending upon the predominant emission sources located there and thus which precursors are considered significant for $PM_{2.5}$ formation and identified for ultimate control.

The CAA and USEPA delegated responsibility for ensuring compliance with NAAQS to the states and local agencies. As such, each state must develop air pollutant control programs and promulgate regulations and rules that focus on meeting NAAQS and maintaining healthy ambient air quality levels. When a region or area fails to meet a NAAQS for a pollutant, that region is classified as “non-attainment” for that pollutant. In such cases the affected State must develop a State Implementation Plan (SIP) that is subject to USEPA review and approval. A SIP is a compilation of regulations, strategies, schedules, and enforcement actions designed to move the state into compliance with all NAAQS. Any changes to the compliance schedule or plan (e.g., new regulations, emissions budgets, controls) must be incorporated into the SIP and approved by USEPA.

The TCEQ has adopted the NAAQS to regulate air pollutant levels within the state of Texas. The MTR airspace lies entirely in areas of attainment and proposed operations within the MTR airspace are classified as mobile source of emissions. As such, permitting programs that are applicable only to stationary sources will not apply for the proposed MTR airspace operations.

The CAA required the USEPA draft general conformity regulations that are applicable in nonattainment areas, or in designated maintenance areas (i.e., attainment areas that were reclassified from a previous nonattainment status, which are required to prepare a maintenance plan for air quality). These regulations are designed to ensure that federal actions do not impede local efforts to achieve or maintain attainment with the NAAQS. The General Conformity Rule and the promulgated regulations found in 40 CFR Part 93 exempt certain federal actions from conformity determinations (e.g., contaminated site cleanup and natural disaster response activities). Other federal actions are assumed to conform if total indirect and direct project emissions are below de minimis levels presented in 40 CFR § 93.153. The threshold levels (in tons of pollutant per year) depend upon the nonattainment status that USEPA has assigned to a region. Once the net change in nonattainment pollutants is calculated, the federal agency must compare them to the de minimis thresholds.

Table C-12
National Ambient Air Quality Standards

Pollutant	Standard Value[6]		Standard Type
Carbon Monoxide (CO)			
8-hour average	9 ppm	(10 mg/m^3)	Primary
1-hour average	35 ppm	(40 mg/m^3)	Primary
Nitrogen Dioxide (NO_2)			
Annual arithmetic mean	0.053 ppm	(100 µg/m^3)	Primary and Secondary
1-hour average[1]	0.100 ppm	(188 µg/m^3)	Primary
Ozone (O_3)			
8-hour average[2]	0.070 ppm	(137 µg/m^3)	Primary and Secondary
Lead (Pb)			
3-month average[3]		0.15 µg/m^3	Primary and Secondary
Particulate <10 Micrometers (PM_{10})			
24-hour average[4]		150 µg/m^3	Primary and Secondary
Particulate <2.5 Micrometers ($PM_{2.5}$)			
Annual arithmetic mean[4]		12 µg/m^3	Primary
Annual arithmetic mean[4]		15 µg/m^3	Secondary
24-hour average[4]		35 µg/m^3	Primary and Secondary
Sulfur Dioxide (SO_2)			
1-hour average[5]	0.075 ppm	(196 µg/m^3)	Primary
3-hour average[5]	0.5 ppm	(1,300 µg/m^3)	Secondary

Notes:

Source: USEPA, 2016

1 In February 2010, the USEPA established a new 1-hour standard for NO_2 at a level of 0.100 ppm, based on the 3-year average of the 98th percentile of the yearly distribution concentration, to supplement the then-existing annual standard.

2 In October 2015, the USEPA revised the level of the 8-hour standard to 0.070 ppm, based on the annual 4th highest daily maximum concentration, averaged over 3 years; the regulation became effective on 28 December 2015. The previous (2008) standard of 0.075 ppm remains in effect for some areas. A 1-hour standard no longer exists.

3 In November 2008, USEPA revised the primary Pb standard to 0.15 µg/m^3. USEPA revised the averaging time to a rolling 3-month average.

4 In October 2006, USEPA revised the level of the 24-hour $PM_{2.5}$ standard to 35 µg/m^3 and retained the level of the annual $PM_{2.5}$ standard at 15 µg/m^3. In 2012, USEPA split standards for primary & secondary annual $PM_{2.5}$. All are averaged over 3 years, with the 24-hour average determined at the 98th percentile for the 24-hour standard. USEPA retained the 24-hour primary standard and revoked the annual primary standard for PM_{10}.

5 In 2012, the USEPA retained a secondary 3-hour standard, which is not to be exceeded more than once per year. In June 2010, USEPA established a new 1-hour SO_2 standard at a level of 75 parts per billion, based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations.

6 Parenthetical value is an approximately equivalent concentration for NO_2, O_3, and SO_2.

µg/m^3 = microgram(s) per cubic meter; mg/m^3 = milligram(s) per cubic meter; ppm = part(s) per million; USEPA = United States Environmental Protection Agency

Under Title I of the CAA Amendments of 1990, the federal government develops the technical guidance that states need to control stationary sources of pollutants. Title I also allow the USEPA to define boundaries of nonattainment areas. Title V of the CAA Amendments of 1990 requires state and local agencies to implement permitting programs for major stationary sources. A major stationary source is a facility (plant, base, activity, etc.) that has the potential to emit more than 100 tons annually of any one criteria air pollutant in an attainment area.

Federal Prevention of Significant Deterioration (PSD) regulations also define air pollutant emissions from proposed major stationary sources or modifications to be “significant” if a proposed project’s net emission increase meets or exceeds the rate of emissions listed in 40 CFR § 52.21(b)(23)(i); or (1) a proposed project is within 10 miles of any Class I area (wilderness area greater than 5,000 acres [ac] or national park greater than 6,000 ac).

Although Titles I and V of the CAA Amendments of 1990 apply to Laughlin AFB, compliance requirements under the relevant regulations would not apply to the Proposed Action alternatives. This is because all the

emissions from the Proposed Action would occur from mobile sources which are not governed by Titles I and V; therefore, the requirements originating from Titles I and V are not considered. Moreover, these emissions would occur in MTR airspace away from Laughlin AFB.

National parks and wilderness areas are designated as Class I areas, where any appreciable deterioration in air quality is considered significant. Class II areas are those where moderate, well-controlled industrial growth could be permitted. Class III areas allow for greater industrial development.

In VR-1108 and VR-1109 Segments A-B lie over Big Bend National Park, a Class I area. Parts of Segments B-C lie within 6.25 miles (10 Km) of the Class I area. In VR-1117 Segment E-F lies over the Class I area, and a part of Segment D-E lies within 6.25 miles (10 Km) of the Class I area.

C.2.1.2 Greenhouse Gases

Greenhouse gases (GHGs) are gases that trap heat in the atmosphere. These emissions are generated by both natural processes and human activities. The accumulation of GHGs in the atmosphere helps regulate the earth's temperature and are believed to contribute to global climate change. GHGs include water vapor, carbon dioxide (CO_2), methane, nitrous oxide, O_3, and several hydrocarbons and chlorofluorocarbons. Each GHG has an estimated global warming potential (GWP), which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the earth's surface. The GWP of a particular gas provides a relative basis for calculating its carbon dioxide equivalent (CO_2e) or the amount of CO_2e to the emissions of that gas. CO_2 has a GWP of 1 and is, therefore, the standard by which all other GHGs are measured. Potential impacts associated with GHG emissions are discussed in **Section 3.5.7**.

In Texas, the USEPA regulates GHG primarily through a permitting program known as the GHG Tailoring Rule. This rule applies to GHG emissions from stationary sources. As all the emissions from the Proposed Action would occur from mobile sources, this rule would not apply here and is not discussed further.

In addition to the GHG Tailoring Rule in 2009, the USEPA promulgated a rule requiring sources to report their GHG emissions if they emit more than 25,000 metric tons or more of CO_2e per year (40 CFR § 98.2[a][2]). Again, this only applies to stationary sources of emissions and is not discussed further.

C.2.1.3 Climate Change Considerations

A vast amount of scientific research supports the theory that climate change is affecting weather patterns, average sea levels, ocean acidification, and precipitation rates. Likelihood of occurrence of these patterns are predicted to intensify in the future. Like many locations in the United States, climate trends within the western United States could be adversely affected by global climate change, including mass migration and loss or extinction of plant and animal species. There are scientific studies to indicate that the potential effects of climate change could lead to adverse human health. These include an increase in extreme heat events, increased levels of pollutants in the atmosphere and an increase in intensity and number of natural disasters, such as flooding, hurricanes, and drought.

GHG emissions in Texas are steadily showing a decreasing trend between 2011 and 2019, going down from 408.5 to 380.5 Million Metric Tons Carbon Dioxide Equivalent (MMTCO2e). Texas' GHG emissions have decreased due to various factors, including changes in the energy sector, primarily in power plants. For 2019, Texas' net GHG emissions totaled 380.5 MMTCO2e, with power plants accounting for 53.45% of gross emissions (USEPA, 2021c).

To serve as a reference point, projected GHG emissions were compared against State of Texas' net GHG emissions from various sectors, and to the Title V and PSD major source thresholds for CO2e applicable to stationary sources (**Table 3-14**). Based on the relative magnitude of the project's GHG emissions, a general inference can be drawn regarding whether the Proposed Action is meaningful with respect to the discussion regarding climate change.

C.2.2 Air Conformity Applicability Analysis

Section 176(c) (1) of the CAA contains legislation that ensures federal activities conform to relevant SIPs and thus do not hamper local efforts to control air pollution. Conformity to a SIP is defined as conformity to a SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards. As such, a general conformity analysis is required for areas of nonattainment or maintenance where a federal action is proposed.

The action can be shown to conform by demonstrating that the total direct and indirect emissions are below the de minimis levels (Table C-13) and/or showing that the Proposed Action emissions are within the State- or Tribe-approved budget of the facility as part of the SIP or Tribal Implementation Plan (USEPA, 2010).

Direct emissions are those that occur as a direct result of the action. For example, emissions from new equipment that are a permanent component of the completed action (e.g., boilers, heaters, generators, paint booths) are considered direct emissions. Indirect emissions are those that occur at a later time or at a distance from the Proposed Action. For example, increased vehicular/commuter traffic because of the action is considered an indirect emission. Construction emissions must also be considered. For example, the emissions from vehicles and equipment used to clear and grade building sites, build new buildings, and construct new roads must be evaluated. These types of emissions are considered direct emissions.

Each state is required to develop a SIP that sets forth how CAA provisions will be imposed within the state. The SIP is the primary means for the implementation, maintenance, and enforcement of the measures needed to attain and maintain the NAAQS within each state and includes control measures, emissions limitations, and other provisions required to attain and maintain the ambient air quality standards. The purpose of the SIP is twofold. First, it must provide a control strategy that will result in the attainment and maintenance of the NAAQS. Second, it must demonstrate that progress is being made in attaining the standards in each nonattainment area.

The Air Quality Monitoring Program monitors ambient air throughout the state. The purpose is to monitor, assess, and provide information on statewide ambient air quality conditions and trends as specified by the state and federal CAA. The Air Quality Monitoring Program works in conjunction with local air pollution agencies and some industries, measuring air quality throughout the states.

The air quality monitoring network is used to identify areas where the ambient air quality standards are being violated and plans are needed to reduce pollutant concentration levels to be in attainment with the standards. Also included are areas where the ambient standards are being met, but plans are necessary to ensure maintenance of acceptable levels of air quality in the face of anticipated population or industrial growth.

The result of this attainment/maintenance analysis is the development of local and statewide strategies for controlling emissions of criteria air pollutants from stationary and mobile sources. The first step in this process is the annual compilation of the ambient air monitoring results, and the second step is the analysis of the monitoring data for general air quality, exceedances of air quality standards, and pollutant trends.

Table C-13
General Conformity Rule *De Minimis* Emission Thresholds

Pollutant	Attainment Classification	Tons per year
Ozone (VOC and NO_x)	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other areas outside an ozone transport region	100
Ozone (NO_x)	Marginal and moderate nonattainment inside an ozone transport region	100
	Maintenance	100
Ozone (VOC)	Marginal and moderate nonattainment inside an ozone transport region	50
	Maintenance within an ozone transport region	50
	Maintenance outside an ozone transport region	100
Carbon Monoxide, SO_2 and NO_2	All nonattainment and maintenance	100
PM_{10}	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
$PM_{2.5}$ Direct emissions, SO_2, NO_x (unless determined not to be a significant precursor), VOC and ammonia (if determined to be significant precursors)	All nonattainment and maintenance	100
Lead	All nonattainment and maintenance	25

Source: USEPA, 2017

NO_2 = nitrogen dioxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulates equal to or less than 2.5 microns in diameter; PM_{10} = particulates equal to or less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound

C.2.3 Assumptions

The following assumptions were used in the air quality analysis for the Proposed Action:

1. No construction would be associated with the Proposed Action. This includes no demolition, earth moving, hauling, or paving.
2. No installation of new boilers or generators. No generators would be used for the Proposed Action.
3. No new fuel storage tanks would be installed.
4. No new hush house/engine test cell facilities would be installed.
5. No new paint booth facilities would be installed.
6. Aircraft maintenance and trim testing would not be applicable as there are no airfield operations being considered with the Proposed Action
7. For consideration of potential air quality impacts, it is the volume of air extending up to the mixing height (3,000 ft above ground level [AGL]) and coinciding with the spatial distribution of the region of influence that is considered. Pollutants that are released above the mixing height typically would not disperse downward and thus would have little or no effect on ground level concentrations of pollutants. The mixing height is the altitude at which the lower atmosphere undergoes mechanical or turbulent mixing, producing a nearly uniform air mass. The height of the mixing level determines the

volume of air within which pollutants can disperse. Mixing heights at any one location or region can vary by the season and time of day, but for air quality applications an average mixing height of 3,000 ft AGL is an acceptable default value (40 CFR § 93.153[c][2]).

8. Aircraft emissions at or below 3,000 ft AGL do not appreciably differ by altitude. In other words, the emissions rate at 3,000 ft AGL is assumed to be the same as that at 500 ft AGL. Moreover, ACAM does not distinguish between aircraft operations at different altitudes.
9. Air Force training sorties would not increase or decrease as result of this action.
10. Per AFCEC guidance, intermediate power settings consistent with those used for the noise analyses must be used for operations in MTRs (AFCEC, 2021).
11. Time-in-mode (TIM) estimates were calculated using the distance traveled in each segment and the average speed of the aircraft through those segments. TIM are shown in **Table C-14**.

Table C-14 below show the TIM used as input to ACAM for flight operations.

Table C-14
Air Conformity Applicability Model Time-in-Mode Data Inputs

MTR_IDENT	UNIQ_ID	T-1A				T-38C			
		Distance (Miles)	Speed (Miles/hr)	Time in Mode		Distance (Miles)	Speed (Miles/hr)	Time in Mode	
				(hr)	(min)			(hr)	(min)
VR1117	VR1117_A_B	30.15	N/A	N/A	N/A	30.15	N/A	N/A	N/A
VR1117	VR1117_B_C	16.105	N/A	N/A	N/A	16.105	N/A	N/A	N/A
VR1117	VR1117_C_D	22.152	N/A	N/A	N/A	22.152	N/A	N/A	N/A
VR1117	VR1117_D_E	35.657	N/A	N/A	N/A	35.657	N/A	N/A	N/A
VR1117	VR1117_E_F	26.832	N/A	N/A	N/A	26.832	N/A	N/A	N/A
VR1108	VR1108_A_B	26.832	276.2	0.097	5.83	26.832	414.3	0.065	3.89
VR1108	VR1108_B_C	35.657	276.2	0.129	7.75	35.657	414.3	0.086	5.16
VR1108	VR1108_C_D	17.644	276.2	0.064	3.83	17.644	414.3	0.043	2.56
VR1108	VR1108_D_E	35.345	276.2	0.128	7.68	35.345	414.3	0.085	5.12
VR1108	VR1108_E_F	27.832	276.2	0.101	6.05	27.832	414.3	0.067	4.03
VR1109	VR1109_A_B	26.832	276.2	0.097	5.83	26.832	414.3	0.065	3.89
VR1109	VR1109_B_C	35.657	276.2	0.129	7.75	35.657	414.3	0.086	5.16
VR1109	VR1109_C_D	22.152	276.2	0.080	4.81	22.152	414.3	0.053	3.21
VR1109	VR1109_D_E	16.105	276.2	0.058	3.50	16.105	414.3	0.039	2.33
VR1109	VR1109_E_F	30.15	276.2	0.109	6.55	30.15	414.3	0.073	4.37

C.2.4 Significance Indicators and Evaluation Criteria

The Clean Air Act Section 176(c), *General Conformity*, requires federal agencies to demonstrate that their proposed activities would conform to the applicable State Implementation Plan for attainment of the NAAQS. General conformity applies only to nonattainment and maintenance areas. If the emissions from a federal action proposed in a nonattainment area exceed annual *de minimis* thresholds identified in the rule, a formal conformity determination is required of that action. The thresholds are more restrictive as the severity of the nonattainment status of the region increases. The Council on Environmental Quality defines significance in terms of context and intensity in 40 CFR § 1508.27. This requires that the significance of the action be analyzed with respect to the setting of the Proposed Action and based relative to the severity of the impact. The Council on Environmental Quality National Environmental Policy Act regulations (40 CFR § 1508.27[b]) provide 10 key factors to consider in determining an impact's intensity.

Based on guidance in Chapter 4 of the *Air Force Air Quality Environmental Impact Analysis Process (EIAP) Guide*, Volume II - Advanced Assessments, for air quality impact analysis, project criteria pollutant emissions were compared against the insignificance indicator of 250 tons per year for Prevention of Significant Deterioration (PSD) major source permitting threshold for actions occurring in areas that are in attainment for all criteria pollutants (25 tons per year for lead). These "Insignificance Indicators" were used in the analysis to provide an indication of the significance of potential impacts to air quality based on current ambient air quality relative to the NAAQSs. These insignificance indicators do not define a significant impact; however, they do provide a threshold to identify actions that are insignificant. Any action with net emissions below the insignificance indicators for all criteria pollutant is considered so insignificant that the action will not cause or contribute to an exceedance on one or more NAAQSs. Although PSD and Title V are not applicable to mobile sources, the PSD major source thresholds provide a benchmark to compare air emissions against and to determine project impacts.

For proposed action alternatives that would occur in nonattainment/maintenance areas, the net-change emissions estimated for the relevant criteria pollutant(s) are compared against General Conformity *de minimis* values to perform a General Conformity evaluation. If the estimated annual net emissions for each relevant pollutant from the Proposed Action alternative are below the corresponding *de minimis* threshold values, General Conformity Rule requirements would not be applicable.

Emissions from the Proposed Action in the MTRs were assessed in **Section 3.5** and compared to applicable significance indicators. An overview of ACAM inputs and the methodologies used to estimate emissions are summarized in **Sections C.2.2.1** and **C.2.2.2** of this appendix.

C.2.5 References

AFCEC. 2021. *Personal communication*, June 15, 2021.

USEPA. 2010. *40 CFR Parts 51 and 93, Revisions to the General Conformity Regulations*. 75 Federal Register 14283, EPA-HQ-OAR-2006-0669; FRL-9131-7. 24 March.

USEPA. 2016. *NAAQS Table*. <https://www.epa.gov/criteria-air-pollutants/naaqs-table>. 20 December.

USEPA. 2017. *General Conformity: De Minimis Tables*. <https://www.epa.gov/general-conformity/de-minimis-tables>. 04 August.

C.2.6 Detailed Air Conformity Applicability Model Report

1. General Information

- Action Location
Base: LAUGHLIN AFB
State: Texas
County(s): Brewster; Pecos; Terrell; Val Verde
Regulatory Area(s): NOT IN A REGULATORY AREA

- Action Title: Low-Level Route Altitude Modifications in Support of Laughlin Air Force Base, Texas

- Project Number/s (if applicable): N/A

- Projected Action Start Date: 1 / 2022

- Action Purpose and Need:
The purpose of the Proposed Action is to modify existing Military Training Routes (MTRs) to improve safety and vertical maneuverability on readily available and adequately sized visual routes (VR) with appropriate attributes to meet pilot training syllabi requirements. The need for the Proposed Action is to support the mission of the 47 Flying Training Wing (FTW) to maximize T-1A and T-38C low-level flight and terrain-following training under varying conditions to meet training requirements to the maximum extent possible.

- Action Description:
The Air Force is proposing to adjust the altitudes of three existing Military Training Routes (MTRs) managed by the 47 Flying Training Wing (FTW). AETC student pilots at Laughlin AFB are required to complete low-level navigation with both T-1A and T-38C aircraft and currently utilize VR-1108, VR-1109, and VR-1117 to accomplish this training. The Proposed Action would improve vertical maneuverability along these routes by lowering the floors to 500 ft AGL and raising the ceilings up to 2,000 ft AGL where feasible.

No construction, demolition, or other ground-disturbing activities would occur under the Proposed Action. There would be no changes to overall flight operations or patterns out of Laughlin AFB and no changes to flight training hours. Currently, supersonic operations and the use of defensive countermeasures (e.g., chaff and flare) or training ordnance do not occur as part of T-1A and T-38C training within the MTRs and would not be added under the Proposed Action. Any future increases to the overall number or duration of operations within the MTRs would be analyzed in subsequent environmental analyses.

- Point of Contact
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- Activity List:

Activity Type		Activity Title
2.	Aircraft	T-1A: Baseline in VR-1108
3.	Aircraft	T-1A: Baseline in VR-1109
4.	Aircraft	T-38C: Baseline in VR-1108
5.	Aircraft	T-38C: Baseline in VR-1109

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. Aircraft

2.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Brewster; Pecos; Terrell
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: T-1A: Baseline in VR-1108

- Activity Description:
Baseline operations

- Activity Start Date
Start Month: 1
Start Year: 2022

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

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.002127
SO_x	0.001522
NO_x	0.014340
CO	0.001636
PM 10	0.000323

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.000292
Pb	0.000000
NH_3	0.000000
CO_2e	4.6

- Activity Emissions [Flight Operations (includes Trim Test & APU) part]:

Pollutant	Emissions Per Year (TONs)
VOC	0.002127
SO_x	0.001522
NO_x	0.014340
CO	0.001636
PM 10	0.000323

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.000292
Pb	0.000000
NH_3	0.000000
CO_2e	4.6

2.2 Aircraft & Engines

2.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: T-1A
Engine Model: JT15D-5B
Primary Function: Trainer
Aircraft has After burn: No

Number of Engines: 2

- Aircraft & Engine Surrogate
Is Aircraft & Engine a Surrogate? No
Original Aircraft Name:
Original Engine Name:

2.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Emissions Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	235.50	136.97	1.07	1.66	119.20	0.82	0.74	3234
Approach	524.00	13.46	1.07	4.93	38.60	0.73	0.66	3234
Intermediate	1371.00	1.50	1.07	10.08	1.15	0.23	0.21	3234
Military	1630.00	0.00	1.07	11.13	0.00	0.13	0.12	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

2.3 Flight Operations

2.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 1
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 2
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)
Taxi/Idle Out [Idle] (mins): 0
Takeoff [Military] (mins): 0
Takeoff [After Burn] (mins): 0
Climb Out [Intermediate] (mins): 31.13
Approach [Approach] (mins): 0
Taxi/Idle In [Idle] (mins): 0

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test
Idle (mins): 0
Approach (mins): 0
Intermediate (mins): 0
Military (mins): 0
AfterBurn (mins): 0

2.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year
AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * LTO / 2000

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)

TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
LTO: Number of Landing and Take-off Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year

$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year

$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * TGO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year

$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year

$AEPS_{POL} = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000$

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year

$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

2.4 Auxiliary Power Unit (APU)

2.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: No

- Auxiliary Power Unit (APU)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer

2.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e

2.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year
$APU_{POL} = APU * OH * LTO * EF_{POL} / 2000$

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

3. Aircraft

3.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Brewster; Pecos; Terrell; Val Verde
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: T-1A: Baseline in VR-1109

- Activity Description:
Baseline operations

- Activity Start Date
Start Month: 1
Start Year: 2022

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

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.156417
SO_x	0.111950
NO_x	1.054635
CO	0.120320
PM 10	0.023750

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.021448
Pb	0.000000
NH_3	0.000000
CO_2e	338.4

- Activity Emissions [Flight Operations (includes Trim Test & APU) part]:

Pollutant	Emissions Per Year (TONs)
VOC	0.156417
SO_x	0.111950
NO_x	1.054635
CO	0.120320
PM 10	0.023750

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.021448
Pb	0.000000
NH_3	0.000000
CO_2e	338.4

3.2 Aircraft & Engines

3.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: T-1A
Engine Model: JT15D-5B
Primary Function: Trainer
Aircraft has After burn: No
Number of Engines: 2

- Aircraft & Engine Surrogate
Is Aircraft & Engine a Surrogate? No
Original Aircraft Name:
Original Engine Name:

3.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Emissions Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	235.50	136.97	1.07	1.66	119.20	0.82	0.74	3234
Approach	524.00	13.46	1.07	4.93	38.60	0.73	0.66	3234
Intermediate	1371.00	1.50	1.07	10.08	1.15	0.23	0.21	3234
Military	1630.00	0.00	1.07	11.13	0.00	0.13	0.12	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

3.3 Flight Operations

3.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft:	1
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft:	161
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft:	0
Number of Annual Trim Test(s) per Aircraft:	0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi/Idle Out [Idle] (mins):	0
Takeoff [Military] (mins):	0
Takeoff [After Burn] (mins):	0
Climb Out [Intermediate] (mins):	28.44
Approach [Approach] (mins):	0
Taxi/Idle In [Idle] (mins):	0

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test

Idle (mins):	0
Approach (mins):	0
Intermediate (mins):	0
Military (mins):	0
AfterBurn (mins):	0

3.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year

$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * LTO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
LTO: Number of Landing and Take-off Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year

$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year

$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * TGO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)

TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year

$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year

$AEPS_{POL} = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000$

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year

$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

3.4 Auxiliary Power Unit (APU)

3.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: No

- Auxiliary Power Unit (APU)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer

3.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e

3.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year
$APU_{POL} = APU * OH * LTO * EF_{POL} / 2000$

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

4. Aircraft

4.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Brewster; Pecos; Terrell
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: T-38C: Baseline in VR-1108

- Activity Description:
Baseline operations

- Activity Start Date
Start Month: 1
Start Year: 2022

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

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.042713
SO_x	0.060937
NO_x	0.109345
CO	1.764893
PM 10	0.064354

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.002278
Pb	0.000000
NH_3	0.000000
CO_2e	184.2

- Activity Emissions [Flight Operations (includes Trim Test & APU) part]:

Pollutant	Emissions Per Year (TONs)
VOC	0.042713
SO_x	0.060937
NO_x	0.109345
CO	1.764893

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.002278
Pb	0.000000
NH_3	0.000000
CO_2e	184.2

PM 10	0.064354		

4.2 Aircraft & Engines

4.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: T-38C
Engine Model: J85-GE-5R
Primary Function: Trainer
Aircraft has After burn: Yes
Number of Engines: 2

- Aircraft & Engine Surrogate
Is Aircraft & Engine a Surrogate? No
Original Aircraft Name:
Original Engine Name:

4.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Emissions Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	520.00	16.80	1.07	1.08	177.45	4.70	4.02	3234
Approach	854.00	7.84	1.07	0.84	106.29	2.80	1.85	3234
Intermediate	1030.00	2.78	1.07	0.70	65.07	1.79	0.69	3234
Military	2220.00	0.75	1.07	1.92	30.99	1.13	0.04	3234
After Burn	7695.00	6.97	1.07	6.23	53.43	0.25	0.09	3234

4.3 Flight Operations

4.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 1
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 74
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)
Taxi/Idle Out [Idle] (mins): 0
Takeoff [Military] (mins): 20.8
Takeoff [After Burn] (mins): 0
Climb Out [Intermediate] (mins): 0
Approach [Approach] (mins): 0
Taxi/Idle In [Idle] (mins): 0

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test
Idle (mins): 0

Approach (mins): 0
Intermediate (mins): 0
Military (mins): 0
AfterBurn (mins): 0

4.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year
$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * LTO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
LTO: Number of Landing and Take-off Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year
$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year
$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * TGO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year
$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year
$AEPS_{POL} = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000$

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)

60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year

$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

4.4 Auxiliary Power Unit (APU)

4.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: No

- Auxiliary Power Unit (APU)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer

4.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e

4.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year

$APU_{POL} = APU * OH * LTO * EF_{POL} / 2000$

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

5. Aircraft

5.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location

County: Brewster; Pecos; Terrell; Val Verde
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: T-38C: Baseline in VR-1109

- Activity Description:
Baseline operations

- Activity Start Date
Start Month: 1
Start Year: 2022

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

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.113359
SO_x	0.161725
NO_x	0.290198
CO	4.683984
PM 10	0.170794

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.006046
Pb	0.000000
NH_3	0.000000
CO_2e	488.8

- Activity Emissions [Flight Operations (includes Trim Test & APU) part]:

Pollutant	Emissions Per Year (TONs)
VOC	0.113359
SO_x	0.161725
NO_x	0.290198
CO	4.683984
PM 10	0.170794

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.006046
Pb	0.000000
NH_3	0.000000
CO_2e	488.8

5.2 Aircraft & Engines

5.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: T-38C
Engine Model: J85-GE-5R
Primary Function: Trainer
Aircraft has After burn: Yes
Number of Engines: 2

- Aircraft & Engine Surrogate
Is Aircraft & Engine a Surrogate? No
Original Aircraft Name:
Original Engine Name:

5.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Emissions Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_X	NO_X	CO	PM 10	PM 2.5	CO_2e
Idle	520.00	16.80	1.07	1.08	177.45	4.70	4.02	3234
Approach	854.00	7.84	1.07	0.84	106.29	2.80	1.85	3234
Intermediate	1030.00	2.78	1.07	0.70	65.07	1.79	0.69	3234
Military	2220.00	0.75	1.07	1.92	30.99	1.13	0.04	3234
After Burn	7695.00	6.97	1.07	6.23	53.43	0.25	0.09	3234

5.3 Flight Operations

5.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft: 1
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 215
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi/Idle Out [Idle] (mins): 0
Takeoff [Military] (mins): 19
Takeoff [After Burn] (mins): 0
Climb Out [Intermediate] (mins): 0
Approach [Approach] (mins): 0
Taxi/Idle In [Idle] (mins): 0

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test

Idle (mins): 0
Approach (mins): 0
Intermediate (mins): 0
Military (mins): 0
AfterBurn (mins): 0

5.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year

$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * LTO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
LTO: Number of Landing and Take-off Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year

$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year
$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * TGO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year
$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year
$AEPS_{POL} = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000$

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year
$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

5.4 Auxiliary Power Unit (APU)

5.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: No

- Auxiliary Power Unit (APU)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer

5.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e

5.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year

$APU_{POL} = APU * OH * LTO * EF_{POL} / 2000$

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

C.2.7 Summary Air Conformity Applicability Model Report Record of Air Analysis (ROAA) - Baseline

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Manual 32-7002, Environmental Compliance and Pollution Prevention; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:
Base: LAUGHLIN AFB
State: Texas
County(s): Brewster; Pecos; Terrell; Val Verde
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Low-Level Route Altitude Modifications in Support of Laughlin Air Force Base, Texas

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 1 / 2022

e. Action Description:

The Air Force is proposing to adjust the altitudes of three existing Military Training Routes (MTRs) managed by the 47 Flying Training Wing (FTW). AETC student pilots at Laughlin AFB are required to complete low-level navigation with both T-1A and T-38C aircraft and currently utilize VR-1108, VR-1109, and VR-1117 to accomplish this training. The Proposed Action would improve vertical maneuverability along these routes by lowering the floors to 500 ft AGL and raising the ceilings up to 2,000 ft AGL where feasible.

No construction, demolition, or other ground-disturbing activities would occur under the Proposed Action. There would be no changes to overall flight operations or patterns out of Laughlin AFB and no changes to flight training hours. Currently, supersonic operations and the use of defensive countermeasures (e.g., chaff and flare) or training ordnance do not occur as part of T-1A and T-38C training within the MTRs and would not be added under the Proposed Action. Any future increases to the overall number or duration of operations within the MTRs would be analyzed in subsequent environmental analyses.

f. Point of Contact:

Name: Rahul Chettri
Title: Contractor
Organization: Versar, Inc.
Email: rchettri@versar.com
Phone Number: (757) 557-0810

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total net direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the start of the action through achieving "steady state" (i.e., net gain/loss upon action fully implemented) emissions. The ACAM analysis used the latest and most accurate emission estimation techniques available; all algorithms, emission factors, and methodologies used are described in

detail in the USAF Air Emissions Guide for Air Force Stationary Sources, the USAF Air Emissions Guide for Air Force Mobile Sources, and the USAF Air Emissions Guide for Air Force Transitory Sources.

"Insignificance Indicators" were used in the analysis to provide an indication of the significance of potential impacts to air quality based on current ambient air quality relative to the National Ambient Air Quality Standards (NAAQSs). These insignificance indicators are the 250 ton/yr Prevention of Significant Deterioration (PSD) major source threshold for actions occurring in areas that are "Clearly Attainment" (i.e., not within 5% of any NAAQS) and the GCR de minimis values (25 ton/yr for lead and 100 ton/yr for all other criteria pollutants) for actions occurring in areas that are "Near Nonattainment" (i.e., within 5% of any NAAQS). These indicators do not define a significant impact; however, they do provide a threshold to identify actions that are insignificant. Any action with net emissions below the insignificance indicators for all criteria pollutant is considered so insignificant that the action will not cause or contribute to an exceedance on one or more NAAQSs. For further detail on insignificance indicators see chapter 4 of the Air Force Air Quality Environmental Impact Analysis Process (EIAP) Guide, Volume II - Advanced Assessments.

The action's net emissions for every year through achieving steady state were compared against the Insignificance Indicator and are summarized below.

Analysis Summary:

2022

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.315	100	No
NOx	1.469	100	No
CO	6.571	250	No
SOx	0.336	250	No
PM 10	0.259	250	No
PM 2.5	0.030	250	No
Pb	0.000	25	No
NH3	0.000	250	No
CO2e	1015.9		

2023 - (Steady State)

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.315	100	No
NOx	1.469	100	No
CO	6.571	250	No
SOx	0.336	250	No
PM 10	0.259	250	No
PM 2.5	0.030	250	No
Pb	0.000	25	No
NH3	0.000	250	No
CO2e	1015.9		

None of estimated annual net emissions associated with this action are above the insignificance indicators, indicating no significant impact to air quality. Therefore, the action will not cause or contribute to an exceedance on one or more NAAQSs. No further air assessment is needed.

August 2021

Rahul Chettri, Contractor — DATE

C.2.8 Summary Air Conformity Applicability Model Report Record of Air Analysis (ROAA) – Alternative 1

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Manual 32-7002, Environmental Compliance and Pollution Prevention; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:
Base: LAUGHLIN AFB
State: Texas
County(s): Brewster; Pecos; Terrell; Val Verde
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Low-Level Route Altitude Modifications in Support of Laughlin Air Force Base, Texas

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 1 / 2022

e. Action Description:

The Air Force is proposing to adjust the altitudes of three existing Military Training Routes (MTR) managed by the 47 Flying Training Wing (FTW). AETC student pilots at Laughlin AFB are required to complete low-level navigation with both T-1A and T-38C aircraft and currently utilize VR-1108, VR-1109, and VR-1117 to accomplish this training. The Proposed Action would improve vertical maneuverability along these routes by lowering the floors to 500 ft AGL and raising the ceilings up to 2,000 ft AGL where feasible.

No construction, demolition, or other ground-disturbing activities would occur under the Proposed Action. There would be no changes to overall flight operations or patterns out of Laughlin AFB and no changes to flight training hours. Currently, supersonic operations and the use of defensive countermeasures (e.g., chaff and flare) or training ordnance do not occur as part of T-1A and T-38C training within the MTRs and would not be added under the Proposed Action. Any future increases to the overall number or duration of operations within the MTRs would be analyzed in subsequent environmental analyses.

f. Point of Contact:

Name: Rahul Chettri
Title: Contractor
Organization: Versar, Inc.
Email: rchettri@versar.com
Phone Number: (757) 557-0810

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total net direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the start of the action through achieving "steady state" (i.e., net gain/loss upon action fully implemented) emissions. The ACAM analysis used the latest and most accurate emission estimation techniques available; all algorithms, emission factors, and methodologies used are described in

detail in the USAF Air Emissions Guide for Air Force Stationary Sources, the USAF Air Emissions Guide for Air Force Mobile Sources, and the USAF Air Emissions Guide for Air Force Transitory Sources.

"Insignificance Indicators" were used in the analysis to provide an indication of the significance of potential impacts to air quality based on current ambient air quality relative to the National Ambient Air Quality Standards (NAAQSs). These insignificance indicators are the 250 ton/yr Prevention of Significant Deterioration (PSD) major source threshold for actions occurring in areas that are "Clearly Attainment" (i.e., not within 5% of any NAAQS) and the GCR de minimis values (25 ton/yr for lead and 100 ton/yr for all other criteria pollutants) for actions occurring in areas that are "Near Nonattainment" (i.e., within 5% of any NAAQS). These indicators do not define a significant impact; however, they do provide a threshold to identify actions that are insignificant. Any action with net emissions below the insignificance indicators for all criteria pollutant is considered so insignificant that the action will not cause or contribute to an exceedance on one or more NAAQSs. For further detail on insignificance indicators see chapter 4 of the Air Force Air Quality Environmental Impact Analysis Process (EIAP) Guide, Volume II - Advanced Assessments.

The action's net emissions for every year through achieving steady state were compared against the Insignificance Indicator and are summarized below.

Analysis Summary:

2022

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.223	100	No
NOx	1.671	100	No
CO	8.026	250	No
SOx	0.374	250	No
PM 10	0.298	250	No
PM 2.5	0.032	250	No
Pb	0.000	25	No
NH3	0.000	250	No
CO2e	1130.4		

2023 - (Steady State)

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.223	100	No
NOx	1.671	100	No
CO	8.026	250	No
SOx	0.374	250	No
PM 10	0.298	250	No
PM 2.5	0.032	250	No
Pb	0.000	25	No
NH3	0.000	250	No
CO2e	1130.4		

None of estimated annual net emissions associated with this action are above the insignificance indicators, indicating no significant impact to air quality. Therefore, the action will not cause or contribute to an exceedance on one or more NAAQSs. No further air assessment is needed.

August 2021

Rahul Chettri, Contractor — DATE

C.2.9 Summary Air Conformity Applicability Model Report Record of Air Analysis (ROAA) – Alternative 2

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Manual 32-7002, Environmental Compliance and Pollution Prevention; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:
Base: LAUGHLIN AFB
State: Texas
County(s): Brewster; Pecos; Terrell; Val Verde
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Low-Level Route Altitude Modifications in Support of Laughlin Air Force Base, Texas

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 1 / 2022

e. Action Description:

The Air Force is proposing to adjust the altitudes of three existing Military Training Routes (MTR) managed by the 47 Flying Training Wing (FTW). AETC student pilots at Laughlin AFB are required to complete low-level navigation with both T-1A and T-38C aircraft and currently utilize VR-1108, VR-1109, and VR-1117 to accomplish this training. The Proposed Action would improve vertical maneuverability along these routes by lowering the floors to 500 ft AGL and raising the ceilings up to 2,000 ft AGL where feasible.

No construction, demolition, or other ground-disturbing activities would occur under the Proposed Action. There would be no changes to overall flight operations or patterns out of Laughlin AFB and no changes to flight training hours. Currently, supersonic operations and the use of defensive countermeasures (e.g., chaff and flare) or training ordnance do not occur as part of T-1A and T-38C training within the MTRs and would not be added under the Proposed Action. Any future increases to the overall number or duration of operations within the MTRs would be analyzed in subsequent environmental analyses.

f. Point of Contact:
Name: Rahul Chettri
Title: Contractor
Organization: Versar, Inc.
Email: rchettri@versar.com
Phone Number: (757) 557-0810

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total net direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the start of the action through achieving "steady state" (i.e., net gain/loss upon action fully implemented) emissions. The ACAM analysis used the latest and most accurate emission estimation techniques available; all algorithms, emission factors, and methodologies used are described in

detail in the USAF Air Emissions Guide for Air Force Stationary Sources, the USAF Air Emissions Guide for Air Force Mobile Sources, and the USAF Air Emissions Guide for Air Force Transitory Sources.

"Insignificance Indicators" were used in the analysis to provide an indication of the significance of potential impacts to air quality based on current ambient air quality relative to the National Ambient Air Quality Standards (NAAQSs). These insignificance indicators are the 250 ton/yr Prevention of Significant Deterioration (PSD) major source threshold for actions occurring in areas that are "Clearly Attainment" (i.e., not within 5% of any NAAQS) and the GCR de minimis values (25 ton/yr for lead and 100 ton/yr for all other criteria pollutants) for actions occurring in areas that are "Near Nonattainment" (i.e., within 5% of any NAAQS). These indicators do not define a significant impact; however, they do provide a threshold to identify actions that are insignificant. Any action with net emissions below the insignificance indicators for all criteria pollutant is considered so insignificant that the action will not cause or contribute to an exceedance on one or more NAAQSs. For further detail on insignificance indicators see chapter 4 of the Air Force Air Quality Environmental Impact Analysis Process (EIAP) Guide, Volume II - Advanced Assessments.

The action's net emissions for every year through achieving steady state were compared against the Insignificance Indicator and are summarized below.

Analysis Summary:

2022

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.223	100	No
NOx	1.671	100	No
CO	8.026	250	No
SOx	0.374	250	No
PM 10	0.298	250	No
PM 2.5	0.032	250	No
Pb	0.000	25	No
NH3	0.000	250	No
CO2e	1130.4		

2023 - (Steady State)

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.223	100	No
NOx	1.671	100	No
CO	8.026	250	No
SOx	0.374	250	No
PM 10	0.298	250	No
PM 2.5	0.032	250	No
Pb	0.000	25	No
NH3	0.000	250	No
CO2e	1130.4		

None of estimated annual net emissions associated with this action are above the insignificance indicators, indicating no significant impact to air quality. Therefore, the action will not cause or contribute to an exceedance on one or more NAAQSs. No further air assessment is needed.

August 2021

Rahul Chettri, Contractor — DATE

C.3 BIOLOGICAL RESOURCES

C.3.1 Definition of the Resource

Biological resources include native, or naturalized living plant and animal species and the habitats within which they occur. Plant associations are generally referred to as vegetation and animal species are referred to as wildlife. Habitat is defined as the resources and conditions present in an area that produce occupancy of a plant or animal (Hall et al. 1997). Although the existence and preservation of biological resources are intrinsically valuable, these resources also provide aesthetic, recreational, and socioeconomic values to society. This analysis focuses on species or vegetation types that are important to the function of the ecosystem, of special societal importance, or are protected under federal law or statute. For purposes of this EA, these resources are divided into four major categories: vegetation, wetlands, wildlife, and special status species.

Vegetation types include all existing terrestrial plant communities as well as their individual component species that occur or may occur within the project area.

Wetlands are considered sensitive habitats and are subject to federal regulatory authority under section 404 of the Clean Water Act and EO 11990, Protection of Wetlands. Jurisdictional wetlands are defined by the U.S. Army Corps of Engineers as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (Environmental Laboratory 1987). Areas meeting the federal wetland definition are under the jurisdiction of the U.S. Army Corps of Engineers.

Wildlife generally includes all fish, amphibian, reptile, bird, and mammal species with the exception of those identified as special status species, which are treated separately. Wildlife also includes those bird species protected under the federal Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, and other species-specific conservation legal authorities.

Special status species are defined as those plant and animal species listed as endangered, threatened, candidate, or species proposed for listing by US Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA). The federal ESA protects federally listed endangered and threatened plant and animal species, but the protections are not extended to any state listed species unless they also currently hold a federal listing. Federally identified candidate species and species proposed for listing are not protected under law; however, these species could become federally listed over the near-term.

The following is a description of the primary federal statutes that form the regulatory framework for the evaluation of biological resources.

C3.1.1 Endangered Species Act

The Endangered Species Act (ESA) of 1973 (16 United States [US] Code [U.S.C.] § 1531 et seq.) established protection over and conservation of threatened and endangered species and the ecosystems upon which they depend. Sensitive and protected biological resources include plant and animal species listed as threatened, endangered, or special status by the USFWS. Under the ESA (16 U.S.C. § 1536), an “endangered species” is defined as any species in danger of extinction throughout all, or a large portion, of its range. A “threatened species” is defined as any species likely to become an endangered species in the foreseeable future. USFWS maintains a list of species considered to be candidates for possible listing under the ESA. The ESA also allows the designation of geographic areas as critical habitat for threatened or endangered species. Although candidate species receive no statutory protection under the ESA, USFWS has attempted to advise government agencies, industry, and the public that these species are at risk and may warrant protection under the ESA. All species of plants and animals, except pest insects, are eligible for listing as endangered or threatened.

Section 7 of the ESA requires action proponents to consult with USFWS or National Oceanic and Atmospheric Administration (NOAA) to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species or result in the destruction or adverse modification of designated critical habitat. USFWS has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of NOAA are mainly marine wildlife such as whales and anadromous fish such as salmon.

Section 9 of the ESA prohibits the take of federally listed species. “Take” as defined under the ESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” Any federal agency proposing an action which may adversely impact an endangered or threatened species must "consult" with USFWS (on an informal or formal basis, as appropriate) before carrying out that action would place a listed species and/or its critical habitat in jeopardy.

Endangered Species Act. The purpose of the ESA is to conserve the ecosystems upon which threatened and endangered species depend and to recover listed species. Section 7 of the ESA requires action proponents to consult with USFWS or National Oceanic and Atmospheric Administration to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species or result in the destruction or adverse modification of designated critical habitat. The USFWS has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of National Oceanic and Atmospheric Administration are mainly marine wildlife such as whales and anadromous fish such as salmon. Under the ESA, species may be listed as either endangered or threatened. “Endangered” means a species is in danger of extinction throughout all or a significant portion of its range. “Threatened” means a species is likely to become endangered within the foreseeable future. All species of plants and animals, except pest insects, are eligible for listing as endangered or threatened (USFWS 2017).

C.3.1.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (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 MBTA, “take” is defined as to “pursue, hunt, shoot, wound, kill, trap, capture, or collect” (50 Code of Federal Regulations § 10.12). Migratory birds include nearly all species in the United States, with the exception of some upland game birds and nonnative species.

Executive Order 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 MBTA.

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 July 2006, the DoD and USFWS signed the Memorandum of Understanding to promote the conservation of migratory birds. In it, specific activities were identified (e.g., Partners in Flight and Integrated Natural Resources Plans) where cooperation between the two agencies will contribute to the conservation of migratory birds and their habitats. In February 2007, 50 CFR part 21.15 authorized the take incidental to military readiness activities. It states that the Armed Forces may take migratory birds incidental to military readiness activities provided that, for those ongoing or proposed activities that the Armed Forces determine may result in a significant adverse effect on a population of a migratory bird species, the Armed Forces must confer and cooperate with the USFWS to develop and implement appropriate conservation measures to minimize or mitigate such significant adverse effects. Military readiness activities, as defined in PL 107-314, section 315(f) in the 2003 National Defense Authorization Act, includes all training and operations of the 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 (US Department of Interior, 2017) which concluded that the take of migratory birds from an activity is not prohibited by the MBTA when the underlying purpose of that activity is not the take of a migratory bird. USFWS interprets the M-Opinion to mean that the MBTA'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 7 January 2021, the USFWS issued Final Rule (86 Federal Register 1134), effective 8 February 2021 determining that the MBTA's prohibitions on pursuing, hunting, taking, capturing, killing, or attempting to do the same, applies only to actions directed at migratory birds, their nests, or their eggs; however, the USFWS delayed the implementation of the final MBTA rule until 8 March 2021 in conformity with the Congressional Rule Act (86 Federal Register 8715).

C.3.1.3 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BGEPA) of 1940 (16 U.S.C. § 668 to 668c) prohibits the "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle (*Haliaeetus leucocephalus*) or golden eagle (*Aquila chrysaetos*), alive or dead, or any part, nest, or egg thereof." "Take" is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb," and "disturb" is defined as "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, injury to an eagle, a decrease in productivity by substantially interfering with the eagle's normal breeding, feeding or sheltering behavior, or nest abandonment by substantially interfering with the eagle's normal breeding, feeding or sheltering behavior." BGEPA also prohibits activities around an active or inactive nest site that could result in an adverse impact on the eagle.

C.3.2 Threatened and Endangered Species/Critical Habitat

Federally endangered and threatened species are protected under the ESA. In addition, AFPD 32-70, *Environmental Quality*, and AFMAN 32-7003, *Environmental Conservation* (19 Apr 2020), require all Air Force installations to protect species classified as federally or state endangered or threatened. Species that could potentially occur within the MTRs and Designated Critical Habitat were obtained from the USFWS Information for Planning and Consultation website are listing in **Table C.15**. Descriptions for these federally listed mammal and bird species that could potentially be affected by the Proposed Action area provided below.

Table C-15 Federally listed animal and plant species with potential for occurrence within the Low-Level Flight Training Routes (MTRs VR-1108, VR-1109, and VR-1117) at Laughlin Air Force Base, Texas.

Species	Federal Protection Status[1]	State Protection Status[2]	Designated Critical Habitat[1]	Effect Determination
Birds				
Aquila chrysaetos golden eagle	SP[3]	-	None	--
Calidris canutus rufa red knot	T	-	Yes, outside ROI	May affect, not likely to adversely affect.
Charadrius melodus piping plover	T	-	Yes, outside ROI	May affect, not likely to adversely affect.
Coccyzus americanus occidentalis western yellow-billed cuckoo	T	-	Proposed, outside ROI	May affect, not likely to

Table C-15 Federally listed animal and plant species with potential for occurrence within the Low-Level Flight Training Routes (MTRs VR-1108, VR-1109, and VR-1117) at Laughlin Air Force Base, Texas.

Species	Federal Protection Status[1]	State Protection Status[2]	Designated Critical Habitat[1]	Effect Determination
				adversely affect.
Dendroica chrysoparia golden-cheeked warbler	E	-	None	May affect, not likely to adversely affect.
Empidonax traillii extimus southwestern willow flycatcher	E	-	Yes, outside ROI	May affect, not likely to adversely affect.
Falco femoralis septentrionalis northern aplomado falcon	E	-	None	May affect, not likely to adversely affect.
Haliaeetus leucocephalus bald eagle	SP	-	None	--
Strix occidentalis lucida Mexican spotted owl	T	-	Yes, outside ROI	May affect, not likely to adversely affect.
Fish				
Cyprinodon bovinus Leon Springs pupfish	E	E	Yes, outside ROI	No effect
Dionda diaboli Devils River minnow	T	T	Yes, outside ROI	No effect
Gambusia gaigei Big Bend gambusia	E	E	None	No effect
Gambusia nobilis Pecos gambusia	E	E	None	No effect
Hybognathus amarus Rio Grande silvery minnow	EXPN	-	Yes, outside ROI	No effect
Prietella phreatophila Mexican blindcat (catfish)	E		None	No effect
Mammals				
Leptonycteris nivalis Mexican long-nosed bat	E	E	None	No effect
Crustaceans				
Gammarus pecos Pecos amphipod	E	-	Yes, within ROI	No effect
Mollusks				
Assiminea pecos Pecos assiminea snail	E	E	Yes, within ROI	No effect, no effect to CH
Popenaias popeii Texas hornshell	E	E	Proposed, within ROI	No effect, no effect to CH

Table C-15 Federally listed animal and plant species with potential for occurrence within the Low-Level Flight Training Routes (MTRs VR-1108, VR-1109, and VR-1117) at Laughlin Air Force Base, Texas.

Species	Federal Protection Status[1]	State Protection Status[2]	Designated Critical Habitat[1]	Effect Determination
Tryonia cheatumi phantom tryonia	E	E	Yes, within ROI	No effect, no effect to CH
Tryonia circumstriata Gonzales tryonia	E	E	Yes, within ROI	No effect, no effect to CH No effect, no effect to CH
Plants				
Coryphantha ramillosa ssp. *ramillosa* bunched cory cactus	T	T	None	No effect
Cryptantha crassipes Terlingua Creek cat's-eye	E	E	None	No effect
Echinocereus chisosensis var. *chisoensis* Chisos Mountains hedgehog cactus	T	T	None	No effect
Echinocereus davisii Davis' green pitaya	E	E	None	No effect
Escobaria (Coryphantha) minima Nellie's cory cactus	E	E	None	No effect
Festuca ligulata Guadalupe fescue	E	E	Yes, within ROI	No effect, no effect to CH
Helianthus paradoxus Pecos sunflower	T	T	Yes, within ROI	No effect, no effect to CH
Quercus hinckleyi Hinckley's oak	T	T	None	No effect
Sclerocactus brevihamatus ssp. *tobuschii* Tobusch fishhook cactus	T	E	None	No effect
Sclerocactus (Echinomastus) mariposensis Lloyd's mariposa cactus	T	T	None	No effect
Styrax platanifolius ssp. *texanus* Texas snowbells	E	E	None	No effect

Notes:
1. https://ecos.fws.gov/ipac/; ref. 8/5/2021 for selected counties: Brewster, Pecos, Terrell, & Val Verde
   E = Endangered
   T = threatened
   EXPN = Experimental Population, non-essential
2. https://tpwd.texas.gov/gis/rtest/; ref. 8/5/2021 for selected counties: Brewster, Pecos, Terrell, & Val Verde
3. SP = special protection under Bald and Golden Eagle Protection Act
4. https://ecos.fws.gov/ecp/

The following information concerning listed species occurrences within the MTRs is primarily derived from the USFWS Environmental Conservation Online System (ECOS) online database (USFWS 2021) and Texas Parks and Wildlife Department (TPW) Rare, Threatened, and Endangered Species of Texas by County Online Application (TPW 2021). Additional life history documents from other state and federal resources were utilized as cited in the following discussion.

There are 19 animal and 11 plant species listed under the ESA as either threatened or endangered species known to occur, or that may occur within the 4 counties that underlie the MTR as reported by USFWS (USFWS 2021) and TPW (TWP 2021). As indicated in **Table C-15**, federally listed wildlife consists of seven bird and one mammal species, EXPN indicates that the species was a released experimental population but considered endangered everywhere else. No candidate species were identified during the initial data review for this EA. Additionally, the Texas Parks and Wildlife Department protects state-listed plant and animal species through state environmental conservation administrative codes. Again, listed plant, fish, and invertebrate species were excluded from analysis due to the absence of construction or ground disturbance associated with the proposed action. A discussion of the potential for occurrence and preferred habitat for each bird and mammal species follows:

The **red knot** (*Calidris canutus rufa*) is a Federally designated Threatened species which nests in the Artic. This species typically immigrates to southern South America during the winter making one of the longest known migrations in the animal kingdom. The red knot is a specialized molluscivore, eating hard-shelled mollusks, sometimes supplemented with easily accessed softer invertebrate prey, such as shrimp- and crab-like organisms, marine worms, and horseshoe crab. Long-distance migrant shorebirds are highly dependent on the continued existence of quality habitat at a few key staging areas. These areas serve as steppingstones between wintering and breeding areas. Habitats used by red knots in migration and wintering areas are generally coastal marine and estuarine habitats with large areas of exposed intertidal sediments (USFWS 2015). There is no Critical Habitat for this species in Texas.

The **piping plover** (*Charadrius melodus*) is Federally listed as Threatened outside the Great Lakes watershed where it is listed as endangered (USFWS 2017). Wintering plovers primarily feed on invertebrates such as polycheate marine worms, various crustaceans, fly larvae, beetles, and occasionally bivalve mollusks pecking these invertebrates on top of the soil or just beneath the surface. Wintering piping plovers prefer coastal habitat that include sand spits, islets (small islands), tidal flats, shoals (usually flood tidal deltas), and sandbars that are often associated with inlets (Harrington 2008). Sandy mud flats, ephemeral pools, and over-wash areas are also considered primary foraging habitats. Piping plovers migrate through and winter in coastal areas of the U.S. from North Carolina to Texas and in portions of Mexico and the Caribbean. In Texas, Critical Habitat for this migratory species is along the Gulf Coast.

The **western yellow-billed cuckoo** (*Coccyzus americanus*) is Federally listed as Threatened. These cuckoos use wooded habitat with dense cover and water nearby, including woodlands with low, scrubby, vegetation, overgrown orchards, abandoned farmland, and dense thickets along streams and marshes. In the West cuckoos frequently nest in willows along streams and rivers, with nearby cottonwoods serving as foraging sites. Caterpillars are a primary prey item for these birds which take advantage of the annual insect outbreaks, eating cicadas, katydids and crickets, as well as frogs and lizards. In summer and fall, cuckoos forage on small wild fruits, including elderberries, blackberries, and wild grapes. In winter, fruit and seeds become a larger part of their diet (USFWS 2021f). There is Critical Habitat for this species along the Rio Grande River in Brewster County, just outside the MTRs.

The **golden-cheeked warbler** (*Dendroica chrysoparia*) is listed a Federally designated Endangered with a breeding range restricted to Texas (TPW undated; Campbell 2003). This species nests in tall, closed canopy, dense, mature stands of Ashe juniper frequently mixed with deciduous hardwood trees. This type of woodland generally grows in relatively moist areas such as steep-sided canyons, slopes, and adjacent uplands. Generally, trees required for nesting habitat are at least 4.6 meters (15 feet) tall with a trunk diameter of about 15.2 centimeters (6 inches) at 0.6 meters (2 feet) above the ground (Kroll 1980). The essential element is that juniper trees have shredding bark, which happens at the base of the tree around 20 years old and at the crown around 41 years old. Golden-cheeked warblers eat only insects, including caterpillars, spiders, and beetles typically found on foliage (Campbell 2003). In Texas, the birds are thought to take advantage of insect blooms, large insect populations, associated with different plants as the growing season progresses. There has been no Critical Habitat designated for this species.

The **southwestern willow flycatcher** (*Empidonax traillii extimus*) is a Federally designated Endangered species which feeds primarily on flying insects. These flycatchers have specific nesting requirements: dense riparian habitats (cottonwood/willow and tamarisk vegetation) with microclimatic conditions dictated by the local surroundings. Saturated soils, standing water, or nearby streams, pools, or cienegas are a component of nesting habitat that also influences the microclimate and density vegetation component. They

are typically found below 8,500 feet of elevation. The southwestern willow flycatcher is a summer breeder within its range in the United States. Nest territories are set up for breeding, and there is some site fidelity to nest territories. It migrates to wintering areas in Central America by the end of September (USFWS 2021d). There is no designated Critical Habitat for this species in Texas.

The Federally designated Endangered **northern aplomado falcon** (*Falco femoralis septentrionalis*) was considered extirpated from the Unites States in the 1950's. Historically, the northern aplomado falcon habitat was estimated to extend from western New Mexico through southwestern Texas. Currently, USFWS considers the species to be a potential resident along the Texas/Mexico border. Attempts to reintroduce the species back into historic ranges have had only limited success. (USFWS 2021c). Aplomado falcon habitat consists of open terrain with scattered trees or shrubs and relatively low ground cover (USFWS 2014). In 2002, the Peregrine Fund began reintroducing northern aplomado falcons in the Trans-Pecos region of west Texas due to the success of similar programs in coastal southeastern Texas. However, by 2013 no nesting pairs have been observed in the Trans-Pecos region that underlies a good portion MTRs (USFWS 2014). While there have been no specific studies on the responses of aplomado falcons to aircraft overflights, there have been studies on the closely related peregrine and prairie falcons and other raptor species (e.g., Ellis 1991). These studies suggest that breeding birds do flush at times in response to aircraft overflight;however, they return, and the nest success is not affected. There has been no Critical Habitat designated for this species.

The **Mexican spotted owl** (*Strix occidentalis lucida*) is Federally designated as Threatened. Spotted owls are residents of old-growth or mature forests that possess complex structural components (uneven aged stands, high canopy closure, multi-storied levels, high tree density). Canyons with riparian or conifer communities are also important components. Owls are usually found in areas with some type of water source. Even small sources of water such as small pools or puddles create humid conditions. Roosting and nesting habitats exhibit certain identifiable features, including large trees with uneven aged multi-storied tree canopy with over 40 percent closure, and decadence in the form of downed logs and snags (standing dead trees) (USFWS 2013). Owl foraging habitat includes a wide variety of forest conditions, canyon bottoms, cliff faces, tops of canyon rims, and riparian areas. They feed on primarily upon small mammals, particularly mice, voles, and woodrats and will also take birds, bats, reptiles, and arthropods. Juvenile owls disperse into a variety of habitats ranging from high-elevation forests to pinyon-juniper woodlands and riparian areas surrounded by desert grasslands (USFWS 2021b). There is no designated Critical Habitat for this species in Texas.

The **Mexican long-nosed bat** (*Leptonycteris nivalis*) is a Federally designated Endangered mammal species potentially occurring with the counties underlying the MTRs. The Mexican long-nosed bat is found in the mountains of the Trans-Pecos along the Texas/Mexico border. They prefer desert scrub vegetation dotted with agave, mesquite, creosote bush, and a variety of cacti. The bats use caves, crevices, abandoned mines, tunnels, and old buildings as day roosting sites. Reasons for decline include loss of roost areas and their primary food source, blooming agave. (USFWS 2018). The only two known roosting sites are in the US and only one is in Texas: Emory Peak Cave, Chisos Mountains, Big Bend National Park (Campbell 2003; Schmidly 2016). There is no designated Critical Habitat for the Mexican long-nosed bat (USFWS 2021a).

No nesting **bald eagles** (*Haliaeetus leucocephalus*) have been identified within the four-county area underlying the project area (TAMU 2007). Bald eagles are found in the affected environment, primarily during the winter when they are known to nest between October and July. Bald eagles are primarily found near water sources as they feed primarily on fish, but also eat a variety of waterfowl, small mammals, and turtles (Campbell 2003). **Golden eagles** (*Aquila chrysaetos*) are resident in Texas (breeding pairs have been observed in the Davis Mountains area), and breed from early February to November (TAMU 2007a). This eagle species is found primarily in mountainous and canyon habitats.

Proposed Critical Habitat within or near the proposed project area was identified for only one species: the **Texas hornshell** (*Popenaias popeii*), Federally designated Endangered (Figure D.8.1).

C.3.3 Regional Biological Setting

The Region of Interest includes the areas underlying utilize VR-1108, VR-1109, and VR-1117, which are located primarily in the trans-Pecos and Edwards Plateau ecoregions of Texas (Gould et al. 1960),

supporting both the Southwest Plateau and Plains Dry Steppe and Shrub and the Chihuahuan Semi-Desert Provinces (Ecoregions 315 & 321, respectively) in west Texas (McNab and Avers 1994).

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C.4 SAFETY

C.4.1 Introduction

Safety concerns associated with MTR flight activities are considered in this section and address issues related to the health and well-being of both military personnel operating in and civilians living under or near VRs 1108, 1109, and 1117. These concerns are with regard to flight safety hazards associated with aircraft mishaps, bird/wildlife-aircraft strike hazards (BASH), munitions, and obstructions to flight.

Proposed Action planes would follow United States Air Force (Air Force) safety procedures and aircraft specific emergency procedures based on the aircraft design which are produced by the original equipment manufacturer of the aircraft. Basic airmanship procedures also exist for handling any deviations to Air Traffic Control procedures due to an in-flight emergency; these procedures are defined in Air Force Instruction 11-202 (Volume 3), *General Flight Rules*, and established aircraft flight manuals. The Flight Crew Information File is a safety resource for aircrew day-to-day operations which is composed of air and ground operation rules and procedures.

Flight safety concerns are organized by aircraft mishaps, BASH, munitions safety, and obstructions to flight. The ROI includes MTRs VR-1108, VR-1109, VR-1117, and areas under or near these airspaces.

Aircraft Mishaps. Aircraft mishaps and their prevention represent a prime concern of the Air Force and the 47th Flying Training Wing. A mishap is defined by the Air Force in AFI 91-204 (Air Force, 2019). “A mishap is an unplanned occurrence or series of occurrences, that result in damage or injury and meets Class A, B, C, D, and Class E event reporting criteria.” (AFI 91-204, *Safety Investigation and Hazard Reporting*). Class A mishaps are the most severe with total property damage of $2 million or more or a fatality and/or permanent total disability.

Bird/Wildlife Aircraft Strike Hazard (BASH). BASH presents a safety concern for aircraft operations because of the potential for damage to aircraft or injury to aircrews or local populations if a crash should occur. Aircraft can encounter birds at nearly all altitudes up to 30,000 ft MSL; however, most birds fly close to the ground. According to the Air Force Safety Center, BASH statistics, about 52 percent of strikes occur from birds flying below 400 ft, and 88 percent occur at less than 2,000 ft AGL (AFSC, *USAF Wildlife Strikes by Altitude (AGL) FY 1995-2016*).

Munitions Safety. Aircraft munitions include ammunition, propellants (solid and liquid), pyrotechnics, warheads, explosive devices, and chemical agent substances and associated components that present real or potential hazards to life, property, or the environment. Defense Explosives Safety Regulation (DESR) 6055.09_Air Force Manual (AFMAN) 91-201, *Explosives Safety Standards*, defines the guidance and procedures dealing with munition storage and handling. T-38 and T-1 aircraft are not loaded with high-explosive ordnance. Explosive safety concerns for these aircraft only include Cartridge Actuated Devices (CADs) and Propellant Actuated Devices (PADs) associated with egress and life-support systems.

Obstructions to Flight. A flight obstruction is any obstruction in navigable airspace that apply to existing and proposed man-made objects, objects of natural growth, and terrain. Enroute VFR flight operations begin and end outside the airport traffic pattern airspace area or Class B, C, and D airspace areas. FAA provides considerations/guidance for evaluating obstructions to enroute VFR flight operations (FAA, *Procedures for Handling Airspace Matters, Section 3. Identifying/Evaluating Aeronautical Effect*).

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APPENDIX E
GLOSSARY OF TERMS

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Above ground level (AGL): Altitude expressed in feet (ft) measured above the surface of the ground. Altitudes are referred to as mean sea level (MSL) when flying above water; while flying over land, both MSL and AGL are used to delineate airspace structure.

Alert Area: Airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft. Alert Areas are depicted on aeronautical charts for the information of nonparticipating pilots. All activities within an Alert Area are conducted in accordance with Federal Aviation Regulations, and pilots of participating aircraft as well as pilots transiting the area are equally responsible for collision avoidance.

Instrument Route (IR): Routes used by the Department of Defense and associated Reserve and Air Guard units for the purpose of conducting low-altitude navigation and tactical training in both Instrument Flight Rules and Visual Flight Rules weather conditions below 10,000 ft MSL at airspeeds in excess of 250 knots (kn) indicated airspeed (IAS).

Mean sea level (MSL): Altitude expressed in feet measured above average (mean) sea level. MSL is most commonly used when operating at or below 18,000 ft where clearance from terrain is less a concern for aircraft operation. Altitudes are referred to as MSL when flying above water; while flying over land, both MSL and AGL are used to delineate airspace structure.

Military Operations Area (MOA): Designated airspace outside of Class A airspace to separate or segregate certain nonhazardous military activities from Instrument Flight Rules traffic. Activities in MOAs include, but are not limited to, air combat maneuvers, air intercepts, and low-altitude tactics. The defined vertical and lateral limits vary for each MOA. While MOAs generally extend from 1,200 ft AGL to 18,000 ft MSL, the floor may extend below 1,200 ft AGL if there is a mission requirement and there is minimal adverse aeronautical effect.

Military Training Route (MTR): Airspace of defined vertical and lateral dimensions established for the conduct of military flight training at airspeeds in excess of 250 kn IAS.

Sortie: A single military aircraft flight from initial takeoff through final landing.

Specialized Undergraduate Pilot Training (SUPT): A year-long program of classroom instruction, simulator training, and flying to learn the basic flight skills common to all military pilots.

Special Use Airspace (SUA): Airspace of defined dimensions identified by an area on the surface of the earth wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities; e.g., where military activities are separated from civilian flights. Examples of special use airspace may include, but are not limited to, Alert Areas, or MOAs, and Restricted Areas.

Visual Route (VR): Routes used by the Department of Defense and associated Reserve and Air Guard units for the purpose of conducting low-altitude navigation and tactical training under Visual Flight Rules below 10,000 ft MSL at airspeeds in excess of 250 kn IAS.

Waypoint: A specified geographical location used to define the flight path of an aircraft.

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