DRAFT

SEPTEMBER 2025

Environmental Assessment for Laughlin Air Force Base Low Military Operations Area Special Use Airspace

Prepared for:
The Department of the Air Force

Privacy Advisory

This Draft Environmental Assessment (EA) has been provided for public comment in accordance with the National Environmental Policy Act (NEPA), which provides an opportunity for public input on United States Department of the Air Force (DAF) decision-making, allows the public to offer input on alternative ways for DAF to accomplish what it is proposing, and solicits comments on DAF's analysis of environmental effects.

Public input allows DAF to make better-informed decisions. Letters or other written or verbal comments provided may be published in this EA. Providing personal information is voluntary. Private addresses will be compiled to develop a stakeholders inventory. However, only the names of the individuals making comments and specific comments will be disclosed. Personal information, home addresses, telephone numbers, and e-mail addresses will not be published in this EA.

Section 508 of the Rehabilitation Act of 1973

The digital version of this EA complies with Section 508 of the Rehabilitation Act of 1973 because assistive technology (e.g., "screen readers") can be used to help the disabled to understand these electronic media. Accessibility may be limited to a descriptive title for each item because of the nature of graphics, figures, tables, and images in the document.

Page Limit Certification

AFCEC CIE certifies that DAF has considered the factors mandated by NEPA; that the Draft EA represents DoD's good-faith effort to prioritize documentation of the most important considerations required by the statute within the congressionally mandated page limits; that this prioritization reflects DAF's expert judgment; and that any considerations addressed briefly or left unaddressed were, in DAF's judgment, comparatively unimportant or frivolous.

COVER PAGE

ENVIRONMENTAL ASSESSMENT FOR LAUGHLIN AIR FORCE BASE LOW MILITARY OPERATIONS AREA SPECIAL USE AIRSPACE

a. **Responsible Agency:** Department of the Air Force (DAF)

b. **Cooperating Agency:** Federal Aviation Administration (FAA)

c. **Proposals and Actions:** The environmental assessment (EA) analyzes the Proposed Action and Alternatives (Proposed Action) to obtain a new permanent low-altitude airspace for the 47th Flying Training Wing (47 FTW) at Laughlin Air Force Base (AFB), Texas to support Fighter Bomber Fundamentals pilot training syllabus requirements. The proposed airspace would be managed and scheduled by the 47 FTW.

d. **For Additional Information:** Laughlin AFB Public Affairs at 47FTWPA.TASKER@us.af.mil

e. **Designation:** Draft EA

f. **Abstract:** This EA has been prepared pursuant to provisions of the National Environmental Policy Act, as amended by Public Law 30 118-5, Fiscal Responsibility Act of 2023 (42 United States Code 4321 et seq. and the Department of Defense National Environmental Policy Act Implementing Procedures (June 30, 2025). The requirements of other federal, state, and local regulations are also addressed in this EA, as applicable.

The purpose of the DAF Proposed Action is to obtain new airspace that affords the 47 FTW autonomous scheduling and ensures nearby access to airspace necessary to perform low-altitude, nonhazardous flight training from 500 feet above ground level (AGL) up to, but not including 7,000 feet mean sea level (MSL), and allows for continuous flight training to Flight Level 180 or scheduled independently (500 feet AGL up to, but not including 7,000 feet MSL), as needed, to support new multidirectional tactical flying training requirements. The Proposed Action is needed because pilots do not have regular, prioritized (scheduling / management of airspace) access to multidirectional, low-altitude training down to 500 feet AGL (low altitude/ configuration), with ceilings of up to, but not including 7,000 feet AGL (size), within 10 minutes transit time of Laughlin AFB (minimize transit time). The FAA's purpose and need for the Proposed Action is to provide the Special Use Airspace to support the anticipated increased need for military pilot training while minimizing the impacts to the National Airspace System.

The proposed low-altitude airspace would need to have a floor of 500 feet AGL and a ceiling of up to, but not including 7,000 feet MSL. Training within the proposed airspace would primarily consist of low-altitude air-to-ground training, which would simulate attacks by training aircraft against simulated ground-based targets. Up to 1,570 aircraft operations would occur in the proposed airspace annually. Aircraft operations in the proposed airspace would primarily be performed by pilots from the 47 FTW initially flying the T-38C *Talon* and transitioning to the T-7A *Red Hawk* beginning in 2030 as evaluated in the 2024 *Final Environmental Impact Statement and Record of Decision for T-7A Recapitalization at Laughlin Air Force Base, Texas*. Fighter Bomber Fundamentals aircraft operations would be performed Monday through Friday, sunrise to sunset (adjusted seasonally as needed), with other times announced via Notice to Airmen. No nighttime aircraft operations would be proposed in the new airspace.

The Proposed Action would not involve changes to the lateral boundaries of existing Military Operations Areas managed by Laughlin AFB. No demolition, construction, or other ground-disturbing activities would occur. None of the proposed training activities would involve releases of live or inert ammunition or ordnance (including defensive countermeasures such as chaff and flares). No supersonic aircraft operations would occur in the proposed airspace. The Proposed Action would not require changes to the number of personnel or to the number or types of aircraft assigned to Laughlin AFB, or changes to the existing boundaries of that or any other DoD or DAF installation.

The EA analyzes one alternative for implementing the Proposed Action (Alternative 1). Based on the analysis of the affected environment and potential environmental consequences in the Draft EA, Alternative 1 would have no significant adverse impacts on environmental resources in the region of influence.

This page intentionally left blank.

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
47 FTW	47th Flying Training Wing
47 OG	47th Operations Group
ACAM	Air Conformity Applicability Model
AETC	Air Education and Training Command
AFB	Air Force Base
AGL	above ground level
APE	Area of Potential Effects
AQCR	Air Quality Control Regions
ATC	air traffic control
ATCAA	Air Traffic Control Assigned Airspace
BASH	bird aircraft strike hazard
CAA	Clean Air Act
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO_2 equivalent
DAF	Department of the Air Force
DAFMAN	Department of the Air Force Manual
dB	decibel
dBA	A-weighted decibel
DNL	Day-Night Average Sound Level
E.O.	Executive order
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FBF	Fighter Bomber Fundamentals
FICAN	Federal Interagency Committee on Aviation Noise
FL	flight level
FLIP	Flight Publication
GHG	greenhouse gases
GPT	Graduate Pilot Training
IFR	Instrument Flight Rules
IR	Instrument Route
L_{dn}	Day-Night Average Sound Level
L_{dnmr}	Onset-Rate Adjusted Monthly Day-Night Average Sound Level
L_{eq}	equivalent sound level

L_{max}	maximum sound level
MBTA	Migratory Bird Treaty Act
MOA	Military Operations Area
MSL	mean sea level
mton/yr	metric tons per year
MTR	Military Training Route
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAS	National Airspace System
NEPA	National Environmental Policy Act
NM	nautical mile
NO_2	nitrogen dioxide
NOTAM	Notice to Airmen
NOx	nitrogen oxides
NRHP	National Register of Historic Places
Pb	lead
PM_{10}	particulates equal to or less than 10 microns in diameter
$PM_{2.5}$	particulates equal to or less than 2.5 microns in diameter
PSD	Prevention of Significant Deterioration
ROI	region of influence
RTHL	Recorded Texas Historic Landmarks
SEL	sound exposure level
SHPO	State Historical Preservation Officer
SR	Slow Route
SUA	Special Use Airspace
TPWD	Texas Parks and Wildlife Department
tpy	tons per year
U.S.C.	U.S. Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VFR	Visual Flight Rules
VR	Visual Route
WMA	wildlife management area

1 Purpose and Need

1.1 Introduction

The Department of the Air Force (DAF) has prepared this Environmental Assessment (EA) to evaluate the potential environmental consequences from the Proposed Action and Alternatives (Proposed Action) to obtain new permanent low-altitude airspace for the 47th Flying Training Wing (47 FTW) at Laughlin Air Force Base (AFB), Texas to support Fighter Bomber Fundamentals (FBF) pilot training syllabus requirements. The proposed airspace would also be available for use by other DAF and DoD flying units as scheduling and operational requirements allow. The proposed airspace would be managed and scheduled by the 47 FTW.

The Federal Aviation Administration (FAA) is the primary federal agency responsible for establishing and managing navigable airspace above the United States. Therefore, the FAA is participating as a cooperating agency during the preparation of this EA in accordance with the Memorandum of Understanding between the DoD and the FAA for environmental review of Special Use Airspace (SUA) actions under FAA Order JO 7400.2[1], Procedures for Handling Airspace Matters (FAA, 2025a).

This EA has been prepared in accordance with the National Environmental Policy Act (NEPA), as amended by Public Law 30 118-5, Fiscal Responsibility Act of 2023 (42 United States Code [U.S.C.] 4321 et seq.) and the Department of Defense National Environmental Policy Act Implementing Procedures (June 30, 2025). The requirements of other federal, state, and local regulations are also addressed in this EA, as applicable.

1.2 Background

1.2.1 Airspace Overview

Four types of airspace are defined by the FAA: Controlled, Uncontrolled, Special Use, and Other (FAA, 2023a). These types of airspace are defined based on the complexity or density of aircraft movements, nature of the operations conducted within the airspace, the level of safety required, and national and public interest. Airspace is defined with fixed horizontal and vertical boundaries to delineate where aircraft are allowed to operate.

SUA is airspace in which certain activities must be confined, or where limitations may be imposed on the operations of other aircraft that are not involved in those activities. Military Operations Areas (MOAs) are a type of SUA where nonhazardous military flight activities are conducted. Such activities include, but are not limited to, air combat maneuvers, air intercepts, and low-altitude tactics (DAF, 2022). MOAs are SUA established outside of Class A airspace (airspace typically below 18,000 feet mean sea level [MSL]) to separate or segregate certain nonhazardous military flight activities from aircraft operating under Instrument Flight Rules (IFR) and to identify where these activities are conducted for aircraft operating under Visual Flight Rules (VFR).

Air Traffic Control Assigned Airspace (ATCAA) is airspace of defined vertical and lateral limits, assigned by Air Traffic Control (ATC) operators, for the purpose of providing air traffic

[1] The most recent versions of FAA guidance and policy documents are referenced throughout this EA, as applicable.

segregation between the specified activities being conducted within the assigned airspace and other IFR air traffic. Typically, ATCAA is airspace which starts at flight level (FL)[2] 180 or 18,000 feet above MSL and, in some cases, is contoured to the dimensions of the MOAs beneath them.

1.2.2 Laughlin AFB and 47 FTW

Laughlin AFB covers approximately 4,355 acres near the city of Del Rio in Val Verde County, Texas along the U.S./Mexico international border. The installation is home to the 47 FTW/47th Operations Group (47 OG) of Air Education and Training Command (AETC's) 19th Air Force. Laughlin AFB operates three MOAs (Laughlin 1, Laughlin 2, and Laughlin 3) **(Figure 1.2-1)**. Additionally, Laughlin AFB operates six Military Training Routes (MTRs) (Instrument Route [IR] 169 and IR-170 and Visual Route [VR] 165, VR-187, VR-196, and VR-197), and six Slow Routes (SRs) (SR-276, SR-277, SR-281, SR-282, SR-283, and SR-284). Collectively, airspace managed and operated by Laughlin AFB is referred to as the Laughlin Airspace Complex.

The 47 FTW provides Specialized Undergraduate Pilot Training using the T-6A *Texan II* (T-6A) and Graduate Pilot Training (GPT) using the T-38C *Talon* (T-38C) and the T-1A *Jayhawk* (T-1A) (Laughlin AFB, 2024). T-1A operations ended at Laughlin AFB in January 2025 but are considered part of existing conditions because their operations are included in data used to support development of this EA. The T-38C is a high-speed, highly maneuverable fighter-like jet trainer with avionics designed to simulate the tactical weapons delivery systems of actual fighter aircraft virtually without dropping live ordnance. The 47 FTW supports GPT which focuses on training newly qualified pilots in high-performance aircraft operations. The 47 FTW has been tasked by AETC to implement the FBF program, which combines GPT and Introduction to Fighter Fundamentals to instruct the combat-oriented maneuvers of fighter aircraft.

The FBF program is expected to start in 2026. The Proposed Action is necessary for the success of the future FBF program and has a direct impact on the quality and quantity of future pilot training. The mission of the 47 FTW is a top priority for the Air Force in streamlining both pilot production programs and the manning needed to support increased production. The 47 FTW will extend beyond its current mission of training basic high-performance aircraft flight to also include training Airmen in the basics they will use in subsequent fighter training and future combat.

The requirement to obtain new low-altitude airspace within proximity to Laughlin AFB would provide all the necessary training requirements to support the FBF training syllabus. The Proposed Action evaluated in this EA is not associated with any basing action or requirement to support the DAF's newest flying trainer, the Boeing/Saab T-7A *Red Hawk* (T-7A). Potential effects from the proposed recapitalization (basing and operation) of the T-7A at Laughlin AFB were evaluated in the 2024 *Final Environmental Impact Statement and Record of Decision for T-7A Recapitalization at Laughlin Air Force Base, Texas* (2024 T-7A Recapitalization Final EIS and ROD) (DAF, 2024a). The 47 FTW would continue to fly the T-38C in the FBF program until the transition to the T-7A is complete in 2033.

[2] Fight level (FL) is an aircraft's altitude at standard air pressure, expressed in increments of 100 feet (e.g., FL180 = 18,000 feet). The air pressure is computed using an international standard atmosphere pressure at sea level and therefore, is not necessarily the same as the aircraft's actual altitude, either above sea level or above ground level.

Figure 1.2-1 Locations of Laughlin AFB and Laughlin 1, 2, and 3 MOAs

Multidirectional tactical flight training requirements at altitudes at or above 500 feet above ground level (AGL) are a key component of the FBF program. Currently, aircraft operations in MOAs scheduled and managed by Laughlin AFB are not permitted below 7,000 feet MSL **(Section 1.2.3)**. No existing low-altitude MOAs are currently within 100 miles of Laughlin AFB.

The 47 FTW serves as the designated scheduling agency for the Laughlin Airspace Complex. As the scheduling authority, the 47 FTW controls scheduling access to the SUA creating essential flexibility to support pilot training needs on a nearly uninterrupted basis. In addition, the FAA has delegated ATC authority to the DAF for the airspace which resides within and under the Laughlin Airspace Complex. Laughlin AFB ATC personnel, assigned to the 47 FTW, provide National Airspace System (NAS) ATC services to commercial, general aviation, and military users operating within the confines of the Laughlin AFB-delegated airspace. The combination of FAA-delegated ATC authority coupled with autonomous SUA scheduling affords 47 FTW ATC personnel real-time situational awareness to all airspace activities enabling the application of highly efficient ATC services in support of all NAS users operating within the Laughlin AFB-delegated airspace footprint.

The 47 FTW trains Airmen in the basics they will use in subsequent training and potential future combat. The efficient use of available airspace, including location and proximity to Laughlin AFB, has a direct impact on the quality and quantity of training that the 47 FTW provides to future pilots and weapon systems officers.

1.2.3 Laughlin 2 MOA

The Laughlin 2 MOA is approximately 18 miles east of Laughlin AFB and encompasses approximately 3,100 square miles of airspace **(Figure 1.2-1)**. The MOA extends from 7,000 to 17,999 feet MSL. The Laughlin 2 MOA is overlain by ATCAA which extends from FL180 to FL220. Flight training operations currently occur throughout the Laughlin 2 MOA and overlying ATCAA but are not permitted below 7,000 feet MSL. The 47 OG and FAA Houston Air Route Traffic Control Center (Houston Center) observe deconfliction procedures established in a Letter of Agreement regarding approach control service for all airports within the airspace delegated to Laughlin AFB.

Aircraft currently operating in the Laughlin 2 MOA consists of the T-38C **(Section 1.2.2)** and the T-6A, a single-engine, two-seat turboprop-powered airplane used to train military pilots in basic flying skills (DAF, 2024b). The T-1A, a medium-range, twin-engine jet trainer used in GPT for students selected to fly airlift or tanker aircraft, also operated in the Laughlin 2 MOA until January 2025 (DAF, 2024c). Operational data for this aircraft are considered as part of existing conditions presented in this EA.

In the 12-month period that ended in September 2024, pilots from Laughlin AFB performed more than 17,000 operations in the Laughlin 2 MOA **(Table 1.2-1)**. Most annual aircraft operations are performed by the T-6A. T-38C operations represent approximately 5 percent of operations within the MOA. Laughlin 2 MOA aircraft operations are not performed during nighttime hours (10:00 p.m. to 7:00 a.m. local time) (DAF, 2024d).

Table 1.2-1 Existing Annual Aircraft Operations in the Laughlin 2 MOA

Aircraft Type	Daytime Aircraft Operations [1,2] (7:00 a.m. – 10:00 p.m.)	Nighttime Aircraft Operations [1, 2] (10:00 p.m. – 7:00 a.m.)
T-1A[3]	200	0
T-6A	16,200	0
T-38C	880	0
Total	**17,280**	**0**

Notes:

[1] An operation is defined as a single aircraft taking off from Laughlin AFB, completing its training objective within the MOA, and landing at Laughlin AFB.

[2] The number of operations listed here includes those performed in the ATCAA overlying the Laughlin MOA.

[3] T-1A operations at Laughlin AFB ended in January 2025 but are considered as part of existing conditions because their operations are included in data collected to support development of this EA.

Source: DAF. 2024d

1.3 Purpose of and Need for the Proposed Action

The purpose of the DAF Proposed Action is to obtain new airspace that affords the 47 FTW autonomous scheduling and ensures nearby access to airspace necessary to perform low-altitude, nonhazardous flight training from 500 feet AGL up to, but not including 7,000 feet MSL, and allows for continuous flight training to FL180 or scheduled independently (500 feet AGL up to, but not including 7,000 feet MSL), as needed, to support new multidirectional tactical flying training requirements.

The Proposed Action is needed because pilots do not have regular, prioritized (scheduling / management of airspace) access to multidirectional, low-altitude training down to 500 feet AGL (low altitude / configuration), with ceilings of up to, but not including 7,000 feet AGL (size), within 10 minutes transit time of Laughlin AFB (minimize transit time).

The FAA's purpose and need for the Proposed Action is to establish the SUA to support the anticipated increased need for military pilot training while minimizing the impacts to the NAS.

1.4 Decision to Be Made

This EA evaluates potential environmental consequences associated with obtaining new permanent low-altitude MOA to support FBF training at Laughlin AFB. Based on the analysis in this EA, the DAF will make one of three decisions regarding the Proposed Action: 1) determine the potential environmental consequences associated with the Proposed Action or alternatives are not significant and issue a signed Finding of No Significant Impact; 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 at this time.

As required by NEPA, 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.

1.5 Public and Interagency and Intergovernmental Coordination and Consultation

Scoping is an early and open process for developing the range of issues to be addressed in an EA and for identifying significant concerns related to an action. Public and agency review of the Draft EA is described in **Appendix A**. Compliance with NEPA requires coordination and consultation with federal, state, and local agencies and Native American tribes to address regulatory requirements established under the National Historic Preservation Act (36 Code of Federal Regulations [CFR] Part 800), DoD Instruction 4710.02, *DoD Interactions with Federally Recognized Tribes*, DAF Instruction 90-2002, *Interactions with Federally Recognized Tribes*, and Section 7 of the Endangered Species Act (ESA) (16 U.S.C. § 1531 et seq.). Other laws and regulations that are applicable to the Proposed Action are described in **Appendix F**.

1.5.1 Cooperating Agency

The FAA is participating as a cooperating agency during this EA because it is the federal agency responsible for managing navigable airspace in the United States for public safety. The FAA also ensures the efficient use of airspace for commercial air traffic, general aviation, and national defense, including SUA utilized by the DoD. The FAA processes requests for the establishment or modification of airspace in accordance with procedures defined in FAA Order JO 7400.2. The FAA may or may not adopt this EA, in whole or in part, to comply with its NEPA procedures defined in FAA Order 1050.1, *Environmental Impacts: Policies and Procedures* and Chapter 32 of FAA Order JO 7400.2, prior to making a decision to chart any proposed airspace addressed in this EA. If approved, the proposed airspace would be published in the current issue of FAA Order JO 7400.10, *Special Use Airspace* and charted on aeronautical publications, at which time it would be available for use as defined in this EA. The airspace associated with the Proposed Action would lie within the jurisdiction of FAA Houston Center. Additional information on the role of the FAA is included in **Appendix A.2.1**.

On June 30, 2025, the FAA published FAA Order 1050.1G, *FAA National Environmental Policy Act Implementing Procedures*. Those procedures were immediately effective. However, because the preparation of this Draft EA was substantially complete prior to the Order's publication, the FAA has relied on FAA Order 1050.1F, the version of the agency-wide Order that was in effect at the time the EA's analytical work was completed. This EA deviates from the environmental analysis requirements outlined in FAA Order 1050.1F where an executive order or decisions of the U.S. Supreme Court requires it. This includes elimination of analysis as described in FAA Order 1050.1F pertaining to environmental justice, climate change, and cumulative impacts.

1.6 Scope of the Environmental Analysis

This EA analyzes the potential environmental consequences from the DAF's Proposed Action to obtain low-altitude airspace to support FBF training requirements at Laughlin AFB. The EA focuses on resources that would be measurably or meaningfully affected by the Proposed Action and Alternatives. Detailed discussions of these resources and the potential impacts are provided in **Chapter 3**. Cumulative impacts are also described for each resource, as applicable, in **Appendix C**. Resources dismissed from detailed analysis because the Proposed Action would have no potential to affect them are described in **Appendix B.2.4**.

2 Description of the Proposed Action and Alternatives

2.1 Proposed Action

Under the Proposed Action, the DAF would obtain new low-altitude airspace to support low-altitude pilot training requirements of the FBF syllabus. The proposed low-altitude airspace would need to have a floor of 500 feet AGL and a ceiling of up to, but not including 7,000 feet MSL. Training within the proposed airspace would primarily consist of low-altitude air-to-ground training, which would simulate attacks by training aircraft against simulated ground-based targets. This type of training would occur between 500 feet AGL and 3,000 feet MSL.

Up to 1,570 aircraft operations would occur in the proposed airspace annually (which would equate to an average of 4.3 sorties per day) distributed across approximately 976 square miles of airspace. Average sortie time in the proposed airspace would be 20 minutes. Aircraft operations in the proposed airspace would primarily be performed by pilots from the 47 FTW at Laughlin AFB initially flying T-38Cs, transitioning to the T-7A beginning in 2030 (DAF, 2024a). FBF aircraft operations would be performed Monday through Friday, sunrise to sunset (adjusted seasonally as needed), with other times announced via Notices to Airmen (NOTAM). No nighttime aircraft operations would be proposed in the new airspace.

2.2 Alternatives Development

2.2.1 Selection Standards and Alternatives Screening

NEPA requires federal agencies to consider a reasonable range of alternatives for implementing a proposed action that are technically and economically feasible and meet the purpose and need of the proposal. NEPA also requires the consideration of effects from potentially implementing a No Action Alternative. Detailed information on the DAF's alternatives development and selection process regarding the Proposed Action evaluated in this EA is provided in **Appendix B**.

To identify reasonable alternatives for analysis in the EA, the DAF developed the following selection standards that would meet the purpose of and need for the Proposed Action: 1) provide airspace with sufficient volume and availability; 2) pilot production; 3) scheduling; 4) maximize training time and minimize transit time; 5) limit impacts on existing military flying training operations; 6) limit impacts on other NAS users.

The DAF considered multiple alternatives to implement the Proposed Action. **Table 2.2-1** summarizes how each alternative did or did not meet the selection standards. Of the alternatives considered, Alternative 1 met all the selection standards and is retained for detailed analysis in the EA. The remaining alternatives failed to meet one or more of the selection standards and were dismissed from detailed analysis because they would not meet the purpose and need. Although it would not meet the purpose and need, the No Action Alternative is also retained for detailed analysis in accordance with NEPA.

Alternative 1 is described in **Section 2.2.2**. The No Action Alternative is described in **Section 2.2.3**. Alternatives that failed to meet one or more of the selection standards are listed in **Section 2.2.4**.

Table 2.2-1 Comparison of Alternatives

Selection Standards	Alternatives Considered			
	ALT 1 New Low MOA Under Laughlin 2 MOA	ALT 2 New Low MOA Under Other Laughlin MOA	ALT 3 Forward Deployment	ALT 4 Use Other Regional Proposed Low MOAs
1. Airspace Volume and Availability	Yes	Yes	Yes	Yes
2. Pilot Production	Yes	Yes	Yes	No
3. Scheduling	Yes	Yes	No	No
4. Maximize Training Time and Minimize Transit Time	Yes	Yes	Yes	No
5. Limit Impact on Existing Military Training Operations	Yes	No	Yes	Yes
6. Limit Impacts on Other NAS Users	Yes	No	Yes	Yes
Meets Selection Standards	**YES**	**NO**	**NO**	**NO**

2.2.2 Alternative 1 – Establish New Low-Altitude MOA Directly Under Laughlin 2 MOA

Alternative 1 would implement the Proposed Action described in **Section 2.1**. Under this alternative, the DAF would request FAA to establish a new low-altitude MOA directly under the Burr 1 and a portion of the Burr 2 subdivisions of the existing Laughlin 2 MOA. Laughlin airspace managers determined that this configuration would best align with existing and ongoing aircraft operations in the Laughlin Airspace Complex and would result in no or minimal conflicts or constraints with underlying topography, development, or other potential encroachments. Variations of this alternative that would modify other portions of the Laughlin 2 MOA by lowering the existing airspace floor or creating a new low-altitude airspace under another portion of the Laughlin 2 MOA were dismissed by the DAF because they would result in irreconcilable conflicts with other existing Laughlin AFB aircraft operations or be constrained by underlying topography, development, or other encroachments.

The new airspace would be designated as the Laughlin 2A Low MOA ("proposed MOA"). The proposed MOA would have a floor of 500 feet AGL and a ceiling of up to, but not including 7,000 feet MSL (directly beneath the floor of the Laughlin 2 MOA). The proposed MOA would encompass approximately 976 square miles of airspace with the exception of the existing avoidance area around Real County Airport (49R). In accordance with the Letter of Agreement regarding approach control service for airports within the airspace delegated to Laughlin AFB **(Section 1.2.3)**, the 47 OG would coordinate with FAA Houston Center when the proposed MOA would be active to deconflict military and civilian aircraft operations within an approximately 125-square mile area between 500 feet AGL and 6,000 feet MSL (designated as the "Excluded Area") to support ongoing civilian IFR aircraft operations at Garner Field Airport (UVA) east of Uvalde. No aircraft operations associated with the Proposed Action would occur or be scheduled within the Excluded Area below 6,000 feet MSL. The lateral boundaries of the proposed MOA, including the Excluded Area, are shown on **Figure 2.2-1**. A conceptual view of the proposed MOA is shown on **Figure 2.2-2**.

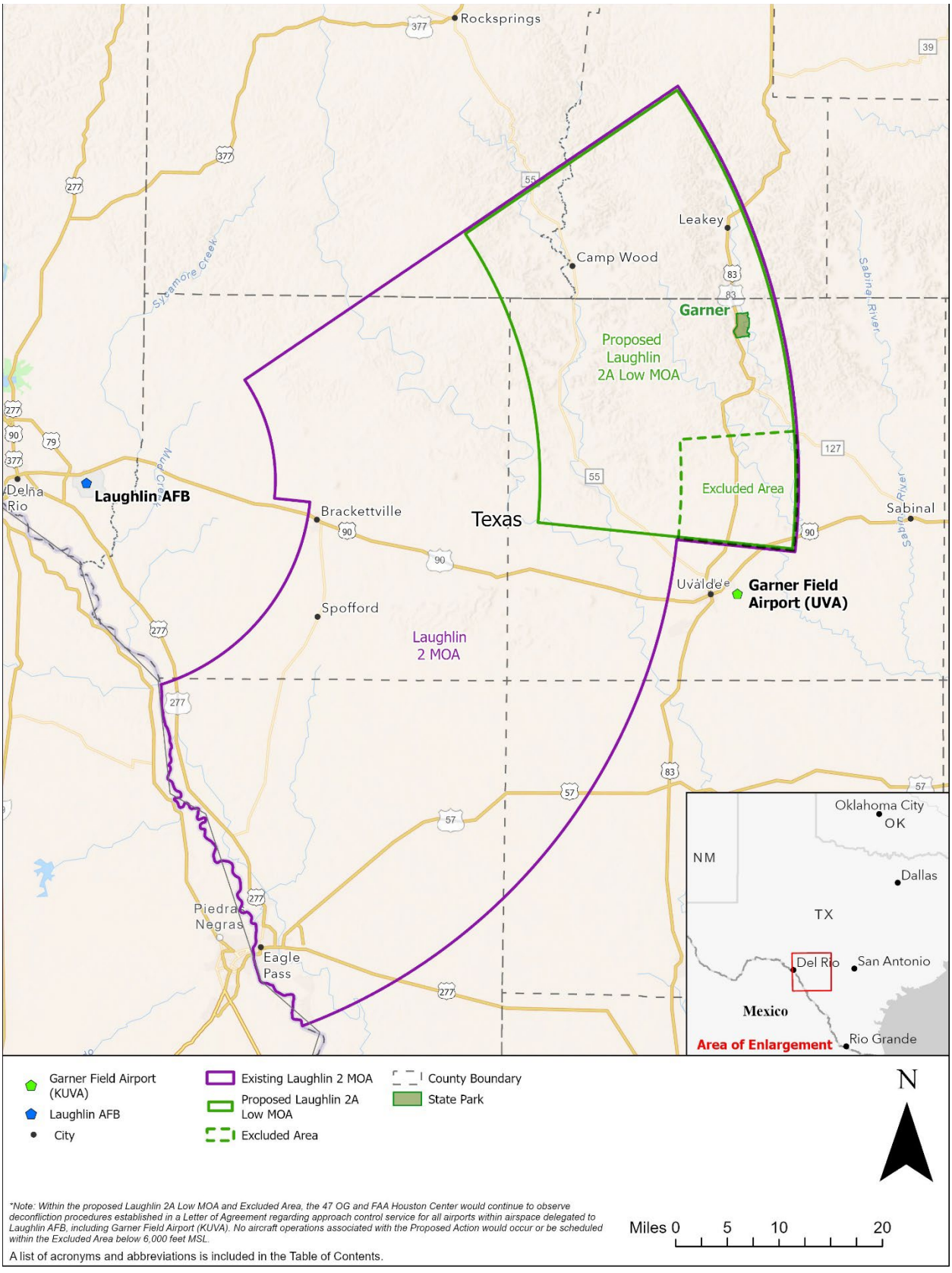


Figure 2.2-1 Lateral Boundaries of Alternative 1 – Proposed Laughlin 2A Low MOA

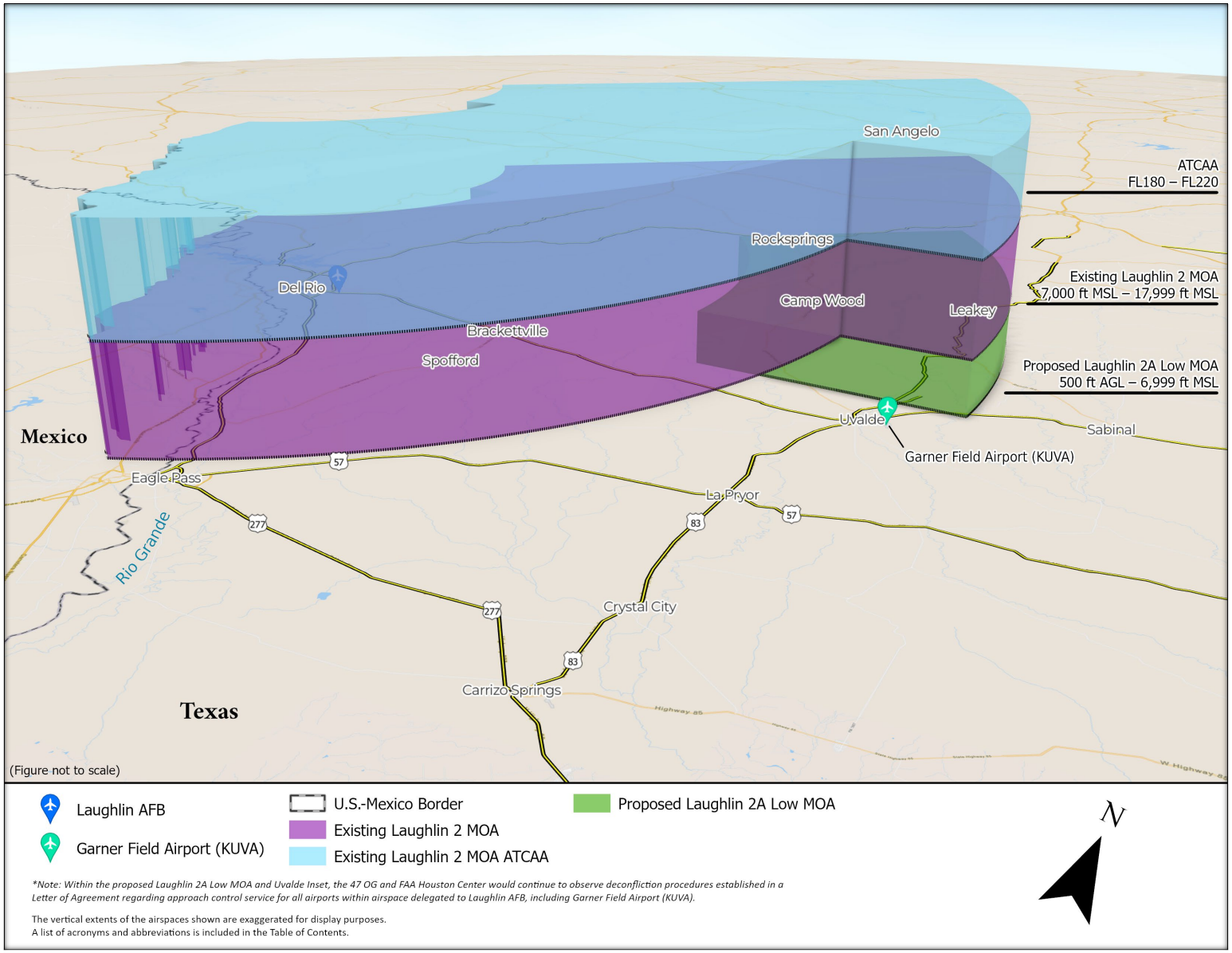


Figure 2.2-2 Conceptual View of Alternative 1 – Proposed Laughlin 2A Low MOA

The proposed MOA would be established immediately below and within the smaller footprint of the established contoured dimensions of the SUA (MOAs/ATCAAs) assigned to the 47 FTW to support FBF requirements. The proposed MOA would be managed and operated separately from the existing Laughlin 2 MOA and could be combined with that airspace, as needed, to support seamless flight operations from 500 feet AGL to FL220. Training activities would occur in the new low MOA as described in **Section 2.1**.

Alternative 1 would not involve changes to the lateral boundaries of the existing Laughlin 2 MOA **(Figure 2.2-1)** or any other airspace managed by Laughlin AFB. No demolition, construction, or other ground-disturbing activities would occur under Alternative 1. None of the proposed training activities would involve releases of live or inert ammunition or ordnance (including defensive countermeasures such as chaff and flares). Aircraft would not exceed supersonic speeds while operating within the proposed airspace. Alternative 1 would not require changes to the number of personnel or to the number or types of aircraft assigned to Laughlin AFB, or changes to the existing boundaries of that or any other DoD or DAF installation.

2.2.3 No Action Alternative

Under the No Action Alternative, the proposed low-altitude MOA would not be obtained. Low-altitude pilot training requirements of the FBF syllabus would not be met, which would contribute to the degradation of the quality and quantity of pilot training and impede the overall production of future DAF pilots and weapons system officers. The No Action Alternative provides a baseline for the evaluation of potential impacts from the Proposed Action and also represents a potential and viable decision to not implement the Proposed Action.

2.2.4 Alternatives Dismissed from Detailed Analysis in the EA

Alternatives considered by the DAF that did not meet one or more of the selection standards and were dismissed from detailed analysis in the EA include Alternative 2 – Establish Low-Altitude MOA Under Other Laughlin MOAs; Alternative 3 – Forward Deployment to Existing Low-Altitude MOAs; and Alternative 4 – Use Other Regional Existing and Proposed Low-Altitude MOAs. These alternatives are described in additional detail in **Appendix B**. Additionally, alternatives consisting of partial or complete training using flight simulators were not considered for detailed analysis because they did not provide a fully realistic training experience and could not replace real-world, in-flight training.

2.3 Summary of Potential Environmental Consequences

The potential impacts associated with the Proposed Action (Alternative 1) and the No Action Alternative are summarized in **Table 2.3-1**. This summary is based on the detailed analysis of each resource presented in **Chapter 3**.

Table 2.3-1 Summary of Impacts from the Proposed Action and No Action Alternative

Resource	Proposed Action (Alternative 1)	No Action Alternative
Airspace Management and Use	No significant adverse impacts.	No significant adverse impact.
Noise	No significant adverse impacts.	No significant adverse impact.
Land Use	No significant adverse impacts.	No significant adverse impact.
Air Quality	No significant adverse impacts. Net changes in criteria pollutant emissions would be less than the indicator of significance and would not result in changes to the attainment status of the Air Quality Control Regions	No significant adverse impact.
Biological Resources	No significant adverse impacts. U.S. Fish and Wildlife Service (USFWS) concurrence with the DAF's determination is pending.	No significant adverse impact.
Cultural Resources	No significant adverse impacts. In May 2025, the Texas State Historical Preservation Officer (SHPO) stated that no historic archaeological properties would be affected. SHPO concurrence with the DAF's determination of no adverse effect on historic above-ground resources is pending.	No significant adverse impact.
Safety	No significant adverse impacts.	No significant adverse impact.
Socioeconomics	No significant adverse impacts.	No significant adverse impact.
Visual Resources	No significant adverse impacts.	No significant adverse impact.

3 Affected Environment and Environmental Consequences

3.1 Introduction

This chapter describes the affected environment and environmental consequences for resources that would potentially be affected by the Proposed Action. Throughout this EA, the terms "environmental consequences," "effects," and "impacts" are used interchangeably and have the same meaning.

Environmental resources analyzed in the EA, and the region of influence (ROI) for each resource, are listed in **Table 3.1-1**. Detailed resource definitions and ROI descriptions are provided in **Appendix D**. As applicable, the resource analyses in this EA consider potential impacts associated with the proposed transition from T-38C operations to T-7A operations at Laughlin AFB during implementation of the Proposed Action (also see **Sections 1.2.2** and **2.1**). Additional information on potential impacts from proposed T-7A operations at and near Laughlin AFB is provided in the 2024 T-7A Recapitalization Final EIS and ROD (DAF, 2024a).

Table 3.1-1 Resource Areas Analyzed in the EA and ROI

Resource[1]	ROI
Airspace Management and Use	Airspace within the proposed MOA; the existing Laughlin 1, 2, and 3 MOAs and overlying ATCAA; local airports under the proposed MOA; and civilian and military air traffic and MTRs that cross the proposed MOA.
Noise	Airspace within and lands below the proposed MOA and parts of the existing Laughlin 1, 2, and 3 MOAs and ATCAA.
Land Use	Lands below the proposed MOA within portions of Edwards, Kinney, Real, and Uvalde Counties, Texas.
Air Quality	Edwards, Kinney, Real, and Uvalde Counties, Texas and the Air Quality Control Regions that contain these counties.
Biological Resources	Lands under and airspace within the proposed MOA.
Cultural Resources	Contiguous with the APE which consists of lands below or intersected by the boundaries of the proposed MOA.
Safety	Airspace in and under portions of the existing Laughlin 1, 2, and 3 MOAs and ATCAA, including airspace above 500 feet AGL where the proposed low-altitude MOA would be established.
Socioeconomics	Edwards, Kinney, Real, and Uvalde Counties, Texas.
Visual Resources	Airspace within, above, and below the proposed MOA; lands in Edwards, Kinney, Real, and Uvalde Counties, Texas directly below the proposed MOA; and adjacent lands where viewers may observe aircraft activity within the proposed MOA.

Notes:

Water Resources, Earth Resources, Hazardous Materials and Waste, Infrastructure / Utilities, Coastal Zone Management, Section 4(f) of the U.S. Department of Transportation Act (49 U.S.C. § 303(c)), and Prime and Unique Farmland, and Land of Statewide or Local Importance were dismissed from detailed analysis in this EA because the Proposed Action would have no potential to affect them. Refer to **Appendix B** for additional information.

Reasonably foreseeable future actions that could contribute to cumulatively significant effects in the ROI when considered with the Proposed Action and the potential effects to each resource are summarized in **Appendix C**. When considered with other reasonably foreseeable future actions,

the Proposed Action would have no potential to contribute to cumulatively significant impacts on resources analyzed in this EA.

3.2 Airspace Management and Use

3.2.1 Affected Environment

Laughlin AFB was established in Texas in 1943 and training in military airspace has occurred over southwest Texas, including the areas containing the Laughlin MOA Complex, for more than 80 years. MOAs may overlap or be crossed by other types of military and nonmilitary airspace, and have been historically compatible with nonmilitary aviation operations including commercial passenger aviation and local or regional operations such as medical transport, crop dusting, pest control, aerial assessments for farming and wildlife management purposes, and similar activities. Military and nonmilitary pilots flying VFR and transiting through MOAs as part of their routine flight operations and patterns must use "see and avoid" techniques to prevent conflicts with military aircraft actively using the MOAs. Pilots flying under IFR also rely on their instruments and communications with ATC when cleared to transit nonactive parts of MOAs.

Existing flight operations in the affected environment, as identified in the *Final Report for Airspace Analysis in Support of the Environmental Impact Analysis Process for the United States Air Force Laughlin 2 Military Operating Area, Texas* (ATAC, 2025) are summarized in this section.

Note that the flight operations are summarized to help differentiate the primary sources of air traffic in the affected environment. All flight operations reported in the proposed MOA, and all other airspace listed above, are the totals for each airspace; those totals include all flights from local and regional civilian airports and military airfields that transit each airspace. In addition, MTR operations were provided by Laughlin AFB, separate from the data used in the air traffic analysis. Unless otherwise noted, all data presented in this section for existing aircraft operations in the ROI are based on recorded flight data from September 1, 2023, to August 31, 2024.

3.2.1.1 Proposed Laughlin 2A Low MOA

Filtering and analysis of the air traffic data associated with the proposed MOA yielded the operations listed in **Tables 3.2-1** through **3.2-8**. More than 3,100 aircraft crossed or operated within the proposed MOA between September 2023 and August 2024 **(Table 3.2-1)**. Of the air traffic crossings by operator type listed in **Table 3.2-1**, 76 percent of the total crossings were civilian, general aviation and air taxi operators, 23 percent were military operators, less than 0.1 percent were civilian air carrier operators, and less than 0.2 percent were unknown aircraft operators for which aircraft type and flight plan could not be associated with tracking data.

Table 3.2-1 Crossings of the Proposed Laughlin 2A Low MOA by Operator Type and Category

Operator Type/Category		Count	Percent
Civilian	Air Carrier	2	<0.1
	Air Taxi	869	27
	General Aviation	1,543	49
Military		719	23
Unknown		6	<0.2
Total		**3,139**	**100**

The most common civilian aircraft observed in the proposed MOA include the Cessna 208 Caravan (32 percent), Raytheon Beech 1900-D (7 percent), and Cessna 172 *Skyhawk* (5 percent), a mix of single and twin-engine propeller aircraft (18 percent), and other/unknown aircraft (39 percent). The most common military aircraft were the Beechcraft T-6A *Texan II* (46 percent), Northrop T-38C *Talon* (40 percent), and Raytheon T-1A *Jayhawk* (6 percent), and other/unknown aircraft (8 percent). T-1A operations at Laughlin AFB ended in January 2025, but are considered as part of existing conditions because their operations are included in data collected to support development of this EA.

Table 3.2-2 summarizes crossings in the proposed MOA by operator type and flight category (IFR or VFR). More than 99 percent of the aircraft transiting the proposed MOA operated using IFR.

Table 3.2-2 IFR and VFR Crossings of the Proposed Laughlin 2A Low MOA

Flight Category	Civilian			Military	Unknown	Total	Percent
	Air Carrier	Air Taxi	General Aviation				
IFR	2	869	1,527	710	2	3,110	99
VFR	0	0	16	9	4	29	1
Total	**2**	**869**	**1,543**	**719**	**6**	**3,139**	**100**

Monthly, daily, and hourly crossings in the proposed MOA are listed in **Tables 3.2-3** through **3.2-5**, respectively, for different operator categories. The combined information in these tables indicates the number of crossings for different periods throughout the year. Based on these data, the busiest months were February, July, and December **(Table 3.2-3)**, the busiest weekdays were Tuesday through Thursday **(Table 3.2-4)**, and the busiest times of day were from 7:00 a.m. to 7:00 p.m., and with peak hours from 7:00 a.m. to 9:00 a.m. and 12:00 p.m. **(Table 3.2-5)**. In **Section 3.2.2**, this existing airspace usage information, estimated primarily for IFR operations, is compared with the anticipated activity schedule for the proposed MOA to estimate potential impacts on existing operations.

Table 3.2-3 Monthly Crossings of the Proposed Laughlin 2A Low MOA

Month	Air Carrier	Air Taxi	General Aviation	Military	Unknown	Total	Daily Average
Jan	0	77	134	49	0	**260**	8
Feb	1	78	151	95	0	**325**	11
Mar	0	80	100	65	0	**245**	8
Apr	0	75	155	60	0	**290**	10
May	0	100	137	51	0	**288**	9
Jun	0	77	134	49	0	**260**	8
Jul	1	78	151	95	0	**325**	11
Aug	0	80	100	65	0	**245**	8
Sep	0	75	155	60	0	**290**	10
Oct	0	100	137	51	0	**288**	9
Nov	0	77	134	49	0	**260**	8
Dec	1	78	151	95	0	**325**	11
Total	0	80	100	65	0	**245**	8

Table 3.2-4 Day of Week Crossings of the Proposed Laughlin 2A Low MOA (2023 – 2024)

Day of Week	Air Carrier	Air Taxi	General Aviation	Military	Unknown	Total	Daily Average
Mon	0	69	261	143	0	**473**	9
Tues	1	167	219	189	0	**576**	11
Wed	1	187	215	137	1	**541**	10
Thurs	0	174	231	130	0	**535**	10
Fri	0	169	276	72	1	**518**	10
Sat	0	94	155	0	3	**252**	5
Sun	0	9	186	48	1	**244**	5
Total	**2**	**869**	**1,543**	**719**	**6**	**3,139**	**9**

Table 3.2-5 Hourly Crossings of the Proposed Laughlin 2A Low MOA (2023 – 2024)

Hour	Air Carrier	Air Taxi	General Aviation	Military	Unknown	Total	Daily Average
0	0	1	5	0	0	**6**	0
1	0	0	1	1	1	**3**	0
2	0	0	1	0	0	**1**	0
3	0	0	4	0	0	**4**	0
4	0	0	6	0	0	**6**	0
5	0	0	7	1	0	**8**	0
6	0	17	7	0	0	**24**	0
7	0	333	33	3	1	**370**	1
8	0	166	77	32	3	**278**	1
9	1	30	111	41	0	**183**	1
10	0	10	144	49	1	**204**	1
11	0	13	145	68	0	**226**	1
12	0	4	156	108	0	**268**	1
13	0	7	138	48	0	**193**	1
14	0	6	126	61	0	**193**	1
15	0	4	129	66	0	**199**	1
16	0	9	122	59	0	**190**	1
17	0	27	99	57	0	**183**	1
18	0	3	49	35	0	**87**	0
19	1	131	93	22	0	**247**	1
20	0	107	63	23	0	**193**	1
21	0	0	15	34	0	**49**	0
22	0	1	6	9	0	**16**	0
23	0	0	6	2	0	**8**	0
Total	**2**	**869**	**1,543**	**719**	**6**	**3,139**	**9**

Notes:
Military operations data collected between September 1, 2023 and August 31, 2024 represent aircraft transiting the airspace while performing other missions and do not reflect low-altitude FBF training operations.

Aircraft crossing durations are listed in **Table 3.2-6** by operator category. Over 98 percent of the crossings occurred in 15 minutes or less and most of the remaining crossings (1.6 percent) occurred over a 15- to 30-minute period. Crossing durations could be used to estimate potential impacts

(delays) on IFR flights by comparing the crossing times of existing flights with estimated times for any future flights that would potentially be rerouted due to the Proposed Action.

Table 3.2-6 Distribution of Aircraft Crossing Durations in the Proposed Laughlin 2A Low MOA

Time (minutes)	Air Carrier	Air Taxi	General Aviation	Military	Unknown	Total	Percent
0-15	2	864	1,500	717	6	**3,089**	98.4
15-30	0	5	43	2	0	**50**	1.6
Total	**2**	**869**	**1,543**	**719**	**6**	**3,139**	**100.0**

The distribution of aircraft crossings by altitude (in 1,000-foot increments) is listed for each operator category in **Table 3.2-7**. Most aircraft crossings (48.7 percent) occurred at an average operating altitude of 6,000 feet MSL. Most of the remaining crossings occurred at average operating altitudes of 5,000 feet MSL (34 percent) and 4,000 feet MSL (11.5 percent). Only 1.5 percent of the crossings were below an average operating altitude of 2,000 feet.

Table 3.2-7 Distribution of Aircraft Crossings by Altitude in the Proposed Laughlin 2A Low MOA

Altitude (MSL)	Air Carrier	Air Taxi	General Aviation	Military	Unknown	Total	Percent
1,000	0	1	0	1	0	**2**	0.1
2,000	0	1	21	18	3	**43**	1.4
3,000	0	5	129	4	0	**138**	4.4
4,000	1	54	254	51	0	**360**	11.5
5,000	0	344	507	215	0	**1,066**	34.0
6,000	1	464	632	430	3	**1,530**	48.7
Total	**2**	**869**	**1,543**	**719**	**6**	**3,139**	**100.0**

A summary of the air traffic crossing data for the proposed MOA, shown in the previous tables, is presented in **Table 3.2-8**. This summary table provides high-level information for each of the air traffic metrics shown and characterizes the existing conditions for air traffic in the proposed MOA that primarily define the affected environment.

Table 3.2-8 Summary of Air Traffic Crossings in the Proposed Laughlin 2A Low MOA

Air Traffic Metric	Summary Information
Altitude Range	500 feet AGL to, but not including, 7,000 feet MSL.
Total Aircraft Crossings	3,139 aircraft transited the proposed MOA with 77% civilian operators (64% by general aviation), 23% military, and less than 1% unknown operators.
VFR / IFR	1% VFR and 99% IFR.
Monthly Aircraft Crossings (High / Low)	Air traffic peaks occurred in February, July, and December with 325 total aircraft crossings per month and the lowest traffic counts were in March and August with 245 total aircraft crossings per month.
Daily Aircraft Crossings (High / Low)	Average: 9 aircraft per day. Highest: Tuesdays (11 aircraft per day). Lowest: Saturdays and Sundays (5 aircraft per day).
Civilian Air Traffic	Busiest: Fridays 7:00 a.m. and 9:00 a.m. General aviation traffic was highest from 10:00 a.m. to 1:00 p.m. Air taxi traffic peaked from 7:00 a.m. to 9:00 a.m.
Military Air Traffic	Monday through Thursday, busiest from 11:00 a.m. to 5:00 p.m. The most prevalent determinable airports were Laughlin AFB and Kelly Field.

Similarly, air traffic summary tables are provided for the other SUA, that are also considered part of the affected environment, including Burr 1 and Burr 2 High areas within Laughlin 2 MOA, Burr 1 and Burr 2 Low areas within Laughlin 2 MOA, Laughlin 2 MOA, and the Laughlin 2 ATCAA **(Table 3.2-9).** These airspace could potentially be affected during times when the proposed MOA would be active, causing a shift in traffic flows from the low MOA to these higher altitude airspace (though the need for this type of traffic shift is currently unknown).

Included in the military air traffic reported for the Laughlin 2 MOA and Laughlin 2 ATCAA (including the Burr 1 and Burr 2 High and low areas) are the existing annual T-38C, T-1A, and T-6A flight operations conducted by the 47 FTW at Laughlin AFB. The 47 FTW schedules and uses the Laughlin 2 MOA and Laughlin 2 ATCAA simultaneously, Monday through Friday, nominally from 8:00 a.m. to 7:30 p.m., though most of the flight operations are during daytime hours, so this flying window would normally be shorter during the fall and winter months. This nominal flying period also occurs during the busiest period of air traffic, each day, in the existing airspace designated for the proposed MOA, 7:00 a.m. to 8:00 p.m. **(Table 3.2-5)**.

3.2.1.2 Local Civilian Airports with Flight Operations in the Proposed Laughlin 2A Low MOA

Civilian flight operations at local and regional airports that transit the proposed MOA are summarized by origin and destination airport and prevalence of flight operations in **Table 3.2-10**. Based on the air traffic analysis, **Table 3.2-10** identifies the local civilian airports that could be affected by the Proposed Action. San Antonio International Airport followed by Del Rio International Airport and Garner Field Airport are the largest operators that have flight traffic in the proposed MOA. Six smaller local airports are directly under or within 3 nautical miles (NM) of the proposed MOA: Flying Bull Ranch (TA52), Real County (49R), Fossil Creek Ranch (TE78), Flying J Ranch (7TE4), Ox Ranch (10X), and Annandale Ranch (2XS7) **(Figure 3.2-1)**. For safety and deconfliction purposes, the Real County (49R) airport would have a 1,500-foot altitude, 3-NM exclusion zone around it in compliance FAA Order 7400.2 Section 25-1-4.

Table 3.2-9 Summary of Air Traffic Crossings

Special Use Airspace	Altitude Range	Total Aircraft Crossings	VFR / IFR	Monthly Aircraft Crossings (High / Low)	Average Daily Aircraft Crossings	Civilian Air Traffic (Busiest)	Military Air Traffic (Peak)
Burr 1 and Burr 2 High Areas	15,000 feet MSL to FL220	2,365; 58% civilian, 38% military, 4% unknown	6% VFR, more than 90% IFR, and the rest unknown; 25% of VFR was military	Peak: Dec. / 222 total crossings. Lowest: Aug. / 158 total crossings	6; highest on Wednesdays / lowest on weekends	Sundays 11:00 a.m. to 2:00 p.m. and ~ 7:00 p.m. Monday - Friday. General aviation 11:00 a.m. to 2:00 p.m. Air taxi: afternoon / early evening	8:00 a.m. with most activity on Thursdays
Burr 1 and Burr 2 Low Areas	7,000 feet MSL to 12,000 feet MSL	2,848; 65% civilian, 35% military, and less than 1% unknown	Fewer than 2% VFR and 98% IFR crossings; 60% of VFR was military	Peak: Feb. / 304 total crossings. Lowest: Jan. / 198 total crossings	8; highest on Tuesdays / lowest on weekends	Weekdays 7:00 p.m. General aviation: 11:00 to 2:00 p.m. Air taxi: 7:00 p.m.	Noon with most activity on Tuesdays
Laughlin 2 MOA	7,000 feet MSL to FL180	9,963; 40% civilian, 58% military, and 2% air carrier or unknown	4% VFR and 96% IFR; approximately 50% of VFR was military	Peak: April / 974 total crossings. Lowest: Jan. / 673 crossings	27; highest on Tuesdays / lowest on weekends	Sundays between 10:00 a.m. and 3:00 p.m. General aviation: 11:00 a.m. to 2:00 p.m.	Between 7:00 a.m. and noon, with most activity on Tuesdays
Laughlin 2 ATCAA	FL180 to FL220	2,934; ~50% civilian, ~50% military, and 4% unknown	5% VFR and 95% IFR; approximately 20% of VFR was military	Peak: April / 297 total crossings. Lowest: Jan. / 203 crossings	8; highest on Tuesdays / lowest on weekends	Sunday from 10:00 a.m. to 3:00 p.m. General aviation: 11:00 a.m. to 2:00 p.m.	Between 7:00 a.m. and noon, with most activity on Tuesdays

1

Table 3.2-10 Local and Regional Airport Operators in the Proposed Laughlin 2A Low MOA

Origin Airport	Prevalence
San Antonio International Airport (SAT)	29%
Del Rio International Airport (DRT)	17%
Garner Field Airport (UVA)	11%
Other/Unknown	43%

Destination Airport	Prevalence
DRT	34%
SAT	17%
UVA	12%
Ox Ranch Airport (10X)	3%
Maverick County Memorial International Airport (5T9)	2%
Other/Unknown	32%

Many of the aircraft flying out of the smaller airports are not on flight plans and thus do not appear in the radar data that were collected and analyzed in the final airspace report (ATAC, 2025).

3.2.1.3 Military Airfields with Flight Operations in the Proposed Laughlin 2A Low MOA

Military airfields or airports that have military air traffic through the proposed MOA are summarized by the origin and destination airfields and prevalence of flight operations in **Table 3.2-11**. Laughlin AFB has the most air traffic through the proposed MOA followed by Kelly Field and San Antonio International Airport.

Table 3.2-11 Airfield Military Operators in the Proposed Laughlin 2A Low MOA

Origin Airfield	Prevalence
Laughlin AFB (DLF)	37%
Kelly Field (KSKF)	19%
San Antonio International Airport (SAT)	10%
Easterwood Field (CLL)	4%
Austin-Bergstrom International Airport (AUS)	3%
Corpus Christi International Airport (CRP)	3%
Other/Unknown	25%

Destination Airfield	Prevalence
DLF	74%
SAT	8%
Garner Field Airport (UVA)	4%
KSKF	3%
Other/Unknown	11%

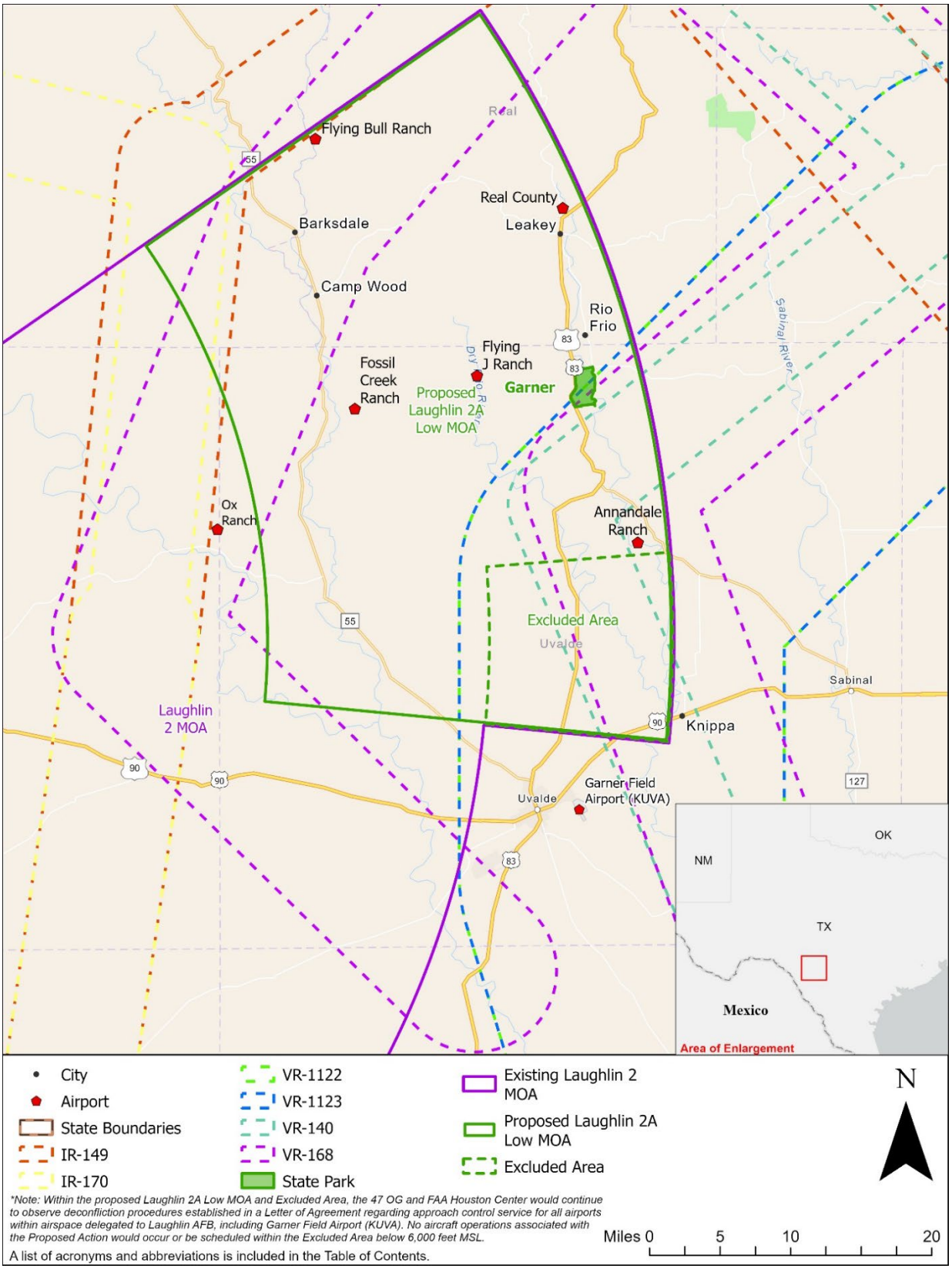


Figure 3.2-1 Existing MTR Segments and Local Airports within the Proposed Laughlin 2A Low MOA

3.2.1.4 Military Training Routes that Cross the Proposed Laughlin 2A Low MOA

Segments of six MTRs cross the proposed MOA: IR-149, IR-170, VR-140, VR-168, VR-1122, and VR-1123 (the reverse of VR-1122) **(Figure 3.2-1)**. Annual operations by aircraft type within the four active MTRs are listed in **Table 3.2-12** (DAF, 2024d). Aircraft operating in segments of VR-1122 and VR-1123 within the ROI are authorized to fly as low as 100 feet AGL; however, based on the altitude utilization data provided by the DAF, most aircraft typically fly at or above 500 feet AGL on this MTR. All active MTRs have route ceilings that are well above the floor of the proposed MOA (500 feet AGL); however, VRs are flown under see-and-avoid, so there would be no restriction to entering the MOA. Aircraft on an IR could enter an active MOA if separation could be provided using standard ATC procedures or if Military Authority Assumes Responsibility for Separation of Aircraft as described by the Letters of Agreement. Therefore, if implemented, the Proposed Action would have little to no impact to operations in these MTRs.

Table 3.2-12 Existing Annual Flight Operations on Segments of Active MTRs Crossing the Proposed Laughlin 2A Low MOA

MTR	Segment	Aircraft	Airfield	Existing Floor (feet)	Existing Ceiling (feet)	Day Operations[1]	Night Operations[2]
IR-170	D-E	T-38C	Laughlin AFB	Surface	3,000	200	0
VR-140	C-D	T-38C	Randolph AFB	500	4,000	197	0
VR-140	D-E	T-38C	Randolph AFB	500	4,000	197	0
VR-1122	C-D	F-16C	Kelly Field	100	1,500	80	0
VR-1122	D-E	F-16C	Kelly Field	100	1,500	80	0
VR-1123	C-D	F-16C	Kelly Field	100	1,500	80	0
VR-1123	D-E	F-16C	Kelly Field	100	1,500	80	0

Notes:
One annual operation is one sortie flying the route.
[1]Day Operations hours are 7:00 a.m. to 10:00 p.m. local time for the purposes of this analysis.
[2]Night Operations hours are 10:00 p.m. to 7:00 a.m. local time for the purposes of this analysis.

3.2.2 Environmental Consequences

3.2.2.1 Evaluation Criteria

Impacts on airspace and airspace management would be considered adverse if the Proposed Action encroached on or caused disruptions to existing aviation traffic in the ROI. An adverse impact would be considered significant if the Proposed Action permanently reduced the volume of an existing airspace or required changes to the lateral or horizontal extents of such airspace to continue operation. Additionally, any impact on airspace management would be considered significant if implementation of the Proposed Action were to substantially increase risks associated with flying activities; safety of personnel, contractors, military personnel, or the local community; hinder the ability to respond to an emergency; or introduce new health or safety risks for which the DAF or the surrounding community is not prepared or does not have adequate management and response plans in place.

Potential impacts from the Proposed Action on existing airspace and flight operations are assessed in terms of several measures, including:

- Airspace size – Does the proposed airspace have adequate size and vertical and lateral dimensions to accommodate the proposed flight operations in addition to existing flight operations?
- Airspace capacity – Can airspace controllers effectively manage the increased workload associated with the proposed flight operations?
- Impacts on existing flight operations, including flight delays, that could potentially result from rerouting traffic to avoid the proposed MOA when it is active, instead of clearing traffic to cross through it.

Existing conditions and potential impacts on flight safety are addressed in **Section 3.8**.

3.2.2.2 Alternative 1 – Establish New Low-Altitude MOA Directly Under Laughlin 2 MOA

Alternative 1 would establish the proposed MOA as described in **Section 2.1**. Training activities would be as described in **Section 2.2.2**. Unless otherwise noted, potential effects on airspace management and use would be the same whether T-38s or T-7As are being operated under Alternative 1.

While there is an FAA regulatory prohibition on nonparticipating aircraft flying in an active MOA during IFR conditions, there is no such prohibition when it is active under VFR conditions. Non-participating civilian and military aircraft operating in the ROI using VFR procedures would have the same mutual obligation to use "see and avoid" flying to prevent conflicts. The FAA Houston Center would procedurally deconflict civilian and military IFR flights during times when the proposed MOA would be active and, in some cases, flights may be rerouted around the proposed MOA.

Airspace Size and Capacity. In evaluating potential impacts, the approach is to assess the size of the airspace, existing traffic flow, additional traffic flow that would result from the Proposed Action and consider the additional airspace deconfliction procedures required by Laughlin ATC in coordination with FAA.

The proposed MOA would encompass approximately 976 square statute miles and the vertical extent would be from 500 feet AGL to, but not including 7,000 feet MSL. As shown in **Table 3.2-1**, 3,139 aircraft transited the proposed MOA from September 2023 through August 2024 (approximately 76 percent civilian operators [49 percent by general aviation], 23 percent military, and less than 0.2 percent unknown operators). Overall, there was an average of nine crossings per day (more than eight by IFR) in the airspace. Further, the busiest traffic periods occurred between 11:00 a.m. and 2:00 p.m. Alternative 1 would add 1,580 flight operations per year in the airspace within the proposed MOA, an increase of just over 50 percent. Sorties would include one to four aircraft (T-38Cs or T-7As) in the proposed MOA at a time. Should Alternative 1 be selected for implementation, pilots approved to operate in the proposed MOA would be responsible for remaining within the assigned area. The supporting controlling agency, per Letter of Agreement determination, may assist with providing radar advisory service, workload permitting, to aid pilots in remaining in the assigned areas.

Existing aircraft crossings within the proposed airspace total nine per day or typically no more than one per hour during the busiest traffic periods. These operations are easily accommodated by

the airspace and controllers at Laughlin ATC and FAA. The proposed MOA would also likely accommodate all the aircraft traffic that would result if Alternative 1 were to be implemented; resulting in about four to five flights per day, based on 365 days, or six to seven flights per day based on 240 flying days per year. On average, approximately one to two aircraft would be in the proposed MOA per hour during the busiest traffic periods (with the maximum estimated to be five aircraft per hour in cases when four aircraft would use the airspace at the same time). Civilian aircraft operators would continue to conduct most of the crossings in the airspace. Based on size and the number of hourly and daily crossings, the proposed MOA would be more than adequate to accommodate the additional traffic flow associated with Alternative 1.

The FAA considers airspace nominal capacity to be the maximum demand per hour a controller can safely handle in a particular sector (FAA, 2025b). Airspace capacity measures could include the maximum number of aircraft entering an airspace sector in a given period or the maximum number of aircraft within an airspace sector in a given period. The capacity of an airspace changes routinely based on a variety of dynamic factors including weather, temporary restrictions, and sectorization (virtual division of airspace to balance controller workload with respect to traffic flows). While the capacity of the existing airspace may be able to accommodate a 50 percent traffic increase due to Alternative 1, given the relatively low number of hourly flights expected, Laughlin ATC and FAA would review controller workload at the control centers to ensure the safe and efficient handling of this increase in traffic.

These assessments of the proposed MOA, based on the analysis of aircraft operations in the airspace between September 2023 and August 2024 (ATAC, 2025), suggest that it would have the size and capacity to accommodate the proposed additional air traffic. A third measure used to evaluate potential impacts on existing aviation activity is the potential for flight conflicts that could result from Alternative 1 when the proposed MOA would be active. These conflicts could potentially cause IFR flights to be rerouted, with associated delays, or require schedule adjustments that may be impractical. However, these types of conflicts are routinely addressed throughout the NAS primarily through FAA procedural deconfliction (as would be the case for IFR flights requesting to cross the proposed MOA, if established, when it would be operational). A secondary means to resolve certain types of conflicts could involve some local operators making flight schedule adjustments. The potential for flight conflicts between military operations in the proposed MOA and existing civilian and military air traffic, and how these conflicts would be addressed, are described in the following sections.

Proposed Laughlin 2A Low MOA. Approximately 99 percent of the 3,139 crossings in the proposed MOA are IFR **(Table 3.2-2)**. This includes 2,398 of 2,414 civilian crossings (99 percent) and 710 of 719 military aircraft crossings (99 percent) flying IFR. Potential impacts on future flights in the proposed MOA would include all IFR flights that occur during the period expected to be scheduled daily by the 47 FTW (Monday through Friday, sunrise to sunset [adjusted seasonally as needed], with other times announced via NOTAM).

As established by FAA Letter of Agreement with Laughlin AFB and the 47 FTW, Laughlin ATC and FAA control centers would procedurally deconflict IFR traffic by restricting military operations by sector or by altitude band, as needed to route crossing air traffic through the remaining airspace. This would be the most efficient approach to deconflict IFR crossings from

military operations in the proposed MOA. A less efficient alternative would be to reroute the IFR traffic to the north or south, around the proposed MOA which could result in substantial delays for some flights. VFR traffic in the proposed MOA, if established, would continue to use "see and avoid" flying to prevent conflicts. FAA deconfliction of the IFR traffic in the proposed MOA would help to minimize impacts on air traffic and ensure that they would not be significant.

Special Use Airspace (Existing Laughlin 2 MOA). Existing crossings in the Laughlin 2 MOA are 4 percent VFR and 96 percent IFR **(Table 3.2-9)**. The IFR crossings, 77 percent by civilian operators and 23 percent by military operators, already require FAA procedural deconfliction with existing military operations in the Laughlin 2 MOA, using either airspace restrictions by sector or altitude band. Impacts on future air traffic in the existing Laughlin 2 MOA would potentially include all IFR flights that occur during the period scheduled daily by the 47th Flying Training Wing (Monday through Friday, sunrise to sunset [adjusted seasonally as needed], with other times announced via NOTAM). These impacts would be substantially reduced via FAA procedural deconfliction. As such, impacts on air traffic in the existing Laughlin 2 MOA would not be significant.

Air Traffic Control-Assigned Airspace (Laughlin 2 ATCAA). There were 2,934 existing crossings in the existing Laughlin 2 ATCAA **(Table 3.2-9)**, with about half identified as civilian operators, half as military operators, and 4 percent unknown. About 95 percent of the crossings were IFR flights. It is expected that all future IFR flights in Laughlin 2A ATCAA would be handled using FAA deconfliction procedures, like the Laughlin 2 MOA, such that impacts on these flights would not be significant.

Local Civilian Airports with Flight Operations in the Proposed Laughlin 2A Low MOA. The three most prevalent determinable arrival and departure airports for civilian traffic transiting the proposed MOA during September 2023 through August 2024 were Del Rio International Airport, Garner Field Airport, and San Antonio International Airport. Local airport traffic counts are associated with flight tracks that started or ended at one of these airports, or these airports were listed in the flight plan; thus, there may be more unidentified flights landing or departing these airports for which radar data did not extend to the airport or for which flight plan data were not available.

In addition, there are multiple private airfields operating in the vicinity of the proposed MOA that have aircraft departing that are not on flight plans and do not appear in the radar data. Therefore, the number of local airport IFR flights is not known; however, as stated above, approximately 99 percent of the civilian crossings were flying IFR, most of which would be from local airports.

These local airport IFR flights operating within the proposed MOA could be affected by Alternative 1 whereas VFR flights would continue to use "see and avoid" flying to prevent conflicts. Since the proposed MOA would typically be scheduled simultaneously with the existing higher altitude Laughlin 2 MOA and Laughlin 2 ATCAA, FAA procedural deconfliction of local airport IFR flights would occur by the same restricting of military flights to certain airspace sectors or altitude bands to provide available airspace for these local flights to cross the proposed MOA. Six smaller local airports, including Flying Bull Ranch (TA52), Real County (49R), Fossil Creek Ranch (TE78), Flying J Ranch (7TE4), Ox Ranch (10X), and Annandale Ranch (2XS7) are in the

ROI (i.e., directly under or within 3 NM of the proposed MOA) (**Figure 3.2-1**). For safety and deconfliction purposes, Real County (49R) is the only public airport of these five and as such, would have a 1,500-foot altitude, 3-NM exclusion zone around it in compliance with FAA Order 7400.2 Section 25-1-4. As a result, potential impacts on local airport IFR operators would not be significant.

Military Airfields with Flight Operations in the Proposed Laughlin 2A Low MOA. Most of the military flights that crossed the proposed MOA, and were identified in the radar data analysis, originated from Laughlin AFB (37 percent), followed by Kelly Field (19 percent). Of the total number of existing military aircraft crossings in the proposed MOA (719), 710 were IFR (99 percent) and 9 were VFR (1 percent). Deconfliction of the affected military (IFR) flights would be required when the proposed MOA would be active. As with civilian IFR flights, Laughlin ATC and FAA control centers would be required to perform procedural deconfliction of these transiting military IFR operations from active proposed MOA operations. Some military IFR flights might also fly around the MOAs. The resulting potential impact on military airfield IFR operators would not be significant.

Military Training Routes that Cross the Proposed Laughlin 2A Low MOA. The six active MTRs that cross the proposed MOA (and the total number of annual operations on each) include IR-149 (0), IR-170 (200), VR-140 (197), VR-168 (0), VR-1122 (80), and VR-1123 (80), the reverse of VR-1122. These MTR operations are a relatively low number of annual flight operations, compared with other existing flight activity in the proposed MOA. Annual operations on the MTRs are expected to remain about the same in the future, regardless of whether Alternative 1 is selected for implementation.

All four active MTRs have route ceilings well above the floor of the proposed MOA (500 feet AGL), such that future operations on these routes have the potential to be affected by Alternative 1 if selected for implementation. However, VFR are used on three of these four MTRs to prevent potential conflicts, and the low number of annual operations may offer some flexibility to schedule these MTRs during periods when the proposed MOA is inactive. As such, deconfliction of these routes may not be required regularly; although should this become necessary, appropriate deconfliction procedures for aircraft operations in the MTRs and proposed MOA would need to be codified in an approved written agreement with Laughlin AFB scheduling authorities to schedule these operations safely and effectively, as required. Thus, potential impacts on MTR operations from Alternative 1 would not be significant.

3.2.2.3 No Action Alternative

Under the No Action Alternative, the proposed low-altitude airspace would not be obtained and existing conditions would continue. The existing Laughlin 1, 2, and 3 MOAs and ATCAAs would continue to be used and their dimensions would remain unchanged. Aircraft operations in these airspace would be expected to remain the same as or similar to existing conditions. This would have no significant impact on airspace management and use.

3.3 Noise

3.3.1 Affected Environment

3.3.1.1 Background Noise Levels

Background noise levels were estimated for areas under the Laughlin 1, 2, and 3 MOAs using the methods in American National Standard Institute – *Quantities and Procedures for Description and Measurement of Environmental Sound Part 3: Short-Term Measurements with an Observer Present* which provides estimated background noise levels for different land use categories. **Table 3.3-1** shows the levels (DNL and L_{eq}) estimated for rural or remote areas for several different categories of suburban and urban residential land use which can be used to represent background levels occurring under the Laughlin 1, 2, and 3 MOAs and surrounding areas (i.e., observed levels not including aircraft flights or other identifiable noise sources). Land areas under the Laughlin 1, 2, and 3 MOAs are mostly rural but include several small towns and cities. These populated areas have relatively low levels of ambient noise, and background sound levels without aircraft normally do not exceed 45 dBA L_{eq} in the daytime, or 39 dBA L_{eq} at night. Background sound levels are typically lower in rural areas and much lower in remote areas. According to these estimates, many of the remote areas under the Laughlin 1, 2, and 3 MOAs would be expected to have a DNL less than 49 dBA while active parts of the cities of Camp Wood, Leakey, and Uvalde, Texas would be expected to have a DNL in the range of 50 to 55 dBA.

Table 3.3-1 Estimated Background Sound Levels

Land Use Category	DNL Range (dBA)	Typical DNL (dBA)	L_{eq}	
			Daytime	Nighttime
Normal suburban residential	50-55	52	50	44
Quiet suburban residential	45-50	47	45	39
Rural residential	<45	42	40	34
Rural/Remote	<45	<42	<40	<34

3.3.1.2 Laughlin 1, 2, and 3 MOAs

The primary source of noise within the existing Laughlin 1, 2, and 3 MOAs is aircraft operations. Existing annual operations include T-38C (8,800), T-1A (300), and T-6A (18,000) in the Laughlin 1, 2, and 3 MOAs as summarized in **Table 3.3-2**. These operations occur annually in the MOA during the daytime period (defined as 7:00 a.m. to 10:00 p.m. for the purposes of this analysis using DNL). Approximately 85 to 90 percent of all T-38C operations in the Laughlin 1 and 2 MOAs occur between 7,000 feet MSL and FL180, with the remaining operations occurring in the ATCAA. More than 80 percent of T-1A flights occur between 7,000 feet MSL and FL180, with the remaining flights occurring in the ATCAA. Approximately 90 percent of T-6A flights occur between 7,000 feet MSL and FL180, with the remaining flights occurring in the ATCAA. These operations and their associated average airspeeds, power settings, time in airspace, and altitudes are the primary inputs to the noise models used in this analysis.

Table 3.3-2 Summary of Existing Operations in the Laughlin 1, 2, and 3 MOAs (2024)

Laughlin 1 MOA Operations				
	Aircraft	**T-38C**	**T-1A**	**T-6A**
	Number of Day[1] Sorties	7,920	100	900
	Number of Night[2] Sorties	0	0	0
	Time in Airspace per Sortie (minutes)	45	45	45
Altitude Utilization (feet MSL)				
Existing Laughlin 1 MOA	9,000-12,000	15%	30%	40%
	12,000-15,000	35%	30%	40%
	15,000-FL180	35%	30%	10%
ATCAA	FL180-FL220	15%	10%	10%
Laughlin 2 MOA Operations				
	Aircraft	**T-38C**	**T-1A**	**T-6A**
	Number of Day[1] Sorties	880	200	16,200
	Number of Night[2] Sorties	0	0	0
	Time in Airspace per Sortie (minutes)	45	105	45
Altitude Utilization (feet MSL)				
Existing Laughlin 2 MOA	7,000-9,000	10%	20%	30%
	9,000-12,000	30%	20%	30%
	12,000-15,000	30%	20%	20%
	15,000-FL180	20%	20%	10%
ATCAA	FL180-FL220	10%	20%	10%
Laughlin 3 MOA Operations				
	Aircraft	**T-38C**	**T-1A**	**T-6A**
	Number of Day[1] Sorties	NA	NA	900
	Number of Night[2] Sorties	NA	NA	0
	Time in Airspace per Sortie (minutes)	NA	NA	45
Altitude Utilization (feet MSL)				
Existing Laughlin 3 MOA	7,000-9,000	NA	NA	30%
	9,000-12,000	NA	NA	30%
	12,000-15,000	NA	NA	20%
	15,000-FL180	NA	NA	10%
ATCAA	FL180-FL220	NA	NA	10%

Notes:
[1] Daytime hours are defined as 7:00 a.m. to 10:00 p.m. local time for the purposes of this analysis.
[2] Nighttime hours are defined as 10:00 p.m. to 7:00 a.m. local time for the purposes of this analysis.
NA = not applicable

Table 3.3-3 shows cumulative noise levels from existing T-38C, T-1A, and T-6A operations in the Laughlin 1, 2, and 3 MOAs and existing T-38C and F-16C operations on existing MTR segments underlying each MOA (such that noise on the ground from both MOA and MTR operations would be additive). The estimated L_{dn} and L_{dnmr} for the existing Laughlin 1, 2, and 3 MOAs and each MTR segment is less than 40.2 dBA (the lower limit for MOAs reported by the MR_NMAP program is 35 dBA; additional information on the MR_NMAP program is provided in **Appendix D.2**). As shown in **Table 3.3-3**, estimated cumulative aircraft noise levels do not exceed 65 dBA under any part of the existing Laughlin 1, 2, and 3 MOAs and therefore, do not exceed the threshold for compatibility of aircraft noise with underlying land uses. Estimated total noise levels, reported as less than 35 dBA in **Table 3.3-3**, are primarily due to existing high-altitude flight operations in the MOAs **(Table 3.3-2)** and the low number of annual aircraft operations in each MTR **(Appendix D.2.2.3)**.

Table 3.3-3 Estimated Cumulative Noise Levels in the Laughlin 1, 2, and 3 MOAs from Existing Aircraft Operations in the MOAs and MTRs

Aircraft Operating in Existing MOA	MTR Segment and Aircraft	Laughlin 1 MOA		MTRs		Total (MOA+MTRs)	
		L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)
T-38C, T-1A, and T-6A	IR-170 D-E (T-38C)	<35.0[1]	<35.0	<35.0	<35.0	38.0	38.0
	VR-140 C-E (T-38C)			<35.0	<35.0	<35.0	<35.0
	VR-1122 A-G (F-16C)			38.4	38.6	40.0	40.2
	VR-1123 A-G (F-16C)			38.4	38.6	40.0	40.2
Aircraft Operating in Existing MOA	**MTR Segment and Aircraft**	**Laughlin 2 MOA**		**MTRs**		**Total (MOA+MTRs)**	
		L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)
T-38C, T-1A, and T-6A	IR-170 D-E (T-38C)	<35.0	<35.0	<35.0	<35.0	38.0	38.0
	VR-140 C-E (T-38C)			<35.0	<35.0	38.0	38.0
	VR-1122 A-G (F-16C)			38.4	38.6	40.0	40.2
	VR-1123 A-G (F-16C)			38.4	38.6	40.0	40.2
Aircraft Operating in Existing MOA	**MTR Segment and Aircraft**	**Laughlin 3 MOA**		**MTRs**		**Total (MOA+MTRs)**	
		L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)
T-6A	IR-170 D-E (T-38C)	<35.0	<35.0	<35.0	<35.0	<35.0	<35.0
	VR-140 C-E (T-38C)			<35.0	<35.0	<35.0	<35.0
	VR-1122 A-G (F-16C)			38.4	38.6	40.0	40.2
	VR-1123 A-G (F-16C)			38.4	38.6	40.0	40.2

Notes:
[1] MR_NMAP reports 35 dBA as the lower limiting noise level for MOAs and <35 dBA for MTRs and specific points. All levels less than or equal to 35 dBA are reported here as <35 dBA.

Potential noise-sensitive receptors underlying or near the existing Laughlin 1, 2, and 3 MOAs that overlie the proposed MOA are listed in **Table 3.3-4** and shown on **Figure 3.3-1**. As with the estimated cumulative noise levels shown in **Table 3.3-3**, estimated cumulative noise levels from existing T-38C, T-1A, T-6A, and F-16C operations at potential noise-sensitive receptors listed in **Table 3.3-4** are less than 35 dBA, except for three sites, and do not exceed the 65 dBA compatibility threshold for underlying land uses.

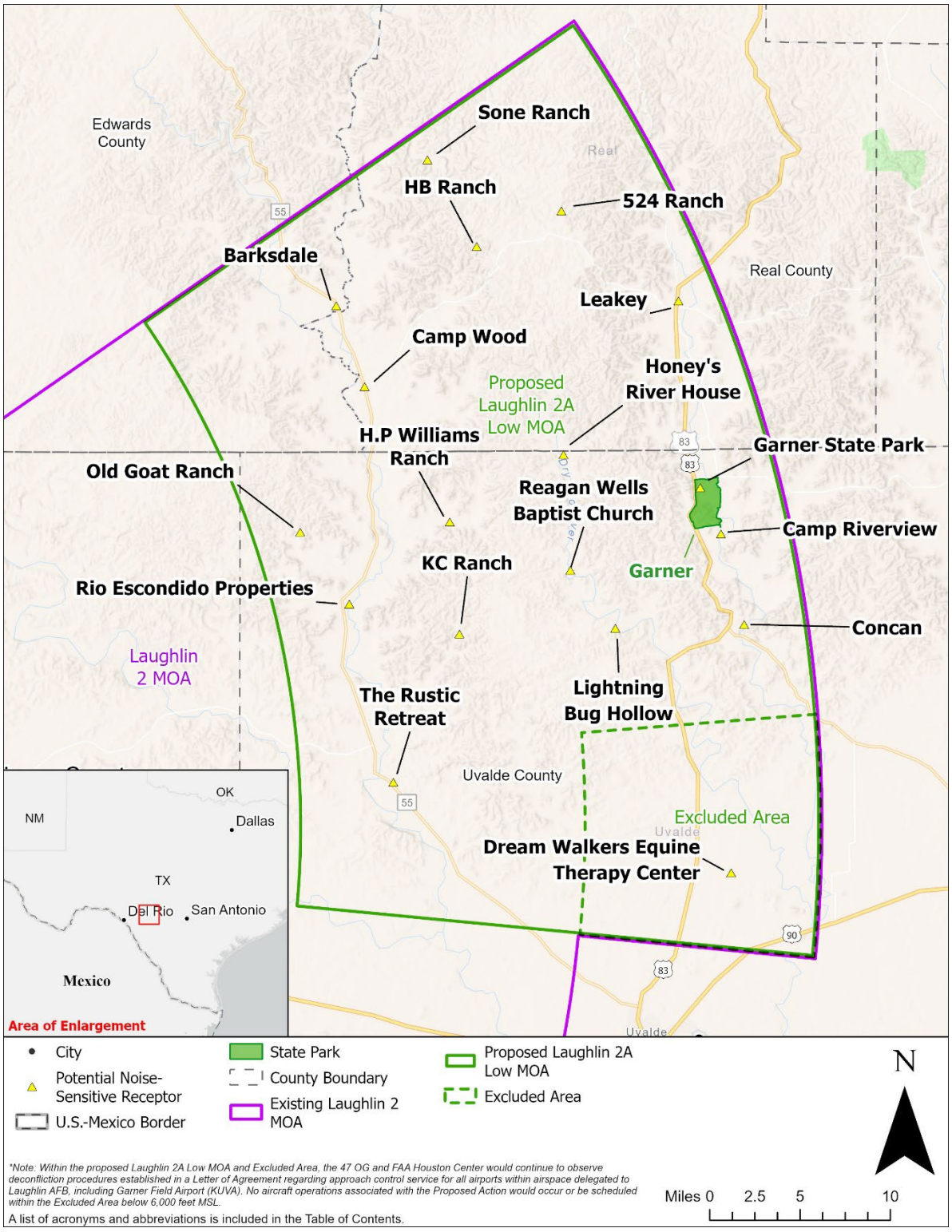


Figure 3.3-1 Potential Noise-Sensitive Receptors Under or Near the Proposed Laughlin 2A Low MOA

Table 3.3-4 Estimated Noise Levels from Existing T-38C, T-1A, T-6A, and F-16C Operations at Potential Noise-Sensitive Receptors Under or Near the Laughlin 1, 2, and 3 MOAs

Potential Noise-Sensitive Receptor	Latitude (degrees)	Longitude (degrees)	L_{dn} (dBA)	L_{dnmr} (dBA)
Sone Ranch	29.827019	-99.962098	<35	<35
524 Ranch	29.791517	-99.854916	<35	<35
HB Ranch	29.766811	-99.922704	<35	<35
Barksdale	29.725644	-100.035099	<35	<35
Leakey	29.728992	-99.761214	<35	<35
Camp Wood	29.669362	-100.012362	<35	<35
Honey's River House	29.622047	-99.853191	<35	<35
Old Goat Ranch	29.568116	-100.063940	<35	<35
H.P Williams Ranch	29.575153	-99.944241	<35	<35
Garner State Park	29.599078	-99.743731	<35	<35
Camp Riverview	29.566836	-99.727196	<35	<35
Reagan Wells Baptist Church	29.541520	-99.847673	<35	<35
Rio Escondido Properties	29.517926	-100.024636	<35	<35
Lightning Bug Hollow	29.501138	-99.811723	<35	<35
KC Ranch	29.497141	-99.936467	<35	<35
Concan	29.503757	-99.708617	39.0	39.2
The Rustic Retreat	29.393790	-99.989389	<35	<35
Dream Walkers Equine Therapy Center	29.330589	-99.718996	41.5	41.7
Uvalde High School/Uvalde	29.221226	-99.78229	37.9	38.1

Individual Overflight Noise. Noise from individual overflights is considered here, in addition to DNL, to more completely describe the noise environment from existing military aircraft operations in the Laughlin 1, 2, and 3 MOAs. While DNL is used to assess land use compatibility for airfield and airspace actions, the FAA and DAF support the use of supplemental metrics, typically based on L_{max} or SEL, to describe other potential noise effects such as hearing loss, sleep and speech interference, and structural damage. Supplemental metrics are useful to assess the noise impacts of airfield flight activity, and particularly for airspace flight activity. This is because the DNL or average noise exposure tends to be lower, due to flight operations being spread throughout the airspace, whereas individual overflights can generate potentially higher noise levels at sensitive receptors, particularly for direct overflights. The NOISEMAP program was used to calculate L_{max} and SEL for individual overflights beneath the Laughlin 1, 2, and 3 MOAs to assess the potential for causing speech or sleep interference to more fully understand the potential noise effects. Structural damage from aircraft flight events is more typically caused by supersonic flights that generate sonic booms with peak overpressures above 2 pounds per square foot, rather than from subsonic flight events. Since there are no supersonic flight operations in the Laughlin 1, 2, and 3 MOAs, the potential for structural damage is low.

Hearing Loss. Considerable data on hearing loss has been collected and analyzed by the scientific and medical communities, and it has been well established that continuous exposure to high noise levels will damage human hearing. People exposed to high noise environments may experience temporary or permanent hearing loss; those exposed over a long period of time are at an increased risk of experiencing permanent hearing loss. While various government organizations have defined noise thresholds based on L_{eq}, to protect workers from noise exposure during their lifetime working period (40 hours per week over 40 years), the DoD uses a screening threshold for residences of DNL 80 dB to ensure a conservative approach to assessing the potential for hearing loss

(DNWG, 2013). If residences are identified within the DNL 80 dB exposure area, then additional analysis should be performed using L_{eq}. Estimates of DNL, made under the Laughlin 1, 2, and 3 MOAs, indicate that existing operations on the MOAs and MTRs that cross the MOAs are well below the DNL threshold for potential hearing loss.

Additionally, the Occupational Safety and Health Administration and Air Force Occupational Safety and Health guidelines are intended to protect human hearing from long-term, continuous exposures to high noise levels and aid in the prevention of noise-induced hearing loss. Both guidelines have permissible daily noise exposure limits including a L_{max} of 115 dBA for a duration of 15 minutes or less. This level and duration indicate when a hearing conservation program should be implemented at a given site. As shown in **Table 3.3-5**, overflights in the Laughlin 1, 2, and 3 MOAs, individually or together, are not expected to exceed 115 dBA for 15 minutes or longer on any given day.

Table 3.3-5 Estimated Noise Levels for Existing T-38C and T-1A Overflights in the Laughlin 1, 2, and 3 MOAs at Various Altitudes

Altitude (feet MSL)	T-38C		T-1A	
	L_{max}[1] (dBA)	SEL[1] (dBA)	L_{max}[1] (dBA)	SEL[1] (dBA)
8,000	55.7	65.1	46.8	55.0
12,000	47.5	57.1	37.6	46.4
15,000	42.8	52.4	32.5	42.2

Notes:
T-6 overflight noise levels (not shown) are noticeably lower than T-38C and T-1A noise levels.
[1] Noise levels (L_{max} and SEL) were calculated using NOISEMAP.

Table 3.3-5 shows estimated single event noise levels (L_{max} and SEL), directly under the flight path, for T-38C and T-1A aircraft at representative altitudes in the existing Laughlin 1, 2, and 3 MOAs from 8,000 feet MSL up to 15,000 feet MSL. For each altitude, the estimated SEL values are higher than the L_{max} values as the SEL includes both the overflight noise levels and the event duration. For both metrics, estimated noise levels are loudest for aircraft at an altitude of 8,000 feet MSL and levels decrease accordingly at higher altitudes. **Table 3.3-5** shows the expected range of levels estimated to occur for T-38C and T-1A overflights in the Laughlin 1, 2, and 3 MOAs with the highest levels including L_{max} of 55.7 dBA and SEL of 65.1 dBA. Overflights above 8,000 feet MSL in the MOAs are audible to individuals on the ground, but do not normally interfere with communication at ground level. Note that flight paths would typically be distributed within the MOA such that these highest overflight levels, estimated directly under the flight path, would not be expected to occur repeatedly at a single location on the ground.

Noise generated by aircraft within the boundaries of the Laughlin 1, 2, and 3 MOAs is occasionally audible in areas beyond the MOA boundaries. Military aircraft assigned to operate in a MOA utilize onboard mapping tools which assist them in avoiding flying too close to the MOA boundary to decrease the potential of an aircraft "spill out" (military aircraft unintentionally and temporarily flying beyond the airspace boundaries) which, should such an event occur, could cause noise events to be heard outside the MOA boundary. However, loud overflight noise events are experienced less frequently outside the MOA boundary than within the boundary and are limited

to some extent by the higher altitudes being flown. In general, people would need to be within about 5 miles of a military aircraft overflight to hear it clearly above ambient noise levels.

Speech Interference. In general, low- to mid-altitude aircraft overflights (e.g., below 1,000 feet AGL to several thousand feet AGL) can interfere with communication on the ground, and in homes, schools or other buildings directly under their flight path. The disruption of routine activities in the home, such as radio or television listening, telephone use, or family conversation, can cause annoyance. The quality of speech communication is also important in classrooms, offices, and industrial settings and can cause fatigue and vocal strain in those who attempt to communicate over the noise. The threshold at which aircraft noise may begin to interfere with speech and communication is established at 75 dBA outdoors (DNWG, 2013) which corresponds to roughly 50 dBA indoors assuming 25 dB of structural noise reduction. This level is consistent with the thresholds outlined in the ANSI's *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools*. None of the individual overflight levels shown in **Table 3.3-5** exceed L_{max} 75 dBA; therefore, existing overflights in the Laughlin 1, 2, and 3 MOAs are not expected to cause speech interference on the ground.

Sleep Interference. Sleep interference is another source of annoyance associated with louder, low-altitude aircraft overflights. This is especially true due to the intermittent nature of aircraft noise, which can be more disturbing than continuous noises. Sleep disturbance is not just a factor of the loudness, but also the duration of each noise event; therefore, sleep disturbance is best reflected with the SEL metric, which captures the total energy (i.e., level and duration) of each noise event. The Federal Interagency Committee on Aviation Noise (FICAN) recommends the use of the following SEL-based relationship for assessing potential sleep disturbance caused by aircraft noise (FICAN, 1997):

$$\text{Awakenings} = 0.0087 \times (\text{SEL}-30)^{1.79}$$

The above relationship, which defines the FICAN 1997 curve, should be interpreted as predicting the "maximum percent of the exposed population expected to be behaviorally awakened", or the "maximum % awakened" for a given residential population. This relationship predicts that 10 percent awakenings would occur to people exposed to an indoor SEL of 80 dB and less than 5 percent awakenings would occur to people exposed to an indoor SEL of 60 dB. Existing T-38C or T-1A aircraft activities on the Laughlin 1, 2, and 3 MOAs are not conducted between 10:00 p.m. and 7:00 a.m., except perhaps on rare occasion, and the outdoor SELs for these overflight operations **(Table 3.3-5)** are expected to be less than SEL 65 dB. Indoor SELs would be 15 to 25 dB lower depending on the design and types of materials used in housing construction; therefore, sleep interference during nighttime hours is not anticipated.

3.3.2 Environmental Consequences

3.3.2.1 Evaluation Criteria

Potential impacts from noise associated with the Proposed Action would be beneficial if the number of sensitive receptors exposed to unacceptable noise levels is reduced. Adverse impacts would occur if noise associated with the Proposed Action permanently exceeded the 65 dB cumulative noise threshold below which most types of land use are compatible.

The FAA defines a threshold for significant noise impacts as an increase in noise by 1.5 dB DNL or more in a noise sensitive area that is exposed to noise at or above the 65 dB DNL noise exposure level, or that would be exposed at or above the 65 dB DNL level due to a 1.5 dB or greater increase, when compared to the No Action Alternative for the same timeframe (FAA Order 1050.1).

For airspace actions, FAA requires that an action proponent identify where noise would change by the following specified amounts in noise sensitive areas (FAA Order 1050.1): for DNL 65 dB and higher: +/- DNL 1.5 dB (significant); for DNL 60 dB to <65 dB: +/- DNL 3 dB (reportable [3]); for DNL 45 dB to <60 dB: +/- DNL 5 dB (reportable [4])

Per FAA Order 1050.1, a noise sensitive area is defined as an area where noise interferes with normal activities associated with its use. Normally, noise sensitive areas include residential, educational, health, and religious structures and sites, cultural and historical sites, and parks, recreational areas, wilderness areas, and wildlife refuges. The FAA recognizes that there are settings where the 65 dB DNL standard for land use compatibility may not apply. These areas would likely be areas of extreme quiet, very rural areas, or natural areas with little human activity, such as wilderness areas or other protected natural areas.

The primary effect of recurring aircraft noise on exposed communities is long-term annoyance. The scientific community has adopted the use of long-term annoyance as a primary indicator of community response because it attempts to account for all negative aspects of effects from noise, including sleep disturbance, speech interference, and distraction from other human activities. Attitudinal surveys conducted over the past 30 years show a consistent relationship between DNL and the percentages of people who express annoyance. DNL estimates for the existing Laughlin 1, 2, and 3 MOAs and proposed MOA can be evaluated using **Table 3.3-6** to provide an estimate of the percentage of the population that would be "highly annoyed" by the noise.

Table 3.3-6 Relationship of DNL to Human Annoyance

DNL (dBA)	Highly Annoyed (percent)
45	0.83
50	1.66
55	3.31
60	6.48
65	12.29
70	22.10

3.3.2.2 Alternative 1 – Establish New Low-Altitude MOA Directly Under Laughlin 2 MOA

As noted in **Section 1.2.2**, T-38Cs would continue to operate at Laughlin AFB until the proposed transition to the T-7A is completed in 2033. Therefore, this analysis describes potential effects from noise associated with the operation of both the T-38C and T-7A under Alternative 1. Potential effects described for proposed aircraft operations involving the use of T-38Cs represent conditions that would be expected before the proposed T-7A recapitalization beginning in 2030. Potential

[3] Reportable changes in noise level may warrant further evaluation of potential impacts. FAA criteria are used because FAA would be responsible for approving and charting the proposed airspace.

effects from noise associated with proposed aircraft operations including the future operation of T-7As represent conditions following completion of the proposed T-7A recapitalization in and beyond 2033.

As noted in **Section 1.2.2**, the DAF is requesting the FAA to establish the new low-altitude airspace under Alternative 1 to support the necessary training requirements of the FBF training syllabus rather than to support the requirements of any particular type of aircraft, including either the T-38C or the T-7A. Potential effects from noise associated with proposed T-7A operations at and near Laughlin AFB are described in additional detail in the 2024 Final T-7A Recapitalization EIS and ROD (DAF, 2024a).

Effects from Proposed Aircraft Operations Including T-38Cs. This section describes potential noise effects from proposed aircraft operations under Alternative 1 involving T-38s, either individually or in combination with other aircraft operating in the proposed and adjacent existing MOAs and MTRs. Potential effects described in this section represent conditions that would be expected before the proposed T-7A recapitalization beginning in 2030. Potential effects from noise associated with the proposed operation of T-7As under Alternative 1 are described later in this analysis.

Proposed T-38C and T-6A operations on the Laughlin 1, 2, and 3 MOAs and proposed MOA are summarized in **Table 3.3-7**. These operations would occur annually in the MOA during the daytime period (defined as 7:00 a.m. to 10:00 p.m. for the purposes of this analysis using DNL). T-38C annual operations would consist of 1,570 daytime flights in the proposed MOA and 10,120 daytime flights in the Laughlin 1 and 2 High (existing) MOAs. T-6A annual operations would consist of 10 daytime operations in proposed MOA and 18,000 daytime operations in the Laughlin 1, 2, and 3 High MOAs. T-38C low-altitude air-to-ground training operations were analyzed with the T-6A training operations using the altitude utilization shown in **Table 3.3-7**. Approximately 75 percent of all T-38C operations in the proposed MOA would occur between 500 feet AGL and 2,000 feet AGL, with the remaining 25 percent occurring between 2,000 feet AGL and 6,999 feet MSL. All flights in the Laughlin 1 and 2 MOAs would be above 9,000 feet MSL and all flights in the Laughlin 3 MOA would be above 7,000 feet MSL. These operations and associated average airspeeds, power settings, time in airspace, and altitudes are the primary inputs to the noise models used in this analysis.

Estimated cumulative noise levels (L_{dn} and L_{dnmr}) from proposed aircraft operations in the proposed MOA and Laughlin 1, 2, 3 High MOAs under Alternative 1, and estimated noise levels from aircraft operations on MTR segments that cross the proposed MOA and Laughlin High MOAs, would not exceed 40.2 dBA **(Table 3.3-8)**. Estimated noise levels from aircraft operations in the MTR segments would contribute to the overall noise levels under the proposed Laughlin 2A Low and existing Laughlin High MOAs (directly under the MTR segments that cross these MOAs). Areas under the proposed MOA would remain well below the 65 dBA threshold below which most types of land uses are compatible with aircraft noise. In addition, since there would be no change in levels (or a minor change associated with areas under IR-170) compared with existing cumulative noise levels **(Table 3.3-3)**, these would be considered not significant in accordance with FAA Order 1050.1.

Table 3.3-7 Estimated Cumulative Noise Levels Under the Existing Laughlin 1, 2, and 3 MOAs and Proposed Laughlin 2A Low MOA from Proposed Aircraft Operations

Aircraft	Laughlin 2A Low MOA, Laughlin 1, 2, and 3 MOAs, and ATCAAs		MTRs			Total		Change		FAA Determination of Impact in Noise Sensitive Areas
	L_{dn} dBA)	L_{dnmr} (dBA)	MTR/ Segment	L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)	
T-38C and T-6A	<35.0	<35.0	IR-170 D-E (T-38C)	<35.8	<35.8	38.4	38.4	0.4	0.4	Not significant
			VR-140 C-E (T-38C)	<35.0	<35.0	38.0	38.0	0.0	0.0	Not significant
			VR-1122 A-G (F-16C)	38.4	38.6	40.0	40.2	0.0	0.0	Not significant
			VR-1123 A-G (F-16C)	38.4	38.6	40.0	40.2	0.0	0.0	Not significant
			High MOAs/ATCAA Levels Only			35.0	35.0	0.0	0.0	Not significant

Table 3.3-8 Estimated Noise Levels from Proposed T-38C and T-6A Operations at Potential Noise-Sensitive Receptors Under or Near the Existing Laughlin 1, 2, and 3 MOAs and Proposed Laughlin 2A Low MOA

Potential Noise-Sensitive Receptor	L_{dn} (dBA)	L_{dnmr} (dBA)	Change		FAA Determination of Impact in Noise-Sensitive Areas
			L_{dn} (dBA)	L_{dnmr} (dBA)	
Sone Ranch	<35.0	<35.0	0.0	0.0	Not significant
524 Ranch	35.6	35.6	0.6	0.6	Not significant
HB Ranch	35.6	35.6	0.6	0.6	Not significant
Barksdale	35.5	35.5	0.5	0.5	Not significant
Leakey	<35.0	<35.0	0.0	0.0	Not significant
Camp Wood	<35.0	<35.0	0.0	0.0	Not significant
Honey's River House	<35.0	<35.0	0.0	0.0	Not significant
Old Goat Ranch	35.5	35.5	0.5	0.5	Not significant
H.P Williams Ranch	<35.0	<35.0	0.0	0.0	Not significant
Garner State Park	35.6	35.6	0.6	0.6	Not significant
Camp Riverview	37.0	37.0	0.4	0.4	Not significant
Reagan Wells Baptist Church	35.6	35.6	0.6	0.6	Not significant
Rio Escondido Properties	35.6	35.6	0.6	0.6	Not significant
Lightning Bug Hollow	36.7	36.8	1.7	1.8	Not significant
KC Ranch	35.6	35.6	0.6	0.6	Not significant
Concan	40.3	40.4	1.3	1.2	Not significant
The Rustic Retreat	35.6	35.6	0.6	0.6	Not significant
Dream Walkers Equine Therapy Center	42.4	42.6	0.9	0.9	Not significant
Uvalde High School/Uvalde	37.9	38.1	0.0	0.0	Not significant

Estimated noise levels from proposed aircraft operations that would occur at potential noise-sensitive receptors under or near the proposed MOA and existing Laughlin 1, 2, and 3 MOAs under Alternative 1 are presented in **Table 3.3-9**. The receptor locations are shown on **Figure 3.3-1**. These estimated noise levels would not exceed 42.6 dBA at any potential noise-sensitive receptor

and would remain well below the 65 dBA threshold below which most types of land uses are compatible with aircraft noise. The noise levels would change by 0.6 dB or less at most of the noise sensitive receptors in **Table 3.3-9**, compared with existing noise levels **(Table 3.3-4)**; the greatest change would be 1.8 dB (at Lightning Bug Hollow) compared with the existing noise levels. All changes shown in **Table 3.3-9**, resulting from Alternative 1, would be considered not significant in accordance with FAA Order 1050.1.

Table 3.3-9 Estimated Noise Levels from Proposed T-38C Aircraft Overflights in the Existing Laughlin 1, 2, and 3 MOAs and Proposed Laughlin 2A Low MOA at Various Altitudes

Proposed Aircraft Overflights	Altitude (feet)							
	500 AGL	1,000 AGL	5,000 MSL	8,000 MSL	500 AGL	1,000 AGL	5,000 MSL	8,000 MSL
	L_{max} (dBA)[1]				SEL (dBA)[1]			
T-38C Low-Altitude Air-to-Ground Training and High MOA Training	91.3	83.4	66.8	55.7	94.7	88.6	74.7	65.1

Notes:
[1] Noise levels (L_{max} and SEL) shown in this table were calculated using NOISEMAP.

The number of aircraft operations in the MOAs would show a minor increase under Alternative 1, relative to Existing Conditions, and noise levels would show a limited increase primarily due to the addition of low-altitude T-38C (primary user) and T-6A operations in the proposed MOA. However, noise from proposed aircraft operations under Alternative 1 would not be expected to temporarily or permanently impede or prevent the continued occupation of any land use underlying the proposed MOA and existing Laughlin 1, 2, and 3 MOAs and associated ATCAA. Therefore, long-term impacts from noise under Alternative 1 with T-38C aircraft would not be adverse.

Under Alternative 1, estimated L_{max} and SEL values for proposed T-38C operations in the proposed Laughlin 2A Low and Laughlin High MOAs would be highest at altitudes of 500 feet AGL and would decrease accordingly at higher altitudes **(Table 3.3-9)**.

Estimated SEL values are somewhat higher at each representative altitude, relative to the corresponding L_{max} values, because SEL includes both the overflight noise levels and the event duration. Note that the noise levels estimated in **Table 3.3-9** are based on different T-38C airspeed and power settings for low-altitude and high-altitude flight conditions; T-6A noise levels (not shown in **Table 3.3-9**) are substantially lower than T-38C noise levels. Flight paths would typically be distributed across the MOAs such that these highest overflight levels (estimated directly under the flight path) would not be expected to occur repeatedly at a single location on the ground.

Individual noise events from proposed aircraft operations under Alternative 1 would be heard at various locations under the proposed MOA and existing Laughlin 1, 2, and 3 MOAs. However, most annual training flights would occur in the High MOAs at high altitudes; approximately 95 percent of annual T-38C and T-6A flights (28,120 of 29,700) would occur in the Laughlin 1, 2, and 3 MOAs, at altitudes above 7,000 feet MSL. Most of the flights would therefore not be expected to cause annoyance or disrupt common activities any more than typical everyday events (such as automobile noise, lawn mowing, other civil aircraft flyovers). Of the remaining 1,580 flights in the proposed MOA under Alternative 1, individual noise events would occasionally be heard, though flight paths in the proposed MOA (like the Laughlin 1, 2, and 3 MOAs) would typically be

distributed throughout the airspace such that the highest expected overflight levels would not occur repeatedly at a single location on the ground. Noise from individual military overflights within the boundaries of the proposed MOA would increase due to the requirements for low altitude training; however, most of the noise generated by T-38C and T-6A aircraft would be contained within the boundary of the proposed MOA. Additionally, military aircraft would typically avoid flying too close to the MOA boundary to decrease the potential of an aircraft "spill out" (military aircraft unintentionally and temporarily flying beyond the airspace boundaries) which, should such an event occur, could cause noise events to be heard outside the proposed MOA boundary. No residences were identified within noise exposure areas exceeding DNL 80 dB, such that noise levels from Alternative 1 would be below the DNL threshold for potential hearing loss.

Table 3.3-9 indicates L_{max} values of up to 91 dB for individual T-38C low-altitude training flights. However, these values, individually or cumulatively throughout the day, would not be expected to exceed 115 dB for the associated permitted exposure duration of 15 minutes. As such, overflights in the proposed MOA and existing Laughlin 1, 2, and 3 MOAs and MTRs, individually or together, would not have the potential to cause hearing loss.

These same aircraft, however, would be loud enough to occasionally interfere with speech occurring indoors, such as in residences or schools. Direct overflights from T-38C activity on the low MOA would generate levels that exceed L_{max} 75 dBA **(Table 3.3-9)**, such that, occasionally, speech interference would occur. Any such interference would be brief due to the short nature of these events (i.e., planes flying at hundreds of miles per hour). Since no nighttime flight operations are proposed, sleep interference during nighttime hours is not anticipated. Flights would also be dispersed throughout the proposed MOA and existing High MOAs, limiting the number of overflights of a particular area on the ground.

Effects from Proposed Aircraft Operations Including T-7As. This section describes potential noise effects from proposed aircraft operations under Alternative 1 involving T-7As, either individually or in combination with other aircraft operating in the proposed and adjacent existing MOAs and MTRs. Potential effects described in this section represent conditions that would be expected following completion of the proposed T-7A recapitalization in and beyond 2033.

Proposed T-7A and T-6A operations on the existing Laughlin 1, 2, and 3 MOAs and proposed MOA under Alternative 1 are summarized in **Table 3.3-10**. These operations would occur annually in the MOA during the daytime period (defined as 7:00 a.m. to 10:00 p.m. using DNL). T-7A annual operations would consist of 1,570 daytime flights in the proposed MOA and 10,120 daytime flights in the Laughlin 1 and 2 High MOAs. T-6A annual operations would consist of 10 daytime operations in the proposed MOA and 18,000 daytime operations in the Laughlin 1, 2, and 3 High MOAs. T-7A low-altitude air-to-ground training operations were analyzed with the T-6A training operations using the altitude utilization shown in **Table 3.3-10**. Ninety-one percent of all T-7A operations in the proposed MOA would occur between 500 and 2,000 feet AGL, with the remaining 9 percent occurring between 2,000 feet AGL and 6,999 feet MSL. All flights in the Laughlin 1 MOA would be above 9,000 feet MSL and all flights in the Laughlin 2 and 3 MOAs would be above 7,000 feet MSL. These operations and associated average airspeeds, power settings, time in airspace, and altitudes are the primary inputs to the noise models used in this analysis.

Table 3.3-10 Summary of Proposed Flight Operations in the Existing Laughlin 1, 2, and 3 MOAs and Proposed Laughlin 2A Low MOA

Laughlin 1 MOA Operations				
	Aircraft	**T-7A**	**T-6A**	**T-38C**
	Number of Day[1] Sorties	9,108	900	9,108
	Number of Night[2] Sorties	0	0	0
	Time in Airspace per Sortie (minutes)	45	45	45
Altitude Utilization (feet MSL)				
Existing Laughlin 1 MOA	9,000-12,000	15%	40%	15%
	12,000-15,000	35%	40%	35%
	15,000-FL180	35%	10%	35%
ATCAA	FL180-FL220	15%	10%	15%
Laughlin 2 MOA Operations				
	Aircraft	**T-7A**	**T-6A**	**T-38C**
	Number of Day[1] Sorties	1,012	16,200	1,012
	Number of Night[2] Sorties	0	0	0
	Time in Airspace per Sortie (minutes)	25	45	25
Altitude Utilization (feet MSL)				
Existing Laughlin 2 MOA	7,000-9,000	0%	30%	0%
	9,000-12,000	5%	30%	30%
	12,000-15,000	10%	20%	30%
	15,000-FL180	80%	10%	35%
ATCAA	FL180-FL220	5%	10%	5%
Proposed Laughlin 2A Low MOA Operations				
	Aircraft	**T-7A**	**T-6A**	**T-38C**
	Number of Day[1] Sorties	1,570	10	1,570
	Number of Night[2] Sorties	0	0	0
	Time in Airspace per Sortie (minutes)	20	45	20
Altitude Utilization (feet AGL)				
Proposed Laughlin 2A Low MOA	500-1,000	20%	30%	20%
	1,000-2,000	71%	40%	55%
	2,000-3,000	3%	30%	16%
	3,000-5,000	3%	0%	5%
ATCAA	5,000 (AGL)-6,999 (MSL)	3%	0%	4%
Laughlin 3 MOA Operations				
	Aircraft	**T-7A**	**T-6A**	**T-38C**
	Number of Day[1] Sorties	NA	900	NA
	Number of Night[2] Sorties	NA	0	NA
	Time in Airspace per Sortie (minutes)	NA	45	NA
Altitude Utilization (feet MSL)				
Existing Laughlin 3 MOA	7,000-9,000	NA	30%	NA
	9,000-12,000	NA	30%	NA
	12,000-15,000	NA	20%	NA
	15,000-FL180	NA	10%	NA
ATCAA	FL180-FL220	NA	10%	NA

Notes:
[1] Daytime hours are defined as 7:00 a.m. to 10:00 p.m. local time for the purposes of this analysis.
[2] Nighttime hours are defined as 10:00 p.m. to 7:00 a.m. local time for the purposes of this analysis.
NA = not applicable

Table 3.3-11 Estimated Cumulative Noise Levels Under the Existing Laughlin 1, 2 and 3 MOAs and Proposed Laughlin 2A Low MOA from Proposed Aircraft Operations

Aircraft	Laughlin 2A Low MOA		MTRs			Total		Change		FAA Determination of Impact
	L_{dn} dBA)	L_{dnmr} (dBA)	MTR/ Segment	L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)	
T-7A and T-6A	41.4	41.4	IR-170 D-E (T-38C)	49.0	49.0	49.8	49.8	14.8	14.8	Reportable
			VR-140 C-E (T-38C)	43.2	43.2	45.6	45.6	10.6	10.6	Reportable
			VR-1122 A-G (F-16C)	38.4	39.0	43.2	43.4	8.2	8.4	Not significant
			VR-1123 A-G (F-16C)	38.4	39.0	43.2	43.4	8.2	8.4	Not significant
Aircraft	**Laughlin 1, 2, and 3 MOAs, and ATCAAs**		**MTRs**			**Total**		**Change**		**FAA Determination of Impact**
	L_{dn} dBA)	L_{dnmr} (dBA)	MTR/ Segment	L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)	L_{dn} (dBA)	L_{dnmr} (dBA)	
T-7A and T-6A	<35	<35	IR-170 D-E (T-38C)	49.0	49.0	49.2	49.2	14.2	14.2	Reportable
			VR-140 C-E (T-38C)	43.2	43.2	43.8	43.8	8.8	8.8	Not significant
			VR-1122 A-G (F-16C)	38.4	39.0	40.0	40.5	0.0	0.3	Not significant
			VR-1123 A-G (F-16C)	38.4	39.0	40.0	40.5	0.0	0.3	Not significant
			High MOAs/ATCAA Levels Only			35.0	35.0	0.0	0.0	Not significant

Estimated cumulative noise levels (L_{dn} and L_{dnmr}) from proposed aircraft operations in the proposed MOA and existing Laughlin 1, 2, 3 High MOAs under Alternative 1, and estimated noise levels from aircraft operations on MTR segments that cross the proposed MOA and Laughlin High MOAs, would not exceed 49.8 dBA **(Table 3.3-11)**. Estimated noise levels from aircraft operations in the MTR segments would contribute to the overall noise levels under the Laughlin 2A Low and Laughlin High MOAs (directly under the MTR segments that cross these MOAs). Areas under the proposed MOA would remain well below the 65 dBA threshold below which most types of land uses are compatible with aircraft noise. The change in noise levels, compared with existing cumulative noise levels, is shown in **Table 3.3-11** along with the FAA determination of noise impact; in three cases, the noise level changes are considered to be reportable, though not significant, and the rest are considered to be not significant in accordance with FAA Order 1050.1.

Table 3.3-12 Estimated Noise Levels from Proposed T-7A and T-6A Operations at Potential Noise-Sensitive Receptors Under or Near the Existing Laughlin 1, 2, and 3 MOAs and Proposed Laughlin 2A Low MOA

Potential Noise-Sensitive Receptor	L_{dn} (dBA)	L_{dnmr} (dBA)	Change		FAA Determination of Impact in Noise Sensitive Areas
			L_{dn} (dBA)	L_{dnmr} (dBA)	
Sone Ranch	35.0	35.0	0.0	0.0	Not significant
524 Ranch	41.6	41.6	6.6	6.6	Not significant
HB Ranch	41.6	41.6	6.6	6.6	Not significant
Barksdale	41.5	41.5	6.5	6.5	Not significant
Leakey	35.0	35.0	0.0	0.0	Not significant
Camp Wood	35.0	35.0	0.0	0.0	Not significant
Honey's River House	35.0	35.0	0.0	0.0	Not significant
Old Goat Ranch	41.5	41.5	6.5	6.5	Not significant
H.P Williams Ranch	35.0	35.0	0.0	0.0	Not significant
Garner State Park	41.6	41.6	6.6	6.6	Not significant
Camp Riverview	42.2	42.3	7.2	7.3	Not significant
Reagan Wells Baptist Church	41.6	41.6	6.6	6.6	Not significant
Rio Escondido Properties	41.6	41.6	6.6	6.6	Not significant
Lightning Bug Hollow	42.2	42.2	7.2	7.2	Not significant
KC Ranch	41.6	41.6	6.6	6.6	Not significant
Concan	45.2	45.4	6.2	6.2	Reportable
The Rustic Retreat	41.6	41.6	6.6	6.6	Not significant
Dream Walkers Equine Therapy Center	45.8	46.0	4.3	4.3	Not significant
Uvalde High School/Uvalde	37.9	38.5	0.0	0.4	Not significant

Estimated noise levels from proposed aircraft operations that would occur at potential noise-sensitive receptors under or near the proposed MOA and Laughlin 1, 2, and 3 MOAs under Alternative 1 are presented in **Table 3.3-12**. The receptor locations are shown on **Figure 3.3-1**. These estimated noise levels would not exceed 46 dBA at any potential noise-sensitive receptor and would remain well below the 65 dBA threshold below which most types of land uses are compatible with aircraft noise. The noise level changes would be about 6 to 7 dB at most of the noise sensitive receptors in **Table 3.3-12**, compared with existing noise levels **(Table 3.3-4)**; the greatest change would be 7.3 dB at Camp Riverview compared with existing noise levels at this site. One change shown in **Table 3.3-12**, resulting from proposed aircraft operations under Alternative 1 using T-7A aircraft, would be considered reportable (at Concan), though not significant, in accordance with FAA Order 1050.1. Changes at all other locations would be considered not significant.

Table 3.3-13 Estimated Noise Levels from Proposed T-7A Aircraft Overflights in the Existing Laughlin 1, 2, and 3 MOAs and Proposed Laughlin 2A Low MOA at Various Altitudes

Proposed Aircraft Overflights	Altitude (feet)							
	500 AGL	1,000 AGL	5,000 MSL	8,000 MSL	500 AGL	1,000 AGL	5,000 MSL	8,000 MSL
	L_{max} (dBA)[1]				SEL (dBA)[1]			
T-7A Low-Altitude Air-to-Ground Training and High MOA Training	104.7	97.4	81.5	69.1	106.6	101.2	88.0	77.4

Notes:
[1] Noise levels (L_{max} and SEL) shown in this table were calculated using NOISEMAP.

The number of aircraft operations in the MOAs would show a minor increase under Alternative 1, relative to existing conditions, and noise levels would show a limited increase primarily due to the addition of low-altitude T-7A (primary user) and T-6A operations in the proposed MOA. However, noise from proposed aircraft operations under Alternative 1 would not be expected to temporarily or permanently impede or prevent the continued occupation of any land use underlying the proposed MOA and Laughlin 1, 2, and 3 MOAs and associated ATCAA. Therefore, long-term impacts from noise under Alternative 1 with T-7A aircraft would not be adverse.

Under Alternative 1, estimated L_{max} and SEL values for proposed T-7A operations in the new Laughlin 2A Low and existing Laughlin High MOAs would be highest at altitudes of 500 feet AGL and would decrease accordingly at higher altitudes **(Table 3.3-13)**. Estimated SEL values are somewhat higher at each representative altitude, relative to the corresponding L_{max} values, because SEL includes both the overflight noise levels and the event duration. Note that the noise levels estimated in **Table 3.3-13** are based on different T-7A airspeed and power settings for low-altitude and high-altitude flight conditions; T-6A noise levels (not shown in **Table 3.3-13**) are substantially lower than T-7A noise levels. Flight paths for each aircraft would typically be distributed across the MOAs such that these highest overflight levels (estimated directly under the flight path) would not be expected to occur repeatedly at a single location on the ground.

Individual noise events from proposed aircraft operations under Alternative 1 involving T-7A aircraft would be heard at various locations under the proposed MOA and existing Laughlin 1, 2, and 3 MOAs. However, most annual training flights would occur in the High MOAs at high altitudes; approximately 95 percent of annual T-7A and T-6A flights (28,120 of 29,700) would occur in the Laughlin 1, 2, and 3 MOAs, at altitudes above 7,000 feet MSL. Most of the flights would therefore not be expected to cause annoyance or disrupt common activities any more than typical everyday events (e.g., automobile noise, lawn mowing, other civil aircraft flyovers). Of the remaining 1,580 flights in the proposed MOA under Alternative 1, individual noise events would occasionally be heard, though flight paths in the proposed MOA (like the Laughlin 1, 2, and 3 MOAs) would typically be distributed throughout the airspace such that the highest expected overflight levels would not occur repeatedly, at a single location on the ground. Noise from individual military overflights within the boundaries of the proposed MOA would increase due to the requirements for low altitude FBF training; however, most of the noise generated by T-7A and T-6A aircraft would be contained within the proposed MOA boundary. Additionally, military aircraft would typically avoid flying too close to the MOA boundary to decrease the potential of

an aircraft "spill out" (military aircraft unintentionally and temporarily flying beyond the airspace boundaries) which, should such an event occur, could cause noise events to be heard outside the proposed MOA boundary. No residences were identified within noise exposure areas exceeding DNL 80 dB, such that Alternative 1 noise levels would be below the DNL threshold for potential hearing loss.

Table 3.3-13 indicates L_{max} values of up to 105 dB for individual T-7A low-altitude training flights. However, these values, individually or cumulatively throughout the day, would not be expected to exceed 115 dB for the associated permitted exposure duration of 15 minutes. As such, overflights in the proposed MOA and existing Laughlin 1, 2, and 3 MOAs and MTRs, individually or together, would not have the potential to cause hearing loss.

These same aircraft, however, would be loud enough to occasionally interfere with speech occurring indoors, such as in residences or schools. Direct overflights from T-7A activity in the proposed MOA would generate levels that exceed L_{max} 75 dBA **(Table 3.3-13)** such that, occasionally, speech interference would occur. Any such interference would be brief due to the short nature of these events (i.e., planes flying at hundreds of miles per hour). Sleep interference during nighttime hours is not anticipated because no nighttime aircraft operations are proposed under Alternative 1. Flights would also be dispersed throughout the Laughlin Low and High MOAs, limiting the number of overflights of a particular area on the ground.

3.3.2.3 No Action Alternative

Under the No Action Alternative, the proposed low-altitude airspace would not be obtained, and existing conditions would continue. Aircraft operations in the existing Laughlin 1, 2, and 3 MOAs and MTRs would continue as they currently do, and the dimensions of these airspace would remain unchanged. This would have no significant impact from noise.

3.4 Land Use

3.4.1 Affected Environment

Given the large geographic area within the ROI, data from the U.S. Geological Survey's (USGS) National Land Cover Database (USGS, 2024) was used to characterize existing land use. Although more generalized than locality-specific land use data, the National Land Cover Database data is generally indicative of existing land use conditions and appropriate to characterize potential impacts from the Proposed Action at this scale of analysis.

The ROI encompasses approximately 624,734 acres (976 square miles) in Edwards, Real, Kinney, and Uvalde Counties. The land area of each county within the ROI is summarized in **Table 3.4-1**.

Land use categories within the ROI are summarized in **Table 3.4-2** and shown on **Figure 3.4-1**. Lands categorized as Shrub / Scrub and Grassland / Herbaceous (406,387.8 acres) and Forest (192,276.3 acres) represent nearly 96 percent of land within the ROI. Collectively, less than 4 percent of land in the ROI is categorized as Developed (10,176.3 acres) or Cultivated Crops and Pasture / Hay (11,562.3 acres). Lands categorized as Open Water, Barren Land, and Wetlands each represent less than 1 percent of lands in the ROI.

Table 3.4-1 Land Area in the ROI by County

County	Acres	Square Miles
Edwards	53,626.8	83.8
Kinney	1,051.1	1.6
Real	189,938.2	296.8
Uvalde	380,118.2	593.9
Total	**624,734.3**	**976.1**

Table 3.4-2 Land Cover in the ROI

Land Cover Category	Acres	Percent of ROI
Shrub / Scrub and Grassland / Herbaceous	406,387.8	65.0
Forest	192,276.3	30.8
Cultivated Crops and Pasture / Hay	11,562.3	1.9
Developed	10,176.3	1.6
Wetlands	2,636.9	0.4
Barren Land	767.7	0.1
Open Water	926.9	0.1
Total	**624,734.2**	**100.0**

Source: USGS, 2024

Lands in the ROI are sparsely developed, with a population density of 5.7 persons per square mile in 2020 **(Section 3.9)**. Cities and towns in the ROI with larger concentrations of development summarized in **Table 3.4-3** and shown on **Figure 3.4-1**.

Table 3.4-3 Cities and Towns in the ROI

City / Town	County	Population
Barksdale	Edwards	91
Camp Wood	Real	517
Knippa	Uvalde	606
Leakey	Real	315
Rio Frio	Real	307

Sources: U.S. Census Bureau, 2020a; 2020b; 2020c; 2020d; 2020e

Garner State Park is in the east-central portion of the ROI **(Figure 3.4-1)**. This state park covers 1,774 acres and includes a 2.9-mile segment of the Frio River. Park amenities include cabins, campsites, and 16 miles of trails (TPWD, 2025). No other state parks, national parks, national wildlife refuges, wildlife management areas, or Native American reservations are in the in the ROI. Five airports are within the ROI **(Section 3.2.1.2)**; additionally, Garner Field Airport (UVA) is just outside the ROI approximately 4 miles to the south.

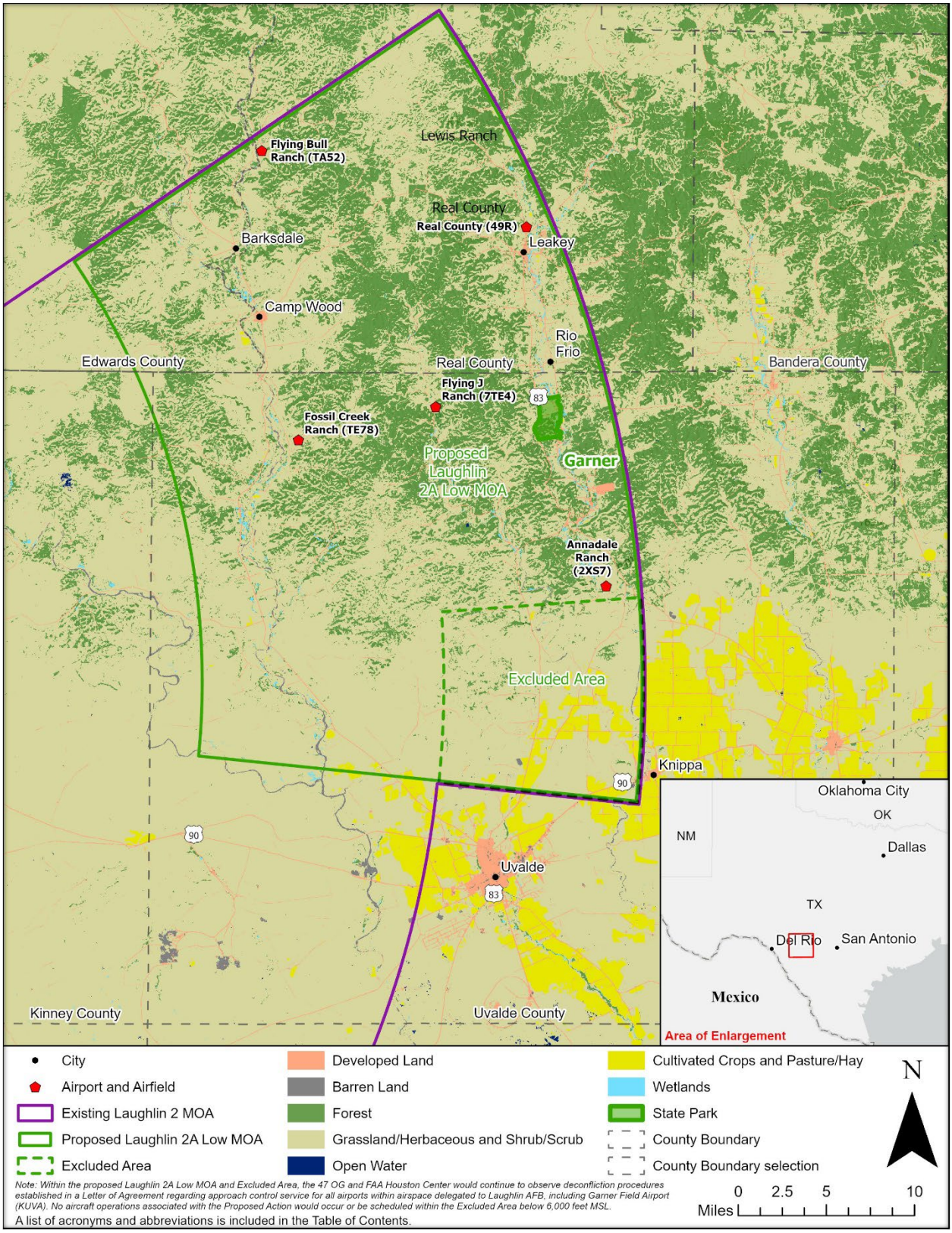


Figure 3.4-1 Existing Land Cover in the ROI

The DAF identifies wind turbines, local airfields, airports, towers, and other vertical structures as avoidance areas that are factored into flight plans. The potential for overflight obstruction hazards is a shared concern for all aviation users, including the DoD, commercial, business, and general aviation users. As with any large vertical construction project, such as telecommunication towers or wind turbines, the DoD considers potential impacts of wind farm development on flight safety from obstructions introduced near DoD airfields, training ranges, and in areas used for military flight operations.

No utility-scale wind turbines are currently located in the ROI (USGS, 2025). Areas where annual average wind speeds are at least 13 miles per hour are considered optimal for siting utility-scale turbines, which range from 500 feet to as high as 900 feet tall (USEIA, 2024). Annual average wind speeds in and around the ROI, modeled at 328 feet above the ground surface, vary from approximately 8.9 to 13 miles per hour (USDOE, 2023).

The DoD is supportive of renewable energy where it is compatible with the DoD mission to test, train, and operate. The DAF is a member of the DoD Siting Clearinghouse established by Congress in January 2011 in Section 358 of the Ike Skelton National Defense Authorization Act for FY11 (Public Law 111-383). That authority was amended and codified in 2017 as 10 U.S.C. § 183a. The Clearinghouse provides a timely, transparent, and repeatable process that can evaluate potential impacts and explore mitigation options, while preserving the DoD mission through collaboration with internal and external stakeholders. In addition to the DoD Clearinghouse process, all structures constructed taller than 200 feet trigger a review from the FAA (through the Obstruction Evaluation / Airport, Airspace, Analysis process).

3.4.2 Environmental Consequences

3.4.2.1 Evaluation Criteria

Impacts on land use and recreational resources would be significant if the Proposed Action failed to comply with existing land use plans or policies; undermined the viability of existing land uses; prevented continued use or occupation of an area; created incompatibility with adjacent land uses that threatens public health or safety; or conflicted with planning criteria established to protect human life and property. Recreational resources would be affected if the Proposed Action changed the access to or availability of recreation sites or activities, or altered the characteristics of the area in a way that diminishes recreational opportunities.

3.4.2.2 Alternative 1

Establishment of the proposed MOA would be unlikely to result in development activities or population changes in the ROI that would require changes to existing or proposed land use patterns or be inconsistent with existing land use plans and policies. Aircraft operations occurring as low as 500 feet AGL in the proposed MOA, including either T-38Cs or T-7As, would increase noise experienced at underlying land uses **(Section 3.3.2)** due to lowering the flight floor to 500 feet AGL; however, aircraft would not exceed supersonic speeds while operating within the proposed airspace. Cumulative noise levels from proposed aircraft operations under Alternative 1 would be similar to existing ambient noise conditions in the ROI and would not exceed the 65 dBA threshold below which most types of land use are compatible with aircraft noise. Of the operations in the

proposed MOA under Alternative 1, individual noise events would be heard but would be distributed throughout the airspace such that the highest expected overflight levels would not occur repeatedly at a single location on the ground. Additional information regarding potential impacts on land use from the proposed T-7A recapitalization at Laughlin AFB is provided in the 2024 T-7A Recapitalization Final EIS and ROD (DAF, 2024a).

If Alternative 1 is selected for implementation and future development of utility-scale wind turbines is proposed on land in the ROI, the DoD would evaluate the turbine project and engage with the developer(s) through the DoD Siting Clearinghouse process to identify technically feasible and affordable mitigation measures to avoid flight obstruction impacts on proposed low-level aircraft operations. Much of the proposed MOA is already subject to DoD Siting Clearinghouse review because segments of six existing MTRs cross the airspace **(Figure. 3.2-1)**. Therefore, if Alternative 1 is selected for implementation, airspace within the proposed MOA would continue to be subject to DoD Siting Clearinghouse reviews. In most cases, the DoD Energy Siting Clearinghouse, through its mitigation response team process, finds a compromise where turbines can proceed under the airspace if proposed turbine locations are laterally relocated or through the implementation of other mitigation strategies. In the 13-year history of the DoD Energy Siting Clearinghouse process, only a few objections have been issued out of thousands of proposed wind farms.

Overall, Alternative 1 would be unlikely to require temporary or permanent changes to existing or proposed land uses, prevent the continued use and occupation of existing land uses, or result in incompatibilities with existing or planned land use plans and policies. Therefore, impacts on land use from Alternative 1 would not be significant.

3.4.2.3 No Action Alternative

Under the No Action Alternative, the proposed airspace would not be obtained, and existing conditions would continue. This would have no impact on land use.

3.5 Air Quality

3.5.1 Affected Environment

3.5.1.1 Regional Climate

The lateral boundaries of the proposed MOA encompass portions of Edwards, Real, Uvalde and Kinney Counties, which are located in the interior semi-arid region of south Texas. The general climate conditions for Leakey, in Real County were chosen to represent regional climate conditions in the ROI. In Leakey, the summers are hot and muggy; the winters are short, cold, and windy; and it is partly cloudy year-round. The estimated annual average temperature in Leakey is 66.6 degrees Fahrenheit (°F). The warmest month is August, with an average maximum temperature of 93°F. The coolest month is January, with an average minimum temperature of 40°F. Leakey experiences significant seasonal variation in monthly rainfall. The most rainfall occurs in May, with an average of 3.0 inches. The least rainfall occurs in January, with an average of 0.9 inches. The predominant average hourly wind direction in Leakey is from the south throughout the year and the annual average hourly wind speed in Leakey is approximately 10 miles per hour. (Weatherspark, 2025)

3.5.1.2 Regional Air Quality

Counties in the ROI are in attainment (or are unclassifiable) for each of the criteria pollutants regulated under the National Ambient Air Quality Standards (NAAQS) (Air Conformity Applicability Model [ACAM], 2024). Therefore, the General Conformity Rule does not apply to the Proposed Action and is not addressed further in this air quality analysis.

The proposed MOA would not be located within 100 kilometers (approximately 62 miles) of any U.S. Environmental Protection Agency (USEPA)-designated Class 1 areas protected by the Regional Haze Rule. No Class 1 areas would be affected by emissions associated with the Proposed Action.

3.5.1.3 Greenhouse Gases

Total annual greenhouse gases (GHG) emissions in Texas, based on a 5-year average (2016 through 2020), were approximately 836 million metric tons per year (mton/yr) of CO_2e (ACAM GHG emissions). This represents approximately 13 percent of total annual U.S. CO_2e emissions during the same 5-year period, which is reported to be 6,252 million mton/yr of CO_2e (ACAM GHG emissions).

Transportation activities accounted for 28.4 percent of U.S. GHG emissions from fossil fuel combustion in 2022. The largest sources of transportation greenhouse gas emissions in 2022 were light-duty trucks (36.5 percent); medium- and heavy-duty trucks (22.9 percent); passenger cars (20.4 percent); commercial aircraft (7.2 percent); pipelines (3.8 percent); ships and boats (2.8 percent); other aircraft (2.0 percent), and rail (2.0 percent) (USEPA, 2024).

3.5.2 Environmental Consequences

3.5.2.1 Evaluation Criteria

Jurisdictions within the ROI are in attainment (or are unclassifiable) for each of the criteria pollutants regulated under the NAAQS. As such, the General Conformity Rule is not applicable to emissions from the Proposed Action and is not addressed in this air quality analysis.

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

The ACAM Version 5.0.24a (ACAM, 2024) was used to estimate the total non-exempt direct and indirect net emissions from the Proposed Action. The "Low Flight Pattern" activity type in ACAM was selected for estimating emissions in the proposed MOA. The Proposed Action is completely new and therefore, the total net emissions from the Proposed Action would be entirely additive (the current level would be zero). Impacts from the Proposed Action are evaluated based on the estimated net change in emissions compared against insignificance indicators for each pollutant. Pollutants emitted by aircraft above 3,000 feet AGL (or above the mixing height) are excluded from the air quality impact analysis for criteria pollutants.

The start date in ACAM is assumed to be January 1, 2026, which is the date when the proposed MOA would be assumed to become operational. The projected number of aircraft and aircraft operations in the proposed MOA is based on information in the data validation package prepared for the noise analysis **(Section 3.3)** (DAF, 2024d). Currently, aircraft operations in MOAs scheduled and managed by Laughlin AFB are not permitted below 7,000 feet MSL **(Section 1.2.2)**. This analysis assumes that potential impacts on air quality from the Proposed Action would be associated with the operation of aircraft in the proposed MOA starting January 2026 and operating indefinitely. This analysis further assumes that aircraft operations in the proposed airspace would primarily be performed by pilots from the 47 FTW at Laughlin AFB initially flying T-38Cs and transitioning entirely to the T-7As beginning in 2034. **Table 3.5-1** summarizes the annual number of sorties used for estimating emissions in ACAM, considering the transition from T-38Cs to T-7As. Additional information on potential effects from the proposed T-7A recapitalization at Laughlin AFB is provided in the T-7A Recapitalization Final EIS and ROD (DAF, 2024a).

Table 3.5-1 Annual Number of Sorties for Alternative 1

Aircraft	Annual Laughlin 2A Low MOA Sorties					
	2026-2029[1]	2030[2]	2031[2]	2032[2]	2033[2]	2034 and Beyond[3]
T-38C	1,570	1,256	942	628	314	0
T-7A	0	314	628	942	1,256	1,570

Notes:
[1] Represents sorties from existing T-38C operations in the newly established Laughlin 2A Low MOA for each year.
[2] Represents annual number of sorties from a mix of T-38C vs. T-7A operations in the Laughlin 2A Low MOA.
[3] Represents annual number of sorties entirely from T-7A operations (T-38Cs phased out) in the Laughlin 2A Low MOA.

Greenhouse Gases. ACAM Version 5.0.24a was also used to evaluate GHG emissions from the Proposed Action. The GHG Emissions Evaluation calculates potential GHG emissions (CO_2e) from the action, determines if the action's emissions are insignificant, and provides a relative significance comparison. For the analysis, the PSD threshold for GHG of 75,000 tpy of CO_2e (or 68,039 mton/yr) was used as an indicator or "threshold of insignificance" for NEPA air quality impacts in all areas. This indicator does not define a significant impact; rather, it provides a threshold to identify actions that are insignificant (*de minimis*). Actions with a net change in GHG (CO_2e) emissions below the insignificance indicator (threshold) are considered too insignificant on a global scale to warrant further analysis. Actions with a net change in GHG (CO_2e) emissions above the insignificance indicator (threshold) are considered potentially significant and require further assessment to determine if the action would have a significant impact. If activities have *de minimis* (insignificant) GHG emissions, then on a global scale they are effectively zero and irrelevant (AFCEC, 2023).

ACAM assumptions, detailed emissions calculations, and summary results for the Proposed Action are provided in **Appendix D.4** .

3.5.2.2 Alternative 1

This analysis assumes that the proposed MOA would become operational in January 2026. From 2026 to 2029, T-38Cs would operate in the proposed MOA and would start to transition to the T-7A in 2030, with the transition being complete at the end of 2033. In 2034 and beyond, T-7As would operate exclusively and indefinitely in the proposed MOA; the T-38Cs would have been completely phased out. The T-7A is a single-engine, two-person, training aircraft that is currently programmed to be a one-for-one operational replacement for the T-38C.

Table 3.5-2 summarizes the annual net change (increase, decrease, or zero) in estimated criteria pollutant emissions considering the transition schedule from T-38C to T-7A aircraft that would take place during the timeframe of the Proposed Action. Emissions for each pollutant within the ROI would increase as a result of proposed operations under Alternative 1, but the estimated emission increase for each criteria pollutant would be less than their associated insignificance indicator values. As shown in **Table 3.5-2**, the highest annual emission increase would be for CO (31.92 tpy), which would be well below the insignificance indicator value of 250 tpy (25 tpy for Pb). These estimated net increases in criteria pollutant emissions would not be significant under Alternative 1 and therefore, would not be expected to result in an exceedance of the NAAQS for any criteria pollutant or cause an adverse impact on the attainment status of the Metropolitan San Antonio Intrastate AQCR.

Table 3.5-2 Estimated Total Annual Criteria Pollutant Emissions for Alternative 1

Pollutant	Emissions (tons/year)						Insignificance Indicator	Exceeds Indicator Level in any Year?
	2026-2029[1]	2030[2]	2031[2]	2032[2]	2033[2]	2034 and Beyond[3]		
VOC	1.36	1.87	2.38	2.89	3.40	3.91	250	No
NO_x	0.34	5.92	11.49	17.07	22.64	28.21	250	No
CO	31.92	26.18	20.44	14.70	8.96	3.22	250	No
SO_x	0.53	0.79	1.05	1.31	1.58	1.84	250	No
PM_{10}	0.88	0.75	0.62	0.49	0.36	0.22	250	No
$PM_{2.5}$	0.79	0.67	0.55	0.43	0.31	0.19	250	No
Pb	0	0	0	0	0	0	25	No
NH_3	0	0	0	0	0	0	N/A	N/A

Notes:
[1] Represents annual emissions from existing T-38C operations in the newly established Laughlin 2A Low MOA.
[2] Represents annual emissions from a mix of T-38C and T-7A operations in the Laughlin 2A Low MOA.
[3] Represents annual emissions entirely from T-7A operations (T-38Cs phased out) in the Laughlin 2A Low MOA.
CO = carbon monoxide; N/A = not applicable; NH3 = ammonia; NOx = nitrogen oxides; Pb = lead; PM2.5 = particulate matter less than 2.5 microns; PM10 = particulate matter less than 10 microns; SOx = sulfur oxides; VOC = volatile organic compound

Although CO emissions in **Table 3.5-2** are the highest during the initial years of the Proposed Action (2026 to 2029), the highest emissions generated during the steady state[4] (2034 and beyond)

[4] Steady state means that the Proposed Action is considered to be fully implemented and no further net gain or loss in emissions would occur.

are for nitrogen oxides (NOx). This is because during the initial years of Proposed Action implementation only T-38Cs would operate in the proposed MOA and their engines generate more CO than NOx per sortie relative to T-7A engines, which emit more NOx than CO per sortie. By 2034, only T-7As would be operational and associated NOx emissions would be higher than CO. Regardless, annual emissions from both CO and NOx would be well below the insignificance indicator value of 250 tpy (25 tpy for Pb) and impacts on air quality would not be significant. The ACAM Report Record of Air Analysis and the Detailed ACAM Report are provided in **Appendix D.4.8.**

Greenhouse Gases. Table 3.5-3 summarizes estimated increases in maximum annual GHG emissions through the projected life cycle of Alternative 1 and provides its relative significance in a national and global context. Estimated annual GHG emissions for the projected life cycle of the Proposed Action would be well below the insignificance threshold value. Also, the total increase in GHG emissions from Alternative 1 is estimated to be 28,646 mton of CO_2e, which would result from the combustion of fossil fuels during aircraft operations in the proposed MOA. This increase would represent approximately 0.00034258 percent of total GHG emissions in the state and approximately 0.00004582 percent of total U.S. GHG emissions. At these low levels, Alternative 1 would not result in significant impacts from GHG on a regional or global scale.

Table 3.5-3 Estimated Annual GHG Emissions for Alternative 1 and Total GHG Relative Significance

Year	GHG Emissions (mton/yr)[1]				Threshold (mton/yr)[2]	Exceedance
	CO_2	CH_4	N_2O	CO_2e		
2026	1,426	0.05994052	0.01169441	1,430	68,039	No
2027	1,426	0.05994052	0.01169441	1,430	68,039	No
2028	1,426	0.05994052	0.01169441	1,430	68,039	No
2029	1,426	0.05994052	0.01169441	1,430	68,039	No
2030	2,140	0.08999557	0.01755816	2,147	68,039	No
2031	2,855	0.12005063	0.0234219	2,865	68,039	No
2032	3,570	0.15010568	0.02928565	3,582	68,039	No
2033	4,285	0.18016074	0.0351494	4,299	68,039	No
2034	4,999	0.21021579	0.04101315	5,016	68,039	No
2035 [SS Year]	4,999	0.21021579	0.04101315	5,016	68,039	No
Total GHG (CO_2e) Relative Significance (mton)[1]						
	CO_2	**CH_4**	**N_2O**	**CO_2e**		
2026-2032 (Action)	28,550	1.200506	0.234219	28,646		
Percent of State Totals				0.00034258		
Percent of U.S. Totals				0.00004582		

Notes:
[1] ACAM output results of GHG emissions and percent of Texas state and U.S. GHG emissions (see **Appendix D.3.7**).
[2] Air Force PSD threshold for GHG of 75,000 tpy of CO_2e (or 68,039 mton/yr) as an indicator or "threshold of insignificance" for NEPA air quality impacts in all areas.
CH_4 = methane; CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalent; GHG = greenhouse gases; mton/yr = metric ton per year; N_2O = nitrous oxide; SS = steady state

3.5.2.3 No Action Alternative

Under the No Action Alternative, the proposed low-altitude airspace would not be obtained and existing conditions in the ROI would continue. This would have no significant impact on air quality.

3.6 Biological Resources

3.6.1 Affected Environment

Wildlife. Wildlife within the ROI include a variety of grassland and generalist species, along with species that have successfully adapted to mixed agricultural landscapes. At least 45 species of mammals, 211 species of birds, and 54 reptile/amphibian species have the potential to occur within the ROI (iNaturalist, 2025a). Representative species with the potential to occur within the ROI include mammals such as big brown bat (*Eptesicus fuscus*), coyote (*Canis latrans*), common raccoon (*Procyon lotor*), rock squirrel (*Otospermophilus variegatus*), eastern cottontail rabbit (*Sylvilagus floridanus*), white-tailed deer (*Odocoileus virginianus*), and wild boar (*Sus scrofa*); birds including American crow (*Corvus brachyrhynchos*), barn swallow (*Hirundo rustica*), purple martin (*Progne subis*), cliff swallow (*Petrochelidon pyrrhonota*), and mourning dove (*Zenaida macroura*); and reptiles and amphibians such as Blanchard's cricket frog (*Acris blanchardi*), gopher snake (*Pituophis catenifer*), checkered garter snake (*Thamnophis marcianus*), Texas horned lizard (*Phrynosoma cornutum*), diamondback water snake (*Nerodia r. rhombifer*), and Texas spiny lizard (*Sceloporus olivaceus*). Additional wildlife species with potential to occur in the ROI are listed in **Table D.5-1**. These species could be expected to breed, nest, and/or forage in terrestrial areas of the ROI where suitable habitat is present, while bird species could also occur within, below, or above the proposed airspace during migration or foraging activities.

The Ox Ranch, approximately 25 miles northwest of Uvalde, offers hunting opportunities for more than 70 species of exotic game such as aoudad (*Ammotragus lervia*), blackbuck (*Antilope cervicapra*), European fallow deer (*Dama dama*), lechwe (*Kobus leche*), red deer (*Cervus elaphus*), scimitar-horned oryx (*Oryx dammah*), and sika deer (*Cervus nippon*) (Ox Ranch, n.d.). The semi-arid conditions in the ROI are similar to habitats in east Africa and Asia from which some of these species originated.

Domestic Animals. Agricultural land uses within the ROI and surrounding Edwards Plateau / Texas Hill Country are dominated by large ranches (averaging 1,375 to 3,242 acres each) (NASS, 2022). At most ranches, domestic animals include sheep, goats, and cattle**.**

Migratory Flyways. In North America, approximately 70 percent of bird species are known to migrate, with approximately 80 percent of these (especially smaller songbirds) primarily migrating at night (Job, 2023). Migrating at night may allow birds to take advantage of calmer air, avoid predators, use the stars and moon to aid navigation, and minimize the risk of overheating (Job, 2023). Based on available radar data, many of these species begin their migratory flights approximately 30 to 45 minutes after local sunset, with peak bird density normally occurring 2 to 4 hours after sunset (BirdCast, 2025), though some local variations to this pattern exist.

The ROI is within the Central Flyway, a major north-south migratory corridor for waterfowl and songbirds that passes through Texas. Approximately 400 avian species use this flyway to transit

through central North America between summer breeding grounds to the north and wintering grounds to the south. It is estimated that up to 50 percent of all migratory waterfowl in North America use this flyway/migratory route (Fritts, 2022).

Federally Listed, Proposed, and Candidate Species and Federally Designated Critical Habitat. Table 3.6-1 summarizes federally listed, proposed, and candidate species known or having potential to occur in the ROI, and federally designated critical habit in the ROI. Additional information on these species is provided in **Table D.5-2**. Although they have potential to occur in the ROI, the federally threatened piping plover (*Charadrius melodus*) and red knot (*Calidris canutus rufa*) are only considered in Texas for proposed wind energy projects and therefore, are not addressed further in this EA. The USFWS Official Species List for the ROI is provided in **Appendix E** (USFWS, 2025a).

Table 3.6-1 Federally Listed, Proposed, and Candidate Species Known or Having Potential to Occur in ROI

Common and Scientific Name	Federal Status	Critical Habitat in the ROI?
Mammals		
tricolored bat (*Perimyotis subflavus*)	Endangered (Proposed)	No
Birds		
golden-cheeked warbler (*Setophaga chrysoparia*)	Endangered	No
Amphibians		
San Marcos salamander (*Eurycea nana*)	Threatened	No
Texas blind salamander (*Eurycea rathbuni*)	Endangered	No
Fishes		
fountain darter (*Etheostoma fonticola*)	Endangered	No
Insects		
Comal Springs dryopid beetle (*Stygoparnus comalensis*)	Endangered	No
Comal Springs riffle beetle (*Heterelmis comalensis*)	Endangered	No
monarch butterfly (*Danaus plexippus*)	Threatened (Proposed)	No
Crustaceans		
Peck's cave amphipod (*Stygobromus pecki*)	Endangered	No
Flowering Plants		
Bracted twistflower (*Streptanthus bracteatus*)	Threatened	Yes
Texas snowbells (*Styrax platanifolius*)	Endangered	No
Texas wild-rice (*Zizania texana*)	Endangered	No
Tobusch fishhook cactus (*clerocactus brevihamatus*)	Threatened	No

Sources: USFWS, 2025a

Migratory Bird Treaty Act (MBTA). Most bird species are protected under the MBTA, and their protection by federal agencies is mandated by E.O. 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*.

Bald and Golden Eagle Protection Act. Bald (*Haliaeetus leucocephalus*) and golden (*Aquila chrysaetos*) eagles are federally protected under the Bald and Golden Eagle Protection Act. No

nesting bald or golden eagles are known to be present in the ROI or the four underlying counties (iNaturalist, 2025b). However, transient bald eagles have potential to occur in the ROI, with occurrences most likely between October and March (Monk, 2021), and transient golden eagles are considered rare (TBBA, 2007).

Parks and Other Managed Lands. Lands within the ROI that are managed or otherwise protected by state and local agencies or non-profit or private organizations to conserve natural features or minimize development include Garner State Park, managed by TPWD and conservation easements managed by The Nature Conservancy, the U.S. Department of Agriculture Natural Resources Conservation Service, Green Spaces Alliance, the City of San Antonio, or joint management by any of the aforementioned entities, and other privately-owned easements. These lands may provide suitable habitat for common or protected species of wildlife and plants described above.

Garner State Park is a 1,775-acre park in north-central Uvalde County owned and managed by TPWD. This park contains mixed Ashe juniper and oak woodlands that provide suitable habitat for the golden-cheeked warbler.

None of the following types of parks or managed lands are present within the ROI: State Wildlife Management Areas managed by the TPWD; National Parks managed by the National Park Service; National Wildlife Refuges or Fish Hatcheries managed by the USFWS; or National Forests or Grasslands managed by the U.S. Forest Service.

3.6.2 Environmental Consequences

3.6.2.1 Evaluation Criteria

Potential impacts on biological resources would be adverse if the Proposed Action resulted in the inadvertent injury or death of individual animals of common wildlife species, or the temporary removal of suitable habitat for one or more common wildlife species; temporarily impeded or prevented the continued foraging, breeding, nesting, or migration of common wildlife at the community, population, or species level; reduced the distribution of one or more common wildlife species; resulted in the spread of invasive or nonnative species; or if Section 7 consultation with USFWS determined that the Proposed Action would be likely to adversely affect federally listed threatened and endangered species under the ESA. Adverse impacts on biological resources would be considered significant if the Proposed Action permanently impeded or prevented the continued foraging, breeding, nesting, or migration of common wildlife at the community, population, or species level; resulted in the permanent destruction of suitable habitat for common wildlife species; or if adverse effects on special status species or critical habitat could not be mitigated through consultation with USFWS.

As required by the ESA, federal agencies must determine that their proposed actions do not adversely affect the existence of any threatened or endangered species. Federal agencies must avoid unauthorized "take" of federally threatened or endangered species or adverse modification of designated critical habitat. The ESA Section 7 consultation process results in a "no effect" determination, USFWS concurrence with the DAF's determination of "may affect, but not likely to adversely affect" federally listed species, or a "may affect, likely to adversely affect" determination, resulting in 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.

3.6.2.2 Alternative 1 – Proposed Laughlin 2A Low MOA

Unless otherwise noted, potential impacts on biological resources from the Proposed Action would be the same regardless of which type of aircraft (T-38C or T-7A) would operate in the proposed MOA (also see **Sections 1.2.2** and **3.1**). The proposed T-7A recapitalization at Laughlin AFB was previously determined to have less than significant adverse effects on wildlife and no effect on federally listed, proposed, or candidate species (DAF, 2024a).

Several factors, including direct strikes and visual effects associated with approaching aircraft could potentially impact wildlife in the ROI. Any impacts from visual sightings of approaching aircraft would most likely occur within the ROI below 1,000 feet AGL, the altitude accounting for most reactions to visual stimuli by wildlife (Bowles, 1995). 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; Krausman et al., 2010).

Noise that is close, loud, sudden, and combined with a visual stimulus produces the most intense reactions in animals. Rotary-wing aircraft (helicopters) generally induce startle effects more frequently than fixed-wing aircraft (Gladwin 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). Some studies suggest that hearing damage may occur at sound levels louder than 115 dB (Ising, 1990). 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.

Portions of the lands in the ROI support 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; U.S. 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 (Gladwin et al., 1988).

- 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 feet 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 typically resume normal behavior within two 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 daily, such as from vehicles or blowing vegetation. Historical interactions between 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 feet 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.

Visual and noise effects from fixed-wing aircraft flying below 1,000 feet AGL on flight-capable wildlife are dependent upon species demeanor, time of day, migration cycle, and behavioral activity. These are largely bird aircraft strike hazard (BASH) considerations accommodated by flight scheduling. No ground disturbance is associated with the Proposed Action, and it is anticipated that wildlife and domestic animals would generally habituate to noise and visual elements associated with aircraft operating in the proposed MOA. Therefore, noise and visual effects associated with the Proposed Action would have no significant adverse effects on wildlife and domesticated animals.

The low floor (500 feet AGL) in the proposed MOA may increase the potential for bird strikes. However, given the large (976-square mile) area where the training would occur, that most training would occur during daytime hours (sunrise to sunset, adjusted seasonally as needed), and the relatively low numbers of sorties proposed (1,570 annually, which would equate to an average of approximately 4.3 sorties per day, distributed across the 976-square mile proposed MOA), the likelihood for birds to encounter aircraft during training operations would remain low. Research suggests that approximately 80 percent of birds (especially smaller songbirds) using the Central Flyway primarily migrate at night (with peak volumes 3 to 4 hours after sunset). As a result, no significant increase in impacts on these migratory species is anticipated.

If BASH risk increases, pilots would follow additional avoidance procedures during low-altitude training. The inadvertent injury or death of birds from collisions with aircraft operating in the proposed MOA would represent an adverse impact. However, such impacts would occur at the individual level and would not permanently impede or prevent the continued foraging, breeding, nesting, or migration of common bird species wildlife at the community, population, or species level. Therefore, adverse impacts on birds would not be significant. Any “take” of birds protected by the MBTA would be small on an annual basis and would be considered incidental to military readiness activities in accordance with 50 CFR § 21.42.

Given the low frequency of proposed flight operations in the proposed MOA and the large area covered by the proposed MOA, the DAF has determined that Alternative 1 may affect, but is not

likely to adversely affect the golden-cheeked warbler, and would not jeopardize the continued existence of the tricolored bat or monarch butterfly. Alternative 1 would have no effect on federally listed plant species, aquatic or semi-aquatic species (fishes, crustaceans, and insects), or federally designated critical habitat because no earth disturbance or activities in or adjacent to surface water bodies would occur. USFWS concurrence with these determinations is pending. Additional rationale for federally protected species with a determination other than a "no effect" determination is provided below.

Tricolored bat. The primary threats to the tricolored bat are white-nose syndrome, habitat loss and fragmentation, and climate change. Tricolored bats are active and forage early in the evening and throughout the night, primarily within forests. Similarly, tricolored bats migrate to and from hibernacula at night. Although aircraft operations in the proposed airspace could occur in the early evening when the bats may be foraging, because of the relatively low numbers of sorties proposed (1,570 annually, which would equate to an average of approximately 4.3 sorties per day) and the 500-foot (AGL) floor of the proposed airspace, the likelihood for bats to encounter aircraft during proposed operations would remain low. Therefore, the DAF has determined that the Proposed Action would not jeopardize the continued existence of the tricolored bat.

Golden-cheeked warbler. The primary threat to the golden-cheeked warbler is habitat loss. The golden-cheeked warbler is a migratory species that overwinters in southern Mexico and central America. This warbler breeds exclusively in Texas in mixed Ashe juniper and deciduous woodlands in the Edwards Plateau and Cross Timbers ecoregions (USFWS, 2025b). The Proposed Action would not involve ground disturbance or any other activities that would further contribute to existing threats to the golden-cheeked warbler. Low-flying aircraft have the potential to startle nesting birds. However, given the large (976-square mile) area where the training would occur and the relatively low numbers of sorties proposed (1,570 annually, which would equate to an average of approximately 4.3 sorties per day), the likelihood for golden-cheeked warblers encountering aircraft during training operations would be low and thus, discountable. Further, the Laughlin AFB Safety Office models and forecasts bird activity to limit the risks of bird strikes (Air Force Safety Center, 2025). Therefore, the DAF has determined that the Proposed Action may affect, but is not likely to adversely affect, the golden-cheeked warbler.

Monarch butterfly. The primary threats to the monarch butterfly include loss of habitat (breeding, migratory, overwintering), insecticides, and long-term weather patterns (e.g., drought, storm events). The eastern population of the monarch butterfly likely migrates throughout Texas, en route to breeding grounds further north. The Proposed Action would not involve ground disturbance or any other activities that would further contribute to existing threats to the monarch butterfly. Given the large (976-square mile) area where the training would occur and the relatively low numbers of sorties proposed (1,570 annually, which would equate to an average of approximately 4.3 sorties per day), the likelihood for monarchs to encounter aircraft during training operations would be low. Therefore, the DAF has determined that the Proposed Action would not jeopardize the continued existence of the monarch butterfly.

3.6.2.3 No Action Alternative

Under the No Action Alternative, the proposed low-altitude airspace would not be obtained and existing conditions would continue. This would have no effect on biological resources.

3.7 Cultural Resources

3.7.1 Affected Environment

The proposed MOA overlies approximately 976 square miles of airspace in southwest Texas, including portions of Edwards, Kinney, Real, and Uvalde Counties **(Figure 2.2-1).** The southern portion of the APE straddles the interface of the interior coastal plain, Balcones Escarpment, and the Edwards Plateau, which is characterized by low rolling to nearly flat terrain, underlain by unconsolidated sands, muds, limestones, and dolomites (Bureau of Economic Geology, 1996). Vegetation consists of grasslands with live oak-ashe juniper communities grading westward to creosote bush–tarbush shrub communities. From west to east, the lands underlying the APE are dissected by tributaries of the southerly flowing Nueces and Frio Rivers. Elevations vary between 300 and 2,300 feet above MSL.

There are no National Register of Historic Places (NRHP)-listed properties within the APE. The State of Texas identifies three NRHP-eligible properties and three Recorded Texas Historic Landmarks (RTHL) within the APE (TDOT, 2024). These architectural resources include two churches, two courthouse buildings, a hotel, and a private home **(Table 3.7-1)**. The resources are located along Highway 55 and US 83 in Edwards, Real, and Uvalde Counties.

Table 3.7-1 List of NRHP-Eligible and RTHL Resources in the APE

Resource Name	Resource Status	Year	County
Church of the Ascension	RTHL	1890	Uvalde
Davenport Home	RTHL	ca 1880	Uvalde
First Baptist Church of Barksdale	RTHL	1883	Edwards
Merritt Hotel	NRHP-Eligible; Criterion A	1925	Real
Real County Courthouse	NRHP-Eligible RTHL; Criterion A and C	1918	Real
Real County Courthouse Annex	NRHP-Eligible; Criterion C	1920	Real

Source: TDOT, 2024

No federally recognized tribal lands are present within the APE (Bureau of Indian Affairs, 2016). No traditional cultural properties or Indian sacred sites have been identified on lands underlying the APE. Native American tribes with ancestral ties to land underlying the APE are listed in **Appendix A**.

The DAF initiated government-to-government consultation with these tribes in April 2025. To date, responses received from the San Carlos Apache Tribe (May 8, 2025), Comanche Nation (May 30, 2025), White Mountain Apache Tribe (June 6, 2025), and Ysleta del Sur Pueblo (July 24, 2025) have expressed no concerns regarding potential effects from the Proposed Action on properties of religious, historic, or cultural importance to those or other tribes. No other tribal responses have been received. Government-to-government consultation correspondence is in **Appendix A**.

3.7.2 Environmental Consequences

3.7.2.1 Evaluation Criteria

Adverse impacts on cultural resources could include altering characteristics of the resource that make it eligible for listing in the NRHP. Such impacts could 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 would be considered significant if it would alter the integrity of an NRHP-listed or eligible resource or if it has the potential to adversely affect traditional cultural properties or Indian sacred sites and the practices associated with the property or sacred site.

3.7.2.2 Alternative 1–Establish New Low-Altitude MOA Directly Under Laughlin 2 MOA

Noise analysis conducted for the Proposed Action indicates that estimated cumulative noise levels associated with Alternative 1 would not exceed 49.8 dBA in any area of the APE (following full transition to the T-7A in 2033) and would remain well below the 65 dBA threshold below which most types of land uses are compatible with aircraft noise (see **Section 3.3**). Noise levels that can negatively affect buildings and structures typically exceed 130 dBA (U.S. Navy, 2018), and noise levels at or below 35 dBA would not be expected to introduce audible elements that would alter the character, setting, or integrity of a historic property. Although some individual locations within the APE could experience noise levels from Alternative 1 that could exceed 49.8 dBA, these occurrences would be brief and relatively infrequent and would be unlikely to affect the integrity or character-defining features of any historic property. No ground disturbance would take place as part of Alternative 1; therefore, no archaeological resources (surface or subsurface) would be disturbed or otherwise affected. Likewise, Alternative 1 would not physically disturb or otherwise affect the NRHP-eligible or RTHL architectural resources underlying the APE. Alternative 1 would have no potential to affect traditional cultural properties or Indian sacred sites, as no such properties or sites have been identified in the APE.

Therefore, per guidance set forth in 36 CFR § 800.5, the DAF has determined that Alternative 1 would have no adverse effect on historic properties. In a response dated May 30, 2025, the Texas SHPO stated that no historic archaeological properties would be affected. SHPO concurrence with the DAF's determination of no adverse effect on historic above-ground resources is pending. Section 106 correspondence is included in **Appendix A**.

3.7.2.3 No Action Alternative

Under the No Action Alternative, the proposed low-altitude airspace would not be obtained, and existing conditions would continue. This would have no impact on historic properties.

3.8 Safety

3.8.1 Affected Environment

3.8.1.1 MOA Operating Procedures

Military aircraft flight training operations in MOAs are governed by standard rules of flight and may be conducted on a scheduled basis. MOAs are charted so nonparticipating aircraft may be aware of these operations. Additional information and operational procedures applicable to MOAs, including the existing Laughlin 1, 2, and 3 MOAs, are provided in Flight Publication (FLIP) AP/1A (DoD, 2025). Units responsible for scheduling flight training activities on MOAs must ensure that airspace information and procedures listed in FLIP AP/1A are complete and accurate for the safe and efficient operation of aircraft in the MOAs for which they are responsible. At a minimum, operational procedures or remarks provided in FLIP AP/1A typically include the following:

Scheduling and Coordination. Each MOA has a designated military office responsible for scheduling all military flights for use of that area. Areas shall not be used for military training unless scheduled.

Special conditions of use and procedures for each MOA are established by Letter of Agreement between the local military authority and the concerned ATC facility. The scheduling office will advise all scheduled military users of the operating procedures contained in the Letter of Agreement.

Military operations in excess of 250 knots below 10,000 feet should be conducted in SUA to the maximum extent possible.

Flight Procedures. Military training operations within MOAs shall be conducted in accordance with the Letter of Agreement.

Although not required, ATC or a military radar unit may provide advisory/monitoring/separation services within the MOA. However, the pilot is responsible for remaining within the area and exercising "see and avoid" during visual conditions.

Basic airmanship procedures exist for handling any deviations from air traffic control procedures due to an in-flight emergency; these procedures are defined in Air Force Manual 11-202 Volume 3, *Flight Operations* 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.

3.8.1.2 Aircraft Mishaps

Aircraft mishaps and their prevention represent a prime concern of the DAF. 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 DAFMAN 91-224, *Ground Safety Investigations and Reports*. Class A mishaps are the most severe with total property damage of $2 million or more or a fatality and/or permanent total disability. Class E mishaps consist of work-related mishap that fall below Class D criteria; reporting is voluntary, and events requiring mandatory reporting are listed in discipline-specific safety manuals. Mishap classes are defined in **Table D.7-1**.

Based on historical data on mishaps at all DoD 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, Air Force Safety Center reports of Class A mishaps for all manned aviation (excluding flight related ground operations) have ranged from 7 in 2014 (a rate of 0.44 per 100,000 flight hours) to 23 in 2018 (a rate of 1.51 per 100,000 flight hours) (HQ AFSEC, 2023a). Similarly, Air Force Safety Center reports of Class B mishaps for all manned aviation (excluding flight related ground operations) have ranged from 23 in 2019 (a rate of 1.54 per 100,000 flight hours) to 38 in 2016 (a rate of 2.34 per 100,000 flight hours) (HQ AFSEC, 2023b). In comparison, from 2012 through 2021, T-38 aircraft have had 8 Class A mishaps (a rate of 0.79 per 100,000 flight hours) and 6 Class B mishaps (a rate of 0.59 per 100,000 flight hours) (Air Force Safety Center, 2024a). Over the same period, F-16 aircraft have had 35 Class A mishaps (a rate of 1.81 per 100,000 flight hours) and 24 Class B mishaps (a rate of 1.24 per 100,000 flight hours) (Air Force Safety Center, 2024b).

Laughlin's *Mishap Response Plan* (Laughlin AFB, 2022) is implemented following any major (Class A or B) Aviation, Occupational, Weapons or other category of mishap in the Laughlin AFB area of responsibility. Class A and B mishaps are the two categories with the most severe outcomes with regard to property damage, including destroyed aircraft, and fatalities and injuries. Over the last 5 years, Laughlin's safety statistics show no mishaps involving flights within the MOAs.

3.8.1.3 Bird/Wildlife Aircraft Strike Hazard

Aircraft collisions with birds and wildlife present 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 feet MSL; however, most birds fly close to the ground. Approximately 52 percent of strikes occur from birds flying below 400 feet and 88 percent occur at less than 2,000 feet AGL (Air Force Safety Center, 2016)

The Air Force BASH program was established to minimize the risk for collisions of aircraft with birds and wildlife and the potential for subsequent human injury or loss of life, and property damage. In accordance with DAF Instruction 91-202, *The DAF Mishap Prevention Program* (DAF, 2024f), each DAF flying unit is required to develop a BASH plan to reduce hazardous bird/wildlife activity relative to airfield flight operations. The intent of each plan is to reduce BASH risks at airfields by establishing an integrated hazard abatement program through monitoring, avoidance, and actively controlling bird and animal population movements. Laughlin AFB is located within the Central Flyway migration corridor **(Section 3.6)**, resulting in increased potential for in-flight encounters with birds during migration.

Areas near the existing Laughlin 1, 2, and 3 MOAs 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. The *Laughlin AFB BASH Plan 91-212* (Laughlin AFB, 2023) establishes a program designed to minimize local and transient aircraft exposure to potentially hazardous bird/wildlife strikes at or near Laughlin AFB, in addition to other areas owned or managed by Laughlin AFB, including MOAs, where Laughlin local and transient aircraft operate on a regular basis. BASH incidents that occur in MOAs are reported and included

in each installation's BASH statistics. In the last year, no BASH incidents have been reported associated with flight operations in or under the existing Laughlin 1, 2, and 3 MOAs.

3.8.1.4 Obstructions to Flight

A flight obstruction is any obstruction in navigable airspace that applies to existing and proposed human-made objects, objects of natural growth, and terrain. Flight operations in the proposed MOA would begin and end outside the airfield traffic pattern airspace area or Class B, C, and D airspace areas. FAA considerations and guidance for evaluating obstructions in airspace where aircraft are operating under VFR (such as the MOAs) include (FAA, 2025a):

- A structure would have an adverse effect upon VFR air navigation if its height is greater than 500 feet above the surface at its site, and within 2 statute miles of any regularly used VFR route.
- Evaluation of obstructions located within MOAs or 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.
- Operations in MOAs and MTRs provide military aircrews low altitude, high speed navigation and tactics training, and are a basic requirement for combat readiness (see FAA Order JO 7610.14, *Non-Sensitive Procedures and Requirements for 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 en route VFR operations are based on consideration for those operations conducted under 14 CFR Part 91 that permits flight clear of clouds with 1-mile flight visibility outside controlled airspace. A proposed structure's location within the boundaries of a MOA 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 DAF would disseminate Part 77 notices and aeronautical study information to military representatives. Additionally, attempts are made 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.

Flight safety concerns include obstacle avoidance which varies by aircraft and is published for each aircraft's associated 11-series publication. For example, Air Force Instruction 11-2F-16 Volume 3, *F-16 Operations Procedures* directs flight leads who are unable to visually acquire or ensure lateral separation from known vertical obstructions in the route of flight, to direct a climb to an altitude that ensures vertical separation, no later than 3 NM prior to the obstruction.

With gentle, rolling plains in and around the ROI, potential flight obstructions in or near these airspaces include commercial wind turbines and cellular towers which are both prevalent throughout southwest Texas. The U.S. Wind Turbine Database, which provides the location of land-based and offshore wind turbines in the United States, does not identify any wind turbines in

the ROI. There are a small number of built and pending wind turbines approximately forty miles west of the proposed MOA (USGS, 2025). Safety concerns would involve proper monitoring and updating for future towers. Mitigation of these towers would include maintaining draw files on the T-38C to include updated tower locations and avoidance areas. Any safety concerns would be mitigated by applying similar procedures as Laughlin does with low level training.

3.8.2 Environmental Consequences

3.8.2.1 Evaluation Criteria

Impacts on safety from 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 may include modifying the airspace such that aircraft would overfly populated areas at lower altitudes or implementing new flight procedures that result in greater flight safety risk; both types of changes could result from the establishment of the proposed MOA. 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. Analysis of aircraft flight safety risks correlates projected Class A mishaps and potential collisions between birds with current airspace use to consider the magnitude of the change in risk associated with the Proposed Action.

Unless otherwise noted, potential effects described in this section would be the same regardless of whether T-38Cs or T-7As would be operating in the proposed MOA.

3.8.2.2 Alternative 1 - Establish New Low-Altitude MOA Directly Under Existing Laughlin 2 MOA

Aircraft Mishaps. Under Alternative 1, DAF pilots would utilize the proposed MOA, with vertical extents from 500 feet AGL up to, but not including 7,000 feet MSL possibly along with the existing Laughlin 1, 2, and 3 MOAs and ATCAA as described for Alternative 1. The proposed MOA would be managed and operated as a separate airspace distinct from the existing Laughlin 1, 2, and 3 MOAs and ATCAA. This would allow FAA civilian ATC to restrict military operations in the airspace, when needed, to facilitate safe transit of the airspace by civilian aircraft (including any civil airports located directly below the airspace). The proposed MOA could be combined with the existing Laughlin 1, 2, and 3 MOAs and ATCAA to provide seamless flight operations from 500 feet AGL to FL 220, which would increase the space for vertical maneuverability and improve flight safety in that respect. However, the Proposed Action includes reasons why flight safety could potentially deteriorate. Foremost, there would be new, low-altitude military flights in the proposed MOA (initially including 1,570 T-38C and 10 T-6A annual operations, which would be below 2,000 feet AGL most of the time, and down to 500 feet AGL), whereas all operations are currently above 7,000 feet MSL. Aircraft mishaps due to BASH incidents, weather-related accidents, mechanical failure, or pilot error would therefore have the potential to increase.

With the T-7A recapitalization at Laughlin AFB, T-7A operations would gradually replace T-38C operations; the 47 FTW would continue to fly the T-38C in the FBF program until the transition to the T-7A is complete in 2033 (when 1,570 T-7A and 10 T-6A annual operations would occur in the proposed low MOA [**Section 2.1**]). However, the FBF training syllabus would require that the T-

7A fly similar low-level mission profiles and otherwise fly like the T-38C throughout the Laughlin low and high MOAs.

The risk of aircraft mishaps under Alternative 1 would likely increase due to the introduction of low-level flying, whereas flights are currently conducted at higher altitudes. However, the limited amount of time an aircraft would be over any specific location, combined with sparsely populated areas under the proposed MOA and existing Laughlin 1, 2, and 3 MOAs and ATCAA, including limited areas that would be crossed by existing MTRs (IR-149, IR-170, VR-140, VR-168, VR-1122, and VR-1123; see **Figure 3.2-1**), would minimize the probability that an aircraft mishap would occur over a populated area. All MOA flight operations would continue to be conducted in accordance with procedures established in applicable DAF regulations and orders with the safety of its pilots and people in the surrounding communities as the primary concern. DAFMAN 13-201 addresses participation in the Midair Collision Avoidance Program, which helps inform the local civil aviation community of mission flight activities and the locations and times when those activities occur. Such ongoing interactions help promote a safe flying environment for both military and civil aviation pilots. Strict control and use of established safety procedures would minimize the potential for aircraft mishaps and safety risks in general and would ensure that any potential adverse impacts would not be significant.

Bird/Wildlife-Aircraft Strike Hazards. Military aircrews (T-38C, T-7A, and others) operating within the proposed MOA and existing Laughlin 1, 2, and 3 MOAs and ATCAA would continue to follow applicable procedures outlined in the *Laughlin AFB BASH Plan 91-212* (Laughlin AFB, 2023). General flight safety risks and BASH risks would be assessed for flights lower than 1,000 feet AGL, and additional avoidance procedures outlined in the *Laughlin AFB BASH Plan* would be followed during low-altitude training as applicable. Continued adherence to current safety procedures, and taking preventive action when BASH risk increases, would ensure that potential impacts from BASH under Alternative 1 would not be significant.

Obstructions to Flight. Under Alternative 1, with the establishment of the proposed MOA and implementation of low altitude flying as low as 500 feet AGL, pilots would exercise "see and avoid" actions during visual conditions to avoid potential obstructions in accordance with all applicable DAF procedures and requirements. As such, potential adverse impacts on safety from flight obstructions under Alternative 1 would not be significant.

All MOA flight operations would continue to be conducted in accordance with procedures established in the applicable DAF regulations and orders with the safety of its pilots and people in the surrounding communities as the primary concern. Therefore, Alternative 1 would have no significant adverse impacts on flight safety.

3.8.2.3 No Action Alternative

Under the No Action Alternative, the proposed low-altitude airspace would not be obtained and existing conditions would continue. Flight training operations would continue in existing Laughlin 1, 2, and 3 MOAs and ATCAA in accordance with all applicable safety requirements. The No Action Alternative would have no adverse impacts on safety.

3.9 Socioeconomics

3.9.1 Affected Environment

3.9.1.1 Population and Economy

In 2024, the socioeconomics ROI had a population of 32,484 people **(Table 3.9-1)**. Edwards County (1,383 people) had the smallest population and Uvalde County (25,138 people) had the largest. Kinney and Real Counties had populations of 3,191 and 2,772 people in 2024, respectively. The ROI had a population per square mile of 5.7 people in 2020 (U.S. Census Bureau, 2024).

In 2024 dollars, the ROI had a median household income of $52,027 and a per capita income of $27,292, which were lower than the respective amounts for the state of Texas as a whole ($76,292 and $39,446). The ROI had an unemployment rate of 4.2 percent, which was comparable to that of the state (4.1 percent) (U.S. Bureau of Labor Statistics, 2024).

The average percentages of people younger than 5 years of age and persons 65 years and older in the ROI were 20.9 and 25.7 percent, respectively. These were somewhat lower and notably higher than the respective statewide percentages for the same age groups in Texas (24.8 and 13.7 percent), indicating that the ROI contains a larger concentration of people 65 years of age and older relative to the statewide population (U.S. Census Bureau, 2024).

3.9.1.2 Air Travel and Transport

According to the Texas Department of Transportation (TDOT, 2018), Texas has one of the largest airport systems in the United States. Texas also has 25,000 registered aircraft, more than any other state. Overall, Texas airports provide $94 billion in annual economic output, ranking first in the United States for air transportation employment with 789,000 jobs at 289 system facilities and a $30 billion payroll. The economic impacts of these airports account for a wide variety of aviation services. At commercial airports, airlines move large volumes of people and cargo through the system. General aviation airports offer accessibility across Texas.

At least 18 airports or airfields are in the four Texas counties that make up the socioeconomics ROI **(Table 3.9-1)**. Of these, three are general aviation airports (Edwards County, Real County, and Garner Field Airport) and the remainder are private-use airfields associated with ranches. Two facilities in Real County and three in Uvalde County are directly below the proposed MOA **(Figure 3.2-1)**. None of the airports in Edwards or Kinney Counties are under the proposed MOA.

Table 3.9-1 Airports in the Socioeconomics ROI

Airport Name	Airport Symbol	County	Type	Directly Under Proposed Laughlin 2A Low MOA?
Edwards County	ECU	Edwards	General Aviation	No
Four Square Ranch	3TA0	Edwards	Private	No
Freeman Ranch	8TX2	Edwards	Private	No
Hackberry Ranch	XS69	Edwards	Private	No
Pinon Rach	1XS8	Edwards	Private	No
Fort Clark Springs	74TX	Kinney	Private	No
L. Davis Ranch	5XS8	Kinney	Private	No
Leona Ranch	75TX	Kinney	Private	No
Flying Bull Ranch	TA52	Real	Private	Yes

Table 3.9-1 Airports in the Socioeconomics ROI

Airport Name	Airport Symbol	County	Type	Directly Under Proposed Laughlin 2A Low MOA?
Prade Ranch	57TE	Real	Private	No
Real County	49R	Real	General Aviation	Yes
Fossil Creek Ranch	TE78	Uvalde	Private	Yes
Flying J Ranch	7TE4	Uvalde	Private	Yes
K Bar Ranch	83TE	Uvalde	Private	No
Annandale Ranch	2XS7	Uvalde	Private	Yes
Benson Airstrip	2XS8	Uvalde	Private	No
Garner Field Airport	UVA	Uvalde	General Aviation	No

Source: tollfreeairline.com, n.d.

3.9.2 Environmental Consequences

3.9.2.1 Evaluation Criteria

Impacts on socioeconomics would be considered significant if they resulted in either substantial changes in the local or regional population, housing, community general services (health, police, and fire services), disproportionate impacts on children, or social conditions from the demands of additional population/population shifts, (e.g., local or regional economy, employment, or spending or earning patterns).

3.9.2.2 Alternative 1

Alternative 1 consists entirely of activities that would occur in airspace above the earth's surface and would not involve changes to the number of personnel assigned to any DoD or DAF installation; construction, demolition, or other ground-disturbing activities in the ROI; or any other associated activities that could result in changes in population, employment, income, or other social or economic activity in the ROI. Sustained aircraft noise levels associated with Alternative 1 would not exceed 65 dBA in any given location in the ROI, and as such, would be unlikely to directly result in either population growth or loss within the ROI. Therefore, Alternative 1 would have no potential to result in changes in population, disproportionate impacts on children or senior citizens, employment, income, or other social or economic activity within the ROI.

Increased noise levels from aircraft operating at lower altitudes in the proposed MOA would be comparable to existing conditions and not frequent enough, or loud enough, in the ROI to permanently impede or prevent the continued operation of existing businesses or other economic activities, prevent the establishment of new businesses in the ROI, or adversely affect property values or the continued occupation or operation of underlying land uses, including those where concentrations of persons under the age of 18 or over 65 years of age could be present.

Civilian and commercial flights from airports in the ROI could be delayed slightly or be required to deviate for avoidance of military training activities in the airspace. However, during times when the proposed MOA would be active, Laughlin AFB ATC would implement and adhere to applicable airspace deconfliction procedures in accordance with its FAA-delegated ATC authority to ensure the safe operation and transit or avoidance of the airspace by commercial and general aviation aircraft. In compliance with FAA Order 7400.2 Section 25-1-4, Laughlin AFB ATC and

pilots would also observe a 3-NM exclusion zone starting at 1,500 feet AGL around the Real County (49R) airport to prevent disruptions to ongoing operations at that facility **(Section 3.2.2.2)**. As such, Alternative 1 would not affect the economic activity or output of municipal and regional airfields or notably impede the movement of people and goods. Generally, these impacts would be the same whether T-38C or T-7A aircraft are operating in the proposed MOA. Therefore, impacts on socioeconomics from Alternative 1 would not be significant.

3.9.2.3 No Action Alternative

Under the No Action Alternative, the proposed low-altitude airspace would not be obtained, and existing conditions would continue. This would have no impact on socioeconomics.

3.10 Visual Resources

3.10.1 Affected Environment

The visual character of the ROI is characterized by environments ranging from mostly flat to low rolling topography with rounded limestone hills and upland plateaus interspersed with dry creek beds and shallow drainages. The landscape exhibits moderate relief, with hilltops and occasional escarpments providing intermittent vistas across wooded uplands and open grasslands. Scrubland vegetation including live oak-ashe juniper communities and grasses are generally dominant, with denser brush cover along riparian corridors. Development within the ROI is sparse and primarily rural. Scattered residential dwellings, ranches, and outbuildings such as barns, sheds, and water storage tanks are visible throughout the landscape. Small, unincorporated communities are present but widely dispersed. Transportation infrastructure primarily includes two-lane paved roads such as U.S. Highway 377 and Farm-to-Market roads (secondary roads primarily in rural areas maintained by the Texas Department of Transportation), along with unpaved county roads and private ranch access roads. Utility lines, including overhead electrical distribution supported by wooden or metal poles, are common along transportation corridors. There is minimal non-agricultural commercial or industrial development within the ROI. Visibility is typically high throughout the ROI due to the relatively open terrain and low building density. In elevated areas, long sight distances afford views of surrounding ridgelines and valleys extending for several miles. Seasonal variation in vegetative cover and atmospheric clarity may slightly alter visibility, but unobstructed views are common during clear weather.

State and national parks and other natural areas place a value on maintaining and preserving natural features that contribute to a natural, rural, or rustic visual character. Such features include native vegetation and wildlife, naturally occurring topography and landscape features, and minimal buildings, structures, lighting, roads and infrastructure, and other features associated with human development. Wildlife management areas (WMAs) have a similar goal, providing opportunities for research and education by preserving natural habitats and wildlife populations of representative ecological systems. No national parks or WMAs are located within the ROI; however, Garner State Park is located within the eastern portion of the ROI along the Frio River, south of the unincorporated community of Rio Frio, and is a popular location for camping, hiking, bicycling, nature study, fishing, and non-motorized watersports (TPWD, 2025). Small local parks and natural areas may also be present in towns and communities within the ROI. Public recreational infrastructure is minimal and typically associated with rural roadways or small community

gathering spaces, such as local churches or volunteer fire departments. These areas offer limited recreational amenities and are not focused on preserving scenic or natural visual resources.

Aircraft activity is part of the visual character in the ROI given the presence of the existing Laughlin 2 MOA, MTRs, and the approximately 3,100 military and civilian overflights that occurred within the proposed MOA airspace between September 2023 and August 2024 **(Section 3.2.1)**. Most of these operations take place during daytime hours, contributing to the visual landscape by briefly altering the sky's appearance during the passage of aircraft through the airspace. As described in **Section 3.2.1.1**, 23 percent of the total operations within the proposed airspace consisted of military aircraft, with the remainder (77 percent) consisting of either civilian operators or aircraft of unknown origin. Approximately 49 percent of all operations in the ROI occurred at an average altitude of 6,000 feet MSL, with the remainder operating at an average of 5,000 feet MSL or below. Approximately 6 percent of aircraft in the proposed airspace operated at average altitudes of 3,000 feet MSL or less. Most military activity in the region occurs above 7,000 feet MSL (the floor of the Laughlin 2 MOA), although the ROI is crossed by MTRs with floors as low as surface level or 100 feet AGL **(Section 3.2.1.4)**.

Given the ROI's large size (approximately 976 square miles), rugged terrain, low population density (approximately 5.7 persons per square mile; [U.S. Census Bureau, 2024]), and the distribution of aircraft operations throughout the airspace, most aircraft in the ROI are likely observed by a limited number of people at any given time, particularly aircraft operating at 7,000 feet MSL and higher. Wildlife and domestic animals in the region have likely adapted to the presence of military aircraft operating in the airspace. Overall, aircraft operating in airspace in the ROI have been a consistent part of the visual landscape for decades.

3.10.2 Environmental Consequences

3.10.2.1 Evaluation Criteria

The FAA has not established a significance threshold for light emissions or visual resources. However, factors considered in determining whether effects on visual resources from the Proposed Action would be considered significant include the following: the Proposed Action would affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources; the Proposed Action would contrast with the visual resources and/or visual character in the ROI; the Proposed Action would block or obstruct the views of visual resources, including whether these resources would still be viewable from other locations; light emissions associated with the Proposed Action would create annoyance or interfere with normal activities, or would affect the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources; and unless otherwise noted, effects on visual resources from the Proposed Action would be the same regardless of which type of aircraft (T-38C or T-7A) would operate in the proposed airspace.

3.10.2.2 Alternative 1

Alternative 1 does not involve construction, demolition, or other earth-disturbing activities and therefore, would not introduce new permanent or temporary buildings, structures, light sources, or other constructed, inanimate features that would alter or block visual resources in the existing visual landscape of the ROI. Additionally, Alternative 1 would not change, modify, remove, or

otherwise alter existing topography, vegetation, or other naturally occurring features. Therefore, Alternative 1 would have no permanent impacts from light emissions, and no permanent impacts on visual resources, in the ROI.

Aircraft operating in the proposed airspace at altitudes as low as 500 feet AGL would likely be visible to viewers in the ROI, given the relatively clear weather conditions that occur most days in the area; however, given that these operations would consist of jet aircraft traveling at hundreds of miles per hour, their appearance in the overlying airspace would be brief (likely less than a few minutes) at any given time as observed from a particular location. Given the need for pilots to adjust their flight patterns to prevent unintentional "spill outs" of the proposed airspace boundaries **(Section 3.3.1.2)**, most aircraft operations would likely only be observable for a few moments by viewers in lands adjacent to the proposed Laughlin 2A MOA. The distribution of proposed low-altitude aircraft operations throughout an approximately 976 square mile area, combined with the low population density of the ROI, would further minimize the appearance of aircraft to viewers at any particular location in the ROI.

Although overflights as low as 500 feet AGL over Garner State Park could occur under Alternative 1, such overflights would be unlikely given the park's proximity to the proposed MOA's eastern boundary and the need for pilots to adjust their flight patterns to avoid unintentionally and temporarily flying beyond the airspace boundary ("spill outs"; see **Section 3.3.1.2**). Any such overflights would be infrequent, given the relatively low number of proposed daily sorties (4.3 on average; see **Section 2.1**) and the distribution of proposed aircraft operations throughout the 976-square mile airspace, and brief, given aircraft operating speeds. Furthermore, the occasional appearance of an aircraft associated with Alternative 1 over Garner State Park would not introduce a new or unusual visual feature given the presence of existing aircraft operations already occurring in the ROI; this includes existing MTRs with floors as low as 100 feet AGL that cross the park, including VR-1123 and VR-1122 (the reverse of VR-1123). Alternative 1 would have no effects on visual resources in national parks, WMAs, and other designated areas because none of these resources are present in the ROI.

Aircraft operations at altitudes ranging from surface level or 100 feet AGL to 8,000 feet MSL are already a common occurrence throughout the year in the proposed airspace. In addition to existing aircraft operations **(Section 3.2.1.1)**, segments of six existing MTRs with floors of surface level, 100 feet AGL, and 500 feet AGL cross the proposed airspace **(Section 3.2.1.4** and **Figure 3.2-1)**. Therefore, aircraft passing overhead are already part of the existing visual landscape in the ROI, and aircraft operations under Alternative 1 would not introduce a new visual element that is not already commonly observed within the ROI. Wildlife and domestic animals in the ROI are likely conditioned to the presence of aircraft transiting the airspace. In the event that the visual appearance of an aircraft in the proposed airspace elicited a startle response in animals within the ROI, it is anticipated that they would quickly resume typical behaviors within a few minutes of the aircraft's passing **(Section 3.6.2)**.

Aircraft operations under Alternative 1 would have no effect on traditional cultural places or Indian sacred sites, as no such properties or sites have been identified in the APE. In a response dated May 30, 2025, the Texas SHPO stated that no historic archaeological properties would be affected.

SHPO concurrence with the DAF's determination of no adverse effect on historic above-ground resources is pending.

For these reasons, adverse impacts on visual resources in the ROI from Alternative 1 would be temporary and not significant.

3.10.2.3 No Action Alternative

Under the No Action Alternative, the proposed low-altitude airspace would not be obtained, and existing conditions would continue. This would have no effect on visual resources.

4 References

ACAM. 2024. Air Conformity Applicability Model. Air Impact Modeling Software by Solutio Environmental, Inc. for U.S. Air Force Civil Engineering Center (AFCEC/CZTQ), Version 5.0.24a, 2024.

AFCEC. 2023. Air Force Civil Engineer Center. Compliance Technical Support Branch (CZTQ). DAF Greenhouse Gas (GHG) & Climate Change Assessment Guide. December. https://www.aqhelp.com/AQdocs.html. Accessed January 2025.

Air Force Safety Center. 2016. USAF Wildlife Strikes by Altitude (AGL) FY 1995-2016. https://www.safety.af.mil/Portals/71/documents/Aviation/BASH%20Statistics/USAF%20Wildlife%20Strikes%20by%20Altitude.pdf. Accessed 25 September 2025.

Air Force Safety Center. 2024a. T-38 Flight Mishap History, 9 July 2024. https://www.safety.af.mil/Portals/71/documents/Aviation/Aircraft%20Statistics/T-38FY23.pdf. Accessed 5 September 2025.

Air Force Safety Center. 2024b. F-16 Flight Mishap History, 25 June 2024. https://www.safety.af.mil/Portals/71/documents/Aviation/Aircraft%20Statistics/F-16FY23.pdf. Accessed 5 September 2025.

Air Force Safety Center. 2025. Air Force Safety Center. Birdwatchers return to Laughlin. https://www.safety.af.mil/News/Article-Display/Article/4208344/birdwatchers-return-to-laughlin/. Accessed June 11, 2025.

Air Force. 2020. Air Force Air Quality EIAP Guide, Volume II - Advanced Assessments. July.

ATAC. 2025. Draft Report for Airspace Analysis in Support of the Environmental Impact Analysis Process (EIAP) for the United States Air Force (USAF) Laughlin 2 Military Operating Area (MOA), Texas. Prepared for Department of the Air Force. May 2025.

BirdCast, 2025. Migration Dashboard. https://birdcast.info/migration-tools/migration-dashboard/. Accessed May 12, 2025.

Bowles, A.E. 1995. Responses of Wildlife to Noise – Wildlife and Recreationalists: Co-existence Through Management and Research. Island Press. Chapter 8, pp 154-213.

Bureau of Economic Geology. 1996. Physiographic Map of Texas. The University of Texas at Austin, Austin, Texas.

Bureau of Indian Affairs. 2016. Indian Lands of Federally Recognized Tribes of the United States. Department of the Interior, Bureau of Indian Affairs, Office of Trust Services. https://www.bia.gov/sites/default/files/dup/assets/bia/ots/webteam/pdf/idc1-028635.pdf. Accessed March 2025.

Campbell, Linda. 2003. Endangered and Threatened Animals of Texas. 127pp. https://docslib.org/doc/12117187/endangered-and-threatened-animals-of-texas-endangered-and-threatened-animals-of-texas-their-life-history-and-management-by-linda-campbell. Accessed May 15, 2025.

Czech, J.J., and K.J. Plotkin. 1998. NMAP 7.0 User's Manual. Wyle Research Report WR 98-13. Wyle Laboratories, Inc. November.

DAF. 2022. Department of the Air Force. DAF Manual 13-201, *Nuclear, Space, Missile, Command and Control – Airspace Management*, 11 January 2022. https://static.e-publishing.af.mil/production/1/afsoc/publication/dafman13-201_afsocsup/dafman13-201_afsocsup.pdf. Accessed November 6, 2024.

DAF. 2023. "Low-Altitude Flying Training." https://www.af.mil/AboutUs/FactSheets/Display/Article/104591/low-altitude-flying-training/. Accessed November 9, 2024.

DAF. 2024a. *Final Environmental Impact Statement for T-7A Recapitalization at Laughlin Air Force Base, Texas*. https://laughlin.t-7anepadocuments.com/documents. Accessed November 6, 2024.

DAF. 2024b. T-6A *Texan* II. https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104548/t-6a-texan-ii/. Accessed November 10, 2024.

DAF. 2024c. T-1A *Jayhawk*. https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104542/t-1a-jayhawk/. Accessed November 10, 2024.

DAF. 2024d. Laughlin AFB Data Validation Package (pending).

DAF. 2024e. Department of the Air Force Manual 91-224, Ground Safety Investigations and Reports.

DAF. 2024f. Department of the Air Force Instruction 91-202. The Department of the Air Force (DAF) Mishap Prevention Program, 20 March 2020, Incorporating Change 1, 10 April 2024. Certified current on 10 April 2024.

DAF. 2025. Draft Environmental Assessment for Randolph 2A Low Military Operations Area Special Use Airspace. January.

DNWG. 2013. Department of Defense Noise Working Group. Technical Bulletin, Noise-Induced Hearing Impairment, Defense Noise Working Group. December.

DoD. 2025. Flight Information Publication AP/1A, Area Planning Special Use Airspace, North and South America. Published by National Geospatial-Intelligence Agency. July.

FAA. 2023a. Chapter 15 "Airspace" in *Pilot's Handbook of Aeronautical Knowledge*. https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak. Accessed November 6, 2024.

FAA. 2023b. FAA Aeronautical Information Manual. Official Guide to Basic Flight Information and ATC Procedures. April.

FAA. 2023c. 1050.1 Desk Reference. Version 3. https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref.

FAA. 2025a. FAA Order JO 7400.2, *Procedures for Handling Airspace Matters*, February 20, 2025. https://www.faa.gov/regulations_policies/orders_notices/index.cfm/go/document.current/documentNumber/7400.2. Accessed March 21, 2025.

FAA. 2025b. FAA CDM International Online Workshop. https://tfmlearning.faa.gov/tfm-training/atfm-basics/cdm-t1-lesson5b.html. Accessed April 14, 2025.

FICAN. 1997. Federal Interagency Committee on Aviation Noise. Effects of Aviation Noise on Awakenings from Sleep. June.

Fritts, Rachel. 2022. Avian Superhighways - The Fourt Flyways of North America. https://abcbirds.org/blog/north-american-bird-flyways/. Accessed May 14, 2025.

Gladwin, D.N., K.M. Manci, and R. Villella. 1988. Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: A Literature Synthesis. Report AFESC TR 88-14. U.S. Department of the Interior, U.S. Fish and Wildlife Service, U.S. Air Force. 88 pp.

HQ AFSEC. 2023a. Headquarters Air Force Safety Center. Department of the Air Force. Aviation Class A Mishap Summary by Fiscal Year, 5 September.

HQ AFSEC. 2023b. Department of the Air Force. Aviation Class B Mishap Summary by Fiscal Year, 25 September.

Ikelheimer, B. and M. Downing. 2013. MR_NMap Noise Model Improvements. Blue Ridge Research and Consulting Technical Report. August.

iNaturalist. 2025a. iNaturalist Species Search. https://www.inaturalist.org/observations?nelat=29.750086856214907&nelng=-99.71813255171308&page=16&quality_grade=research&subview=map&swlat=29.25407014004412&swlng=-100.0806813798380&iconic_taxa=Aves. Accessed May 13, 2025.

iNaturalist. 2025b. iNaturalist - Texas Eagle Nests. https://www.inaturalist.org/projects/texas-eagle-nests. Accessed May 14, 2025.

Ising, H. 1990. Annoyance and Health Risk Caused by Military Low-Altitude Flight Noise. https://www.academia.edu/83999958/Annoyance_and_health_risk_caused_by_military_low_altitude_flight_noise. Accessed May 16, 2025.

Job, Jacob. 2023. Scientific American Podcast Series: They Tap Into the Magical, Hidden Pulse of the Planet, but What is the Nighttime Bird Surveillance Network? https://www.scientificamerican.com/podcast/episode/they-tap-into-the-magical-hidden-pulse-of-the-planet-but-what-is-the-nighttime-bird-surveillance-network/. Accessed May 12, 2025.

Krausman, P.R., L.K. Harris, C.L. Blasch, K.G. Koenen, and J. Francine. 2010. Effects of Military Operations on Behavior and Hearing of Endangered Sonoran Pronghorn. https://wildlife.onlinelibrary.wiley.com/doi/abs/10.2193/0084-0173%282004%29157%5B1%3AEOMOOB%5D2.0.CO%3B2. Accessed May 16, 2025.

Krausman, P.R., M.C. Wallace, and D.W. De Young. 1999. The Effects of Low-Altitude Jet Aircraft on Desert Ungulates. International Congress on Noise. Conference Proceedings 6(3): pp 471-478.

Larkin. 1994. Effects of Military Noise on Wildlife: A Literature Review. U.S. Army Corps of Engineers, Defense Technical Information Center. Report ADA 305234. 111 pp.

Laughlin AFB. 2022. Laughlin AFB Mishap Response Plan. Headquarters 47th Flying Training Wing. July.

Laughlin AFB. 2023. Laughlin AFB Bird/Wildlife Aircraft Strike Hazard (BASH) Plan 91-212. Headquarters 47th Flying Training Wing. January.

Laughlin AFB. 2024. 47th Flying Training Wing History. https://www.laughlin.af.mil/About-Us/Fact-Sheets/Display/Article/354526/47th-flying-training-wing-history/. Accessed November 9, 2024.

Lucas, Michael J., and Paul T. Calamia. 1997. Military Operating Area and Range Noise Model MR_NMAP User's Manual. Wyle Research Report WR 94-12-R. Wyle Laboratories, Inc. March.

Monk, Matthew. 2021. Bald Eagles in Texas and Making a Comeback: Where You Can See Them. https://texashillcountry.com/bald-eagles-in-texas-are-making-a-comeback/. Accessed May 15, 2025.

NASS. 2022. National Agricultural Statistics Service - County Profiles. https://www.nass.usda.gov/Publications/AgCensus/2022/Online_Resources/County_Profiles/Texas/. Accessed May 14, 2025.

NPS. 1994. Report on Effects of Aircraft Overflights on the National Park System. Report to Congress.

NPS. 2012. National Park Service – Amistad Bird Studies. https://home.nps.gov/articles/amistad-bird-studies.htm. Accessed May 15, 2025.

Ox Ranch. n.d. Hunting. https://www.oxhuntingranch.com/hunting/. Accessed June 11, 2025.

Stusnick, E., K.A. Bradley, J.A. Molino, and G. DeMiranda. 1992. The Effect of Onset Rate on Aircraft Noise Annoyance, Volume 2: Rented Home Experiment. Wyle Laboratories Research Report WR 92-3, March.

TBBA. 2007. The Texas Breeding Bird Atlas: Golden Eagle. https://txtbba.tamu.edu/species-accounts/golden-eagle/. Accessed August 20, 2025.

TDOT. 2018. Texas Department of Transportation. Aviation Division Texas Aviation Economic Impact Study. Accessed April 10, 2025.

TDOT. Texas Department of Transportation. 2024. Historic Resources Aggregator. TxDOT Environmental Affairs Division. https://www.arcgis.com/home/item.html?id=9953d9460ca24701b997bcb176da0fb0. Accessed December 2024.

Tollfreeairline.com. n.d. Texas airports by county. https://www.tollfreeairline.com/texas.htm. Accessed May 5, 2025.

TPWD. 2025. Texas Parks and Wildlife. Garner State Park. https://tpwd.texas.gov/state-parks/garner. Accessed May 5, 2025.

U.S. Bureau of Labor Statistics. 2024. Employment/Unemployment Data_2024. http://data.bls.gov/pdq/SurveyOutputServlet. Accessed April 15, 2025.

U.S. Census Bureau. 2020a. Barksdale Census Designated Place, Texas. https://data.census.gov/profile/Barksdale_CDP,_Texas?g=160XX00US4805648. Accessed on May 29, 2025.

U.S. Census Bureau. 2020b. Camp Wood City, Texas. https://data.census.gov/profile/Camp_Wood_city,_Texas?g=160XX00US4812388. Accessed on May 29, 2025.

U.S. Census Bureau. 2020c. Knippa Census Designated Place, Texas. https://data.census.gov/profile/Knippa_CDP,_Texas?g=160XX00US4839664. Accessed on May 29, 2025.

U.S. Census Bureau. 2020d. Leakey City, Texas. https://data.census.gov/profile/Leakey_city,_Texas?g=160XX00US4842004. Accessed on May 29, 2025.

U.S. Census Bureau. 2020e. ZIP Code Tabulation Area 5 78879 (includes Rio Frio). https://data.census.gov/profile/ZCTA5_78879?g=860XX00US78879. Accessed on May 29, 2025.

U.S. Census Bureau. 2024. Quick Facts: https://www.census.gov/quickfacts/fact/table/US/PST045222. Accessed April 8, 2025.

U.S. Navy. 2018. U.S. Department of the Navy (Environmental Impact Statement for EA-18G "Growler" Airfield Operations at Naval Air Station Whidbey Island Complex, Appendix A1 https://media.defense.gov/2019/Feb/04/2002085739/-1/-1/1/APPENDIX%20A%20NOISE%20STUDY_MAIN%20BODY.PDF Accessed December 2024.

USDOE. 2023. U.S. Department of Energy. Wind Power Resource at 100-Meter Hub Height. https://windexchange.energy.gov/maps-data/324. Updated January 9, 2023. Accessed June 17, 2025.

USEIA. 2024. U.S. Energy Information Administration. Wind explained: Where wind power is harnessed. https://www.eia.gov/energyexplained/wind/where-wind-power-is-harnessed.php. Updated June 12, 2024. Accessed June 17, 2025.

USEPA. 2024. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022. EPA 430-R-24-004. https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text_04-18-2024.pdf.

USFS. 1992. Potential Impacts of Aircraft Overflights of National Forest System Wildernesses. Report to Congress. Authors R.T. Harrison and W.J. Makel.

USFWS. 2017. ESA Basics - 40 Years of Conserving Endangered Species. https://www.fws.gov/sites/default/files/documents/endangered-species-act-basics.pdf. Accessed May 14, 2025.

USFWS. 2025a. U.S. Fish and Wildlife Service. Information Planning and Consultation. https://ipac.ecosphere.fws.gov/. Accessed May 15, 2025.

USFWS. 2025b. Golden-Cheeked Warbler (Setophaga chrysoparia) 5-Year Status Review: Summary and Evaluation.

USGS. 2024. U.S. Geological Survey. National Land Cover Database. https://www.usgs.gov/data/annual-national-land-cover-database-nlcd-collection-1-products. Accessed January 30, 2025.

USGS. 2025. U.S. Wind Turbine Database. Updated May, 2025. https://energy.usgs.gov/uswtdb/viewer/#6.88/32.577/-100.962. Accessed June 17, 2025.

Wasmer, F. and F. Maunsell. 2024a. BaseOps 7.370 User's Guide. Wasmer Consulting.

Wasmer, F. and F. Maunsell. 2024b. NMPlot 4.975 User's Guide. Wasmer Consulting.

Weatherspark. 2025. Climate and Average Weather Year Round in Leakey Texas, United States. https://weatherspark.com/y/6205/Average-Weather-in-Leakey-Texas-United-States-Year-Round. Accessed May 6, 2025.

Weisenberger, M.E. 1996. Effects of Simulated Jet Aircraft Noise on Heart Rate and Behavior of Desert Ungulates. Journal of Wildlife Management, 60(1): pp 52-61.

APPENDICES

This page intentionally left blank

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDIX A
Public and Interagency and Intergovernmental Coordination and Consultation

This page intentionally left blank.

A.1 Public and Interagency and Intergovernmental Coordination and Consultation

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 an action. Per the requirements of the Intergovernmental Cooperation Act (31 United States Code [U.S.C.] § 65) and Executive Order (E.O.) 12372, Intergovernmental Review of Federal Programs, as amended by E.O. 12416, federal, state, and local agencies with jurisdiction that could potentially be affected by the proposed action or alternatives were notified during the development of this EA The stakeholder list and agency and intergovernmental coordination letters and responses are included in this appendix.

A.2 Agency Consultations and Cooperating Agency

Compliance with National Environmental Policy Act (NEPA) requires coordination and consultation with federal, state, and local agencies and Native American tribes to address regulatory requirements established under the National Historic Preservation Act (NHPA) of 1966 (36 Code of Federal Regulations [CFR] Part 800), DoD Instruction 4710.02, *DoD Interactions with Federally Recognized Tribes*, Department of the Air Force (DAF) Instruction 90-2002, *Interactions with Federally Recognized Tribes*, and Section 7 of the Endangered Species Act (ESA) (16 U.S.C. § 1531 et seq.), and other laws and regulations. During the development of this EA, the DAF is consulting with the U.S. Fish and Wildlife Service (USFWS) in compliance with ESA Section 7; and with the Texas State Historic Preservation Officer (SHPO) and Native American Tribes in compliance with Section 106 of the NHPA and applicable DoD and DAF Instructions. Additionally, the Federal Aviation Administration (FAA) is participating as a cooperating agency during the development of the EA. FAA's role as a cooperating agency and the requirements of NHPA Section 106, ESA Section 7, and other applicable laws and regulations are described below. Relevant correspondence is also included in this appendix.

A.2.1 Cooperating Agency

A cooperating agency is defined by NEPA as any federal agency other than a lead agency having jurisdiction by law or special expertise with respect to any environmental issue involved in a proposed action (42 U.S.C. 4336(a)(3)). In accordance with the Federal Aviation Administration's (FAA) jurisdiction by law and the Memorandum of Understanding between the DoD and the FAA for environmental review of Special Use Airspace (SUA) actions under FAA Order JO 7400.2 (FAA, 2025), the DAF invited the FAA to participate as a cooperating agency during the preparation of this EA. The FAA accepted the DAF's invitation via letter dated November 27, 2024.

A.2.1.1 FAA Guidelines

The FAA is responsible for managing navigable airspace in the United States for public safety and ensuring its efficient use for commercial air traffic, general aviation, and national defense, including SUA utilized by the DoD. The FAA processes requests for the establishment or

modification of airspace in accordance with procedures defined in FAA Order JO 7400.2, *Procedures for Handling Airspace Matters* (the current versions of FAA Orders are referenced in the EA and appendices as applicable). The process for establishing (or modifying) airspace is twofold, comprising both aeronautical and environmental analyses. The DAF will submit a formal airspace proposal to the FAA defining the proposed airspace. The FAA ensures the proposed airspace is compliant with airspace regulations and circulates the airspace proposal for public review.

The FAA may or may not adopt the DAF's EA, in whole or in part, to comply with its NEPA procedures defined in FAA Order 1050.1, *Environmental Impacts: Policies and Procedures* and Chapter 32 of FAA Order JO 7400.2, prior to making a decision to chart any proposed airspace addressed in the EA. As part of this process, the FAA will publicly circularize the airspace proposal for a 45-day public review period. The FAA's public review process will be conducted separately from the NEPA public involvement process that the DAF is conducting for the EA. Comments received during the FAA circularization process will be considered in the Final EA and DAF Finding of No Significant Impact (FONSI), as applicable.

If approved, the proposed airspace would be published in the current issue of FAA Order JO 7400.10, *Special Use Airspace* and charted on aeronautical publications, at which time it would be available for use as defined in this EA. The airspace associated with the Proposed Action would lie within the jurisdiction of FAA Houston Center.

A.2.2 National Historic Preservation Act Consultation

The NHPA established the National Register of Historic Places (NRHP) and outlines procedures for managing cultural resources on federal property. The NHPA requires federal agencies to consider the potential impacts of federal undertakings on historic properties that are listed, nominated to, or eligible for listing in the NRHP; designated as a National Historic Landmark; or valued by modern American Indians for maintaining their traditional culture. Section 106 of the NHPA requires federal agencies to consult with SHPOs and others if their undertakings have the potential to adversely affect historic properties and to afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on such undertakings.

Section 106 of the NHPA requires federal agencies to consider the effects of their proposed actions (or "undertakings") on historic properties and to integrate historic preservation values into their decision-making process. Federal agencies must seek to avoid, minimize, or mitigate potential adverse effects on historic properties under Section 106 (36 CFR § 800.1[a]). Section 106 also requires agencies to consult with federally recognized Native American tribes with a vested interest in the undertaking. Other 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, and the Native American Graves Protection and Repatriation Act of 1990.

The Section 106 consultation process is integrated into the NEPA process for the Proposed Action evaluated in the EA. The DAF is consulting with the Texas SHPO regarding potential effects on

historic properties from the Proposed Action. The Laughlin AFB Cultural Resources Manager is the point-of-contact for consultation with the SHPO and ACHP, as applicable.

A.2.3 Endangered Species Act Consultation

The ESA establishes protections for species listed as threatened and endangered and the ecosystems upon which those species depend. Endangered species are those in danger of extinction throughout all, or a large portion, of their range (16 U.S.C. § 1536). Threatened species are those likely to be listed as endangered in the foreseeable future. Section 7 of the ESA prohibits any federal agency from engaging in any action that is likely to jeopardize the continued existence of listed endangered or threatened species or that destroys or adversely affects the critical habitat of such species. 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."

Compliance with Section 7 of the ESA and implementing regulations (50 CFR Part 402), requires communication with the USFWS 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 consultation is to identify such species that are known or have potential to occur in the project area. The DAF would then make a determination of potential adverse impacts on species known or having potential to be present. The DAF is consulting with the USFWS in accordance with Section 7 of the ESA to determine potential effects on federally listed species that could result from the Proposed Action.

A.3 Government-to-Government Consultation

Consistent with the NHPA's implementing regulations (36 CFR Part 800), DoD Instruction 4710.02, *DoD Interactions with Federally Recognized Tribes*, DAF Instruction 90-2002, *Interactions with Federally Recognized Tribes*, and Air Force Manual 32-7003, *Environmental Conservation*, the DAF has a responsibility to consult in good faith with federally recognized tribes who have a documented interest in DAF lands and activities, even though the tribe may not be geographically located near the installation or its airspace, regarding a proposed action's potential to affect properties of cultural, historical, or religious significance to the tribes. The tribal coordination process is distinct from NEPA consultation and the intergovernmental coordination processes and requires separate notification of all relevant tribes. The timelines for tribal consultation are also distinct from those of intergovernmental consultations. The installation commander's role in tribal government-to-government consultation is similar to the commander's role with an ambassador. The installation commander may also designate a civilian government employee as the Installation Tribal Liaison Officer. The Installation Tribal Liaison Officer must be a high-level civilian who is able to interact directly with base leaders and is allowed access to the installation commander without multiple chain of command impediments.

A.4 Public and Agency Review of Environmental Assessment

A Notice of Availability (NOA) was published in the *Eagle Pass News Leader* and *Uvalde Leader News* to announce the availability of the Draft EA and proposed FONSI for a 30-day public comment period. Printed copies of the Draft EA and proposed FONSI were made available for review at the Val Verde Public Library, 300 Spring Street, Del Rio, Texas 78840; Camp Wood Public Library, 106 South Nueces, P.O. Box 138, Camp Wood, Texas 78833; El Progresso Memorial Library, 301 West Main Street, Uvalde, Texas 78801; and Real County Library, 225 Main Street, Leakey, Texas 78873. The Draft EA and proposed FONSI were accessible under "Key Documents" on Laughlin AFB's website at https://www.laughlin.af.mil/. Persons unable to access the Draft EA and proposed FONSI via the methods listed above were directed to contact Public Affairs at (830-298-5262) or (47FTWPA.TASKER@us.af.mil) to arrange alternate access. Substantive comments received during the 30-day public comment period will be considered in the Final EA and FONSI, as applicable.

A.5 Intergovernmental and Stakeholder Coordination

A.5.1 Sample Agency / General Scoping Letter

DEPARTMENT OF THE AIR FORCE
47TH FLYING TRAINING WING
LAUGHLIN AIR FORCE BASE TEXAS

16 April 2025

Laura M. Frerich, DAF
Environmental Chief, 47th Civil Engineer Squadron
47 CES/CEIE
251 Fourth Street
Laughlin AFB, TX 78843-5126

Karen Myers
ES Project Lead, U.S. Fish and Wildlife Service
1505 Ferguson Lake
Austin, TX 78754

Dear Karen Myers

The United States Department of the Air Force (DAF) is preparing an Environmental Assessment (EA) to evaluate potential environmental impacts from the Proposed Action and Alternatives (Proposed Action) to obtain a new permanent low-altitude airspace for the 47th Flying Training Wing (47 FTW) at Laughlin Air Force Base (AFB), Texas to support Fighter Bomber Fundamentals pilot training syllabus requirements. Laughlin AFB is in Val Verde County, Texas approximately 9 miles east of the city of Del Rio and approximately 130 miles west of San Antonio (Figure 1). The EA is being prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and the DAF Environmental Impact Analysis Process (32 Code of Federal Regulations Part 989). The Federal Aviation Administration (FAA) is serving as a cooperating agency during the NEPA process for the Proposed Action.

The proposed low-altitude airspace would need to have a floor of 500 feet above ground level (AGL) and a ceiling of up to, but not including 7,000 feet mean sea level (MSL). Up to 1,570 aircraft operations would occur in the proposed airspace annually. Operations would initially be performed by 47 FTW pilots flying the T-38C, a high-speed, highly maneuverable jet trainer, and would transition to the T-7A *Red Hawk* (T-7A), the DAF's newest jet trainer, beginning in 2030. (Basing of the T-7A at Laughlin AFB was evaluated in the *Final Environmental Impact Statement for T-7A Recapitalization at Laughlin Air Force Base, Texas* and Record of Decision issued in December 2024.) Operations would be performed between 8:00 a.m. and 7:30 p.m. local time; no nighttime aircraft operations are proposed in the new airspace. The proposed airspace would be managed and scheduled by the 47 FTW.

None of the proposed training activities would involve releases of live or inert ammunition or ordnance (including defensive countermeasures such as chaff and flares). Aircraft would not exceed supersonic speeds while operating within the proposed airspace. The Proposed

Action does not include changes to the existing boundaries of Laughlin AFB, the lateral or vertical boundaries of existing airspace managed by Laughlin AFB, the number and types of personnel and aircraft assigned to Laughlin AFB, or the number of aircraft operations occurring at the base. No construction, demolition, or other ground-disturbing activities would occur at Laughlin AFB or on lands underlying the proposed airspace as part of the Proposed Action.

The DAF is considering an alternative to implement the Proposed Action whereby the DAF would request FAA to establish the proposed low-altitude airspace under a portion of the existing Laughlin 2 Military Operations Area (MOA), which encompasses approximately 3,100 square miles of airspace approximately 18 miles east of Laughlin AFB. Currently, military aircraft training operations are not permitted below 7,000 feet in the Laughlin 2 MOA. If established under this alternative, the proposed airspace would be designated as the Laughlin 2A Low MOA (Figure 1). In accordance with an existing letter of agreement between Laughlin AFB and the FAA, the 47th Operations Group would coordinate with the FAA Houston Air Route Traffic Control Center to deconflict military and civilian aircraft operations within an approximately 125-square mile area between 500 feet AGL and 5,000 feet MSL (designated as the "Uvalde Inset") to support ongoing civilian Instrument Flight Rules aircraft operations at Garner Field Airport east of Uvalde. Other alternatives for implementing the Proposed Action will be addressed in the EA.

To support the NEPA process, the DAF requests your input on general or specific resources or conditions that you feel should be considered in the EA. Your comments, questions, or requests for additional information about the Proposed Action should be sent to Mr. Darren Johnson via email at darren.johnson.27@us.af.mil or mail at 47 CES/CEIE, 251 Fourth Street, Laughlin AFB, TX 78843-5126. You may also contact Ms. Laura Claypool at the Laughlin Public Affairs Office via email at laura.claypool@us.af.mil. Your comments are requested within 30 days of receiving this letter to allow sufficient time to consider them during preparation of the Draft EA. Thank you for your assistance.

Sincerely

MEYER FRERICH.LAURA.E.1403703547

Digitally signed by MEYER FRERICH.LAURA.E.1403703547
Date: 2025.04.16 15:05:14 -05'00'

LAURA M. FRERICH, DAF
Environmental Chief, 47th Civil Engineer Squadron

Attachment:
1. Figure 1 – Location of Laughlin AFB, Laughlin 2 MOA, and Proposed Laughlin 2A Low MOA

Figures included in the scoping letters labeled the Excluded Area as the Uvalde Inset.

3

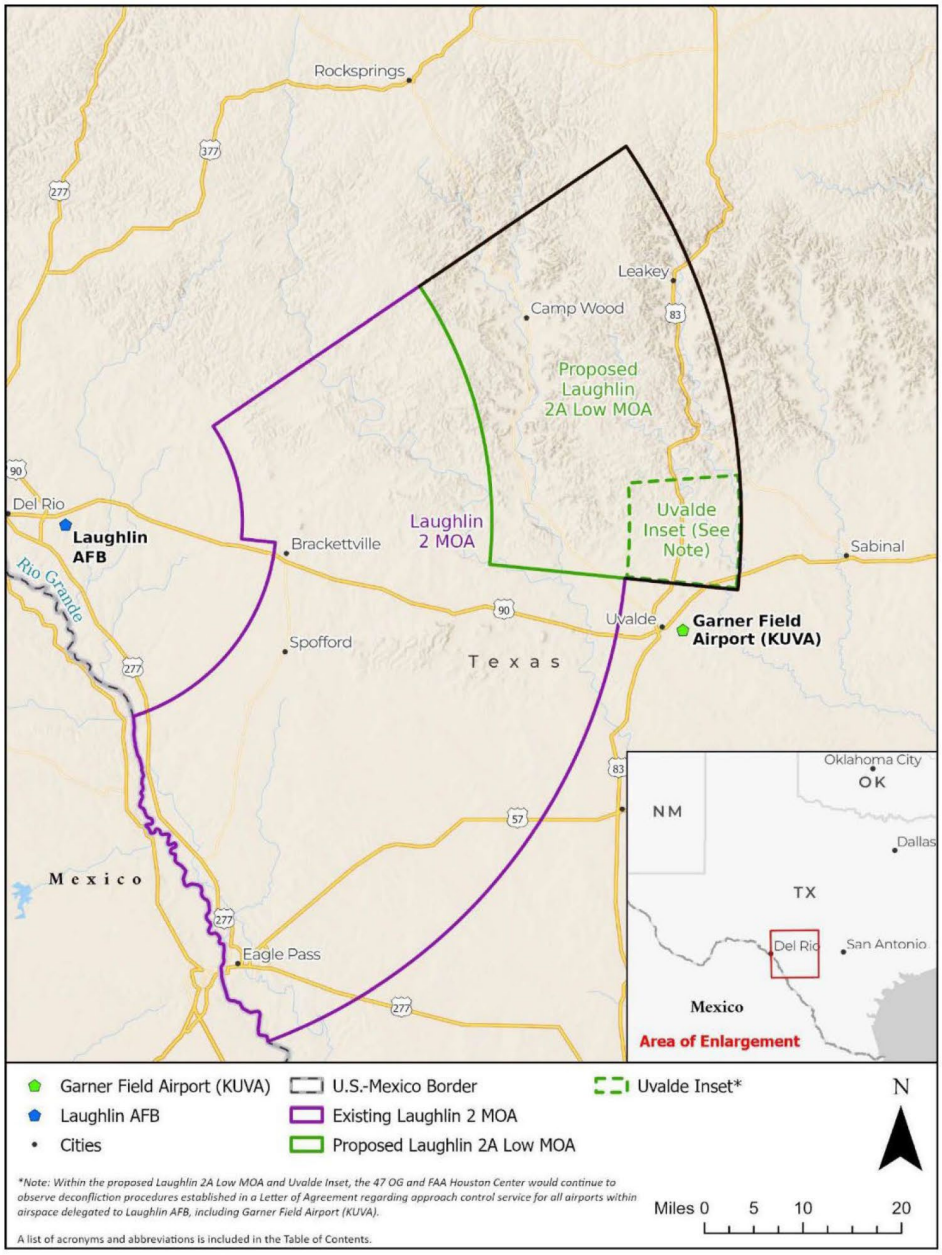


Figure 1 – Location of Laughlin AFB, Laughlin 2 MOA, and Proposed Laughlin 2A Low MOA

A.5.2 Representative Government-to-Government Scoping Letter

DEPARTMENT OF THE AIR FORCE
47TH FLYING TRAINING WING
LAUGHLIN AIR FORCE BASE TEXAS

25 April 2025

Colonel Tyler J. Ellison
47 FTW Commander
561 Liberty Drive, Suite 1
Laughlin AFB, TX 78843-5126

Devon Frazier
THPO, Absentee-Shawnee Tribe of Indians of Oklahoma
2025 S. Gordon Cooper Dr.
Shawnee, OK 74801

Dear Devon Frazier

The United States Department of the Air Force (DAF) is preparing an Environmental Assessment (EA) to evaluate potential environmental impacts from the Proposed Action and Alternatives (Proposed Action) to obtain a new permanent low-altitude airspace for the 47th Flying Training Wing (47 FTW) at Laughlin Air Force Base (AFB), Texas to support Fighter Bomber Fundamentals pilot training syllabus requirements. Laughlin AFB is in Val Verde County, Texas approximately 9 miles east of the city of Del Rio and approximately 130 miles west of San Antonio (Figure 1). The EA is being prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and the DAF Environmental Impact Analysis Process (32 Code of Federal Regulations [CFR] Part 989). The Federal Aviation Administration (FAA) is serving as a cooperating agency during the NEPA process for the Proposed Action.

The Proposed Action is considered an undertaking under Section 106 of the National Historic Preservation Act (NHPA). Therefore, the purpose of this letter is to initiate government-to-government consultation pursuant to Section 106 of the NHPA, implementing regulations at 36 CFR Part 800, and DoD Instruction 4710.02, *DoD Interactions with Federally Recognized Tribes*. The DAF also requests information on any properties of historic, religious, or cultural significance that could potentially be affected by the proposed undertaking.

The proposed low-altitude airspace would need to have a floor of 500 feet above ground level (AGL) and a ceiling of up to, but not including 7,000 feet mean sea level (MSL). Up to 1,570 aircraft operations would occur in the proposed airspace annually. Operations would initially be performed by 47 FTW pilots flying the T-38C, a high-speed, highly maneuverable jet trainer, and would transition to the T-7A *Red Hawk* (T-7A), the DAF's newest jet trainer, beginning in 2030. (Basing of the T-7A at Laughlin AFB was evaluated in the *Final Environmental Impact Statement for T-7A Recapitalization at Laughlin Air Force Base, Texas* and Record of Decision issued in December 2024.) Operations would be performed between 8:00 a.m. and 7:30 p.m. local time; no nighttime aircraft operations are proposed in the new airspace. The proposed airspace would be managed and scheduled by the 47 FTW.

None of the proposed training activities would involve releases of live or inert ammunition or ordnance (including defensive countermeasures such as chaff and flares). Aircraft would not exceed supersonic speeds while operating within the proposed airspace. The Proposed Action does not include changes to the existing boundaries of Laughlin AFB, the lateral or vertical boundaries of existing airspace managed by Laughlin AFB, the number and types of personnel and aircraft assigned to Laughlin AFB, or the number of aircraft operations occurring at the base. No construction, demolition, or other ground-disturbing activities would occur at Laughlin AFB or on lands underlying the proposed airspace as part of the Proposed Action.

The DAF is considering an alternative to implement the Proposed Action whereby the DAF would request FAA to establish the proposed low-altitude airspace under a portion of the existing Laughlin 2 Military Operations Area (MOA), which encompasses approximately 3,100 square miles of airspace approximately 18 miles east of Laughlin AFB. Currently, military aircraft training operations are not permitted below 7,000 feet in the Laughlin 2 MOA. If established under this alternative, the proposed airspace would be designated as the Laughlin 2A Low MOA (Figure 1). In accordance with an existing letter of agreement between Laughlin AFB and the FAA, the 47th Operations Group would coordinate with the FAA Houston Air Route Traffic Control Center to deconflict military and civilian aircraft operations within an approximately 125-square mile area between 500 feet AGL and 5,000 feet MSL (designated as the "Uvalde Inset") to support ongoing civilian Instrument Flight Rules aircraft operations at Garner Field Airport east of Uvalde. Other alternatives for implementing the Proposed Action will be addressed in the EA.

The inadvertent discovery of archaeological resources or human remains during the proposed undertaking is not anticipated because no ground-disturbing activities are proposed. However, in the event such a discovery occurs during the proposed undertaking you will be immediately informed by the DAF, regardless of whether you choose to participate in government-to-government consultation. In accordance with Section 106, the DAF is also consulting with other Native American tribes and the Texas State Historic Preservation Officer with respect to the proposed undertaking.

As part of the government-to-government consultation process, the DAF requests comments or information on properties of historic, religious, or cultural significance that could potentially be affected by the proposed undertaking. Your comments, questions, or requests for additional information should be sent to my designated representative for this matter, Mr. Darren Johnson, Laughlin AFB Environmental Program Manager, via email at darren.johnson.27@us.af.mil or by phone at 830-298-4298. You may also contact Ms. Laura Claypool at the Laughlin Public Affairs Office via email at laura.claypool@us.af.mil. We request your comments at your earliest convenience to allow sufficient time to consider them during preparation of the Draft EA. Thank you for your assistance.

Sincerely

ELLISON.TYLER.J.1175400245 Digitally signed by ELLISON.TYLER.J.1175400245 Date: 2025.04.25 09:40:16 -05'00'

TYLER J. ELLISON, Colonel, USAF
Commander, 47th Flying Training Wing

Attachment:
Figure 1 - Location of Laughlin AFB, Laughlin 2 MOA, and Proposed Laughlin 2A Low MOA

Figures included in the scoping letters labeled the Excluded Area as the Uvalde Inset.

3

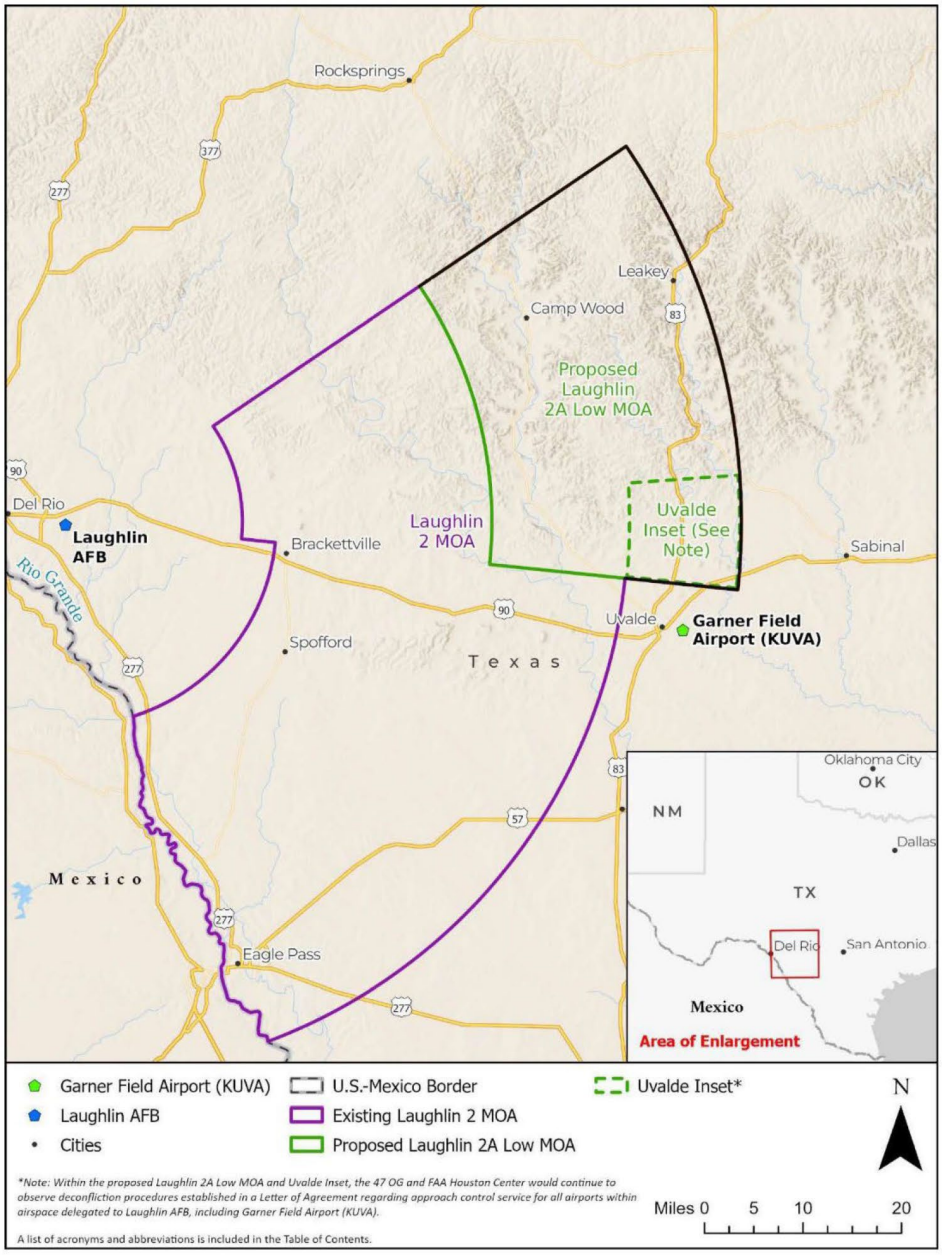


Figure 1 – Location of Laughlin AFB, Laughlin 2 MOA, and Proposed Laughlin 2A Low MOA

A.5.3 SHPO Scoping Letter

DEPARTMENT OF THE AIR FORCE
47TH FLYING TRAINING WING
LAUGHLIN AIR FORCE BASE TEXAS

16 April 2025

Laura M. Frerich, DAF
Environmental Chief, 47th Civil Engineer Squadron
47 CES/CEIE
251 Fourth Street
Laughlin AFB, TX 78843-5126

Joseph Bell
Executive Director and State Historic Preservation Officer
Texas Historical Commission
PO Box 12276
Austin, TX 78711-2276
Submitted via eTRAC: https://xapps.thc.state.tx.us/106Review/

Dear Mr. Bell

The United States Department of the Air Force (DAF) is preparing an Environmental Assessment (EA) to evaluate potential environmental impacts from the Proposed Action and Alternatives (Proposed Action) to obtain a new permanent low-altitude airspace for the 47th Flying Training Wing (47 FTW) at Laughlin Air Force Base (AFB), Texas to support Fighter Bomber Fundamentals pilot training syllabus requirements. Laughlin AFB is in Val Verde County, Texas approximately 9 miles east of the city of Del Rio and approximately 130 miles west of San Antonio (Figure 1). The EA is being prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and the DAF Environmental Impact Analysis Process (32 Code of Federal Regulations Part 989). The Federal Aviation Administration (FAA) is serving as a cooperating agency during the NEPA process for the Proposed Action.

The Proposed Action is considered an undertaking under Section 106 of the National Historic Preservation Act (NHPA). Therefore, the purpose of this letter is to initiate Section 106 consultation between the DAF and Texas State Historic Preservation Office (SHPO) and request information on historic properties that could potentially be affected by the proposed undertaking. The DAF also requests SHPO concurrence with the Area of Potential Effect (APE) for the proposed undertaking described below.

The proposed low-altitude airspace would need to have a floor of 500 feet above ground level (AGL) and a ceiling of up to, but not including 7,000 feet mean sea level (MSL). Up to 1,570 aircraft operations would occur in the proposed airspace annually. Operations would initially be performed by 47 FTW pilots flying the T-38C, a high-speed, highly maneuverable jet trainer, and would transition to the T-7A *Red Hawk* (T-7A), the DAF's newest jet trainer, beginning in 2030. (Basing of the T-7A at Laughlin AFB was evaluated in the *Final Environmental Impact Statement for T-7A Recapitalization at Laughlin Air Force Base, Texas* and Record of Decision issued in December 2024.) Operations would be performed between 8:00 a.m. and 7:30 p.m. local time; no nighttime aircraft operations are proposed in the new airspace. The proposed airspace would be managed and scheduled by the 47 FTW.

None of the proposed training activities would involve releases of live or inert ammunition or ordnance (including defensive countermeasures such as chaff and flares). Aircraft would not exceed supersonic speeds while operating within the proposed airspace. The Proposed Action does not include changes to the existing boundaries of Laughlin AFB, the lateral or vertical boundaries of existing airspace managed by Laughlin AFB, the number and types of personnel and aircraft assigned to Laughlin AFB, or the number of aircraft operations occurring at the base. No construction, demolition, or other ground-disturbing activities would occur at Laughlin AFB or on lands underlying the proposed airspace as part of the Proposed Action.

The DAF is considering an alternative to implement the Proposed Action whereby the DAF would request FAA to establish the proposed low-altitude airspace under a portion of the existing Laughlin 2 Military Operations Area (MOA), which encompasses approximately 3,100 square miles of airspace approximately 18 miles east of Laughlin AFB. Currently, military aircraft training operations are not permitted below 7,000 feet in the Laughlin 2 MOA. If established under this alternative, the proposed airspace would be designated as the Laughlin 2A Low MOA (Figure 1). In accordance with an existing letter of agreement between Laughlin AFB and the FAA, the 47th Operations Group would coordinate with the FAA Houston Air Route Traffic Control Center to deconflict military and civilian aircraft operations within an approximately 125-square mile area between 500 feet AGL and 5,000 feet MSL (designated as the "Uvalde Inset") to support ongoing civilian IFR aircraft operations at Garner Field Airport east of Uvalde. Other alternatives for implementing the Proposed Action will be addressed in the EA.

The APE for the proposed undertaking is defined as lands underlying or intersected by the lateral boundaries of the proposed Laughlin 2A Low MOA (see Figure 1). No ground-disturbing activities would occur within these boundaries under the proposed undertaking. In accordance with Section 106 of the NHPA, the DAF respectfully requests the Texas SHPO's concurrence with the proposed APE. Information is also requested for historic properties that could potentially be affected by the proposed undertaking. The DAF has initiated government-to-government consultation with Native American tribes regarding the proposed undertaking in accordance with Section 106, implementing regulations at 36 CFR Part 800, and DoD Instruction 4710.02, *DoD Interactions with Federally Recognized Tribes*.

Please send your response and any comments, questions, or requests for additional information to Mr. Darren Johnson via email at darren.johnson.27@us.af.mil or mail at 47 CES/CEIE, 251 Fourth Street, Laughlin AFB, TX 78843-5126. You may also contact Ms. Laura Claypool at the Laughlin Public Affairs Office via email at laura.claypool@us.af.mil. Your response is requested within 30 days of receiving this letter to allow sufficient time for consideration of your comments during preparation of the Draft EA. When available, the Draft EA will be provided to your office for review and concurrence with the DAF's determination of effects on historic properties. Thank you for your assistance.

Sincerely

MEYER FRERICH.LAURA.E.1403703547

Digitally signed by MEYER FRERICH.LAURA.E.1403703547
Date: 2025.04.16 10:13:07 -05'00'

LAURA M. FRERICH, DAF
Environmental Chief, 47th Civil Engineer Squadron

Attachment:
1. Figure 1 – Location of Laughlin AFB, Laughlin 2 MOA, and Proposed Laughlin 2A Low MOA (Proposed APE)

Figures included in the scoping letters labeled the Excluded Area as the Uvalde Inset.

3

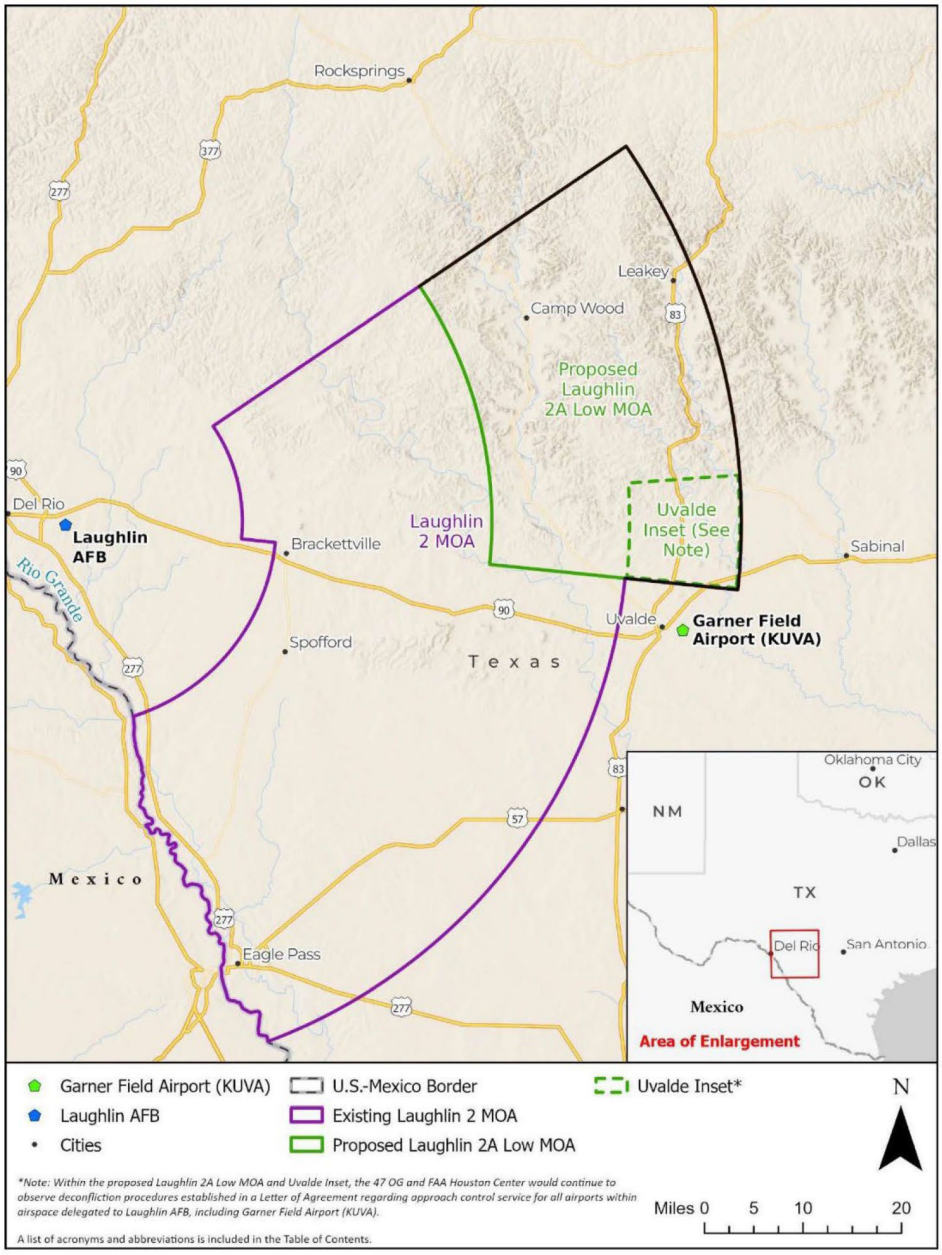


Figure 1 – Location of Laughlin AFB, Laughlin 2 MOA, and Proposed Laughlin 2A Low MOA

A.6 Stakeholder List

The following is the stakeholder list for correspondence associated with this Environmental Assessment.

Table A.6-1 Stakeholder List

Name	Title	Organization
General / Agencies		
Karen Myers	ES Project Lead	U.S. Fish and Wildlife Service
Joseph Bell	Executive Director / SHPO	Texas Historical Commission
Randy Gee	Tribal Program Manager	USEPA Region 6
Stefania Munoz	NEPA Coordinator	Texas Commission on Environmental Quality
Russell Hooten	Environmental Review Biologist	Texas Parks and Wildlife Department
Marcus Brown	General Manager	Uvalde Flight Center, KUVA - Garner Field Airport
Souli Asa Shanklin	Judge	Edwards County
John Paul Schuster	Judge	Kinney County
Bella A. Rubio	Judge	Real County
William R. Mitchell	Judge	Uvalde County
Hector R. Luevano	Mayor	City of Uvalde
Government-to-Government		
Devon Frazier	THPO	Absentee-Shawnee Tribe of Indians of Oklahoma
John Johnson	Governor	Absentee-Shawnee Tribe of Indians of Oklahoma
Bryant Celestine	THPO	Alabama-Coushatta Tribe of Texas
Ricky Sylestine	Chairperson	Alabama-Coushatta Tribe of Texas
Matthew Tselee	Chairman	Apache Tribe of Oklahoma
Rodney “Minnow” Gervais	Chairman	Blackfeet Tribe of the Blackfeet Indian Reservation of Montana
Forrest Tahdooahnippah	Chairman	Comanche Nation (Oklahoma)
Martina Minthorn	THPO	Comanche Nation (Oklahoma)
Crystal Williams	Vice Chair	Coushatta Tribe of Louisiana
Kristian Poncho	THPO	Coushatta Tribe of Louisiana
Deborah Dotson	President	Delaware Nation (Oklahoma)
Katelyn Lucas	THPO	Delaware Nation (Oklahoma)
Michael Darrow	Tribal Historian	Fort Sill Apache Tribe of Oklahoma
Jennifer Heminokeky	Chairwoman	Fort Sill Apache Tribe of Oklahoma
Jeffrey Blythe	THPO	Jicarilla Apache Nation
Adrian Notsinneh	President	Jicarilla Apache Nation
Juan Garza	Chairman	Kickapoo Traditional Tribe of Texas
Gail DuPuis-Cheatham	Chairman	Kickapoo Tribe of Indians of the Kickapoo Reservation in Kansas
Darwin Kaskaske	Chairman	Kickapoo Tribe of Oklahoma

Table A.6-1 Stakeholder List

Name	Title	Organization
Government-to-Government *(continued)*		
Susan Tiger	NAGPRA Representative	Kickapoo Tribe of Oklahoma
Amanda Hill	THPO	Kiowa Indian Tribe of Oklahoma
Lawrence Spottedbird	Chairman	Kiowa Indian Tribe of Oklahoma
Bernard Barcena Jr.	Chairman	Lipan Apache Tribe of Texas
Thora Padilla	President	Mescalero Apache Tribe
Holly Houghten	THPO	Mescalero Apache Tribe
Vernelda Grant	THPO	San Carlos Apache Tribe
Terry Rambler	Chairperson	San Carlos Apache Tribe
Joshua Mann	THPO	Shoshone Tribe of the Wind River Reservation
Vernon Hill	Chairman	Shoshone Tribe of the Wind River Reservation
Russell Martin	President	Tonkawa Tribe of Indians of Oklahoma
Lauren Norman-Brown	THPO	Tonkawa Tribe of Indians of Oklahoma
Kasey Velasquez	Chairman	White Mountain Apache Tribe
Mark Altaha	THPO	White Mountain Apache Tribe
Gary McAdams	THPO	Wichita and Affiliated Tribes
Amber Silverhorn-Wolfe	President	Wichita and Affiliated Tribes
Omar Villanueva	THPO	Ysleta del sur Pueblo
E. Michael Silvas	Governor	Ysleta del sur Pueblo

A.7 Agency and Tribal Comment Letters

From: noreply@thc.state.tx.us <[redacted]
Sent: Friday, May 30, 2025 11:36:18 AM
To: Bowen, Christopher [USA - EMP] <[redacted]; reviews@thc.state.tx.us <[redacted]
Subject: Laughlin AFB Low Military Operations Area Special Use Airspace
Re: Project Review under Section 106 of the National Historic Preservation Act

THC Tracking #202509863
Date: 05/30/2025

Laughlin AFB Low Military Operations Area Special Use Airspace
NA
Leakey,TX

Description: DAF/Laughlin AFB is preparing an Environmental Assessment to evaluate the potential environmental consequences of a Proposed Action to obtain new permanent low-altitude airspace.

Dear Christopher Bowen:

Thank you for your submittal regarding the above-referenced project. This response represents the comments of the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission (THC), pursuant to review under Section 106 of the National Historic Preservation Act.

The review staff, led by Tiffany Osburn, Justin Kockritz and Patrick Bassett, has completed its review and has made the following determinations based on the information submitted for review:

Above-Ground Resources

- Property/properties are eligible for listing or already listed in the National Register of Historic Places.

Archeology Comments

- No historic properties affected. However, if cultural materials are encountered during construction or disturbance activities, work should cease in the immediate area; work can continue where no cultural materials are present. Please contact the THC's Archeology Division at [redacted] to consult on further actions that may be necessary to protect the cultural remains.

We have the following comments: The THC History Programs Division staff, led by Justin Kockritz, notes that within the Proposed Laughlin 2A Low MOA are several properties designated as Recorded Texas Historic Landmarks: the Church of the Ascension in Montell, the Old Davenport Home on FM 1051, the First Baptist Church of Barksdale, and the Real County Courthouse in Leakey. Additional information about these properties is available on the THC's Historic Sites Atlas (https://atlas.thc.texas.gov/). We also note that although Garner State Park has never formally been determined eligible for listing in the National Register of Historic Places, there is a strong likelihood that the park is historically significant for its design and associations with the Civilian Conservation Corps. The THC Division of Architecture review staff, led by Patrick Bassett, recommends the Air Force consult with all appropriate local stakeholders, including Texas Parks and Wildlife Department.

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this review process, and for your efforts to preserve the irreplaceable heritage of Texas. If the project changes, or if new historic properties are found, please contact the review staff. If you have any questions concerning our review or if we can be of further assistance, please email the following reviewers:
[redacted]

This response has been sent through the electronic THC review and compliance system (eTRAC). Submitting your project via eTRAC eliminates mailing delays and allows you to check the status of the review, receive an electronic response, and generate reports on your submissions. For more information, visit http://thc.texas.gov/etrac-system.

Sincerely,

for Joseph Bell, State Historic Preservation Officer
Executive Director, Texas Historical Commission

Received from Tribal Admin 05/08/25 MW
E-mailed 05/30/25 (initial & date)
Scanned 05/30/25 (initial & date)

SAN CARLOS APACHE TRIBE
Historic Preservation & Archaeology Department
[redacted]
Tel. [redacted]

Tribal Consultation Response Letter

Date: May 08, 2025
Contact Name: Ellison Tyle [redacted]
Company: Department of the Air Force – Laughlin Air Force Base Texas
Address: 47 FTW Commander [redacted]
Project Name/#: Preparing an Environmental Impact Statement for the 47th Flying Training Wing (47 FTW) at Laughlin AFB

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:

- O **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**
- O **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 ___ Other _____
- O **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** — But we support Concerns tribes may have for this area.
  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.
- O **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: _____ 05/20/25
Vernelda J. Grant, Tribal Historic Preservation Officer — Date

CONCURRENCE: _____ 5/21/25
Terry Rambler, Tribal Chairman — Date

COMANCHE NATION

Department of the Air Force
47th Flying Training Wing (AETC)
Attn: Mr. Darren A. Johnson
Laughlin Air force Base
Texas 78843-5126

May 30, 2025

Re: The United States Department of the Air Force (DAF) is preparing an Environmental Alternatives (EA) to evaluate potential environmental impacts from the Proposed Action and Alternatives (Proposed Action) to obtain a new permanent low-altitude airspace for the 47th Flying Training Wing (47FTW) at Laughlin Air Force Base (AFB) TX

Dear Mr. Johnson:

In response to your request, the above reference project has been reviewed by staff of this office to identify areas that may potentially contain prehistoric or historic archeological materials. The location of your project has been cross referenced with the Comanche Nation site files, where an indication of ***"No Properties"*** have been identified. (IAW 36 CFR 800.4(d)(1)).

Please contact this office at [redacted] if you require additional information on this project.

This review is performed in order to identify and preserve the Comanche Nation and State cultural heritage, in conjunction with the State Historic Preservation Office.

Regards
Theodore Villicana
Comanche Nation Historic Preservation Office
Theodore E. Villicana, Technician
[redacted]

COMANCHE NATION [redacted]
PHONE: [redacted]

White Mountain Apache Tribe

Office of Historic Preservation

[redacted]

To: Tyller J. Ellison, Colonel, USAF Commander, 47th Flying Training Wing

Date: June 06, 2025

Re: *Proposed New Permanent Low-Altitude Airspace for the 47FTW*

The White Mountain Apache Tribe Historic Preservation Office appreciates receiving information on the project dated; *April 25, 2025.* In regard to this, please refer to the following statement(s) below;

Thank you for allowing the White Mountain Apache tribe the opportunity to review and respond to the above new permanent low-altitude airspace for the 47FTW at Laughlin Air Force Base, in Val Verde County, Texas.

Please be advised, we have reviewed the information provided, and we have determined the proposed action project will have a ***"No Adverse Effect"*** on the tribe's cultural heritage resources and/or historic properties.

Thank you for the continued tribal engagement and consultation, and collaborations in protecting and preserving places of cultural and historical importance.

Sincerely,

Mark Altaha

White Mountain Apache Tribe – THPO
Historic Preservation Office

From: Omar Villanueva [redacted]>
Sent: Wednesday, July 23, 2025 5:32 PM
To: JOHNSON, DARREN A CIV USAF AETC 47 CES/CEIE [redacted]
Cc: Nancy Torres [redacted]
Subject: [Non-DoD Source] New Permanent Low-
Base in Val Verde County, Texas

Dear Mr. Darren Johnson,

This email is in response to the correspondence received at our office in which you are inviting the Ysleta del Sur Pueblo the opportunity to consult on the proposed action to obtain a new permanent low-altitude airspace for the 47th Flying Training Wing (47th FTW) at Laughlin Air Force Base in Val Verde County, Texas to support Fighter Bomber Fundamentals pilot training syllabus requirements.

While we do not have any comments nor wish to consult on the proposed undertaking and believe that this project will not adversely affect traditional, religious or culturally significant sites of our Pueblo.

Thank you for allowing us the opportunity to comment on the proposed project.

Sincerely,

Omar Villanueva
War Captain/THPO

Ysleta del Sur Pueblo
[redacted]
[redacted]

1

A.8 References

FAA. 2025. FAA Order JO 7400.2, *Procedures for Handling Airspace Matters*, February 20, 2025. https://www.faa.gov/regulations_policies/orders_notices/index.cfm/go/document.current/documentNumber/7400.2. Accessed March 21, 2025.

This page intentionally left blank.

APPENDIX B
Alternatives Development and Resources Dismissed

This page intentionally left blank.

Information in **Sections B.1** and **B.2** of this appendix describes the DAF's process for developing alternatives for implementation of the Proposed Action considered in the EA. Based on this process, the DAF retained Alternative 1 and the No Action Alternative for detailed analysis in the EA. A detailed description of the Proposed Action is presented in **Section 2.1** of the EA. **Section 2.2** of the EA summarizes the alternatives development process and provides detailed descriptions of Alternative 1 and the No Action Alternative.

Section B.2.4 of this appendix describes resources that were dismissed from detailed analysis in the EA because the Proposed Action would have no potential to affect them.

B.1 Selection Standards

The DAF developed selection standards to evaluate the reasonableness of an alternative and whether an alternative should be carried forward for further analysis in the EA. The following selection standards meet the purpose of and need for the Proposed Action and were used to identify reasonable alternatives for analysis in the EA:

1) **Provide airspace with sufficient volume and availability.** The alternative must be of adequate size and configuration to provide optimized pilot training that supports achievement of the necessary FBF training syllabi requirements while providing sufficient operational space that minimizes the need to make unnecessary and inefficient maneuvers to avoid existing encroachments. Specifically, the alternative must afford sufficient lateral and vertical maneuverability to a minimum floor of 500 feet AGL.
2) **Pilot production.** Provide suitable multidirectional airspace that is adequately sized to expose new pilots to training needs which prepares them for 4th- and 5th-generation aircraft and beyond.
3) **Scheduling.** Provide 47 FTW-scheduled airspace that would enable scheduling prioritization for 47 FTW pilots and minimize scheduling competition with other entities, thereby allowing 47 FTW pilots more training time in the airspace.
4) **Maximize training time and minimize transit time.** Provide a low-altitude MOA adjoining an existing MOA structure closer to Laughlin AFB to reduce aircraft transit time and maximize training efficiencies. Maximum transit time to and from the training airspace should be 10 minutes to ensure sufficient fuel would be available to complete training objectives within the airspace (no aerial refueling support would be provided).
5) **Limit impacts on existing military flying training operations.** The proposed airspace should avoid or minimize potential conflicts with current and ongoing DoD and DAF flight training operations occurring within existing airspace.
6) **Limit impacts on other NAS users.** The proposed airspace should limit or reduce the potential for conflicts with the structure and use of the current airspace system by civil aviation. Avoid or minimize potential conflicts with airports, Air Traffic Service routes, and other airspace users.

B.2 Alternatives Considered

The DAF considered multiple alternatives to implement the Proposed Action. Some alternatives that were initially considered, such as modifying other portions of the Laughlin Airspace Complex to either lower the existing airspace floor or creating a new low-altitude airspace under other portions of the Laughlin MOAs, were dismissed by Laughlin airspace managers based on their knowledge of the airspace because they would result in irreconcilable conflicts with other existing Laughlin AFB aircraft operations or be constrained by underlying topography, development, or other encroachments. Similarly, alternatives consisting of partial or complete training using flight simulators were not considered for detailed analysis in the EA. Simulators are used to the extent practicable during pilot training, but ultimately do not provide a fully realistic training experience and cannot replace real-world, in-flight training. Low-altitude flying training provides this realism and is considered one of the DAF's highest training priorities (DAF, 2023). Therefore, alternatives involving the partial or complete use of flight simulators to meet the purpose of and need for the Proposed Action are not addressed further in this EA

Alternatives considered and determined by the DAF to potentially meet the purpose and need were compared against the selection standards listed in **Section B.1**. A summary of the alternatives screening is presented in **Table B.2-1**. Of the alternatives considered by the DAF, Alternative 1 met all the selection standards and is retained for detailed analysis in the EA. Alternative 1 is described in **Section 2.2.2** of the EA. The remaining alternatives failed to meet one or more of the selection standards and were dismissed from detailed analysis because they would not meet the purpose and need. These alternatives are described in **Section B.2.1** through **B.2.3**. Although it does not meet the purpose and need, the No Action Alternative is carried forward for detailed analysis and is described in **Section 2.2.3** of the EA.

Table B.2-1 Comparison of Alternatives

Selection Standards	Alternatives Considered			
	ALT 1 New Low MOA Under Laughlin 2 MOA	**ALT 2 New Low MOA Under Other Laughlin MOA**	**ALT 3 Forward Deployment**	**ALT 4 Use Other Regional Proposed Low MOAs**
1. Airspace Volume and Availability	Yes	Yes	Yes	Yes
2. Pilot Production	Yes	Yes	Yes	No
3. Scheduling	Yes	Yes	No	No
4. Maximize Training Time and Minimize Transit Time	Yes	Yes	Yes	No
5. Limit Impact on Existing Military Training Operations	Yes	No	Yes	Yes
6. Limit Impacts on Other NAS Users	Yes	No	Yes	Yes
Meets Selection Standards	**YES**	**NO**	**NO**	**NO**

Notes:
ALT = Alternative

B.2.1 Alternative 2 – Establish Low-Altitude MOA Under Other Laughlin MOAs

Under Alternative 2, the DAF would request FAA to establish a new low-altitude MOA directly below the existing Laughlin 1 MOA or Laughlin 3 MOA. While this alternative could potentially meet Selection Standards 1, 2, 3, and 4, it would irreconcilably conflict with established Laughlin ATC procedures, ongoing military training operations, and civilian aircraft operations occurring in or transiting through those airspaces (Selection Standards 5 and 6). Therefore, this alternative would not meet the purpose and need and was dismissed from detailed analysis in this EA.

B.2.2 Alternative 3 – Forward Deployment to Existing Low-Altitude MOAs

Under Alternative 3, 47 FTW pilots, aircraft, maintainers, and other support personnel would temporarily deploy to Robert Gray Army Airfield, approximately 210 miles northeast of Laughlin AFB, to fulfill low-altitude FBF training requirements in the Brady MOA. Temporary deployment rotations of 47 FTW aircraft and personnel under this alternative would last 2 weeks on a monthly rotation. While this alternative would meet Selection Standards 1, 2, 4, 5, and 6, it would fail to meet Selection Standard 3 because the airspace would not be autonomously scheduled by the 47 FTW, and 47 FTW pilots and aircraft would not receive scheduling priority. Additionally, the anticipated frequency of low-altitude training operations required by the FBF syllabus would make this alternative prohibitively costly from both temporary duty funding and logistics/maintenance perspectives. The 47 FTW previously implemented a similar program approximately 15 years ago to fulfill Introduction to Fighter Fundamentals training requirements, but it was discontinued due to program inefficiencies. Given the 47 FTW's previous experience with a similar program, and application of the Selection Standards for this EA, this alternative was dismissed from detailed analysis.

B.2.3 Alternative 4 – Use Other Regional Existing and Proposed Low-Altitude MOAs

Under Alternative 4, the 47 FTW would seek shared use of other existing or proposed low-altitude MOAs in southern Texas. Such airspace could include the Yankee Range, part of the McMullen Range Complex approximately 145 miles southeast of Laughlin AFB; the proposed Randolph 2A Low MOA, approximately 70 miles east of Laughlin AFB (DAF, 2025); or the proposed Crystal Low MOA, approximately 92 miles southeast of Laughlin AFB. Although this alternative would meet Selection Standards 1, 2, 5, and 6, it would fail to meet Selection Standard 3 because none of these airspaces would be autonomously scheduled and managed by the 47 FTW, which would result in a lack of scheduling priority for 47 FTW pilots. Additionally, given their distance from Laughlin AFB, transit times to and from these airspaces would exceed 10 minutes. These increased distances and transit times would result in corresponding reductions in available training time within the airspace due to fuel constraints while increasing the number of sorties that would be required to fulfill training objectives and the amount of fuel needed per sortie. Therefore, this alternative would also fail to meet Selection Standard 4 and was dismissed from detailed analysis in the EA.

B.3 Resource Areas Dismissed from Analysis

Resources that were dismissed from detailed analysis in the EA are summarized in **Table B.3-1**. These resources were dismissed in accordance with NEPA because the Proposed Action would have no potential to affect them.

Table B.3-1 Resources Dismissed from Analysis

Resource	Rationale for Dismissal
Water Resources	The Proposed Action would occur entirely within airspace above the Earth's surface and would have no potential to affect surface water bodies, wetlands, floodplains, groundwater, or other water resources. The Proposed Action would not increase or otherwise change the use of water resources at Laughlin AFB or under the existing Laughlin 1, 2, and 3 MOAs. Therefore, this resource was dismissed from detailed analysis in the EA.
Earth Resources	The Proposed Action would occur entirely within airspace above the Earth's surface and would not involve the disturbance of soils or geological strata, or the alteration of topography. Therefore, this resource is not analyzed further in the EA.
Hazardous Materials and Waste	Under the Proposed Action, hazardous materials and hazardous waste would continue to be used, handled, stored, and disposed of in accordance with all applicable DoD and DAF regulations and other federal and state regulatory requirements. The quantities and types of these materials and wastes used and generated by the DAF would not change under the Proposed Action. No hazardous materials or hazardous waste would be used, stored, generated, disposed of, or released in areas underlying the existing Laughlin 1, 2, and 3 MOAs. Therefore, this resource is not analyzed further in the EA.
Infrastructure / Utilities	The Proposed Action would not exceed the capacity of existing utility and infrastructure systems and does not involve the installation of new, or the alteration of, existing infrastructure and utilities. Therefore, this resource was dismissed from detailed analysis in the EA.
Coastal Zone Management	The Proposed Action would occur above inland areas of Texas well outside the state's Coastal Zone Boundary and would have no potential to affect coastal zone jurisdictions or resources in Texas or any other state. Therefore, requirements of the Coastal Zone Management Act of 1972 are not applicable to the Proposed Action and are not addressed further in this EA.
Section 4(f) of the U.S. Department of Transportation Act (49 U.S.C. § 303(c))	The U.S. Department of Transportation Act (49 U.S.C. § 303(c)) requires projects funded or authorized by the U.S. Department of Transportation to avoid or minimize the use of or adverse effects on public parks, recreation areas, or wildlife and waterfowl refuges of national, state, or local significance, or land of an historic site of national, state, or local significance. (In this context, such lands or sites are typically referred to as "Section 4(f) resources.") Section 1079 of the National Defense Authorization Act for FY98 (Public Law 105-85, November 18, 1997) states that "No military flight operation (including a military training flight), or designation of airspace for such an operation, may be treated as a transportation program or project for purposes of" 49 U.S.C. § 303(c). Therefore, Section 4(f) resources are not addressed further in this EA.

Table B.3-1 Resources Dismissed from Analysis

Resource	Rationale for Dismissal
Prime and Unique Farmland, and Land of Statewide or Local Importance	The Proposed Action would occur entirely in airspace above the Earth's surface and would not involve the nonagricultural development or use of prime and unique farmland as defined by the U.S. Department of Agriculture, or land of statewide or local importance as defined by applicable state and local agencies. Aircraft noise associated with the Proposed Action would have no potential to impede or prevent agricultural activities currently occurring on or planned for such lands. Therefore, this resource was dismissed from analysis in the EA.

B.4 References

DAF. 2023. "Low-Altitude Flying Training." https://www.af.mil/AboutUs/FactSheets/Display/Article/104591/low-altitude-flying-training/. Accessed November 9, 2024.

DAF. 2025. Draft Environmental Assessment for Randolph 2A Low Military Operations Area 28 Special Use Airspace. January.

This page intentionally left blank.

APPENDIX C
Reasonably Foreseeable Future Actions

This page intentionally left blank.

C.1 Reasonably Foreseeable Future Actions

Reasonably foreseeable future actions that would have the potential to contribute to adverse effects on resources analyzed in the EA are summarized in **Table C.1-1**. The Proposed Action's potential effects on each resource when considered with the actions listed in **Table C.1-1** are described below. When considered with other reasonably foreseeable future actions, the Proposed Action would not contribute to cumulatively significant adverse impacts on any resource analyzed in the EA.

Table C.1-1 Reasonably Foreseeable Future Actions

Project	Project Summary	Implementation Date	Relevance and Description of Action
Proposed Randolph 2A Low Military Operations Area (MOA)	The DAF would request the Federal Aviation Administration to establish new, low-altitude training airspace with a minimum altitude of 500 feet above ground level under the existing Randolph 2A MOA west of San Antonio, Texas. The potential effects from this proposal were evaluated in a Draft EA that was released for public review in February 2025.	Future	Project would occur near but outside of the project area.
Establishment of Bear Creek State Park	The Texas Parks and Wildlife department will establish a new state park on 1,720 acres approximately 1 mile southeast of Garner State Park. An opening date has not been announced and is dependent on the completion of natural and cultural resource surveys and a management plan.	Future	Project partially overlaps with implementation of the Proposed Action and occurs mostly within the project area.
Residential/ commercial development projects	Ongoing and planned construction projects in underlying counties and communities, including infrastructure development and residential growth.	Current / Future	Projects overlap with implementation of the Proposed Action and occur within the project area.
Nueces River Authority, wastewater treatment plant construction, Real County	0.25 million gallons per day sequencing batch reactor wastewater treatment plant, includes a control building, influent structure, chlorine contact tank, chemical building, dewatering bins, and associated civil and site work.	Current	Project overlaps with implementation of the Proposed Action and occurs within the project area.
Behavioral health campus, Uvalde County	Construction of a three-story 86,000 square-foot multi-specialty medical facility.	March 2025-Summer 2026	Project overlaps with implementation of the Proposed Action and occurs within the project area.

Table C.1-1 Reasonably Foreseeable Future Actions

Project	Project Summary	Implementation Date	Relevance and Description of Action
Multiple ongoing and planned highway and road projects	Highways, roads, and bridges construction, maintenance, and other transportation improvements in underlying counties and communities.	Current	Projects overlap with implementation of the Proposed Action and occur within the project area.

Airspace Management and Use: Except for the proposed Randolph 2A Low MOA, reasonably foreseeable future actions would occur entirely at ground level and would have no potential to contribute to adverse effects on airspace management and use. If the proposed Randolph 2A Low MOA is selected for implementation, FAA procedural deconfliction would ensure that potential effects on civilian and military aircraft operations within and around the proposed airspace would not be significant. Therefore, when considered with other reasonably foreseeable future actions, the Proposed Action would not contribute to significant adverse impacts on airspace management and use.

Noise: Reasonably foreseeable future actions could result in short-term and long-term impacts from noise. These impacts would vary based on the location of the noise source, duration and intensity of the noise that would be generated, and proximity to potential listeners. None of the reasonably foreseeable projects would establish a new source of noise that would permanently exceed existing ambient noise levels. Except for the proposed Randolph 2A Low MOA, elevated noise levels associated with the reasonably foreseeable projects would occur during demolition and construction activities, would be highly localized, and would end when construction activities are completed. Noise associated with the proposed Randolph 2A Low MOA, if selected for implementation, would not be expected to exceed the 65 dBA threshold below which most types of land use are compatible with aircraft noise. Through project planning and design, coordination with applicable regulatory agencies, and in accordance with applicable regulatory requirements, these projects would incorporate BMPs and other measures to prevent or minimize excessive noise and ensure impacts from noise would not be significant. Therefore, when considered with other reasonably foreseeable future actions, the Proposed Action would not contribute to significant adverse impacts from noise.

Land Use Noise, construction, and traffic detours associated with reasonably foreseeable future actions could result in adverse effects on land use by causing annoyance to people living or working nearby, or disrupting access to those land uses. However, any such effects would be intermittent, localized, avoided or minimized through applicable planning requirements and best management practices (BMPs), and would end following the completion of those projects. New occupied buildings and facilities constructed by those projects would be planned and implemented through coordination with applicable government authorities and in accordance with applicable land use and zoning requirements. Noise associated with the proposed Randolph 2A Low MOA, if selected for implementation, would not be expected to exceed the 65 dBA threshold below which most types of land use are compatible with aircraft noise. As such, none of the reasonably

foreseeable future actions would be anticipated to permanently impede or prevent the continued operation or occupation of existing or planned land uses in the Region of Influence (ROI), or result in permanent land use incompatibilities. Therefore, the Proposed Action would not contribute to significant adverse impacts on land use when considered with the potential effects from other reasonably foreseeable future actions listed above.

Air Quality: Criteria pollutants regulated by the National Ambient Air Quality Standards would be emitted during the respective construction and operational phases of the reasonably foreseeable future projects listed above. Quantities of criteria pollutants emitted during each of the projects would vary widely; however, these emissions would be regulated in accordance with applicable regulatory and permitting requirements to ensure that they would not contribute to the substantial degradation of local or regional air quality or result in changes to relevant Air Quality Control Region attainment designations. Greenhouse gas emissions from the Proposed Action would not be significant in a regional or global context. Therefore, when considered with other reasonably foreseeable future actions, the Proposed Action would not contribute to significant adverse impacts on air quality or greenhouse gases.

Biological Resources: To varying degrees, reasonably foreseeable future actions would have the potential to affect biological resources. Potential adverse effects from these projects would be avoided, minimized, or mitigated through adherence to applicable planning and permitting processes in coordination with local, regional, state, and federal agencies and authorities. Therefore, when considered with the reasonably foreseeable actions, the Proposed Action would not contribute to significant adverse impacts on biological resources.

Cultural Resources: Reasonably foreseeable future actions could have the potential to affect historic properties, including architectural and archaeological resources, and/or traditional cultural properties. Implementation of these projects would be subject to compliance with applicable federal, state, and local environmental compliance requirements, including the National Environmental Policy Act and Section 106 of the National Historic Preservation Act. Potential adverse effects on historic properties from these projects would be identified, avoided, minimized, or mitigated to less than significant levels through consultation with the Texas State Historic Preservation Officer, tribal governments, local authorities, and/or the Advisory Council on Historic Preservation, as applicable. Therefore, when considered with other reasonably foreseeable future actions, the Proposed Action would not contribute to significant adverse impacts on historic properties.

Safety: Except for the proposed Randolph 2A Low MOA, reasonably foreseeable future actions would occur entirely at ground level and would have no potential to adversely affect flight safety in the ROI. Aircraft operations in the proposed Randoph 2A Low MOA, if selected for implementation, would be conducted in accordance with procedures established in applicable DAF regulations and orders with the safety of its pilots and people in the surrounding communities as the primary concern. Therefore, when considered with other reasonably foreseeable future actions, the Proposed Action would not contribute to significant adverse impacts on flight safety.

Socioeconomics: To varying degrees, reasonably foreseeable future actions would have the potential to affect socioeconomic conditions in the ROI. It is anticipated that any potentially adverse effects on socioeconomics would be identified during project planning and avoided or minimized through coordination with local and regional agencies and authorities, and adherence to applicable permitting requirements. Most of these projects would be expected to have beneficial short-term or long-term beneficial effects on socioeconomics from construction- and operations-related employment and expenditures on materials, supplies, equipment, and services. Therefore, when considered with other reasonably foreseeable future actions, the Proposed Action would not contribute to significant adverse effects on socioeconomics.

Visual Resources: Other reasonably foreseeable future actions would have the potential to temporarily or permanently introduce visual elements that could result in short-term or long-term impacts on visual resources in the ROI. Such impacts on sensitive resources, such as historic properties and traditional cultural properties or Indian sacred sites, would be avoided or minimized through coordination with the Texas SHPO, relevant Native American tribes, and other relevant federal, state, and local agencies and organizations. Therefore, when considered with other reasonably foreseeable future actions, the Proposed Action would not contribute to significant adverse impacts on visual resources.

APPENDIX D
Further Definitions of Resource Areas Analyzed, Methodologies, and Modeling

This page intentionally left blank.

This appendix provides background information on the resource areas and definitions of each resource analyzed in the EA, including detailed methodologies and modeling results as applicable. The Region of Influence (ROI) is also described for each resource.

D.1 Airspace Management and Use

D.1.1 Definition of Resource

Airspace Regulations

Airspace management involves the direction, control, and handling of flight operations in the airspace that overlies the borders of the United States and its territories. Under Title 49, U.S.C. § 40103, Sovereignty and use of airspace, and Public Law No. 103-272, the U.S. government has exclusive sovereignty over the nation's airspace. The FAA is solely responsible for developing plans and policy for airspace use and management to ensure the safety of flight and that all users of the NAS can operate in a safe, secure, and efficient manner. The NAS is made up of a network of air navigation facilities, ATC facilities, airports, technology, and appropriate rules and regulations that are needed to operate the system and establish how and where aircraft may fly.

Airspace for military use is established by the FAA in coordination with the DoD to meet operational needs for military readiness; the DoD requests airspace from the FAA and schedules and uses airspace as described in DoD Directive 5030.19, *DoD Responsibilities on Federal Aviation*. In this process, the FAA is routinely a cooperating agency in developing airspace actions. Special Use Airspace (SUA) identified for military activities is charted and published by the National Aeronautical Navigation Services in accordance with FAA Order JO 7400.2, *Procedures for Handling Airspace Matters* (FAA, 2025). Procedures governing the use of airspace operated and controlled by the DAF are included in Air Force Policy Directive 13-2, *Air Traffic Control, Airfield, Airspace, and Range Management*. The DAF manages airspace in accordance with processes and procedures detailed in Department of Air Force Manual (DAFMAN) 13-201, *Airspace Management*, which also provides the guidance and procedures for developing and processing SUA actions including aeronautical matters governing the efficient planning, acquisition, use, and management of airspace required to support DAF and United States Space Force operations.

D.1.2 Airspace Classification

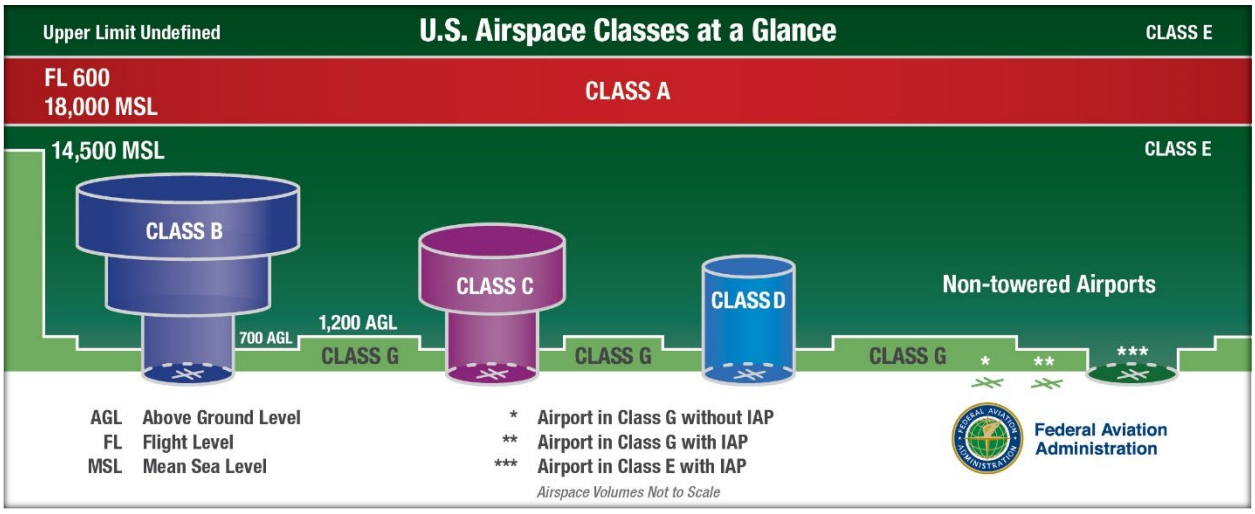
The FAA categorizes airspace as either regulatory or nonregulatory. Regulatory airspace includes Class A, B, C, D, and E airspace, restricted areas, and prohibited areas. Nonregulatory airspace includes MOAs, warning areas, alert areas, controlled firing areas, and national security areas. These two categories are divided into four airspace types: Controlled, Uncontrolled, SUA, and special activity airspace (SAA). These airspace categories and types are determined by the complexity or density of aircraft movements, the nature of the operations conducted within the airspace, the level of safety required, and national and public interest in the airspace.

Controlled airspace includes different classifications of airspace (Class A, Class B, Class C, Class D, and Class E airspace) and defined dimensions where ATC service is provided to IFR flights and

VFR flights according to airspace classification. IFR operations in any class of controlled airspace requires that a pilot must file an IFR flight plan and receive an appropriate ATC clearance. VFR operations require the pilot to ensure that ATC clearance or radio communication requirements are met prior to entry into Class B, Class C, or Class D airspace. Class A is the most restrictive airspace. Altitudes associated with controlled airspace classes vary. FAA Order JO 7400.11, *Airspace Designations and Reporting Points* (September 2024) specifies the airspace altitude ranges for airspaces designated for public and military airports.

Uncontrolled (Class G) airspace is the portion of airspace that has not been designated as Class A, Class B, Class C, Class D, or Class E airspace and is therefore not provided ATC service. Generally, Class G airspace extends from the surface up to but does not include the Class E airspace floor.

Figure D.1-1 shows the altitude ranges and airspace relationship of the controlled and uncontrolled airspace classes. Additional information regarding airspace classes is provided in **Section D.1.3.**



Source: FAA, 2023a

Figure D.1-1 U.S. Airspace Classes

SUA is the designation for airspace in which certain activities must be confined, or where limitations may be imposed on aircraft operations that are not part of those activities. SUA generally consists of prohibited areas, restricted areas, warning areas, MOAs, alert areas, controlled firing areas, and national security areas. MOAs are considered joint use airspace consisting of defined vertical and lateral limits established outside of Class A airspace to separate or segregate certain nonhazardous military flight activities from IFR aircraft and to identify for VFR aircraft where these activities are conducted.

Whenever a MOA is being used, nonparticipating IFR traffic may be cleared through the MOA if IFR separation can be provided by ATC. Otherwise, ATC will reroute or restrict nonparticipating IFR traffic. Nonparticipating pilots are permitted to operate by VFR in active MOAs using see-and-avoid flying to prevent conflicts. Restricted Areas are regulated under 14 CFR Part 73 as designated airspace supporting ground or flight activities that can be hazardous to nonparticipating

aircraft, such as artillery firing, aerial gunnery, guided missiles, or other air-to-ground or ground-to-ground ordnance training activities. All general aviation and nonparticipating military aircraft are prohibited from active Restricted Areas, but they can be authorized for Restricted Area transit when the area is not being activated by the using agency.

SAA refers to most of the remaining airspace including, but not limited to MTRs, temporary flight restrictions, published VFR routes, national security areas, and flight restricted zones (FAA, 2023b). MTRs are established by joint venture between the FAA and the DoD for use by the military for the purpose of conducting low-altitude, high-speed (exceeding 250 knots) training. Routes above 1,500 feet AGL are developed to be flown, to the maximum extent possible, under IFR. Most routes at 1,500 feet AGL and below are developed to be flown under VFR using see-and-avoid flying.

As stated in 14 CFR § 91.119, Minimum Safe Altitudes*,* aircraft operating in the NAS must abide by the following standard altitude restrictions to avoid hazards to persons or property damage. Except when necessary for takeoff or landing, no person may operate an aircraft below the following altitudes: an altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface; over any congested area of a city, town, or settlement, or over any open air assembly of persons, an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft; over uncongested areas, aircraft must maintain an altitude of 500 feet above the surface, except over open water or sparsely populated areas, and no closer than 500 feet to any person, vessel, vehicle, or structure.

The ROI for airspace management and use is primarily the airspace within the proposed MOA, but also includes the existing, adjacent Laughlin 2 MOA (including the Burr 1 subdivision and part of the Burr 2 subdivision of the Laughlin 2 MOA) and ATCAA, local airports located under the proposed MOA, and civilian and military air traffic and MTRs that cross the proposed MOA. Times of use for the SUA and ATCAA are from Monday to Friday, sunrise to sunset, and other times by Notice to Airmen. The controlling agency is FAA Houston Air Route Traffic Control Center and the using agency is DAF, 47 OG, Laughlin AFB (DoD, 2024). These are the airspace that would potentially be impacted by the Proposed Action and which require assessment of the effects on airspace resources.

D.1.3 Airspace Classes

Airspace management involves the direction, control, and handling of flight operations in the airspace that overlies the borders of the United States and its territories. Under Title 49, United States Code § 40103, Sovereignty and use of airspace, and Public Law No. 103-272, the U.S. government has exclusive sovereignty over the nation’s airspace. The Federal Aviation Administration (FAA) has the responsibility to plan, manage, and control the structure and use of all airspace over the United States. The FAA created the National Airspace System which is made up of a network of air navigation facilities, air traffic control (ATC) facilities, airports, technology, and appropriate rules and regulations that are needed to operate the system and 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 civilian and military aircraft. The FAA has two categories of airspace or airspace areas: Regulatory (Class A, B, C, D, and E airspace

areas, restricted and prohibited areas) and Nonregulatory (military operations areas [MOAs], warning areas, alert areas, controlled firing areas, and national security areas). These two categories are divided into four airspace types: Controlled, Uncontrolled, Special use, and Other airspace. These airspace categories and types are dictated by the complexity or density of aircraft movements, the nature of the operations conducted within the airspace, the level of safety required, and national and public interest in the airspace.

Class A. Generally, that airspace from 18,000 feet mean sea level (MSL) up to and including flight level (FL) 600, including the airspace overlying the waters within 12 nautical miles (NM) off the coast of the 48 contiguous states and Alaska; and designated international airspace beyond 12 NM off the coast of the 48 contiguous states and Alaska within areas of domestic radio navigational signal or air traffic control radar coverage, and within which domestic procedures are applied. Unless otherwise authorized, all persons must operate their aircraft under Instrument Flight Rules (IFR).

Class B. Generally, that airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports in terms of IFR operations or passenger enplanements. The configuration of each Class B airspace area is individually tailored and consists of a surface area and two or more layers, and is designed to contain all published instrument procedures once an aircraft enters the airspace. An ATC clearance is required for all aircraft to operate in the area, and all aircraft that are cleared receive separation services within the airspace. The cloud clearance requirement for visual flight rules (VFR) operations is “clear of clouds.”

Class C. Generally, this is the airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and have a certain number of IFR operations or passenger enplanements. Although the configuration of each Class C area is individually tailored, the airspace usually consists of a 5 NM radius core surface area that extends from the surface up to 4,000 feet above the airport elevation, and a 10 NM radius shelf area that extends no lower than 1,200 feet up to 4,000 feet above the airport elevation. Each aircraft must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while within the airspace.

Class D. Generally, Class D airspace extends upward from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures. Unless otherwise authorized, each aircraft must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while in the Class D airspace.

Class E. Generally, if the airspace is not Class A, B, C, or D and is controlled airspace, then it is Class E airspace. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Also in this class are federal airways,

airspace beginning at either 700 or 1,200 feet above ground level (AGL) used to transition to and from the terminal or en route environment and en route domestic and offshore airspace areas designated below 18,000 feet MSL. Unless designated at a lower altitude, Class E airspace begins at 14,500 feet MSL over the United States, including that airspace overlying the waters within 12 NM of the coast of the 48 contiguous states and Alaska, up to but not including 18,000 feet MSL, and the airspace above FL 600.

Class G. Uncontrolled airspace or Class G airspace is the portion of the airspace that has not been designated as Class A, B, C, D, or E. It is therefore designated uncontrolled airspace. Class G airspace extends from the surface to the base of the overlying Class E airspace. Although ATC has no authority or responsibility to control air traffic, pilots should remember there are VFR minimums that apply to Class G airspace.

Special use airspace (SUA) includes MOAs, Restricted Areas, Air Traffic Control Assigned Airspace (ATCAAs), and Warning Areas. A MOA is designated airspace outside of Class A airspace used to separate or segregate certain nonhazardous military activities from IFR traffic and to identify for VFR traffic where these activities are conducted (14 CFR § 1.1). 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 feet AGL to 18,000 feet above MSL, the floor may extend below 1,200 feet AGL if there is a mission requirement and minimal adverse aeronautical effect. MOAs allow military aircraft to practice maneuvers and tactical flight training at airspeeds exceeding 250 knots indicated airspeed (approximately 285 miles per hour). The FAA requires publication of the hours of operation for any MOA so that all pilots, both military and civilian, are aware of when other aircraft could be in the airspace. Each military organization responsible for a MOA develops a daily use schedule. Although the FAA designates MOAs for military use, other pilots may transit the airspace under VFR. MOAs exist to notify civil pilots under VFR where heavy volumes of military training exist which increases the chance of conflict and are generally avoided by VFR traffic. Whenever a MOA is being used, nonparticipating IFR traffic may be cleared through a MOA if IFR separation can be provided by ATC. Otherwise, ATC will reroute or restrict nonparticipating IFR traffic. MOAs in the vicinity of busy airports may have specific avoidance procedures that also apply to small private and municipal airports. Such avoidance procedures are maintained for each MOA, and both civil and military aircrews build them into daily flight plans. Restricted areas are typically used by the military due to safety or security concerns. Hazards include the existence of unusual and often invisible threats from artillery use, aerial gunnery, or guided missiles. An ATCAA is an airspace of defined vertical/lateral limits assigned by FAA ATC for the purpose of providing air traffic segregation between the specified activities being conducted within the assigned airspace and other IFR air traffic. Typically, these blocks of airspace start at flight level 180 or 18,000 feet MSL and, in some cases, are contoured to the dimensions of the MOAs beneath them. A Warning Area is airspace of defined dimensions that extends from 3 NM outward from the coast of the United States and may be over U.S. waters, international waters, or both. The purpose of Warning Areas is to warn nonparticipating pilots of potentially hazardous activity. Warning areas may be used for other purposes if released to the FAA during periods when not required for their intended purpose and are within areas in which the FAA has ATC authority.

Other airspace refers to most of the remaining airspace including, but not limited to, military training routes, temporary flight restrictions, published VFR routes, national security areas, and flight restricted zones (FAA, 2023a). Military training routes are established by joint venture between the FAA and the DoD for use by the military for the purpose of conducting low-altitude, high-speed (exceeding 250 knots) training. The routes above 1,500 feet AGL are developed to be flown, to the maximum extent possible, under IFR. Routes at 1,500 feet AGL and below are developed to be flown under VFR using see-and-avoid flying.

Each military organization responsible for SUA develops a daily use schedule. Although the FAA designates SUA for military use, other pilots may transit the airspace. Avoidance procedures are maintained for each SUA, and military aircrews build them into daily flight plans.

D.1.4 Airspace Traffic Analysis

The *Final Report for Airspace Analysis in Support of the Environmental Impact Analysis Process for the United States Air Force Laughlin 2 Military Operating Area, Texas* (ATAC, 2025) was prepared concurrently with this EA to identify and characterize all existing flight activity in and around the proposed MOA. This report analyzes existing air traffic operations based on recorded flight data from September 1, 2023, to August 31, 2024, from available radar tracking data and associated aircraft type and flight plan information. Performance Data Analysis and Reporting System (PDARS) and System Wide Information Management (SWIM) data were collected from the Albuquerque and Houston Air Route Traffic Control Centers and the Albuquerque Tower, Houston, and Dallas-Fort Worth Terminal Radar Approach Control facilities. These data were merged to conduct this airspace analysis. Airspace elements included in this analysis and some of the data processing assumptions are briefly described in this section as a basis for understanding the air traffic results obtained for the proposed MOA.

The airspace analysis focused on evaluating September 2023 through August 2024 PDARS and SWIM traffic flows within the proposed MOA, SUA, and SAA that are adjacent to or near the proposed MOA. Flight track data for individual flights were associated with aircraft type and flight plan information and these data were subsequently filtered to identify the specific flights that occurred in each airspace analyzed; these data were also entered into the SkyView Reporting System visualization tool to develop data analytics and create graphics for illustrating flight information.

Airspace analyzed in the final report are summarized in **Table D.1-1**. Of note are the flight altitudes; the proposed MOA altitude range is from 500 feet AGL to, but not including, 7,000 feet MSL, and similarly for the Excluded Area, whereas all the other airspace flight altitudes are 7,000 feet MSL or above. The Laughlin 2 MOA includes the Burr 1 and a portion of the Burr 2 airspace subdivisions divided into the high and low areas noted in **Table D.1-1**. The Burr 1 and Burr 2 low and high areas are separate from the Laughlin 2 MOA, for the purposes of this analysis, since the proposed MOA directly underlies these airspace.

Table D.1-1 Definitions of Airspace Evaluated in the Final Airspace Analysis Report

Airspace	Altitudes Used for Analysis
Proposed Laughlin 2A Low MOA	500 feet AGL to (but not including) 7,000 feet MSL
Burr 1 and 2 High areas within the Laughlin 2 MOA and ATCAA	15,000 feet MSL to FL220
Burr 1 and 2 Low areas within the Laughlin 2 MOA and ATCAA	7,000 feet MSL to 12,000 feet MSL
Laughlin 2 MOA	7,000 feet MSL to FL180
Laughlin 2 ATCAA	FL180 to FL220

It is anticipated that the proposed MOA could be scheduled in combination with the existing Laughlin 2 MOA (including the Burr 1 and Burr 2 subdivisions) and Laughlin 2 ATCAA such that training flights would be able to transition seamlessly between these vertically adjacent airspace. Therefore, in defining the affected environment, results for air traffic operations within these six airspace components are presented in **Section 3.2.1** of the EA with the affected environment primarily consisting of airspace within the proposed MOA (see **Figure 2.2-1** in the EA). Flight operations in airspace within the proposed MOA include civilian and military traffic that transit the airspace, flight operations at local civilian airports located under the airspace, and military flights on six (four active) existing MTRs that cross the airspace.

D.1.5 References

ATAC. 2025. Draft Report for Airspace Analysis in Support of the Environmental Impact Analysis Process (EIAP) for the United States Air Force (USAF) Laughlin 2 Military Operating Area (MOA), Texas. Prepared for Department of the Air Force. May

FAA. 2023a. Federal Aviation Administration. Aeronautical Information Manual. *Official Guide to Basic Flight Information and ATC Procedures*. https://www.faa.gov/air_traffic/publications/atpubs/aim_html. Accessed March 2023.

D.2 Noise

D.2.1 Definition of Resource

Military aircraft noise consists of sound events from subsonic flight operations, which occur in MOAs and are discussed in this section, and supersonic flight operations (when aircraft exceed the speed of sound and generate a sonic boom; no supersonic operations would occur under the Proposed Action). Several metrics are used to describe noise events. The primary metrics used for policy decisions, based on guidelines for aircraft noise compatibility, are cumulative, average day metrics including day-night average sound level (DNL or L_{dn}) and onset-rate adjusted monthly day-night average sound level (L_{dnmr}). Other supplemental metrics that are useful to characterize the noise environment in MOAs from individual military aircraft overflights are the maximum sound level (L_{max}) and sound exposure level (SEL). These noise metrics are briefly described in **Table D.2-1**.

Table D.2-1 Descriptions of Noise Metrics Used in the Noise Analysis

Noise Metric	Description
Maximum Sound Level (L_{max})	L_{max} is the highest A-weighted sound level measured during a single event in which the sound changes with time. L_{max} is the maximum level that occurs over a fraction of a second. L_{max} is important in determining 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.
Sound Exposure Level (SEL)	SEL combines both the intensity of a sound and its duration into a single metric. 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. Mathematically, it represents the sound level of the constant sound that would, in one second, generate the same acoustic energy, as did the actual time-varying noise event. Since aircraft overflights usually last longer than a few seconds, the SEL of an overflight is usually greater than the L_{max} of the overflight.
Equivalent Sound Level (L_{eq})	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 period.
Day-Night Average Sound Level (DNL or L_{dn})	DNL is a cumulative metric that accounts for all noise events in a 24-hour period. A 10-decibel (dB) penalty is applied to events during the nighttime period (defined as 10:00 p.m. to 7:00 a.m.) to account for the increased sensitivity of humans to noise occurring at night.
Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr})	L_{dnmr} is a cumulative daily noise metric devised to account for the "surprise" effect of the sudden onset of aircraft noise events on humans associated with the sporadic nature of aircraft operations in training and operational airspace. 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).

L_{dn} and L_{dnmr} are the primary noise metrics used in this noise analysis. Aircraft operations in the proposed MOA would include flights at altitudes as low as 500 feet AGL and airspeeds of up to 425 knots (489 miles per hour). Analysis has shown that, for most flight conditions, L_{dnmr} is the same as L_{dn} or only 0.1 to 0.2 dB higher for a few flight conditions in the proposed MOA due to the onset rate penalty. L_{max} and SEL are used to characterize noise that would result from individual T-38C, T-6A, and T-7A aircraft overflights in the MOAs. Noise metrics presented in this EA were calculated using the MR_NMAP (Lucas and Calamia, 1997) and (Ikelheimer and Downing, 2013), NOISEMAP (Czech and Plotkin, 1998), and NMPLot (Wasmer and Maunsell, 2024a; 2024b) software and are reported as A-weighted decibels (dBA). The dBA unit, an expression of the relative loudness of sounds as perceived by the human ear, is used to better represent and characterize human perception of and sensitivity to sound. The dB unit is also used and taken to mean dBA unless noted otherwise. Detailed information regarding noise metrics, noise models, and other acoustic principles is provided in **Sections D.2.2** and **D.2.3** of this appendix.

The EA noise analysis considers noise levels associated with current T-38C, T-1A[1], and T-6A operations in the existing Laughlin 1, 2, and 3 MOAs, which represent existing conditions, and noise levels associated with proposed future operations of T-38C, T-7A, and T-6A aircraft under Alternative 1. Flight operations on MTRs that cross the existing Laughlin 1, 2, and 3 MOAs are also included in this noise analysis. The EA analysis focuses on the military aircraft that regularly utilize the Laughlin 1, 2, and 3 MOAs and ATCAA; other civilian and military aircraft that fly through these airspace, however, were not modeled because most are small aircraft which generate lower noise levels, have limited modeling data available, and do not regularly fly at lower altitudes such that they would be difficult to model and would have a negligible effect on noise.

The noise ROI consists of airspace within and lands below the proposed MOA and parts of the existing Laughlin 1, 2, and 3 MOAs and ATCAA.

D.2.2 Basics of Sound

D.2.2.1 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 D.2-1** illustrates 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.

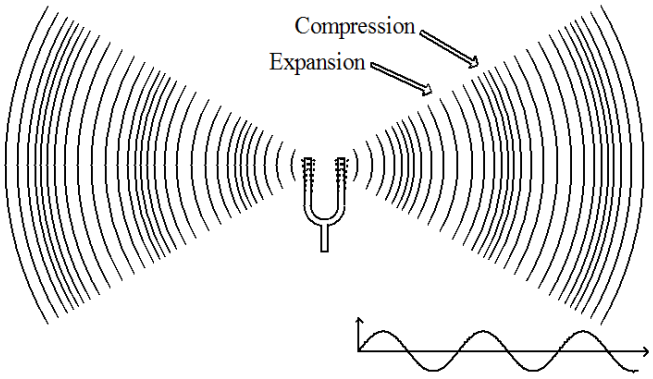


Figure D.2-1 Sound Waves from a Vibrating Tuning Fork

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

[1] T-1A operations at Laughlin AFB ended in January 2025 but are considered as part of existing conditions because their operations are included in data collected to support development of this EA.

- 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 D.2-1**, 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."

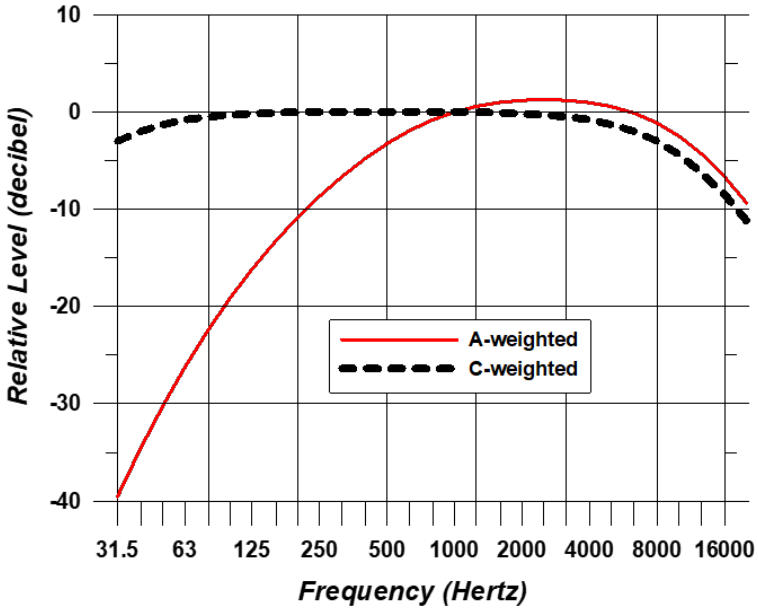
The minimum change in the sound level of individual events that an average human ear can detect is about 3 dB. On average, a person perceives a change in sound level of about 10 dB as a doubling

(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 D.2-1** 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 D.2-2**, 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"

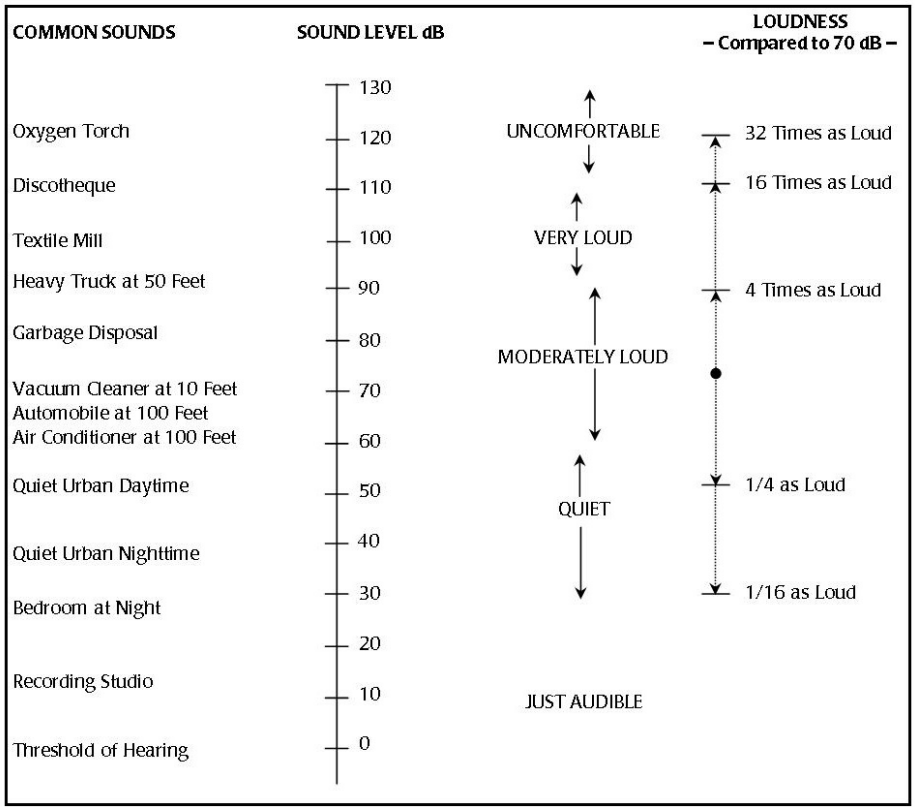
Figure D.2-2 Frequency Characteristics of A- and C-Weighting

D.2.2.2 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, which stands for A-weighted decibel, an expression of the relative loudness of sounds as perceived by the human ear, used to better represent and characterize human perception of and sensitivity to sound. 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 (U.S. Environmental Protection Agency [USEPA], 1978).

Figure D.2-3 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 D.2.2.3**.



Source: Harris, 1979

Figure D.2-3 Typical A-Weighted Sound Levels of Common Sounds

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).

D.2.2.3 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.

D.2.2.3.1 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 abbreviated L_{max}. The L_{max} is depicted for a sample event in **Figure D.2-4**.

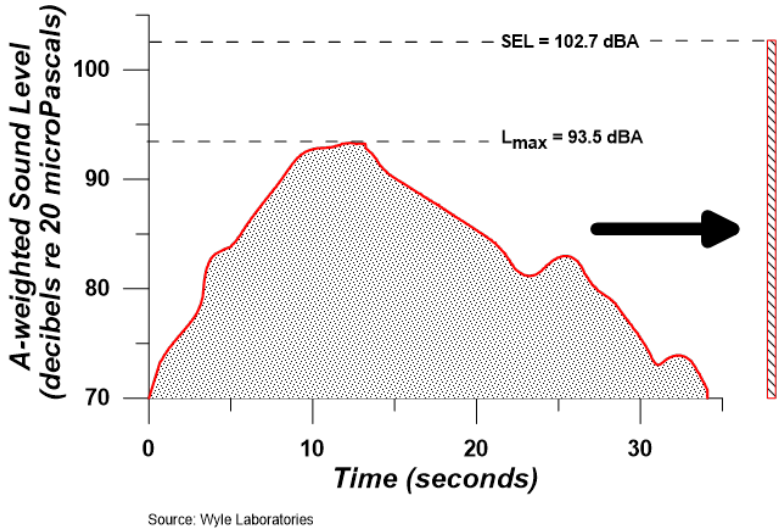
L_{max} is the maximum level that occurs over a fraction of a second. For aircraft noise, the "fraction of a second" is one-eighth of a second, denoted as "fast" response on a sound level measuring meter (ANSI, 1988). Slowly varying or steady sounds are generally measured over 1 second, denoted as "slow" 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 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 D.2-4** indicates the SEL for an example event, representing it as if all the sound energy were contained within 1 second.



Source: Wyle Laboratories

Figure D.2-4 Example Time History of Aircraft Noise Flyover

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 shown on **Figure D.2-4**, 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 from sonic booms are overpressure in pound(s) per square foot (psf) and C-Weighted Sound Exposure Level (CSEL). Overpressure is the peak pressure at any location within the sonic boom footprint. When sonic booms reach the ground, they impact an area that is referred to as a "carpet." The size of the carpet depends on the supersonic flight path and on atmospheric conditions. The width of the boom carpet beneath the aircraft is about 1 mile for each 1,000 feet of altitude (National Aeronautics and Space Administration [NASA], 2017). Sonic booms are loudest near the center of the carpet, under the flight path for steady, level flight conditions, having a sharp "bang-bang" sound. Near the edges, they are weak and have a rumbling sounding like distant thunder. The location of these booms will vary with changing flight paths and weather conditions, so it is unlikely that any given location will experience these undertrack levels more than once over multiple events. Public reaction is expected to occur with overpressures above 1 psf, and in rare instances, damage to structures have occurred at overpressures between 2 and 5 psf (NASA, 2017).

C-Weighted Sound Exposure Level

CSEL is SEL computed with C frequency weighting, which is similar to A-Weighting (see **Section D.2.2.1**) except that C-weighting places more emphasis on low frequencies below 1,000 Hz.

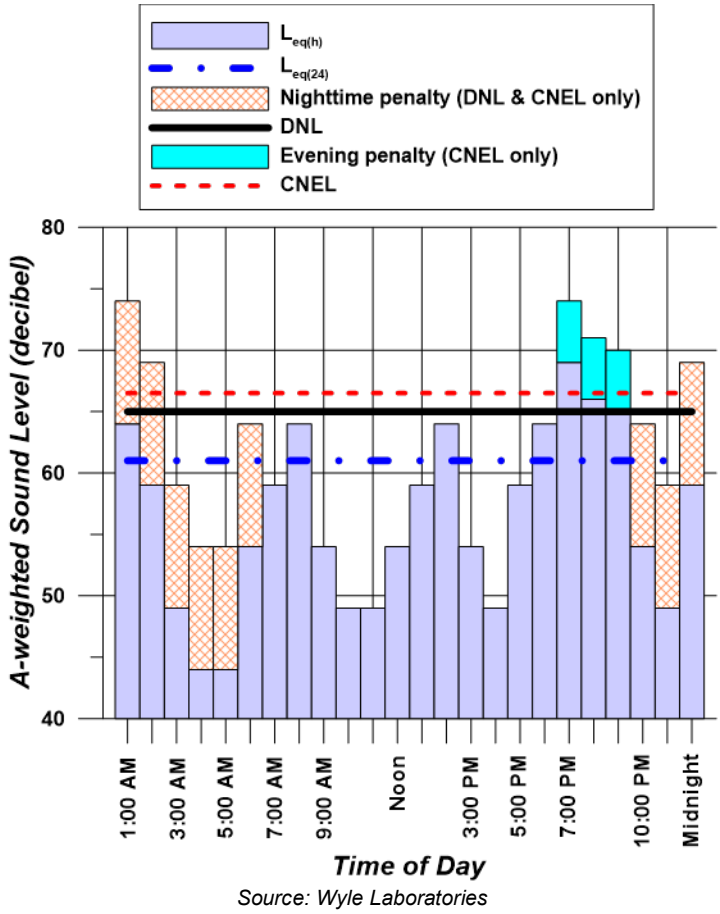
D.2.2.3.2 Cumulative Events

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 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 D.2-5 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 D.2-5 Example of Equivalent Sound Level Over 24 Hours, DNL, and Community Noise Equivalent 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, 1971). 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 D.2-5 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 D.2-6 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.

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 SUA such as MTRs, MOAs, 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.

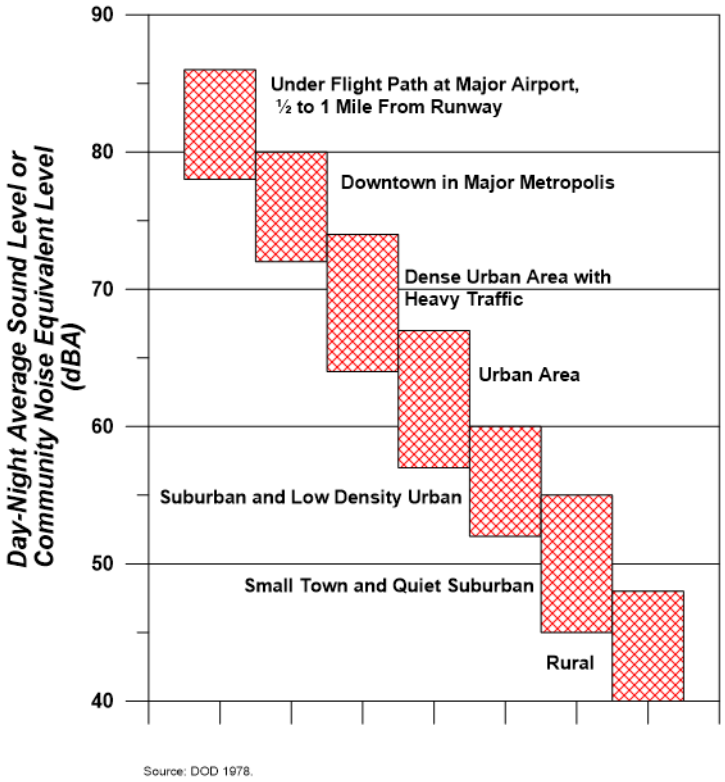


Figure D.2-6 Typical Day-Night Average Sound Level or Community Noise Equivalent Level Ranges in Various Types of Communities

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 ($CNEL_{mr}$).

D.2.2.3.3 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 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.

D.2.2.4 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.

D.2.2.4.1 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 D.2-7** shows the result of his study relating DNL to individual annoyance measured by percent highly annoyed.

Schultz's original synthesis included 161 data points. **Figure D.2-8** 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.

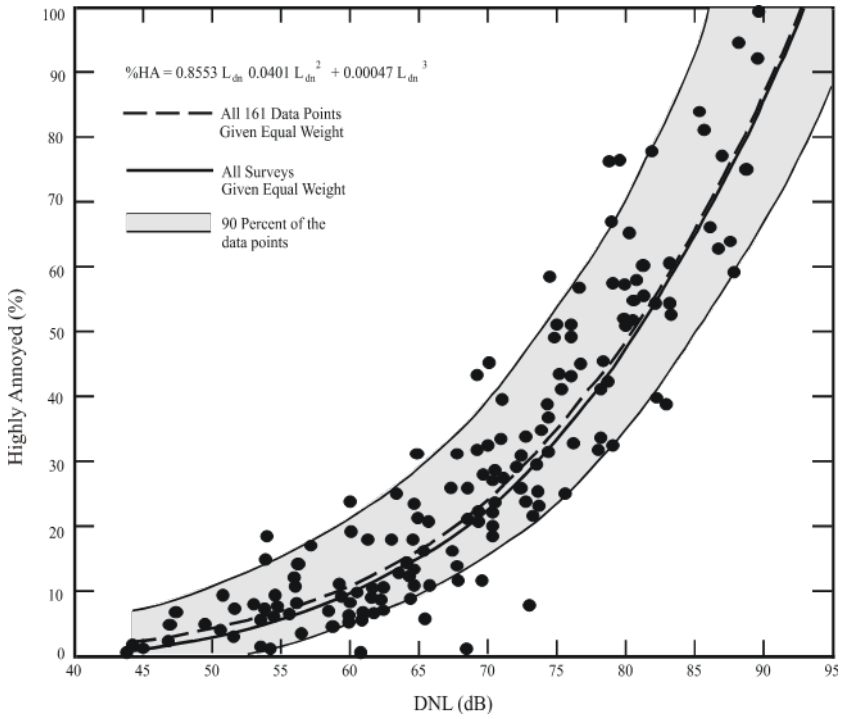


Figure D.2-7 Schultz Curve Relating Noise Annoyance to Day-Night Average Sound Level (Schultz, 1978)

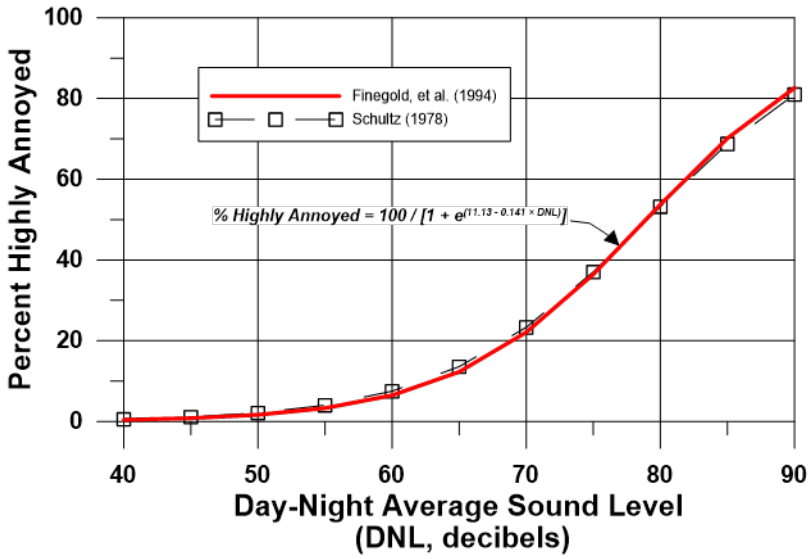


Figure D.2-8 Response of Communities to Noise; Comparison of Original Schultz (1978) with Finegold et al. (1994)

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 from noise is also affected by non-acoustical factors. Newman and Beattie (1985) divided the non-acoustic factors into the emotional and physical variables shown in **Table D.2-2**.

Table D.2-2 Non-acoustic Variables Influencing Aircraft Noise Annoyance

Emotional Variables
Feeling about the necessity or preventability of the noise
Judgment of the importance and value of the activity that is producing the noise
Activity at the time an individual hears the noise
Attitude about the environment
General sensitivity to noise
Belief about the effect of noise on health
Feeling of fear associated with the noise

Physical Variables
Type of neighborhood
Time of day
Season
Predictability of the noise
Control over the noise source
Length of time individual is exposed to a noise

Schreckenberg and Schuemer (2010) recently 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 recent 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 non-acoustical 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 D.2-3** 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 D.2-3 Percent Highly Annoyed for Different Transportation Noise Sources

Day-Night Average Sound Level (decibels)	Percent Highly Annoyed			
	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 (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-dB DNL by approximately 2 to 5 percent greater than the previous ISO definition. **Figure D.2-9** 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.

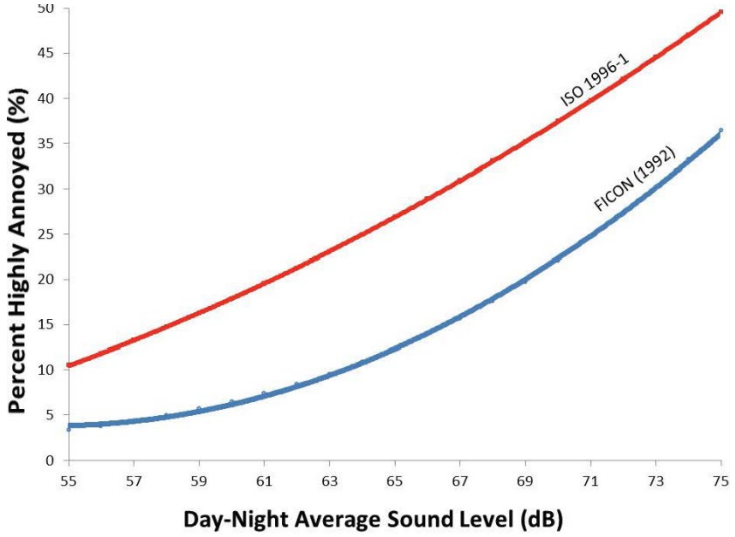


Figure D.2-9 Percent Highly Annoyed Comparison of International Standard 1996-1 to Federal Interagency Committee on Noise (1992)

D.2.2.4.2 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 D.2-10** 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 D.2-10** 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.

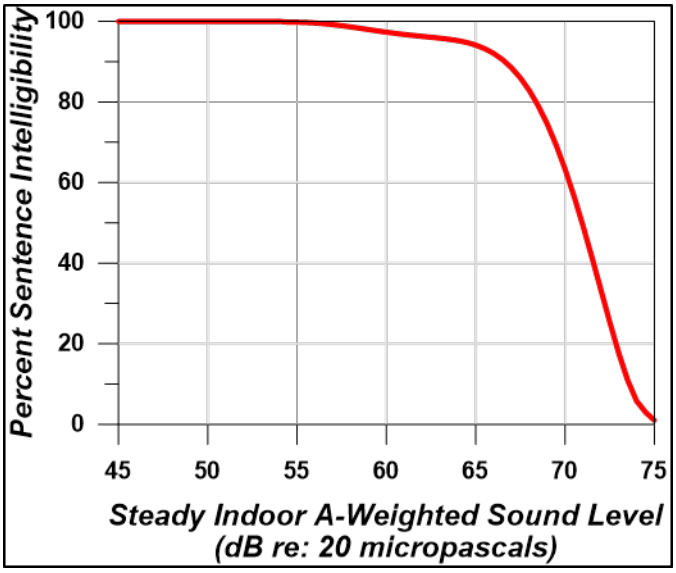


Figure D.2-10 Speech Intelligibility Curve

(digitized from USEPA, 1974)

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 illustrated on **Figure D.2-4**. 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 D.2-4 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 D.2-4 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.

D.2.2.4.3 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 non-acoustic factors cited for annoyance. The easiest effect to 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 (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

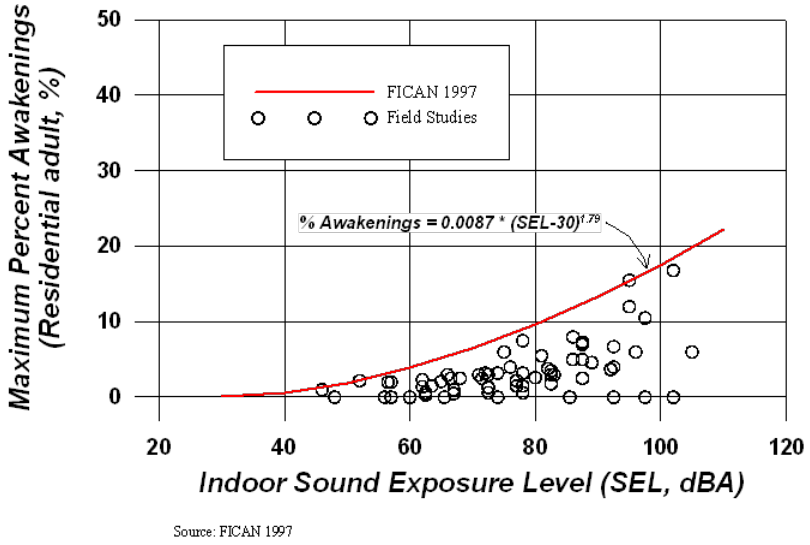
It was noted that early sleep laboratory studies did not account for some important factors. These included habituation to the laboratory, previous exposure to noise, and awakenings from noise other than aircraft. In the early 1990s, field studies in people's homes were conducted to validate the earlier 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 non-noise 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 D.2-11** 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).



Source: FICAN 1997

Figure D.2-11 Federal Interagency Committee on Aviation Noise 1997 Recommended Sleep Disturbance Dose-Response Relationship

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 et al., 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 led 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.

A different approach was taken by an ANSI standards committee (ANSI, 2008). The committee used the average of the data shown on **Figure D.2-11** 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 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 D.2-5**.

Table D.2-5 Probability of Awakening from NA90SEL

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.

D.2.2.4.4 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.

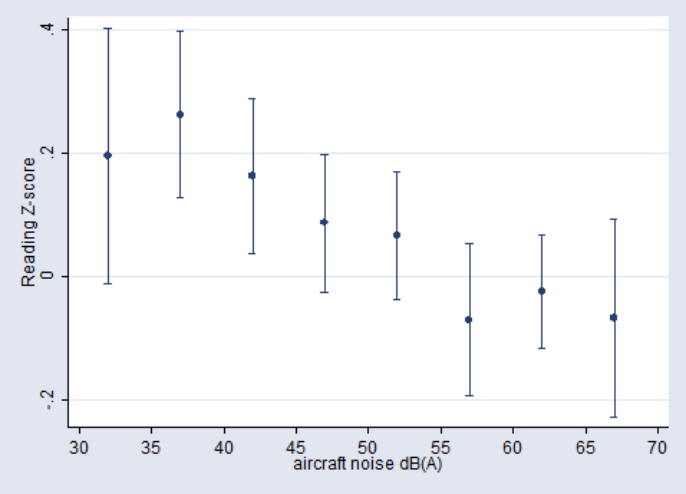
A longitudinal study reported by Evans et al. (1998), conducted prior to relocation of the old Munich airport in 1992, reported that high noise exposure was associated with deficits in long-term memory and reading comprehension in children with a mean age of 10.8 years. Two years after the closure of 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., 2005) 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 D.2-12 shows RANCH's result relating noise to reading comprehension. It shows that reading falls below average (a z-score of 0) at L_{eq} greater than 55 dB. Because the relationship is linear, reducing exposure at any level should lead to improvements in reading comprehension.

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.



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

Figure D.2-12 Road Traffic and Aircraft Noise Exposure and Children's Cognition and Health (RANCH) Study Reading Scores Varying with Equivalent Sound Level

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 is needed to confirm these initial conclusions.

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 is 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., 2014) 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-dB 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).

D.2.2.4.5 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 to wildlife in areas overflown by aircraft at supersonic speed or at low altitudes. The ability 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 (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.

D.2.3 Noise Models

This section summarizes analysis tools used to calculate the noise levels, as applicable to the Proposed Action evaluated in the EA. **Table D.2-6** summarizes values used in the noise modeling for flight operations in the existing Laughlin 1, 2, and 3 MOAs and proposed Laughlin 2A Low MOA that would occur under the Proposed Action.

Table D.2-6 Summary of Proposed Flight Operations in the Existing Laughlin 1, 2, and 3 MOAs and Proposed Laughlin 2A Low MOA

Laughlin 1 MOA Operations			
	Aircraft	T-38C	T-6A
	Number of Day[1] Sorties	9,108	900
	Number of Night[2] Sorties	0	0
	Time in Airspace per Sortie (minutes)	45	45
Altitude Utilization (feet MSL)			
Existing Laughlin 1 MOA	9,000-12,000	15%	40%
	12,000-15,000	35%	40%
	15,000-FL180	35%	10%
ATCAA	FL180-FL220	15%	10%
Laughlin 2 MOA Operations			
	Aircraft	T-38C	T-6A
	Number of Day[1] Sorties	1,012	16,200
	Number of Night[2] Sorties	0	0
	Time in Airspace per Sortie (minutes)	25	45
Altitude Utilization (feet MSL)			
Existing Laughlin 2 MOA	7,000-9,000	0%	30%
	9,000-12,000	30%	30%
	12,000-15,000	30%	20%
	15,000-FL180	35%	10%
ATCAA	FL180-FL220	5%	10%
Proposed Laughlin 2A Low MOA Operations			
	Aircraft	T-38C	T-6A
	Number of Day[1] Sorties	1,570	10
	Number of Night[2] Sorties	0	0
	Time in Airspace per Sortie (minutes)	20	45
Altitude Utilization (feet AGL)			
Proposed Laughlin 2A Low MOA	500-1,000	20%	30%
	1,000-2,000	55%	40%
	2,000-3,000	16%	30%
	3,000-5,000	5%	0%
ATCAA	5,000 (AGL)-6,999 (MSL)	4%	0%
Laughlin 3 MOA Operations			
	Aircraft	T-38C	T-6A
	Number of Day[1] Sorties	NA	900
	Number of Night[2] Sorties	NA	0
	Time in Airspace per Sortie (minutes)	NA	45
Altitude Utilization (feet MSL)			
Existing Laughlin 3 MOA	7,000-9,000	NA	30%
	9,000-12,000	NA	30%
	12,000-15,000	NA	20%
	15,000-FL180	NA	10%
ATCAA	FL180-FL220	NA	10%

Notes:
[1] Daytime hours are defined as 7:00 a.m. to 10:00 p.m. local time for the purposes of this analysis.
[2] Nighttime hours are defined as 10:00 p.m. to 7:00 a.m. local time for the purposes of this analysis.

D.2.3.1 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, 2024a, 2024b). The core computational program of the NOISEMAP suite is NMAP. In this report NMAP Version 7.3 was used to analyze aircraft operations and to generate noise contours.

D.2.3.2 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 or MOAs, the Air Force uses the DoD-approved MR_NMAP program (Lucas and Calamia, 1997). In this report, MR_NMAP Version 3.2 (Ikelheimer, 2013) was used to model subsonic aircraft noise in SUA. For airspace environments where noise levels are calculated to be less than 35 dB, noise levels are stated as "<35 dB."

D.2.3.3 Military Training Routes in the Study Area

Active MTRs that cross the study area under the Laughlin MOAs, which were modeled as part of the noise analysis, include: IR-170, VR-140, VR-1122, and VR-1123 (the reverse of VR-1122). Aircraft operations and flight conditions for the active MTRs that cross the proposed 2A Low MOA, representing Existing Conditions and the Proposed Action, are shown in **Table D.2-7**.

These existing and proposed operations along with their associated average airspeeds, power settings, and altitude distributions were the inputs to the MTR noise models.

Table D.2-7 Existing Annual Flight Operations on MTR Segments Crossing the Laughlin 2A Low MOA

MTR	Segment	Aircraft	Airfield	Existing Floor (feet)	Existing Ceiling (feet)	Day Operations[1]	Night Operations[2]
IR-170	D-E	T-38C	Laughlin AFB	SFC	3,000	200	0
VR-140	C-D	T-38C	Randolph AFB	500	4,000	197	0
VR-140	D-E	T-38C	Randolph AFB	500	4,000	197	0
VR-1122	C-D	F-16C	Kelly Field	100	1,500	80	0
VR-1122	D-E	F-16C	Kelly Field	100	1,500	80	0
VR-1123	C-D	F-16C	Kelly Field	100	1,500	80	0
VR-1123	D-E	F-16C	Kelly Field	100	1,500	80	0

Notes: SFC = Surface.
One annual operation is one sortie flying the route.
[1] Day Operations hours are 7:00 a.m. to 10:00 p.m. local time for the purposes of this analysis.
[2] Night Operations hours are 10:00 p.m. to 7:00 a.m. local time for the purposes of this analysis.

D.2.4 References

American Speech-Language-Hearing Association. 2005. Guidelines for Addressing Acoustics in Educational Settings, ASHA Working Group on Classroom Acoustics.

ANSI. 1985. American National Standards Institute. Specification for Sound Level Meters, ANSI S1.4A-1985 Amendment to ANSI S1.4-1983.

ANSI. 1988. Quantities and Procedures for Description and Measurement of Environmental Sound: Part 1, ANSI S12.9-1988.

ANSI. 1996. Quantities and Procedures for Description and Measurement of Environmental Sound: Part 4, ANSI S12.9-1996.

ANSI. 2002. Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, ANSI S12.60-2002.

ANSI. 2008. Methods for Estimation of Awakenings with Outdoor Noise Events Heard in Homes, ANSI S12.9-2008/Part6.

Basner, M., H. Buess, U. Miller, G. Platt, and A. Samuel. 2004. Aircraft Noise Effects on Sleep: Final Results of DLR Laboratory and Field Studies of 2240 Polysomnographically Recorded Subject Nights. Internoise 2004, The 33rd International Congress and Exposition on Noise Control Engineering, 22-25 August.

Basner M, U. Muller, and E.M. Elmenhorst. 2011. Single and Combined Effects of Air, Road, and Rail Traffic Noise on Sleep and Recuperation. Sleep 2011(34):11–23.

Berglund, B., and T. Lindvall, eds. 1995. Community Noise. Jannes Snabbtryck, Stockholm, Sweden.

Bowles, A.E. 1995. Responses of Wildlife to Noise, In Wildlife and Recreationists: Coexistence through Management and Research, R.L. Knight and K.J. Gutzwiller, eds. Island Press, Covelo, California, pp. 109-156.

Bradley J.S. 1985. Uniform Derivation of Optimum Conditions for Speech in Rooms. National Research Council, Building Research Note, BRN 239, Ottawa, Canada.

Bradley, J.S. 1993. NRC-CNRC NEF Validation Study: Review of Aircraft Noise and its Effects. National Research Council Canada and Transport Canada, Contract Report A-1505.5.

Bronzaft, A.L., and D.P. McCarthy. 1975. The Effects of Elevated Train Noise on Reading Ability. Journal Environment and Behavior 7:517-527.

Clark, C., R. Crombie, J. Head, I. van Kamp, E. van Kempen, and S.A. Stansfeld. 2012. Does Traffic-Related Air Pollution Explain Associations of Aircraft and Road Traffic Noise Exposure on Children's Health and Cognition? A Secondary Analysis of the United Kingdom Sample from the RANCH Project. American Journal of Epidemiology 176(4):327–337.

Clark, C., R. Martin, E. van Kempen, T. Alfred, J. Head, H.W. Davies, M.M. Haines, I.L. Barrio, M. Matheson, and S.A. Stansfeld. 2005. Exposure-Effect Relations Between Aircraft and

Road Traffic Noise Exposure at School and Reading Comprehension: the RANCH Project. American Journal of Epidemiology 163:27-37.

Clark, C., S.A. Stansfeld, and J. Head. 2009. The Long-Term Effects of Aircraft Noise Exposure on Children's Cognition: Findings from the UK RANCH Follow-Up Study. In Proceedings of the Euronoise Conference. Edinburgh, Scotland. October.

Cohen, S., D.C. Glass, and J.E. Singer. 1973. Apartment Noise, Auditory Discrimination, and Reading Ability in Children. Journal of Experimental Social Psychology 9:407-422.

Cohen, S., G.W. Evans, D.S. Krantz. 1980. Physiological, Motivational, and Cognitive Effects of Aircraft Noise on Children: Moving from Laboratory to Field. American Psychologist 35:231-243.

Cohen, S., G.W. Evans, D.S. Krantz. 1981. Aircraft Noise and Children: Longitudinal and Cross-sectional Evidence on Adaptation to Noise and the Effectiveness of Noise Abatement. Journal of Personality and Social Psychology 40:331-345.

Cottereau, P. 1978. The Effect of Sonic Boom from Aircraft on Wildlife and Animal Husbandry, In Effects of Noise on Wildlife, Academic Press, New York, New York, pp. 63-79.

Czech, J.J., and K.J. Plotkin. 1998. NMAP 7.0 User's Manual. Wyle Research Report WR 98-13. Wyle Laboratories, Inc. November.

DoD. 2009a. Department of Defense. Improving Aviation Noise Planning, Analysis, and Public Communication with Supplemental Metrics. Defense Noise Working Group Technical Bulletin, December.

DoD. 2009b. Sleep Disturbance from Aviation Noise. Defense Noise Working Group Technical Bulletin, December.

Eagan, M.E., G. Anderson, B. Nicholas, R. Horonjeff, and T. Tivnan. 2004. Relation Between Aircraft Noise Reduction in Schools and Standardized Test Scores. Washington, DC, FICAN.

Evans, G.W., M. Bullinger, and S. Hygge. 1998. Chronic Noise Exposure and Physiological Response: A Prospective Study of Children Living under Environmental Stress. Psychological Science 9:75-77.

FAA. 1985. Federal Aviation Administration. Airport Improvement Program (AIP) Handbook. Order No. 100.38.

FICAN. 1997. Federal Interagency Committee on Aviation Noise. Effects of Aviation Noise on Awakenings from Sleep. June.

FICAN. 2007. Findings of the FICAN Pilot Study on the Relationship Between Aircraft Noise Reduction and Changes in Standardised Test Scores. Washington, DC, FICAN.

FICAN. 2008. FICAN Recommendation for use of ANSI Standard to Predict Awakenings from Aircraft Noise. December.

FICON. 1992. Federal Interagency Committee on Noise. Federal Agency Review of Selected Airport Noise Analysis Issues. August.

Fidell, S., and L. Silvati. 2004. Parsimonious Alternatives to Regression Analysis for Characterizing Prevalence Rates of Aircraft Noise Annoyance. Noise Control Engineering Journal 52:56–68.

Fidell, S., K. Pearsons, B. Tabachnick, R. Howe, L. Silvati, and D.S. Barber. 1995a. Field Study of Noise-Induced Sleep Disturbance. Journal of the Acoustical Society of America 98(2):1025-1033.

Fidell, S., K. Pearsons, R. Howe, B. Tabachnick, L. Silvati, and D.S. Barber. 1994. Noise-Induced Sleep Disturbance in Residential Settings. AL/OE-TR-1994-0131, Wright Patterson AFB, OH, Armstrong Laboratory, Occupational and Environmental Health Division.

Fidell, S., R. Howe, B. Tabachnick, K. Pearsons, and M. Sneddon. 1995b. Noise-induced Sleep Disturbance in Residences near Two Civil Airports. NASA Contractor Report 198252.

Finegold, L.S., C.S. Harris, and H.E. von Gierke. 1994. Community Annoyance and Sleep Disturbance: Updated Criteria for Assessing the Impact of General Transportation Noise on People. Noise Control Engineering Journal 42(1):25-30.

Green, K.B., B.S. Pasternack, and R.E. Shore. 1982. Effects of Aircraft Noise on Reading Ability of School-Age Children. Archives of Environmental Health 37(1):24-31.

Griefahn, B. 1978. Research on Noise Disturbed Sleep Since 1973. Proceedings of Third International Congress on Noise as a Public Health Problem, pp. 377-390 (as appears in NRC-CNRC NEF Validation Study: (2) Review of Aircraft Noise and Its Effects, A-1505.1, p. 31).

Haines, M.M., S.A. Stansfeld, J. Head, and R.F.S. Job. 2002. Multilevel Modelling of Aircraft Noise on Performance Tests in Schools around Heathrow Airport London. Journal of Epidemiology and Community Health 56:139-144.

Harris, C.M. 1979. Handbook of Noise Control. McGraw-Hill Book Co.

Horne, J.A., F.L. Pankhurst, L.A. Reyner, K. Hume, and I.D. Diamond. 1994. A Field Study of Sleep Disturbance: Effects of Aircraft Noise and Other Factors on 5,742 Nights of Actimetrically Monitored Sleep in a Large Subject Sample. American Sleep Disorders Association and Sleep Research Society: Sleep 17(2):146–195.

Ikelheimer, B. and M. Downing. 2013. MR_NMap Noise Model Improvements. Blue Ridge Research and Consulting Technical Report. 26 August.

Klatte M., K. Bergström, and T. Lachmann. 2013. Does Noise Affect Learning? A Short Review on Noise Effects on Cognitive Performance in Children. Frontiers in Psychology 4:578.

Lazarus, H. 1990. New Methods for Describing and Assessing Direct Speech Communication Under Disturbing Conditions. Environment International 16:373-392.

Lercher, P., G.W. Evans, and M. Meis. 2003. Ambient Noise and Cognitive Processes Among Primary School Children. Journal of Environment and Behavior 35:725-735.

Lind, S.J., K. Pearsons, and S. Fidell. 1998. Sound Insulation Requirements for Mitigation of Aircraft Noise Impact on Highline School District Facilities. Volume I, BBN Systems and Technologies, BBN Report No. 8240.

Lukas, J.S. 1978. Noise and Sleep: A Literature Review and a Proposed Criterion for Assessing Effect, In Daryl N. May, ed., Handbook of Noise Assessment, Van Nostrand Reinhold Company: New York, pp. 313-334.

Lucas, M.J., and P.T. Calamia. 1997. Military Operating Area and Range Noise Model MR_NMAP User's Manual. Wyle Research Report WR 94-12-R. Wyle Laboratories, Inc. March.

Manci, K.M., D.N. Gladwin, R. Villella, and M.G Cavendish. 1988. Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: A Literature Synthesis. US Fish and Wildlife Service National Ecology Research Center, Ft. Collins, CO, NERC-88/29. 88 pp.

Márki, F. 2013. Outcomes of EU COSMA (Community Oriented Solutions to Minimise Aircraft Noise Annoyance) Project. Budapest University of Technology and Economics, London, May.

Miedema, H.M., and C.G. Oudshoorn. 2001. Annoyance from Transportation Noise: Relationships with Exposure Metrics DNL and DENL and Their Confidence Intervals. Environmental Health Perspectives 109.4:409–416.

Miedema, H.M., and H. Vos. 1998. Exposure-Response Relationships for Transportation Noise. Journal of the Acoustical Society of America 104(6):3432–3445. December.

National Park Service. 1994. Report to Congress: Report on Effects of Aircraft Overflights on the National Park System. Prepared Pursuant to Public Law 100-91, The National Parks Overflights Act of 1987. 12 September.

NATO. 2000. North Atlantic Treaty Organization. The Effects of Noise from Weapons and Sonic Booms, and the Impact on Humans, Wildlife, Domestic Animals and Structures. Final Report of the Working Group Study Follow up Program to the Pilot Study on Aircraft Noise, Report No. 241, June.

Newman, J.S., and K.R. Beattie. 1985. Aviation Noise Effects. US Department of Transportation, Federal Aviation Administration Report No. FAA-EE-85-2.

Ollerhead, J.B., C.J. Jones, R.E. Cadoux, A. Woodley, B.J. Atkinson, J.A. Horne, F. Pankhurst, L. Reyner, K.I. Hume, F. Van, A. Watson, I.D. Diamond, P. Egger, D. Holmes, and J. McKean. 1992. Report of a Field Study of Aircraft Noise and Sleep Disturbance. Commissioned by the UK Department of Transport for the 36 UK Department of Safety, Environment and Engineering, London, England: Civil Aviation Authority, December.

Pearsons, K.S., D.S. Barber, and B.G. Tabachnick. 1989. Analyses of the Predictability of Noise-Induced Sleep Disturbance. US Air Force Report HSD-TR-89-029, October.

Plotkin, K.J., B.H. Sharp, T. Connor, R. Bassarab, I. Flindell, and D. Schreckenberg. 2011. Updating and Supplementing the Day-Night Average Sound Level (DNL). Wyle Report 11-04, DOT/FAA/AEE/2011-03, June.

Rosenblith, W.A., K.N. Stevens, and Staff of Bolt, Beranek, and Newman. 1953. Handbook of Acoustic Noise Control, Vol. 2, Noise and Man. US Air Force Report WADC TR-52-204.

Schreckenberg, D. and R. Schuemer. 2010. The Impact of Acoustical, Operational and Non-Auditory Factors on Short-Term Annoyance Due to Aircraft Noise. Inter Noise 2010; Noise and Sustainability. 13 - 16 June 2010, Lisbon, Portugal.

Schultz, T.J. 1978. Synthesis of Social Surveys on Noise Annoyance. Journal of the Acoustical Society of America 64(2):377-405. August.

Sharp, B., T. Connor, D. McLaughlin, C. Clark, S. Stansfeld and J. Hervey. 2014. Assessing Aircraft Noise Conditions Affecting Student Learning, ACRP Web Document 16, http://www.trb.org/Aviation1/

Sharp, B.H., and K.J. Plotkin. 1984. Selection of Noise Criteria for School Classrooms. Wyle Research Technical Note TN 84-2 for the Port Authority of New York and New Jersey, SEPTEMBER.

Smith, D.G., D.H. Ellis, and T.H. Johnston. 1988. Raptors and Aircraft, In R.L Glinski, B. Gron-Pendelton, M.B. Moss, M.N. LeFranc, Jr., B.A. Millsap, and S.W. Hoffman, eds., Proceedings of the Southwest Raptor Management Symposium, National Wildlife Federation, Washington, D.C., pp. 360-367.

Stansfeld, S.A. and C. Clark. 2015. Health Effects of Noise Exposure in Children. Current Environmental Health Reports 2(2):171-178.

Stansfeld, S.A., B. Berglund, and C. Clark, I. Lopez-Barrio, P. Fischer, E. Öhrström, M.M. Haines, J. Head, S. Hygge, and I. van Kamp, B.F. Berry, on Behalf of the RANCH Study Team. 2005. Aircraft and Road Traffic Noise and Children's Cognition and Health: A Cross-National Study. Lancet 365:1942-1949.

Stevens, K.N., W.A. Rosenblith, and R.H. Bolt. 1953. Neighborhood Reaction to Noise: A Survey and Correlation of Case Histories (A). Journal of the Acoustical Society of America 25:833.

Stusnick, E., K.A. Bradley, J.A. Molino, and G. DeMiranda. 1992. The Effect of Onset Rate on Aircraft Noise Annoyance, Volume 2: Rented Home Experiment. Wyle Laboratories Research Report WR 92-3, March.

UKDfES. 2003. United Kingdom Department for Education and Skills. Building Bulletin 93, Acoustic Design of Schools - A Design Guide. London: The Stationary Office.

USEPA. 1974. U.S. Environmental Protection Agency. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. USEPA Report 550/9 74-004, March.

USEPA. 1978. Protective Noise Levels. Office of Noise Abatement and Control, Washington, DC. USEPA Report 550/9-79-100, November.

Wasmer, F. and F. Maunsell. 2024a. BaseOps 7.369 User's Guide. Wasmer Consulting.

Wasmer, F. and F. Maunsell. 2024b. NMPlot 4.974 User's Guide. Wasmer Consulting.

Wesler, J.E. 1986. Priority Selection of Schools for Soundproofing. Wyle Research Technical Note TN 96 8 for the Port Authority of New York and New Jersey, October.

WHO. 1999. World Health Organization. Guidelines for Community Noise. Berglund, B., T. Lindvall, and D. Schwela, eds.

Wyle Laboratories. 1971. Supporting Information for the Adopted Noise Regulations for California Airports. Wyle Report WCR 70-3(R)

D.3 Land Use

D.3.1 Definition of 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. Land use descriptions are often 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.

The land use ROI consists of lands below the proposed MOA (see **Figure 3.4-1** in the EA). These lands are within portions of Edwards, Real, Kinney, and Uvalde Counties.

D.4 Air Quality

D.4.1 Definition of Resource

Air quality is an indicator of the suitability of the atmosphere to support human life and the environment, generally described in terms of the types and levels of air pollutants present in outdoor air. Ambient air quality in a specified area or region is measured by the concentration of various pollutants in the atmosphere. Pollutant concentrations are affected by both the amount of

pollutants in the atmosphere and the extent to which these pollutants can be transported and diluted in the air.

Sections D.4.1.1 through **D.4.1.3** briefly describe the National Ambient Air Quality Standards (NAAQS), Clean Air Act (CAA) General Conformity requirements, and greenhouse gases (GHGs) in the context of the EA analysis. The air quality ROI is also described. Detailed information regarding air quality analysis, methodologies, assumptions, and calculations is presented in **Sections D.4.2** through **D.4.6**. References are provided in **Section D.4.7**. The Record of Air Analysis (ROAA), Air Conformity Applicability Model (ACAM) GHG Emissions, and Detailed ACAM Report are provided in **Section D.4.8**.

D.4.1.1 National Ambient Air Quality Standards

The CAA authorizes the U.S. Environmental Protection Agency (USEPA) to establish NAAQS for select air pollutants, referred to as "criteria pollutants," that are known to affect human health and the environment (40 CFR Part 50). Criteria pollutants regulated by the NAAQS consist of 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).

The USEPA has established Air Quality Control Regions (AQCRs) throughout the United States to evaluate compliance with the NAAQS. Regulatory areas within each AQCR that exceed the NAAQS for a pollutant are classified non-attainment for that pollutant. Regulatory areas where air pollutant concentrations are within an applicable NAAQS are designated attainment/unclassifiable for that NAAQS. Areas that have transitioned from nonattainment to attainment are designated as maintenance, and as such are required to follow requirements in the state's maintenance plans to ensure continued compliance with the NAAQS.

The air quality ROI consists of Edwards, Real, Uvalde, and Kinney Counties, which underlie the proposed MOA, and the Metropolitan San Antonio Intrastate AQCR, which contains those counties.

Air quality permits are not required for flight operations in airspace. Additionally, no new stationary sources of air emissions would be established under the Proposed Action; therefore, air quality permitting requirements are not applicable and are not addressed in the EA analysis.

D.4.1.2 Clean Air Act General Conformity

Under the CAA, the USEPA established the General Conformity rule (40 CFR Part 93), which applies to federal actions occurring in nonattainment or maintenance areas. Proposed federal actions are evaluated to determine if the total indirect and direct net emissions from those actions would be below de minimis levels (that is, too trivial or minor to merit consideration) for each of the pollutants as specified in 40 CFR § 93.153. If *de minimis* levels are not exceeded by any of the pollutants, no further evaluation is required. Additional analysis would be required if net emissions from the proposed project exceed the *de minimis* thresholds for one or more of the specified pollutants.

The CAA provides special protections for air quality in pristine areas of the country known as Class 1 areas. Class 1 areas include National Parks greater than 6,000 acres or National Wilderness Areas greater than 5,000 acres. Any deterioration of air quality, based on Prevention of Significant Deterioration (PSD) criteria established by USEPA, is considered significant in Class 1 areas. The USEPA has also established regional haze regulations that require states to make initial improvements in visibility within their Class 1 areas.

D.4.1.3 Greenhouse Gases

GHG are gases, occurring from natural processes and human activities, that trap heat in the atmosphere. GHG are generally not a concern to human health at normal ambient levels. The USEPA regulates GHG emissions via permitting and reporting requirements that are applicable mainly to large stationary sources of emissions. GHG produced by fossil-fuel combustion are primarily carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) emissions. Emissions from GHG are typically quantified and expressed in terms of the CO_2 equivalents (CO_2e), which is a measure used to compare the emissions from various GHG based upon their Global Warming Potential (GWP). The GWP is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of CO_2. The larger the GWP, the more that a given gas will trap heat in the atmosphere compared to CO_2 over the same time period. Analysts cumulatively compare emission estimates of different gases using standardized GWPs.

Flight training operations that would occur in the proposed MOA would generate GHG emissions from fuel combustion in aircraft engines. The ROI for GHG emissions is global.

D.4.2 Criteria Pollutants and National Ambient Air Quality Standards

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, National Ambient Air Quality 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: 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).

The USEPA has divided the country into geographical regions known as Air Quality Control Regions (AQCRs) to evaluate compliance with the NAAQS. In accordance with CAA requirements, the air quality in the AQCR 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 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 D.4-1**. 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 (Texas Administrative Code Title 30, 101.21).

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 (NO_x) and volatile organic compounds (VOCs) 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. Ammonia (NH_3), for example, is evaluated as a precursor of $PM_{2.5}$. Secondary (indirect) emissions vary by region depending upon the predominant emission sources located there and thus, precursors considered significant for $PM_{2.5}$ formation are identified for ultimate control.

Table D.4-1 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]		9 µg/m^3	Primary
Annual arithmetic mean [4]		15 µg/m^3	Secondary

Table D.4-1 National Ambient Air Quality Standards

Pollutant	Standard Value [6]		Standard Type
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, 2024a

[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 March 2024, USEPA revised the primary annual $PM_{2.5}$ standard from 12.0 mg/m^3 to 9.0 mg/m^3. The Agency is retaining the current primary 24-hour PM2.5 standard and the primary 24-hour PM10 standard. 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

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.

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. Areas designated as "attainment" have demonstrated compliance with NAAQS. An area is designated as unclassified if there is insufficient information for a compliance determination. Maintenance areas are those that were previously designated nonattainment but are now in compliance with the NAAQS. 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 air quality ROI includes the Laughlin 2A Low MOA airspace that overlay portions of Edwards, Real, Uvalde, and a small portion of Kinney in Texas, all of which are in the Metropolitan San Antonio Intrastate AQCR (40 Code of Federal Regulations [CFR] 81.40). The AQCR comprising of these underlying counties in the ROI are in attainment (or is unclassifiable) for each of the

criteria pollutants regulated under the NAAQS (40 CFR 81.344). As such these areas are anticipated to have relatively good air quality (currently not in near-nonattainment or maintenance for any criteria pollutants). There are no mandatory Federal Class I sites located in the region near these counties (40 CFR 81.424) where visibility would be a concern.

For determining potential air quality impacts, it is the volume of air extending up to the mixing height (3,000 feet AGL) and coinciding with the spatial distribution of the ROIs that is considered. Because the Proposed Action is intended entirely in airspaces, 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.

D.4.2.1 State Implementation Program

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. Maintenance areas are subject to a maintenance plan to ensure that compliance is maintained. To demonstrate progress toward attainment or maintenance status, 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. Air monitoring stations collect representative data that indicates how much of a pollutant is in the air. Texas has one of the most robust air monitoring networks in the country consisting of over 200 monitoring stations (TCEQ, 2024).

D.4.2.2 Conformity Rules

The CAA required the USEPA draft general conformity regulations that are applicable in nonattainment areas, or in designated maintenance areas. 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. The General Conformity Rule would not apply to this Proposed Action because the ROI that includes the multiple counties underlying the proposed Laughlin 2A Low MOA is in attainment with the NAAQS for all criteria pollutants.

D.4.2.3 New Source Performance Standards

Title I of the CAA Amendments of 1990 requires the federal government to reduce emissions from cars, trucks, and buses; from consumer products such as hair spray and window-washing compounds; and from ships and barges during the loading and unloading of petroleum products to address urban air pollution problems of O_3, CO, and PM_{10}. Under Title I, the federal government develops the technical guidance that states need to control stationary sources of pollutants. For stationary sources, the CAA establishes New Source Performance Standards for specific source categories. Standards and compliance requirements are listed in Title 40 CFR Parts 60 - 61. 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. The proposed operations within the airspace are classified as mobile source of emissions. As such, the requirements originating from Titles I and V are applicable only to stationary sources and would not apply for the proposed airspace operations.

D.4.2.4 Prevention of Significant Deterioration

Prevention of Significant Deterioration (PSD) applies to new major sources or major modifications at existing sources for pollutants where the area the source is located is in attainment or unclassifiable with the NAAQS (USEPA, 2023). The rule is to ensure that these sources are constructed or modified without causing significant adverse deterioration of the clean air in the area. Sources subject to PSD review are required to obtain a permit before commencing construction. The permit process requires an extensive air quality review of all other major sources within a 50-mile radius and all Class 1 areas within a 62-mile radius of the facility. Emissions from any new or modified source must be controlled using the maximum degree of control that can be achieved. The air quality, in combination with other PSD sources in the area, must not exceed the maximum allowable incremental increase as specified in the regulations. The rule also provides special protections for specific national parks or wilderness areas, known as Mandatory Federal Class 1 Areas (40 CFR Part 81), where any appreciable deterioration in air quality is considered significant. Class 1 areas are given special air quality and visibility protection under the CAA. 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 a proposed project is within 10 miles of any Class 1 area (wilderness area greater than 5,000 acres or national park greater than 6,000 acres). The goals of the PSD program are to (1) ensure economic growth while preserving existing air quality; (2) protect public health and welfare from adverse effects that might occur even at pollutant levels better than the NAAQS; and (3) preserve, protect, and enhance the air quality in areas of special natural recreational, scenic, or historic value, such as national parks and wilderness areas.

The proposed Laughlin 2A Low MOA is not located within 100 kilometers (62 miles) of any USEPA-designated Class 1 areas protected by the Regional Haze Rule. No Class 1 areas would be affected by emissions associated with the Proposed Action. The two designated Class 1 areas in

Texas, Big Bend National Park and Guadalupe Mountains National Park, are more than 100 miles from the ROI and would not be affected by emissions associated with the Proposed Action.

There are no major sources associated with the Proposed Action; thus, PSD does not apply. Mobile sources, including those from aircraft emissions are generally not part of the PSD permit review process.

D.4.3 Greenhouse Gases

Greenhouse gases (GHGs) are gases, occurring from natural processes and human activities, that trap heat in the atmosphere. Natural sources of GHGs include land use, such as through deforestation, land clearing for agriculture, and degradation of soils. The largest source of GHGs from human activities in the United States is from burning fossil fuels for electricity, heat, and transportation. Combustion of fossil fuels (coal, oil, and natural gas) primarily generate three main GHGs: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). These three GHGs alone represent more than 97 percent of the United States' total GHG emissions (USEPA, 2024b).

Emissions from GHG are expressed in terms of the carbon dioxide equivalent emissions (CO_2e), which is a measure used to compare the emissions from various GHGs based on their Global Warming Potential (GWP). The GWP is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of CO_2. The larger the GWP, the more that a given gas warms the Earth compared with CO_2 over the same time period. Analysts cumulatively compare emission estimates of different gases using standardized GWPs.

D.4.4 Air Conformity Applicability Analysis

The CAA Section 176(c), *General Conformity*, requires federal agencies to demonstrate that their proposed activities would conform to the applicable SIP 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 action can be shown to conform by demonstrating that the total direct and indirect emissions are below the *de minimis* levels **(Table D.4-2)**, 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.

Table D.4-2 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
CO, 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, 2024c

D.4.5 Significance Indicators and Evaluation Criteria

Based on guidance in Chapter 4 of the Air Force Air Quality Environmental Impact Analysis Process (EIAP) Guide, Volume II – Advanced Assessments (Air Force, 2020), for air quality impact analysis, 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 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 NAAQS. 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 each criteria pollutant is considered so insignificant that the action would 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 a Proposed Action 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 are below the corresponding *de minimis* threshold values, General Conformity Rule requirements would not be applicable. The net emissions from the Proposed Action Alternatives are assessed in the EA and compared with applicable insignificance indicators.

D.4.5.1 GHG

The Air Conformity Applicability Model (ACAM) version 5.0.24a (ACAM, 2024) was used to evaluate GHG emissions.

A GHG Emissions Evaluation establishes the quantity of speciated GHGs and CO_2e, determines if an action's emissions are insignificant, and provides a relative significance comparison. For the analysis, the PSD threshold for GHG of 75,000 tpy of CO_2e (or 68,039 metric tpy) was used as an indicator or "threshold of insignificance" for NEPA air quality impacts in all areas. This indicator does not define a significant impact; however, it provides a threshold to identify actions that are insignificant (*de minimis*, too trivial or minor to merit consideration). Actions with a net change in GHG (CO_2e) emissions below the insignificance indicator (threshold) are considered too insignificant on a global scale to warrant any further analysis. Note that actions with a net change in GHG (CO_2e) emissions above the insignificance indicator (threshold) are only considered potentially significant and require further assessment to determine if the action poses a significant impact. The action related GHGs have no significant impact to local air quality. However, from a global perspective, individual actions with GHG emissions each make a relatively small addition to global atmospheric GHG concentrations. If activities have *de minimis* (insignificant) GHG emissions, then on a global scale they are effectively zero and irrelevant (AFCEC, 2023).

D.4.6 Emissions Calculations and 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. The Proposed Action would not require changes to the number of personnel or to the number or types of aircraft assigned to Laughlin AFB, or changes to the existing boundaries of that or any other DoD or DAF installation.
3. For the purposes of ACAM, aircraft flight operations in the proposed new airspace were assumed to start January 2026. Emissions were estimated for the Proposed Action in ACAM beginning January 1, 2026, with 2034 and beyond being considered "steady state".
4. The proposed Laughlin 2A Low MOA is assumed to become operational, starting January 2026. From 2026 to 2029, the currently operating T-38Cs would utilize the proposed new Laughlin 2A Low MOA. The 47 FTW will start to transition from T-38C to T-7A in 2030 (DAF, 2024a), assuming an 80 percent T-38C to 20 percent T-7A transition mix in 2030, and decreasing in 20 percent increments through 2033. From 2034 onwards, only T-7A operations

would operate indefinitely within the proposed Laughlin 2A Low MOA; the T-38Cs would have been completely phased out.

5. Net change in annual operational emissions for the proposed alternatives were estimated in ACAM by adding or removing activities related to Laughlin 2A Low MOA operations, as necessary. The total estimated net change in emissions calculated in ACAM is used for analyzing air quality impacts for the proposed alternatives.
6. Mixing height of 3,000 feet (this matches USEPA and DAF Guidance) was assumed. For consideration of potential air quality impacts, it is the volume of air extending up to the mixing height (3,000 feet 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 feet AGL is an acceptable default value (40 CFR § 93.153[c][2]).
7. Flights traveling to and from the Laughlin 2A Low MOA airspace are assumed to operate at altitudes above mixing height of 3,000 feet AGL and are thus not considered in the analyses.
8. Aircraft emissions at or below 3,000 feet AGL do not appreciably differ by altitude. In other words, the emissions rate at 3,000 feet AGL is assumed to be the same as that at 500 feet AGL. Moreover, ACAM does not distinguish between aircraft operations at different altitudes.
9. To represent the time spent at or below 3,000 feet, time spent in minutes for each airspace was assigned to Climb out/Intermediate power mode within the Low Flight Patterns (LFP) Flight Operations activity input field in ACAM. No time was assigned to any other power modes, but default ACAM output also lists trim tests and TGOs; however, all inputs for these fields were set to zero for time spent within the airspace.
10. The projected number of aircraft and aircraft operations and time in airspace is based on information in the data validation package prepared for the noise analysis (DAF, 2024b).
11. Air quality analyses for flight operations were performed using operational data collected and compiled by the noise team for the airspace flight operations (0 to 3,000 feet AGL). Data were provided for annual operations by altitude band, engine power, airspeed, and time in minutes and percent time spent in airspace. Based on this information, ACAM input data for the total number of sorties and estimated total time spent at or below 3,000 feet AGL were estimated and are as shown in **Table D.4-3**.
12. None of the proposed training activities would involve releases of live or inert ammunition or ordnance (including defensive countermeasures such as chaff and flares).

Table D.4-3 Air Conformity Applicability Model Data Inputs for Laughlin 2A Low MOA

Airspace Type	Aircraft Type	Number of Sorties Per Year						Type of Operation	Estimated Time Spent at or Below 3,000 feet AGL per Sortie (minutes)[1]
		2026 - 2029	2030	2031	2032	2033	2034 and Beyond		
Existing Conditions: Laughlin 2A MOA	T-38C	N/A[2]						All Sorties ≥3,000 feet AGL	N/A[2]
	T-7A	-						N/A	
Alternative 1: Laughlin 2A Low MOA	T-38C[3]	1,570	1,256	942	628	314	0	Sorties at ≤3,000 feet AGL	18.2
	T-7A[4]	0	314	628	942	1,256	1,570	Sorties at ≤3,000 feet AGL	18.8

Notes:

[1] Time estimated per sortie is based on noise data provided.

[2] Sorties occur above the atmospheric mixing height. Aircraft operations below 7,000 ft MSL are not currently permitted in Laughlin 2 MOA. No emissions are required to be calculated.

[3] Number of sorties per year from the complete phase-out of T38C aircraft by January 2034.

[4] Number of sorties per year from the implementation of proposed T-7A operations beginning in January 2030. The T-38 is anticipated to transition to T-7 during 2030 through 2033. Assumed a mix of T-38C to T-7A operations in that period.

D.4.7 References

ACAM. 2024. Air Conformity Applicability Model. Air Impact Modeling Software by Solutio Environmental, Inc. for U.S. Air Force Civil Engineering Center (AFCEC/CZTQ), Version 5.0.24a, 2024.

AFCEC. 2023. Air Force Civil Engineer Center. Compliance Technical Support Branch (CZTQ). *DAF Greenhouse Gas (GHG) & Climate Change Assessment Guide*. December. https://www.aqhelp.com/AQdocs.html. Accessed January 2024.

Air Force. 2020. Air Force Air Quality EIAP Guide, Volume II - Advanced Assessments. July.

DAF. 2024a. *Final Environmental Impact Statement for T-7A Recapitalization at Laughlin Air Force Base, Texas*. https://laughlin.t-7anepadocuments.com/documents. Accessed November 6, 2024.

DAF. 2024b. Laughlin AFB Data Validation Package (pending).

TCEQ, 2024. Texas Commission on Environmental Quality. Air Monitoring. https://www.tceq.texas.gov/airquality/monops/air-mon. Accessed May 2025.

USEPA. 2010. U.S. Environmental Protection Agency. *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. 2023. *Prevention of Significant Deterioration (PSD) Basic Information*. https://www.epa.gov/nsr/prevention-significant-deterioration-basic-information. Accessed January 23, 2025

USEPA. 2024a. NAAQS Table. https://www.epa.gov/criteria-air-pollutants/naaqs-table. Last updated on December 16, 2024.

USEPA. 2024b. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022. EPA 430-R- 24-004. https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text_04-18-2024.pdf.

USEPA. 2024c. General Conformity: De Minimis Tables. https://www.epa.gov/general-conformity/de-minimis-tables. Last updated on June 10, 2024

D.4.8 Record of Air Analysis (ROAA), ACAM GHG Emissions, and Detailed ACAM Report

D.4.8.1 Record of Air Analysis (ROAA)

Alternative 1

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform a net change in emissions analysis to assess the potential air quality impact/s associated with the action. The analysis was performed in accordance with the Air Force Manual 32-7002, *Environmental Compliance and Pollution Prevention*; the *Environmental Impact Analysis Process* (EIAP, 32 CFR 989); the *General Conformity Rule* (GCR, 40 CFR 93 Subpart B); and the *USAF Air Quality Environmental Impact Analysis Process (EIAP) Guide*. This report provides a summary of the ACAM analysis.

Report generated with ACAM version: 5.0.24a

a. Action Location:
Base: LAUGHLIN AFB
State: Texas
County(s): Real; Edwards; Kinney; Uvalde
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Laughlin Air Force Base Low Military Operations Area Special Use Airspace – Alternative 1

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 1 / 2026

e. Action Description:

Under the Proposed Action, the proposed low-altitude airspace would need to have a floor of 500 feet AGL and a ceiling of up to, but not including 7,000 feet MSL. Training within the proposed airspace would primarily consist of low-altitude air-to-ground training, which would simulate attacks by training aircraft against simulated ground-based targets. This type of training would occur between 500 feet AGL and 3,000 feet MSL.

Up to 1,570 aircraft operations would occur in the proposed airspace annually. Aircraft operations in the proposed airspace would primarily be performed by pilots from the 47 FTW at Laughlin AFB initially flying T-38Cs, transitioning to the T-7A beginning in 2030 and continuing through 2033.

Alternative 1 would implement the Proposed Action by establishing a new low-altitude airspace that would be designated as the Laughlin 2A Low MOA. The proposed Low MOA would be managed and operated separately from the existing Laughlin 2 MOA and could be combined with that airspace, as needed, to support seamless flight operations from 500 feet AGL to FL180.

Under the No Action Alternative, the proposed low-altitude MOA would not be obtained. Low-altitude pilot training requirements of the FBF syllabus would not be met, which would contribute to the degradation of the quality and quantity of pilot training and impede the overall production of future DAF pilots and weapons system officers.

f. Point of Contact:

Name: Rahul Chettri
Title: AQ Specialist
Organization: Versar Global Services
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 GCR are:

____ applicable
__X__ not applicable

Total reasonably foreseeable 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” (SS, no net gain/loss in emission stabilized and the action is fully implemented) emissions. The ACAM analysis uses 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 the proposed Action’s potential impacts to local air quality. The insignificance indicators are trivial (de minimis) rate thresholds that have been demonstrated to have little to no impact to air quality. These insignificance indicators are the 250 ton/yr Prevention of Significant Deterioration (PSD) major source threshold and 25 ton/yr for lead for actions occurring in areas that are "Attainment" (not exceeding any National Ambient Air Quality Standard (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 pollutants is considered so insignificant that the action will not cause or contribute to an exceedance on one or more NAAQS. For further detail on insignificance indicators, refer to *Level II, Air Quality Quantitative Assessment, Insignificance Indicators*.

The action’s net emissions for every year through achieving steady state were compared against the Insignificance Indicators and are summarized below.

Analysis Summary:

2026

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	1.364	250	No
NOx	0.343	250	No
CO	31.918	250	No
SOx	0.525	250	No
PM 10	0.878	250	No
PM 2.5	0.790	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2027

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	1.364	250	No
NOx	0.343	250	No
CO	31.918	250	No
SOx	0.525	250	No
PM 10	0.878	250	No
PM 2.5	0.790	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2028

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	1.364	250	No
NOx	0.343	250	No
CO	31.918	250	No
SOx	0.525	250	No
PM 10	0.878	250	No
PM 2.5	0.790	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2029

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	1.364	250	No
NOx	0.343	250	No
CO	31.918	250	No
SOx	0.525	250	No
PM 10	0.878	250	No
PM 2.5	0.790	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2030

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	1.872	250	No
NOx	5.917	250	No
CO	26.178	250	No
SOx	0.788	250	No
PM 10	0.747	250	No
PM 2.5	0.670	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2031

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	2.380	250	No
NOx	11.491	250	No
CO	20.438	250	No
SOx	1.051	250	No
PM 10	0.616	250	No
PM 2.5	0.550	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2032

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	2.888	250	No
NOx	17.065	250	No
CO	14.697	250	No
SOx	1.314	250	No
PM 10	0.485	250	No
PM 2.5	0.429	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2033

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	3.397	250	No
NOx	22.639	250	No
CO	8.957	250	No
SOx	1.578	250	No
PM 10	0.355	250	No
PM 2.5	0.309	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2034

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	3.905	250	No
NOx	28.213	250	No
CO	3.217	250	No
SOx	1.841	250	No
PM 10	0.224	250	No
PM 2.5	0.189	250	No
Pb	0.000	25	No
NH3	0.000	250	No

2035 - (Steady State)

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	3.905	250	No
NOx	28.213	250	No
CO	3.217	250	No
SOx	1.841	250	No
PM 10	0.224	250	No
PM 2.5	0.189	250	No
Pb	0.000	25	No
NH3	0.000	250	No

None of the estimated annual net emissions associated with this action are above the insignificance indicators; therefore, the action will not cause or contribute to an exceedance of one or more NAAQSs and will have an insignificant impact on air quality. No further air assessment is needed.

Rahul Chettri, AQ Specialist — June 11 2025
Name, Title — **Date**

D.4.8.2 Air Conformity Applicability Model Greenhouse Gas (GHG) Emissions

Alternative 1

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform a net change in emissions analysis to estimate GHG emissions associated with the action. The analysis was performed 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 *USAF Air Quality Environmental Impact Analysis Process (EIAP) Guide*. This report provides a summary of the GHG emissions analysis.

Report generated with ACAM version: 5.0.24a

a. Action Location:
Base: LAUGHLIN AFB
State: Texas
County(s): Real; Edwards; Kinney; Uvalde
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Laughlin Air Force Base Low Military Operations Area Special Use Airspace – Alternative 1
c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 1 / 2026

e. Action Description:

Under the Proposed Action, the proposed low-altitude airspace would need to have a floor of 500 feet AGL and a ceiling of up to, but not including 7,000 feet MSL. Training within the proposed airspace would primarily consist of low-altitude air-to-ground training, which would simulate attacks by training aircraft against simulated ground-based targets. This type of training would occur between 500 feet AGL and 3,000 feet MSL.

Up to 1,570 aircraft operations would occur in the proposed airspace annually. Aircraft operations in the proposed airspace would primarily be performed by pilots from the 47 FTW at Laughlin AFB initially flying T-38Cs, transitioning to the T-7A beginning in 2030 and continuing through 2033.

Alternative 1 would implement the Proposed Action by establishing a new low-altitude airspace that would be designated as the Laughlin 2A Low MOA. The proposed Low MOA would be managed and operated separately from the existing Laughlin 2 MOA and could be combined with that airspace, as needed, to support seamless flight operations from 500 feet AGL to FL180.

Under the No Action Alternative, the proposed low-altitude MOA would not be obtained. Low-altitude pilot training requirements of the FBF syllabus would not be met, which would contribute to the degradation of the quality and quantity of pilot training and impede the overall production of future DAF pilots and weapons system officers.

f. Point of Contact:

Name: Rahul Chettri
Title: AQ Specialist
Organization: Versar Global Services
Email: rchettri@versar.com
Phone Number: (757) 557-0810

2. Analysis: Total combined direct and indirect GHG emissions associated with the action were estimated through ACAM on a calendar-year basis from the action's start through the action's "steady state" (SS, net gain/loss in emission stabilized and the action is fully implemented) of emissions.

GHG Emissions Analysis Summary:

GHGs produced by fossil-fuel combustion are primarily carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O). These three GHGs represent more than 97 percent of all U.S. GHG emissions. Emissions of GHGs are typically quantified and regulated in units of CO2 equivalents (CO2e). The CO2e takes into account the global warming potential (GWP) of each GHG. The GWP is the measure of a particular GHG's ability to absorb solar radiation as well as its residence time within the atmosphere. The GWP allows comparison of global warming impacts between different gases. All GHG emissions estimates were derived from various emission sources using the methods, algorithms, emission factors, and GWPs from the most current Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and/or Air Emissions Guide for Air Force Transitory Sources.

The Air Force has adopted the Prevention of Significant Deterioration (PSD) threshold for GHG of 75,000 ton per year (ton/yr) of CO2e (or 68,039 metric ton per year, mton/yr) as an indicator or "threshold of insignificance" for NEPA air quality impacts in all areas. This indicator does not define a significant impact; however, it provides a threshold to identify actions that are insignificant (de minimis, too trivial or minor to merit consideration). Actions with a net change in GHG (CO2e) emissions below the insignificance indicator (threshold) are considered too insignificant on a global scale to warrant any further analysis. Note that actions with a net change in GHG (CO2e) emissions above the insignificance indicator (threshold) are only considered potentially significant and require further assessment to determine if the action poses a significant impact. For further detail on insignificance indicators see Level II, Air Quality Quantitative Assessment, Insignificance Indicators (April 2023).

The following table summarizes the action-related GHG emissions on a calendar-year basis through the projected steady state of the action.

Action-Related Annual GHG Emissions (mton/yr)						
YEAR	**CO2**	**CH4**	**N2O**	**CO2e**	**Threshold**	**Exceedance**
2026	1,426	0.05994052	0.01169441	1,430	68,039	No
2027	1,426	0.05994052	0.01169441	1,430	68,039	No
2028	1,426	0.05994052	0.01169441	1,430	68,039	No
2029	1,426	0.05994052	0.01169441	1,430	68,039	No
2030	2,140	0.08999557	0.01755816	2,147	68,039	No
2031	2,855	0.12005063	0.0234219	2,865	68,039	No
2032	3,570	0.15010568	0.02928565	3,582	68,039	No
2033	4,285	0.18016074	0.0351494	4,299	68,039	No
2034	4,999	0.21021579	0.04101315	5,016	68,039	No
2035 [SS Year]	4,999	0.21021579	0.04101315	5,016	68,039	No

The following U.S. and State's GHG emissions estimates (next two tables) are based on a five-year average (2016 through 2020) of individual state-reported GHG emissions (Reference: State Climate Summaries 2022, NOAA National Centers for Environmental Information, National Oceanic and Atmospheric Administration. https://statesummaries.ncics.org/downloads/).

State's Annual GHG Emissions (mton/yr)				
YEAR	**CO2**	**CH4**	**N2O**	**CO2e**
2026	700,652,689	3,554,625	135,896	836,194,567
2027	700,652,689	3,554,625	135,896	836,194,567
2028	700,652,689	3,554,625	135,896	836,194,567
2029	700,652,689	3,554,625	135,896	836,194,567
2030	700,652,689	3,554,625	135,896	836,194,567
2031	700,652,689	3,554,625	135,896	836,194,567
2032	700,652,689	3,554,625	135,896	836,194,567
2033	700,652,689	3,554,625	135,896	836,194,567
2034	700,652,689	3,554,625	135,896	836,194,567
2035 [SS Year]	700,652,689	3,554,625	135,896	836,194,567

U.S. Annual GHG Emissions (mton/yr)				
YEAR	**CO2**	**CH4**	**N2O**	**CO2e**
2026	5,136,454,179	25,626,912	1,500,708	6,251,695,230
2027	5,136,454,179	25,626,912	1,500,708	6,251,695,230
2028	5,136,454,179	25,626,912	1,500,708	6,251,695,230
2029	5,136,454,179	25,626,912	1,500,708	6,251,695,230
2030	5,136,454,179	25,626,912	1,500,708	6,251,695,230
2031	5,136,454,179	25,626,912	1,500,708	6,251,695,230
2032	5,136,454,179	25,626,912	1,500,708	6,251,695,230
2033	5,136,454,179	25,626,912	1,500,708	6,251,695,230
2034	5,136,454,179	25,626,912	1,500,708	6,251,695,230
2035 [SS Year]	5,136,454,179	25,626,912	1,500,708	6,251,695,230

GHG Relative Significance Assessment:

A Relative Significance Assessment uses the rule of reason and the concept of proportionality along with the consideration of the affected area (global, national, and regional) and the degree (intensity) of the proposed action's effects. The Relative Significance Assessment provides real-world context and allows for a reasoned choice against alternatives through a relative comparison analysis. The analysis weighs each alternative's annual net change in GHG emissions proportionally against (or relative to) global, national, and regional emissions.

The action's surroundings, circumstances, environment, and background (context associated with an action) provide the setting for evaluating the GHG intensity (impact significance). From an air quality perspective, context of an action is the local area's ambient air quality relative to meeting the NAAQSs, expressed as attainment, nonattainment, or maintenance areas (this designation is considered the attainment status). GHGs are non-hazardous to health at normal ambient concentrations. Therefore, the action-related GHGs generally have an insignificant impact to local air quality.

However, the affected area (context) of GHG is global. Therefore, the intensity or degree of the proposed action's GHG effects are gauged through the quantity of GHG associated with the action as compared to a baseline of the state, U.S., and global GHG inventories. Each action (or alternative) has significance, based on their annual net change in GHG emissions, in relation to or proportionally to the global, national, and regional annual GHG emissions.

To provide real-world context to the GHG effects on a global scale, an action's net change in GHG emissions is compared relative to the state (where the action will occur) and U.S. annual emissions. The following table provides a relative comparison of an action's net change in GHG emissions vs. state and U.S. projected GHG emissions for the same time period.

Total GHG Relative Significance (mton)					
		CO2	**CH4**	**N2O**	**CO2e**
2026-2035	State Total	7,006,526,895	35,546,248	1,358,958	8,361,945,668
2026-2035	U.S. Total	51,364,541,790	256,269,117	15,007,076	62,516,952,296
2026-2035	Action	28,550	1.200506	0.234219	28,646
Percent of State Totals		0.00040748%	0.00000338%	0.00001724%	0.00034258%
Percent of U.S. Totals		0.00005558%	0.00000047%	0.00000156%	0.00004582%

From a global context, the action's total GHG percentage of total global GHG for the same time period is: 0.00000614%.*

* Global value based on the U.S. emitting 13.4% of all global GHG annual emissions (2018 Emissions Data, Center for Climate and Energy Solutions, accessed 7-6-2023, https://www.c2es.org/content/international-emissions).

D.4.8.3 Detailed Air Conformity Applicability Model Report

Alternative 1

1. General Information

- Action Location
Base: LAUGHLIN AFB
State: Texas
County(s): Real; Edwards; Kinney; Uvalde
Regulatory Area(s): NOT IN A REGULATORY AREA

- Action Title: Laughlin Air Force Base Low Military Operations Area Special Use Airspace

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

- Projected Action Start Date: 1 / 2026

- Action Purpose and Need:

The purpose of the DAF Proposed Action is to obtain new airspace that affords the 47 FTW autonomous scheduling and ensures nearby access to airspace necessary to perform low-altitude, nonhazardous flight training from 500 feet AGL up to, but not including 7,000 feet MSL, and allows for continuous flight training to FL180 or scheduled independently (500 feet AGL up to, but not including 7,000 feet MSL), as needed, to support new multidirectional tactical flying training requirements.

The Proposed Action is needed because pilots do not have regular, prioritized (scheduling / management of airspace) access to multidirectional, low-altitude training down to 500 feet AGL (low altitude/ configuration), with ceilings of up to, but not including 7,000 feet AGL (size), within 10 minutes transit time of Laughlin AFB (minimize transit time).

- Action Description:

Under the Proposed Action, the proposed low-altitude airspace would need to have a floor of 500 feet AGL and a ceiling of up to, but not including 7,000 feet MSL. Training within the proposed airspace would primarily consist of low-altitude air-to-ground training, which would simulate attacks by training aircraft against simulated ground-based targets. This type of training would occur between 500 feet AGL and 3,000 feet MSL.

Up to 1,570 aircraft operations would occur in the proposed airspace annually. Aircraft operations in the proposed airspace would primarily be performed by pilots from the 47 FTW at Laughlin AFB initially flying T-38Cs, transitioning to the T-7A beginning in 2030 and continuing through 2033.

Alternative 1 would implement the Proposed Action by establishing a new low-altitude airspace that would be designated as the Laughlin 2A Low MOA. The proposed Low MOA would be managed and operated separately from the existing Laughlin 2 MOA and could be combined with that airspace, as needed, to support seamless flight operations from 500 feet AGL to FL180.

Under the No Action Alternative, the proposed low-altitude MOA would not be obtained. Low-altitude pilot training requirements of the FBF syllabus would not be met, which would contribute to the degradation of the quality and quantity of pilot training and impede the overall production of future DAF pilots and weapons system officers.

- Point of Contact

Name: Rahul Chettri
Title: AQ Specialist
Organization: Versar Global Services
Email: rchettri@versar.com
Phone Number: (757) 557-0810

Report generated with ACAM version: 5.0.24a

- Activity List:

	Activity Type	Activity Title
2.	Aircraft	Alt 1: Add T-7A (2030) in Laughlin 2A Low MOA only
3.	Aircraft	Alt 1: Add T-7A (2034 and beyond) in Laughlin 2A Low MOA only
4.	Aircraft	Alt 1: Add T-38C (2026-2029) in Laughlin 2A Low MOA only
5.	Aircraft	Alt 1: Add T-38C (2030) in Laughlin 2A Low MOA only
6.	Aircraft	Alt 1: Add T-7A (2031) in Laughlin 2A Low MOA only
7.	Aircraft	Alt 1: Add T-7A (2032) in Laughlin 2A Low MOA only
8.	Aircraft	Alt 1: Add T-7A (2033) in Laughlin 2A Low MOA only
9.	Aircraft	Alt 1: Add T-38C (2031) in Laughlin 2A Low MOA only
10.	Aircraft	Alt 1: Add T-38C (2032) in Laughlin 2A Low MOA only
11.	Aircraft	Alt 1: Add T-38C (2033) in Laughlin 2A Low MOA only

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: Real; Edwards; Kinney; Uvalde
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Alt 1: Add T-7A (2030) in Laughlin 2A Low MOA only

- Activity Description:
In 2030, T-7A aircraft will conduct 314 sorties in Laughlin 2A Low MOA

- Activity Start Date
Start Month: 1
Start Year: 2030

- Activity End Date
Indefinite: No
End Month: 12
End Year: 2030

- Activity Emissions of Criteria Pollutants:

Pollutant	Total Emissions (TONs)
VOC	0.781012
SO_x	0.368142
NO_x	5.642554
CO	0.643389

Pollutant	Total Emissions (TONs)
PM 10	0.044728
PM 2.5	0.037846
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Total Emissions (TONs)
CH_4	0.046345
N_2O	0.009042

Pollutant	Total Emissions (TONs)
CO_2	1102.169715
CO_2e	1105.863455

- Activity Emissions of Criteria Pollutants [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
VOC	0.781012
SO_x	0.368142
NO_x	5.642554
CO	0.643389

Pollutant	Total Emissions (TONs)
PM 10	0.044728
PM 2.5	0.037846
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
CH_4	0.046345
N_2O	0.009042

Pollutant	Total Emissions (TONs)
CO_2	1102.169715
CO_2e	1105.863455

2.2 Aircraft & Engines

2.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine

Aircraft Designation:	T-7A
Engine Model:	F404-GE-102
Primary Function:	Trainer
Aircraft has After burn:	Yes
Number of Engines:	1

- 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 Criteria Pollutant Emission Factors (lb/1000lb fuel)

Proprietary Information. Contact Air Quality Subject Matter Expert for More Information regarding this engine's Emission Factors.

2.3 Flight Operations

2.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft:		1
Flight Operation Cycle Type:	LFP (Low Flight Pattern)	
Number of Annual Flight Operation Cycles for all Aircraft:		314
Number of Annual Trim Test(s) per Aircraft:		0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi [Idle] (mins):	0
Approach [Approach] (mins):	0
Climb Out [Intermediate] (mins):	18.8
Takeoff [Military] (mins):	0
Takeoff [After Burn] (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 Flight Operation Cycles per Year

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

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
FOC: Number of Flight Operation Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Flight Operation Cycles per Year
$AE_{FOC} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{FOC}: 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 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. Aircraft

3.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Real; Kinney; Edwards; Uvalde
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Alt 1: Add T-7A (2034 and beyond) in Laughlin 2A Low MOA only

- Activity Description:
In 2034 and beyond, T-7A aircraft will conduct 1570 sorties in Laughlin 2A Low MOA

- Activity Start Date
Start Month: 1
Start Year: 2034

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

- Activity Emissions of Criteria Pollutants:

Pollutant	Emissions Per Year (TONs)
VOC	3.905060
SO_x	1.840711
NO_x	28.212770
CO	3.216944

Pollutant	Emissions Per Year (TONs)
PM 10	0.223638
PM 2.5	0.189232
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Emissions Per Year (TONs)
CH_4	0.231723
N_2O	0.045209

Pollutant	Emissions Per Year (TONs)
CO_2	5510.848574
CO_2e	5529.317273

- Activity Emissions of Criteria Pollutants [LFP Flight Operations part]:

Pollutant	Emissions Per Year (TONs)
VOC	3.905060
SO_x	1.840711
NO_x	28.212770
CO	3.216944

Pollutant	Emissions Per Year (TONs)
PM 10	0.223638
PM 2.5	0.189232
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [LFP Flight Operations part]:

Pollutant	Emissions Per Year (TONs)
CH_4	0.231723
N_2O	0.045209

Pollutant	Emissions Per Year (TONs)
CO_2	5510.848574
CO_2e	5529.317273

3.2 Aircraft & Engines

3.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: T-7A
Engine Model: F404-GE-102
Primary Function: Trainer
Aircraft has After burn: Yes
Number of Engines: 1

- 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 Criteria Pollutant Emission Factors (lb/1000lb fuel)
Proprietary Information. Contact Air Quality Subject Matter Expert for More Information regarding this engine's Emission Factors.

3.3 Flight Operations

3.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft:		1
Flight Operation Cycle Type:	LFP (Low Flight Pattern)	
Number of Annual Flight Operation Cycles for all Aircraft:		1570
Number of Annual Trim Test(s) per Aircraft:		0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi [Idle] (mins):	0
Approach [Approach] (mins):	0
Climb Out [Intermediate] (mins):	18.8
Takeoff [Military] (mins):	0
Takeoff [After Burn] (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 Flight Operation Cycles per Year
$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * FOC / 2000$

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
FOC: Number of Flight Operation Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Flight Operation Cycles per Year
$AE_{FOC} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{FOC}: 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 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. Aircraft

4.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Real; Edwards; Kinney; Uvalde
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Alt 1: Add T-38C (2026-2029) in Laughlin 2A Low MOA only

- Activity Description:
In 2026 though 2029, T-38C aircraft will conduct 1,570 sorties/year in Laughlin 2A Low MOA

- Activity Start Date
Start Month: 1
Start Year: 2026

- Activity End Date
Indefinite: No
End Month: 12
End Year: 2029

- Activity Emissions of Criteria Pollutants:

Pollutant	Total Emissions (TONs)
VOC	5.454586
SO_x	2.099427
NO_x	1.373457
CO	127.672632

Pollutant	Total Emissions (TONs)
PM 10	3.512126
PM 2.5	3.158951
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Total Emissions (TONs)
CH_4	0.264292
N_2O	0.051563

Pollutant	Total Emissions (TONs)
CO_2	6285.409826
CO_2e	6306.474339

- Activity Emissions of Criteria Pollutants [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
VOC	5.454586
SO_x	2.099427
NO_x	1.373457
CO	127.672632

Pollutant	Total Emissions (TONs)
PM 10	3.512126
PM 2.5	3.158951
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
CH_4	0.264292
N_2O	0.051563

Pollutant	Total Emissions (TONs)
CO_2	6285.409826
CO_2e	6306.474339

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 Criteria Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Idle	520.00	16.80	1.07	1.08	177.45	4.70	4.23
Approach	689.00	7.96	1.07	0.84	119.23	2.42	2.17
Intermediate	1030.00	2.78	1.07	0.70	65.07	1.79	1.61
Military	2220.00	0.75	1.07	1.92	30.99	1.13	1.01
After Burn	7695.00	6.97	1.07	6.23	53.43	0.25	0.23

- Aircraft & Engine Greenhouse Gasses Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	CH_4	N_2O	CO_2	CO_2e
Idle	520.00	0.13	0.03	3203.44	3214.64
Approach	689.00	0.13	0.03	3203.44	3214.64
Intermediate	1030.00	0.13	0.03	3203.44	3214.64
Military	2220.00	0.13	0.03	3203.44	3214.64
After Burn	7695.00	0.13	0.03	3203.44	3214.64

4.3 Flight Operations

4.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft:		1
Flight Operation Cycle Type:	LFP (Low Flight Pattern)	
Number of Annual Flight Operation Cycles for all Aircraft:		1570
Number of Annual Trim Test(s) per Aircraft:		0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi [Idle] (mins):	0
Approach [Approach] (mins):	0
Climb Out [Intermediate] (mins):	18.2
Takeoff [Military] (mins):	0
Takeoff [After Burn] (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 Flight Operation Cycles per Year

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

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
FOC: Number of Flight Operation Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Flight Operation Cycles per Year

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

AE_{FOC}: 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 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. Aircraft

5.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Real; Edwards; Kinney; Uvalde
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Alt 1: Add T-38C (2030) in Laughlin 2A Low MOA only

- Activity Description:
In 2030, T-38C aircraft will conduct 1,256 sorties in Laughlin 2A Low MOA

- Activity Start Date
Start Month: 1
Start Year: 2030

- Activity End Date
Indefinite: No
End Month: 12
End Year: 2030

- Activity Emissions of Criteria Pollutants:

Pollutant	Total Emissions (TONs)
VOC	1.090917
SO_x	0.419885
NO_x	0.274691
CO	25.534526

Pollutant	Total Emissions (TONs)
PM 10	0.702425
PM 2.5	0.631790
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Total Emissions (TONs)
CH_4	0.052858
N_2O	0.010313

Pollutant	Total Emissions (TONs)
CO_2	1257.081965
CO_2e	1261.294868

- Activity Emissions of Criteria Pollutants [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
VOC	1.090917
SO_x	0.419885
NO_x	0.274691
CO	25.534526

Pollutant	Total Emissions (TONs)
PM 10	0.702425
PM 2.5	0.631790
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
CH_4	0.052858
N_2O	0.010313

Pollutant	Total Emissions (TONs)
CO_2	1257.081965
CO_2e	1261.294868

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 Criteria Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Idle	520.00	16.80	1.07	1.08	177.45	4.70	4.23
Approach	689.00	7.96	1.07	0.84	119.23	2.42	2.17
Intermediate	1030.00	2.78	1.07	0.70	65.07	1.79	1.61
Military	2220.00	0.75	1.07	1.92	30.99	1.13	1.01
After Burn	7695.00	6.97	1.07	6.23	53.43	0.25	0.23

- Aircraft & Engine Greenhouse Gasses Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	CH_4	N_2O	CO_2	CO_2e
Idle	520.00	0.13	0.03	3203.44	3214.64
Approach	689.00	0.13	0.03	3203.44	3214.64
Intermediate	1030.00	0.13	0.03	3203.44	3214.64
Military	2220.00	0.13	0.03	3203.44	3214.64
After Burn	7695.00	0.13	0.03	3203.44	3214.64

5.3 Flight Operations

5.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft: 1
Flight Operation Cycle Type: LFP (Low Flight Pattern)
Number of Annual Flight Operation Cycles for all Aircraft: 1256
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi [Idle] (mins): 0
Approach [Approach] (mins): 0
Climb Out [Intermediate] (mins): 18.2
Takeoff [Military] (mins): 0
Takeoff [After Burn] (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 Flight Operation Cycles per Year

AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * FOC / 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
FOC: Number of Flight Operation Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Flight Operation Cycles per Year
$AE_{FOC} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{FOC}: 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 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)

6. Aircraft

6.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Edwards; Kinney; Real; Uvalde
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Alt 1: Add T-7A (2031) in Laughlin 2A Low MOA only

- Activity Description:
In 2031, T-7A aircraft will conduct 628 sorties in Laughlin 2A Low MOA

- Activity Start Date
Start Month: 1
Start Year: 2031

- Activity End Date

Indefinite: No
End Month: 12
End Year: 2031

- Activity Emissions of Criteria Pollutants:

Pollutant	Total Emissions (TONs)
VOC	1.562024
SO_x	0.736284
NO_x	11.285108
CO	1.286778

Pollutant	Total Emissions (TONs)
PM 10	0.089455
PM 2.5	0.075693
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Total Emissions (TONs)
CH_4	0.092689
N_2O	0.018084

Pollutant	Total Emissions (TONs)
CO_2	2204.339430
CO_2e	2211.726909

- Activity Emissions of Criteria Pollutants [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
VOC	1.562024
SO_x	0.736284
NO_x	11.285108
CO	1.286778

Pollutant	Total Emissions (TONs)
PM 10	0.089455
PM 2.5	0.075693
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
CH_4	0.092689
N_2O	0.018084

Pollutant	Total Emissions (TONs)
CO_2	2204.339430
CO_2e	2211.726909

6.2 Aircraft & Engines

6.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine

Aircraft Designation: T-7A
Engine Model: F404-GE-102
Primary Function: Trainer
Aircraft has After burn: Yes
Number of Engines: 1

- Aircraft & Engine Surrogate

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

6.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Criteria Pollutant Emission Factors (lb/1000lb fuel)

Proprietary Information. Contact Air Quality Subject Matter Expert for More Information regarding this engine's Emission Factors.

6.3 Flight Operations

6.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft:		1
Flight Operation Cycle Type:	LFP (Low Flight Pattern)	
Number of Annual Flight Operation Cycles for all Aircraft:		628
Number of Annual Trim Test(s) per Aircraft:		0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi [Idle] (mins):	0
Approach [Approach] (mins):	0
Climb Out [Intermediate] (mins):	18.8
Takeoff [Military] (mins):	0
Takeoff [After Burn] (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

6.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for Flight Operation Cycles per Year

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

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
FOC: Number of Flight Operation Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Flight Operation Cycles per Year

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

AE_{FOC}: 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 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)

7. Aircraft

7.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Edwards; Kinney; Real; Uvalde
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Alt 1: Add T-7A (2032) in Laughlin 2A Low MOA only

- Activity Description:
In 2032, T-7A aircraft will conduct 942 sorties in Laughlin 2A Low MOA

- Activity Start Date
Start Month: 1
Start Year: 2032

- Activity End Date
Indefinite: No
End Month: 12
End Year: 2032

- Activity Emissions of Criteria Pollutants:

Pollutant	Total Emissions (TONs)
VOC	2.343036
SO_x	1.104427
NO_x	16.927662
CO	1.930166

Pollutant	Total Emissions (TONs)
PM 10	0.134183
PM 2.5	0.113539
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Total Emissions (TONs)
CH_4	0.139034
N_2O	0.027126

Pollutant	Total Emissions (TONs)
CO_2	3306.509144
CO_2e	3317.590364

- Activity Emissions of Criteria Pollutants [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
VOC	2.343036
SO_x	1.104427
NO_x	16.927662
CO	1.930166

Pollutant	Total Emissions (TONs)
PM 10	0.134183
PM 2.5	0.113539
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
CH_4	0.139034
N_2O	0.027126

Pollutant	Total Emissions (TONs)
CO_2	3306.509144
CO_2e	3317.590364

7.2 Aircraft & Engines

7.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: T-7A
Engine Model: F404-GE-102
Primary Function: Trainer
Aircraft has After burn: Yes
Number of Engines: 1

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

7.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Criteria Pollutant Emission Factors (lb/1000lb fuel)
Proprietary Information. Contact Air Quality Subject Matter Expert for More Information regarding this engine's Emission Factors.

7.3 Flight Operations

7.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 1
Flight Operation Cycle Type: LFP (Low Flight Pattern)
Number of Annual Flight Operation Cycles for all Aircraft: 942
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)
Taxi [Idle] (mins): 0
Approach [Approach] (mins): 0
Climb Out [Intermediate] (mins): 18.8
Takeoff [Military] (mins): 0
Takeoff [After Burn] (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

7.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for Flight Operation Cycles per Year

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

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
FOC: Number of Flight Operation Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Flight Operation Cycles per Year

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

AE_{FOC}: 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 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)

8. Aircraft

8.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Edwards; Kinney; Real; Uvalde
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Alt 1: Add T-7A (2033) in Laughlin 2A Low MOA only

- Activity Description:
In 2033, T-7A aircraft will conduct 1,256 sorties in Laughlin 2A Low MOA

- Activity Start Date
Start Month: 1
Start Year: 2033

- Activity End Date
Indefinite: No
End Month: 12
End Year: 2033

- Activity Emissions of Criteria Pollutants:

Pollutant	Total Emissions (TONs)
VOC	3.124048
SO_x	1.472569
NO_x	22.570216
CO	2.573555

Pollutant	Total Emissions (TONs)
PM 10	0.178910
PM 2.5	0.151386
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Total Emissions (TONs)
CH_4	0.185379
N_2O	0.036167

Pollutant	Total Emissions (TONs)
CO_2	4408.678859
CO_2e	4423.453818

- Activity Emissions of Criteria Pollutants [CP Flight Operations part]:

Pollutant	Total Emissions (TONs)
VOC	3.124048
SO_x	1.472569
NO_x	22.570216
CO	2.573555

Pollutant	Total Emissions (TONs)
PM 10	0.178910
PM 2.5	0.151386
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [CP Flight Operations part]:

Pollutant	Total Emissions (TONs)
CH_4	0.185379
N_2O	0.036167

Pollutant	Total Emissions (TONs)
CO_2	4408.678859
CO_2e	4423.453818

8.2 Aircraft & Engines

8.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine

Aircraft Designation:	T-7A
Engine Model:	F404-GE-102
Primary Function:	Trainer
Aircraft has After burn:	Yes
Number of Engines:	1

- Aircraft & Engine Surrogate

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

8.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Criteria Pollutant Emission Factors (lb/1000lb fuel)

Proprietary Information. Contact Air Quality Subject Matter Expert for More Information regarding this engine's Emission Factors.

8.3 Flight Operations

8.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft:		1
Flight Operation Cycle Type:	CP (Close Pattern)	
Number of Annual Flight Operation Cycles for all Aircraft:		1256
Number of Annual Trim Test(s) per Aircraft:		0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi [Idle] (mins):	0
Approach [Approach] (mins):	0
Climb Out [Intermediate] (mins):	18.8
Takeoff [Military] (mins):	0
Takeoff [After Burn] (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

8.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for Flight Operation Cycles per Year

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

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
FOC: Number of Flight Operation Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Flight Operation Cycles per Year
$AE_{FOC} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{FOC}: 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 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)

9. Aircraft

9.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Edwards; Kinney; Real; Uvalde
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Alt 1: Add T-38C (2031) in Laughlin 2A Low MOA only

- Activity Description:
In 2031, T-38C aircraft will conduct 942 sorties in Laughlin 2A Low MOA

- Activity Start Date
Start Month: 1
Start Year: 2031

- Activity End Date
Indefinite: No
End Month: 12
End Year: 2031

- Activity Emissions of Criteria Pollutants:

Pollutant	Total Emissions (TONs)
VOC	0.818188
SO_x	0.314914
NO_x	0.206019
CO	19.150895

Pollutant	Total Emissions (TONs)
PM 10	0.526819
PM 2.5	0.473843
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Total Emissions (TONs)
CH_4	0.039644
N_2O	0.007735

Pollutant	Total Emissions (TONs)
CO_2	942.811474
CO_2e	945.971151

- Activity Emissions of Criteria Pollutants [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
VOC	0.818188
SO_x	0.314914
NO_x	0.206019
CO	19.150895

Pollutant	Total Emissions (TONs)
PM 10	0.526819
PM 2.5	0.473843
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
CH_4	0.039644
N_2O	0.007735

Pollutant	Total Emissions (TONs)
CO_2	942.811474
CO_2e	945.971151

9.2 Aircraft & Engines

9.2.1 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:

9.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Criteria Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Idle	520.00	16.80	1.07	1.08	177.45	4.70	4.23
Approach	689.00	7.96	1.07	0.84	119.23	2.42	2.17
Intermediate	1030.00	2.78	1.07	0.70	65.07	1.79	1.61
Military	2220.00	0.75	1.07	1.92	30.99	1.13	1.01
After Burn	7695.00	6.97	1.07	6.23	53.43	0.25	0.23

- Aircraft & Engine Greenhouse Gasses Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	CH_4	N_2O	CO_2	CO_2e
Idle	520.00	0.13	0.03	3203.44	3214.64
Approach	689.00	0.13	0.03	3203.44	3214.64
Intermediate	1030.00	0.13	0.03	3203.44	3214.64
Military	2220.00	0.13	0.03	3203.44	3214.64
After Burn	7695.00	0.13	0.03	3203.44	3214.64

9.3 Flight Operations

9.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft: 1
Flight Operation Cycle Type: LFP (Low Flight Pattern)
Number of Annual Flight Operation Cycles for all Aircraft: 942
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi [Idle] (mins): 0
Approach [Approach] (mins): 0
Climb Out [Intermediate] (mins): 18.2
Takeoff [Military] (mins): 0
Takeoff [After Burn] (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

9.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for Flight Operation Cycles per Year

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

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
FOC: Number of Flight Operation Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Flight Operation Cycles per Year

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

AE_{FOC}: 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 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)

10. Aircraft

10.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Edwards; Kinney; Real; Uvalde
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Alt 1: Add T-38C (2032) in Laughlin 2A Low MOA only

- Activity Description:
In 2032, T-38C aircraft will conduct 628 sorties in Laughlin 2A Low MOA

- Activity Start Date
Start Month: 1
Start Year: 2032

- Activity End Date
Indefinite: No
End Month: 12
End Year: 2032

- Activity Emissions of Criteria Pollutants:

Pollutant	Total Emissions (TONs)
VOC	0.545459
SO_x	0.209943
NO_x	0.137346
CO	12.767263

Pollutant	Total Emissions (TONs)
PM 10	0.351213
PM 2.5	0.315895
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Total Emissions (TONs)
CH_4	0.026429
N_2O	0.005156

Pollutant	Total Emissions (TONs)
CO_2	628.540983
CO_2e	630.647434

- Activity Emissions of Criteria Pollutants [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
VOC	0.545459
SO_x	0.209943
NO_x	0.137346
CO	12.767263

Pollutant	Total Emissions (TONs)
PM 10	0.351213
PM 2.5	0.315895
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
CH_4	0.026429
N_2O	0.005156

Pollutant	Total Emissions (TONs)
CO_2	628.540983
CO_2e	630.647434

10.2 Aircraft & Engines

10.2.1 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:

10.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Criteria Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Idle	520.00	16.80	1.07	1.08	177.45	4.70	4.23
Approach	689.00	7.96	1.07	0.84	119.23	2.42	2.17

Intermediate	1030.00	2.78	1.07	0.70	65.07	1.79	1.61
Military	2220.00	0.75	1.07	1.92	30.99	1.13	1.01
After Burn	7695.00	6.97	1.07	6.23	53.43	0.25	0.23

- Aircraft & Engine Greenhouse Gasses Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	CH_4	N_2O	CO_2	CO_2e
Idle	520.00	0.13	0.03	3203.44	3214.64
Approach	689.00	0.13	0.03	3203.44	3214.64
Intermediate	1030.00	0.13	0.03	3203.44	3214.64
Military	2220.00	0.13	0.03	3203.44	3214.64
After Burn	7695.00	0.13	0.03	3203.44	3214.64

10.3 Flight Operations

10.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft: 1
Flight Operation Cycle Type: LFP (Low Flight Pattern)
Number of Annual Flight Operation Cycles for all Aircraft: 628
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi [Idle] (mins): 0
Approach [Approach] (mins): 0
Climb Out [Intermediate] (mins): 18.2
Takeoff [Military] (mins): 0
Takeoff [After Burn] (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

10.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for Flight Operation Cycles per Year

AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * FOC / 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

FOC: Number of Flight Operation Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Flight Operation Cycles per Year
$AE_{FOC} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{FOC}: 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 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)

11. Aircraft

11.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Edwards; Kinney; Real; Uvalde
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Alt 1: Add T-38C (2033) in Laughlin 2A Low MOA only

- Activity Description:
In 2033, T-38C aircraft will conduct 314 sorties in Laughlin 2A Low MOA

- Activity Start Date
Start Month: 1
Start Year: 2033

- Activity End Date

Indefinite: No
End Month: 12
End Year: 2033

- Activity Emissions of Criteria Pollutants:

Pollutant	Total Emissions (TONs)
VOC	0.272729
SO_x	0.104971
NO_x	0.068673
CO	6.383632

Pollutant	Total Emissions (TONs)
PM 10	0.175606
PM 2.5	0.157948
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses:

Pollutant	Total Emissions (TONs)
CH_4	0.013215
N_2O	0.002578

Pollutant	Total Emissions (TONs)
CO_2	314.270491
CO_2e	315.323717

- Activity Emissions of Criteria Pollutants [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
VOC	0.272729
SO_x	0.104971
NO_x	0.068673
CO	6.383632

Pollutant	Total Emissions (TONs)
PM 10	0.175606
PM 2.5	0.157948
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gasses [LFP Flight Operations part]:

Pollutant	Total Emissions (TONs)
CH_4	0.013215
N_2O	0.002578

Pollutant	Total Emissions (TONs)
CO_2	314.270491
CO_2e	315.323717

11.2 Aircraft & Engines

11.2.1 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:

11.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Criteria Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5
Idle	520.00	16.80	1.07	1.08	177.45	4.70	4.23
Approach	689.00	7.96	1.07	0.84	119.23	2.42	2.17
Intermediate	1030.00	2.78	1.07	0.70	65.07	1.79	1.61
Military	2220.00	0.75	1.07	1.92	30.99	1.13	1.01
After Burn	7695.00	6.97	1.07	6.23	53.43	0.25	0.23

- Aircraft & Engine Greenhouse Gasses Pollutant Emission Factors (lb/1000lb fuel)

	Fuel Flow	CH_4	N_2O	CO_2	CO_2e
Idle	520.00	0.13	0.03	3203.44	3214.64
Approach	689.00	0.13	0.03	3203.44	3214.64
Intermediate	1030.00	0.13	0.03	3203.44	3214.64
Military	2220.00	0.13	0.03	3203.44	3214.64
After Burn	7695.00	0.13	0.03	3203.44	3214.64

11.3 Flight Operations

11.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft: 1
Flight Operation Cycle Type: LFP (Low Flight Pattern)
Number of Annual Flight Operation Cycles for all Aircraft: 314
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi [Idle] (mins): 0
Approach [Approach] (mins): 0
Climb Out [Intermediate] (mins): 18.2
Takeoff [Military] (mins): 0
Takeoff [After Burn] (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

11.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for Flight Operation Cycles per Year

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

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
FOC: Number of Flight Operation Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Flight Operation Cycles per Year

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

AE_{FOC}: 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 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)

D.5 Biological Resources

D.5.1 Definition of the Resource

Biological resources include flora (plants) and fauna (animals), along with their associated terrestrial and aquatic habitats. Species may include native, non-native/invasive/nuisance, and special status/protected (threatened and endangered) organisms. Federal and state protections are in place for some species, and include the ESA, Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, and other species-specific conservation legal authorities.

Special status species are plant and animal species that are listed as endangered, threatened, candidate, or proposed for listing under the federal ESA. Federal candidate species and species proposed for listing are those organisms that could be federally listed as threatened or endangered in the near term but have no current statutory protection under the ESA. Critical habitat consists of federally designated geographic areas that contain essential features or areas that are essential to conserve federally listed species (USFWS, 2017).

The biological resources ROI consists of lands under and airspace within the proposed MOA where potential effects from the Proposed Action on wildlife and habitat could occur. This ROI

encompasses approximately 976 square miles across portions of Edwards, Kinney, Real, and Uvalde Counties in southwestern Texas. The Proposed Action would occur entirely within airspace above the Earth's surface and would have no potential to affect vegetative or aquatic and marine species (such as fish, amphibians, and marine mammals) or their habitat; therefore, such species and their habitat (except for federally listed species) are not addressed in the EA.

D.5.2 Supplemental Information

Table D.5-1 lists representative wildlife species that are known or have potential to occur in the ROI. Information regarding federally listed, proposed, and candidate species known or having potential to occur in ROI is presented in **Table D.5-2**.

Table D.5-1 Representative Wildlife Species Potentially Occurring in the ROI

Common Name	Scientific Name	Common Name	Scientific Name
Mammals			
big brown bat	*Eptesicus fuscus*	coyote	*Canis latrans*
Brazilian free-tailed bat	*Tadarida brasiliensis*	nine-banded armadillo	*Dasypus novemcinctus*
collared peccary	*Tayassu tajacu*	North American porcupine	*Erethizon dorstum*
common raccoon	*Procyon lotor*	rock squirrel	*Otospermophilus variegatus*
eastern cottontail rabbit	*Sylvilagus floridanus*	white-tailed deer	*Odocoileus virginianus*
eastern red bat	*Lasiurus borealis*	wild boar	*Sus scrofa*
Birds			
American crow	*Corvus brachyrhynchos*	lark bunting	*Calamospiza melanocorys*
barn swallow	*Hirundo rustica*	lark sparrow	*Chondestes grammacus*
Chihuahuan raven	*Corvus cryptoleucus*	purple martin	*Progne subis*
cliff swallow	*Petrochelidon pyrrhonota*	mourning dove	*Zenaida macroura*
Reptiles and Amphibians			
Blanchard's cricket frog	*Acris blanchardi*	gopher snake	*Pituophis catenifer*
checkered garter snake	*Thamnophis marcianus*	Rio Grande leopard frog	*Lithobates berlandieri*
common spotted whiptail	*Aspidoscelis g. gularis*	Texas horned lizard	*Phrynosoma cornutum*
diamondback water snake	*Nerodia r. rhombifer*	Texas spiny lizard	*Sceloporus olivaceus*

Table D.5-2 Federally Listed, Proposed, and Candidate Species Known or Having Potential to Occur in ROI

Common and Scientific Name	Federal Status	Critical Habitat Present in the ROI?	Description
Mammals			
tricolored bat *Perimyotis subflavus*	Endangered (Proposed)	No	During the spring, summer, and fall, tricolored bats are found in forested habitats where they roost in trees, primarily among leaves. During the winter, tricolored bats hibernate in caves and mines. Where caves are infrequent, tricolored bats often hibernate in culverts, tree cavities, and abandoned wells. Tricolored bats emerge early in the evening and forage at treetop level or above but may forage closer to ground later in the evening. This and other bat species may migrate and forage at elevations which put them at risk of collisions with aircraft operating at low altitudes.
Birds			
golden-cheeked warbler *Setophaga chrysoparia*	Endangered	No	This species nests only in the Texas Hill Country (Edwards Plateau). Golden-cheeked warblers are generally found in mature juniper oak woodlands, and use bark from ashe juniper trees as nest material (Texas Parks and Wildlife Department [TPWD], 2025). Since this species forages within vegetation close to the ground surface and migrates at night, no impacts from proposed daytime aircraft operations above 500 feet AGL would be anticipated. Additionally, the Proposed Action does not include any tree clearing or impacts on terrestrial habitat used by this species.
Amphibians			
San Marcos salamander *Eurycea nana*	Threatened	No	This aquatic species is only known to occur in Spring Lake and the San Marcos River in Hays County, approximately 88 miles northeast of the ROI (TPWD, 2025). Because this species' habitat is well outside the ROI and the Proposed Action would have no impacts on surface water features or associated aquatic habitat, no effects on this species would be expected.
Texas blind salamander *Eurycea rathbuni*	Endangered	No	This cave-dwelling aquatic species is only known to occur in caves and pools along the San Marcos Fault and in Purgatory Creek in Hays County, approximately 101 miles east-northeast of the ROI. However, it may also inhabit deep interconnected Karst cave systems nearby that are largely inaccessible to researchers (TPWD, 2025). Because this species' habitat is well outside the ROI and the Proposed Action would have no impacts on surface water features or associated aquatic habitat, no effects on this species would be expected.

Table D.5-2 Federally Listed, Proposed, and Candidate Species Known or Having Potential to Occur in ROI

Common and Scientific Name	Federal Status	Critical Habitat Present in the ROI?	Description
Fishes			
fountain darter *Etheostoma fonticola*	Endangered	No	This species of darter has only been observed in the headwaters of the Comal River and San Marcos River, located 90 miles and 104 miles east of the ROI, respectively (TPWD, 2025). Because this species' habitat is well outside the ROI and the Proposed Action would have no impacts on surface water features or associated aquatic habitat, no effects on this species would be expected.
Insects			
Comal Springs dryopid beetle *Stygoparnus comalensis*	Endangered	No	Comal Springs dryopid beetles have only been observed in Comal Springs (Comal County) and Fern Bank Springs (Hays County) (TPWD, 2025). These springs are located approximately 60 miles and 65 miles east of the ROI, respectively. This aquatic species (a monotypic genus) is blind and flightless, though it has vestigial eyes and wings (TPWD, 2025). Due to the inaccessibility of its flooded Karst cave habitat, little is known about its life cycle. Because this species' habitat is well outside the ROI and the Proposed Action would have no impacts on surface water features or associated aquatic habitat, no effects on this species would be expected.
Comal Springs riffle beetle *Heterelmis comalensis*	Endangered	No	This aquatic beetle species has only been observed in Comal Springs (Comal County) and San Marcos Springs (Hays County) (TPWD, 2025). These springs are located approximately 60 miles and 104 miles east of the ROI, respectively. Because this species' habitat is well outside the ROI and the Proposed Action would have no impacts on surface water features or associated aquatic habitat, no effects on this species would be expected.
monarch butterfly *Danaus plexippus*	Threatened (Proposed)	No	Monarchs lay their eggs on their obligate milkweed host plant (primarily *Asclepias* spp.), and larvae emerge after 2 to 5 days. Monarchs breed year-round in many regions. Individual monarchs in temperate climates undergo long-distance migration and live for an extended period. Monarchs that migrate south return to their breeding grounds restarting the cycle of generational migration.

Table D.5-2 Federally Listed, Proposed, and Candidate Species Known or Having Potential to Occur in ROI

Common and Scientific Name	Federal Status	Critical Habitat Present in the ROI?	Description
Crustaceans			
Peck's cave amphipod *Stygobromus pecki*	Endangered	No	This cave-dwelling aquatic crustacean species has only been observed in the following 4 southwestern Texas cavern systems: Comal Springs, Panther Canyon, Landa Park, and Hueco Springs (TPWD, 2025). Peck's cave amphipods are omnivorous scavengers, rarely leave flooded caverns, and have coloration that varies according to diet. Because this species' habitat is well outside the ROI and the Proposed Action would have no impacts on surface or ground water features or associated aquatic habitat, no effects on this species would be expected.
Flowering Plants			
Bracted twistflower *Streptanthus bracteatus*	Threatened	Yes	This rare annual wildflower is found along the southern margin of the Edwards Plateau. Though extents have been reduced due to land development and wildlife/livestock browsing, populations in protected areas remain stable (TPWD, 2025). Proposed aircraft operations occurring entirely in airspace above the Earth's surface would be unlikely to affect this species. Critical habitat has been designated in Uvalde, Medina, Bexar, and Travis Counties. Nine critical habitat areas have been established at locations currently being managed for bracted twistflower, including 345 acres of Garner State Park, 714 acres of City of Austin parkland, 513 acres of City of San Antonio parkland, and 23 acres of private conservation land (USFWS, 2023). The southernmost 60% of the ROI extends over approximately 590 square miles of Uvalde County, and includes Garner State Park. However, proposed aircraft operations occurring entirely in airspace above the Earth's surface would be unlikely to affect this critical habitat or listed species.
Texas snowbells *Styrax platanifolius*	Endangered	No	This deciduous shrub is found in the Nueces River Basin and Devils River Basin of Edwards, Kinney, Real, and Val Verde Counties (and has been introduced in Uvalde County). This species is typically found on limestone cliffs, slopes, and gravel streambeds (TPWD, 2025). The major threat to Texas snowbells is overgrazing, with individual plants now mainly found on inaccessible cliff faces. Proposed aircraft operations occurring entirely in airspace above the Earth's surface would be unlikely to affect this species.

Table D.5-2 Federally Listed, Proposed, and Candidate Species Known or Having Potential to Occur in ROI

Common and Scientific Name	Federal Status	Critical Habitat Present in the ROI?	Description
Flowering Plants ***(cont'd)***			
Texas wild-rice *Zizania texana*	Endangered	No	Texas wild-rice has only been observed in the upper 2 miles of the San Marcos River in Hays County, approximately 104 miles east of outside the ROI (TPWD, 2025). Because this species occurs well outside the ROI and no vegetation disturbance or other ground-disturbing activity would occur, effects on this species from the Proposed Action would not be anticipated.
Tobusch fishhook cactus *Sclerocactus brevihamatus*	Threatened	No	This perennial succulent species is most commonly found in shallow soils over limestone bedrock in grassy or rocky openings in oak-juniper or pinyon pine-oak woodlands. The main threats to this species are cactus weevils (*Gerstaeckeria spp.*) and longhorn beetles (*Moneilema spp.*) (TPWD, 2025). Because no vegetation disturbance or other ground-disturbing activity would occur, effects on this species from the Proposed Action would not be anticipated.

Sources: USFWS, 2023; 2025 and TPWD, 2025

D.5.3 References

TPWD. 2025. Texas Parks and Wildlife Department – Listed Species Profiles. https://tpwd.texas.gov/huntwild/wild/wildlife_diversity/nongame/listed-species/plants/. Accessed May 15, 2025.

USFWS. 2017. ESA Basics - 40 Years of Conserving Endangered Species. https://www.fws.gov/sites/default/files/documents/endangered-species-act-basics.pdf. Accessed May 14, 2025.

USFWS. 2023. U.S. Fish and Wildlife Service - Bracted Twistflower Species Summary. https://www.fws.gov/press-release/2023-04/bracted-twistflower-listed-threatened-under-endangered-species-act. Accessed May 15, 2025.

D.6 Cultural Resources

D.6.1 Definition of the Resource

Cultural resources include archaeological and architectural sites that provide essential information to understand the prehistory and historical development of the United States. The primary federal law protecting cultural resources is the National Historic Preservation Act (NHPA) of 1966. Under Section 106 of the NHPA, federal agencies must consider the effects of their proposed actions (or undertakings) on any historic property, defined as any district, site, building, structure, or object that is listed or eligible for listing in the National Register of Historic Places (NRHP). To the extent

possible, adverse effects on historic properties must be avoided, minimized, or mitigated in consultation with the SHPO and other consulting parties, as appropriate. The Texas Historical Commission is the SHPO for Texas.

Generally, if under Section 106 an action would have an adverse effect on a historic property listed in or eligible for listing in the NRHP, the action would also have an adverse impact under NEPA. An adverse effect that is mitigated in consultation with the SHPO and other parties, as appropriate, can generally be considered a non-significant impact under NEPA.

The Proposed Action is considered an undertaking for the purposes of Section 106. The APE for this undertaking consists of lands underlying or intersected by the boundaries of the proposed MOA (see **Figure 2.2-1** in the EA). In April 2025, the DAF initiated consultation for the proposed undertaking with the Texas SHPO in accordance with Section 106 and requested concurrence with the APE. Section 106 correspondence is provided in **Appendix A.5**.

Properties of traditional religious and cultural importance, also referred to as traditional cultural places (formerly traditional cultural properties) are places eligible for inclusion in the NRHP because of their association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community (NPS, 2024a). E.O. 13007, Indian Sacred Sites, defines Indian sacred sites as "specific, discrete, narrowly delineated locations on Federal land that are identified by an Indian tribe…as sacred by virtue of their established religious significance to, or ceremonial use by, an Indian religion." Indian sacred sites are strictly religious places and can be recent in age, in contrast with traditional cultural places which can be secular and must meet stricter NRHP eligibility criteria (ACHP, 2018). An Indian sacred site can be a traditional cultural place, but not all traditional cultural places are sacred sites. Indian sacred sites are considered under the NEPA process as part of the human environment.

Under the Native American Graves Protection and Repatriation Act, federal agencies are required to plan for and protect Native American human remains or cultural items that may be removed from federal lands and return such remains or items to lineal descendants or tribes (NPS, 2024b). DoD Instruction 4710.2, *DoD Interactions with Federally Recognized Tribes* (September 24, 2018) establishes policy, assigns responsibilities, and provides procedures for DoD interactions with federally recognized Native American tribes. The *2021 DoD Plan of Action on Tribal Consultation* (May 2021) outlines the DoD's commitment to improving implementation of E.O. 13175, Consultation and Coordination With Indian Tribal Governments.

The DAF has initiated government-to-government consultation with Native American tribes having historic, cultural, and religious ties to lands underlying the proposed airspace. Government-to-government correspondence is included in **Appendix A.5**.

The Proposed Action would occur entirely within airspace above the Earth's surface and does not include construction, demolition, or other ground-disturbing activities. Therefore, archaeological sites and architectural resources not formally listed or determined eligible for listing in the NRHP,

of significance at the state level, or identified as traditional cultural properties are not addressed in this EA.

D.6.2 References

ACHP. 2018. Advisory Council on Historic Preservation. The Relationship Between Executive Order 13007 Regarding Indian Sacred Sites and Section 106. https://www.achp.gov/digital-library-section-106-landing/relationship-between-executive-order-13007-regarding-indian. Accessed February 2025.

NPS. 2024a. National Park Service. National Register Bulletin: Identifying, Evaluating, and Documenting Traditional Cultural Places. https://irma.nps.gov/DataStore/DownloadFile/713282. Accessed November 2024.

NPS. 2024b. Native American Graves Protection and Repatriation Act. https://www.nps.gov/subjects/nagpra/index.htm. Accessed November 2024.

D.7 Safety

D.7.1 Definition of the Resource

Safe, effective, and disciplined flying training operations are a critical priority of the DAF. Safety concerns associated with MOA 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 the Laughlin Airspace Complex and primarily the Laughlin 1, 2, and 3 MOAs and ATCAA.

The primary aspect of flight safety addressed in this section is the potential for aircraft accidents. Such accidents could include mid-air collisions involving two or more aircraft, collisions with terrain or manmade structures, collisions with birds or other wildlife, weather-related accidents, mechanical failure, or pilot error. Flight risks apply to civilian and military aircraft. Analysis of flight risks correlates mishap rates and bird/wildlife aircraft strike hazard (BASH) considerations with airspace utilization.

The ROI for safety consists of airspace in and under portions of the existing Laughlin 1, 2, and 3 MOAs and ATCAA, including airspace above 500 feet AGL where the proposed low-altitude MOA would be established under the Proposed Action. The Proposed Action does not involve changes to and would have no impacts on ground safety, which pertains to the safety of personnel and facilities supporting flight operations at installations; therefore, ground safety is not addressed further.

D.7.2 Supplemental Information

Table D.7-1 defines mishap classes discussed in **Section 3.8.1.2** of the EA.

Table D.7-1 Aircraft Mishap Classes and Criteria

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 $600,000 or more but less than $2,500,000. 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; events requiring mandatory reporting are listed in discipline-specific safety manuals.

Notes:
[1] Mishap criteria defined as resulting in one or more item listed by Class.
Source: DAF, 2024c

D.7.3 References

DAF. 2024c. Department of the Air Force Manual 91-224, Ground Safety Investigations and Reports.

D.8 Socioeconomics

D.8.1 Definition of the Resource

Socioeconomic resources addressed in the EA include regional demographics and economic activity. Demographics include the number, distribution, and composition of population and households. Economic activity is represented by the region's major industries, employment, and income characteristics. Socioeconomic data are presented in the EA at the county level. State-level data are provided for comparison.

E.O. 13045, Protection of Children From Environmental Health Risks and Safety Risks (April 21, 1997) 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 and safety risks."

The socioeconomics ROI consists of Edwards, Kinney, Real, and Uvalde Counties, Texas, which are crossed by the boundaries of the proposed MOA **(Figure 2.2-1)**.

D.9 Visual Resources

D.9.1 Definition of the Resource

The assessment of visual effects broadly addresses the extent to which a proposed action would either 1) produce light emissions that create annoyance or interfere with activities or 2) contrast with, or detract from, the visual resources and/or the visual character of the existing environment. Light emissions are defined as "any light that emanates from a light source into the surrounding environment." Visual resources include buildings, sites, traditional cultural properties, and other natural or manmade landscape features that are visually important or have unique characteristics. Visual resources may include structures or objects that obscure or block other landscape features. In addition, visual resources can include the cohesive collection of various individual visual resources that can be viewed at once or in concert from the area surrounding the site of the proposed action or alternative(s). In some circumstances, the nighttime sky may be considered a visual resource.

Visual character refers to the overall visual makeup of the existing environment where a proposed action would occur. For example, areas near densely populated areas generally have a visual character that could be defined as urban, whereas less developed areas could have a visual character defined by the surrounding landscape features, such as open grass fields, forests, mountains, or deserts. The assessment of visual effects involves subjectivity (FAA, 2023b). For simplicity, the term "visual resources" is used to refer to both visual resources and visual character in the EA analysis and is inclusive of both of those terms as described above.

Potential effects on visual resources are evaluated in the EA in accordance with FAA Order JO 1050.1. The visual resources ROI consists of airspace within, above, and below the proposed Laughlin 2A Low MOA; lands directly below the proposed MOA in portions of Edwards, Kinney, Real, and Uvalde Counties; and adjacent lands where viewers may observe aircraft activity within the proposed MOA. Light emissions are not considered in this analysis because no nighttime aircraft operations are included in the Proposed Action, nor does the Proposed Action include any other activities that would have the potential to temporarily or permanently emit light during nighttime hours in the ROI.

D.9.2 References

FAA. 2023b. 1050.1 Desk Reference. Version 3. https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref.

This page intentionally left blank.

APPENDIX E
USFWS Official Species List

This page intentionally left blank.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Austin Ecological Services Field Office
1505 Ferguson Lane
Austin, TX 78754-4501
Phone: (512) 937-7371

In Reply Refer To: 08/20/2025 16:09:34 UTC
Project Code: 2025-0097054
Project Name: Laughlin 2A Low MOA

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

To Whom It May Concern:

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

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

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

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

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

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

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

It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/library/collections/threats-birds.

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

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

Attachment(s):

- Official Species List

OFFICIAL SPECIES LIST

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

This species list is provided by:

Austin Ecological Services Field Office
1505 Ferguson Lane
Austin, TX 78754-4501
(512) 937-7371

PROJECT SUMMARY

Project Code: 2025-0097054
Project Name: Laughlin 2A Low MOA
Project Type: Military Operations
Project Description: Proposed Laughlin AFB 2A Low Military Operating Area (MOA), extending from 500 feet AGL to 7,000 ft AMSL, for fighter bomber fundamentals (FBF) training.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@29.5957412,-99.89788362348696,14z

Counties: Texas

ENDANGERED SPECIES ACT SPECIES

There is a total of 15 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 3 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

BIRDS

NAME	STATUS
Golden-cheeked Warbler *Setophaga chrysoparia* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/33	Endangered
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Rufa Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. This species only needs to be considered under the following conditions: ▪ Wind Energy Projects Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened

AMPHIBIANS

NAME	STATUS
San Marcos Salamander *Eurycea nana* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6374	Threatened
Texas Blind Salamander *Eurycea rathbuni* No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ Effects to water quality and quantity in the Edwards Aquifer and to surface waters in the recharge and contributing zones of the Edwards Aquifer must be considered if they adversely affect water quality and quantity in Texas blind salamander habitat Species profile: https://ecos.fws.gov/ecp/species/5130	Endangered

FISHES

NAME	STATUS
Fountain Darter *Etheostoma fonticola* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5858	Endangered

INSECTS

NAME	STATUS
Comal Springs Dryopid Beetle *Stygoparnus comalensis* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7175	Endangered
Comal Springs Riffle Beetle *Heterelmis comalensis* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3403	Endangered
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

CRUSTACEANS

NAME	STATUS
Peck's Cave Amphipod *Stygobromus (=Stygonectes) pecki* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8575	Endangered

FLOWERING PLANTS

NAME	STATUS
Bracted Twistflower *Streptanthus bracteatus* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2856	Threatened
Texas Snowbells *Styrax platanifolius ssp. texanus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5214	Endangered
Texas Wild-rice *Zizania texana* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/805	Endangered
Tobusch Fishhook Cactus *Sclerocactus brevihamatus ssp. tobuschii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2221	Threatened

CRITICAL HABITATS

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Bracted Twistflower *Streptanthus bracteatus* https://ecos.fws.gov/ecp/species/2856#crithab	Final

IPAC USER CONTACT INFORMATION

Agency:	Air Force
Name:	Ben Leatherland, Versar
Address:	1025 Vermont
Address Line 2:	Suite 500
City:	Washington
State:	DC
Zip:	20005
Email	ben.leatherland@versar.com
Phone:	5402406868

APPENDIX F
Glossary of Environmental Laws and Regulations

This page intentionally left blank.

F.1 Glossary of Environmental Laws and Regulations

Laws, regulations, and other requirements applicable to the Proposed Action are summarized in **Table F.1-1**.

Table F.1-1 Laws, Regulations, and Other Requirements Applicable to the Proposed Action

Title	Summary Description
49 U.S.C. § 40103, Sovereignty and use of airspace and Public Law No. 103-272	Establishes exclusive sovereignty of the U.S. government over the nation's airspace.
Air Force Manual 32-7003, Environmental Conservation	Implements Air Force Policy Directive 32-70, *Environmental Considerations in Air Force Programs and Activities*, and supports DAF Instruction 32-7001, Environmental Management. It provides guidance and procedures for cultural resources and natural resources programs at DAF installations.
Bald and Golden Eagle Protection Act (BGEPA) (16 U. S.C. §§ 668-668d)	Prohibits anyone, without a permit issued by the Secretary of the Interior, from taking eagles, including their parts, nests, or eggs. The BGEPA defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb. "Disturb" means "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, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior".
DAF Instruction 90-2002, Interactions with Federally Recognized Tribes	Establishes the DAF's responsibility to consult in good faith with federally recognized tribes who have a documented interest in DAF lands and activities, even though the tribe may not be geographically located near the installation or its airspace, regarding a proposed action's potential to affect properties of cultural, historical, or religious significance to the tribes.
DAF Instruction 91-202, The DAF Mishap Prevention Program	Requires each DAF flying unit to develop a bird/wildlife aircraft strike hazard (BASH) plan to reduce hazardous bird/wildlife activity relative to airfield flight operations.
DoD Instruction 4710.2, DoD Interactions with Federally Recognized Tribes	Establishes policy, assigns responsibilities, and provides procedures for DoD interactions with federally recognized Native American tribes.
DoD Plan of Action on Tribal Consultation	Outlines the DoD's commitment to improving implementation of E.O. 13175, Consultation and Coordination With Indian Tribal Governments.

Table F.1-1 Laws, Regulations, and Other Requirements Applicable to the Proposed Action

Title	Summary Description
Endangered Species Act (ESA) (16 U.S.C. § 21 1531 et seq.)	Establishes protections for species listed as threatened and endangered and the ecosystems upon which those species depend. Endangered species are those in danger of extinction throughout all, or a large portion, of their range (16 U.S.C. § 1536). Threatened species are those likely to be listed as endangered in the foreseeable future. Section 7 of the ESA prohibits any federal agency from engaging in any action that is likely to jeopardize the continued existence of listed endangered or threatened species or that destroys or adversely affects the critical habitat of such species. 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."
Ike Skelton National Defense Authorization Act for FY11 (Public Law 111-383) (10 U.S.C. § 183a)	Established the DoD Siting Clearinghouse to provide a timely, transparent, and repeatable process that can evaluate potential impacts and explore mitigation options, while preserving the DoD mission through collaboration with internal and external stakeholders.
Intergovernmental Cooperation Act of 1968 (42 U.S.C. § 4231[a]) and E.O. 12372, Intergovernmental Review of Federal Programs (as amended by E.O. 12416)	Require federal agencies to cooperate with and consider state and local views in implementing a federal proposal.
Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712)	Makes it illegal for anyone, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, [or] possess migratory birds or their nests or eggs at any time, unless permitted by regulation.
E.O. 13007, Indian Sacred Sites	Defines Indian sacred sites as "specific, discrete, narrowly delineated locations on Federal land that are identified by an Indian tribe…as sacred by virtue of their established religious significance to, or ceremonial use by, an Indian religion."
E.O. 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 and safety risks."
E.O. 13175, Consultation and Coordination With Indian Tribal Governments	Requires federal agencies to have an accountable process to ensure meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications.
E.O. 13186, Responsibilities of Federal Agencies to Protect Migratory Birds	Directs federal agencies taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement a Memorandum of Understanding with the USFWS that promotes the conservation of migratory bird populations.

Table F.1-1 Laws, Regulations, and Other Requirements Applicable to the Proposed Action

Title	Summary Description
FAA Order 1050.1, Environmental Impacts: Policies and Procedures	Integrates NEPA into FAA's decision-making processes. Specifically, the procedures describe the process by which FAA determines, based on its statutory authorities and Congressional statements of purpose and policy, e.g. safety, efficiency, and minimizing effects of aviation activity on people and the environment, what actions are subject to NEPA's procedural requirements and the applicable level of NEPA review.
FAA Order JO 7400.2, Procedures for Handling Airspace Matters	Prescribes policy, criteria, guidelines, and procedures applicable to the System Operations Services; Mission Support Services; Aeronautical Information Services; Technical Operations Services; Technical Operations Spectrum Engineering Services Group/Spectrum Assignment and Engineering Team; Technical Operations Technical Services; the Office of Airport Planning and Programming; the Office of Airport Safety and Standards; Airports District Office; and the Flight Standards Service.
FAA Order JO 7400.10, Special Use Airspace	Published annually to add all amendments to special use airspace, as well as issued but not yet implemented amendments as published by the FAA as final rules in the Federal Register and the National Flight Data Digest.
FAA Order JO 7400.11, Airspace Designations and Reporting Points	Adds all amendments to the listings of Class A, B, C, D, and E airspace areas; air traffic service routes; and reporting points as published by the FAA as final rules in the Federal Register.
FAA Order JO 7610.14, Non-Sensitive Procedures and Requirements for Special Operations	Establishes non-sensitive procedures and requirements for air traffic control (ATC) planning and coordination; and operational execution of ATC-related services supporting special operations while mitigating collateral safety and efficiency effects on the National Airspace System. The procedures and requirements contained in this Order are applicable to the DoD, including National Guard; Department of Homeland Security; and other government agencies that conduct special operations for national defense, homeland security, intelligence, and emergency operations purposes.
National Environmental Policy Act (NEPA) of 1969 (42 U.S. Code [U.S.C.] §§ 4321 - 4347, as amended)	Requires federal agencies to consider the potential environmental consequences of their proposed actions. The law's intent is to protect, restore, or enhance the environment through well-informed federal decisions.
National Historic Preservation Act (NHPA) of 1966 (54 U.S.C. 300101 et seq.)	Established the National Register of Historic Places (NRHP) and outlines procedures for managing cultural resources on federal property. The NHPA requires federal agencies to consider the potential impacts of federal undertakings on historic properties that are listed, nominated to, or eligible for listing in the NRHP; designated as a National Historic Landmark; or valued by modern American Indians for maintaining their traditional culture. Section 106 of the NHPA requires federal agencies to consult with State Historic Preservation Officers, and others, if their undertakings have the potential to adversely affect historic properties and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings.

Table F.1-1 Laws, Regulations, and Other Requirements Applicable to the Proposed Action

Title	Summary Description
Native American Graves Protection and Repatriation Act	Requires federal agencies to plan for and protect Native American human remains or cultural items that may be removed from federal lands and return such remains or items to lineal descendants or tribes.

APPENDIX G
List of Preparers and Contributors

This page intentionally left blank.

G.1 List of Preparers and Contributors

The following individuals assisted in the preparation of this Environmental Assessment:

Table G.1-1 List of Preparers and Contributors

Consultants – Versar, Inc.

Name	Education	EA Role	Years of Experience
Christopher Bowen	MA, Archaeology and Heritage	Cultural Resources	33
Craig Carver	Master of Urban and Regional Planning	NEPA Planner	15
Rahul Chettri	MS, Environmental Studies	Air Quality	42
Kenneth Erwin	MS, Natural Resources	Biological Resources	11
Benjamin Leatherland	MA, Geography / Environmental Planning	Biological Resources	29
Radhika Narayanan	MS, Environmental Science	Air Quality	29
Alex Noble	BS, Environmental Science; BA, Biological Sciences	Visual Resources	3
Angela Northrop	BS, Marketing	Technical Editing	27
Travis Smith	BA, Geography	GIS/Cartography	29
Christa Stumpf	MS, Forest Resources and Land Use Planning	Senior Technical Review: Project Manager	30

Consultants – QRI

Name	Education	EA Role	Years of Experience
Tim Hall	Ph.D., Science and Public Policy	Socioeconomics, Cumulative Projects	45
Patricia Johnson	BS, Bioenvironmental Science	Land Use	7

Consultants – KBR

Name	Education	EA Role	Years of Experience
Kevin Bradley	MS, Aerospace Engineering	Airspace, Noise, and Safety	30

This page intentionally left blank.