DRAFT
ENVIRONMENTAL ASSESSMENT
FOR
SLOW ROUTE TRAINING AIRSPACE, NORTH TEXAS

Prepared for:
Department of the Air Force

January 2024

Privacy Advisory

This Environmental Assessment (EA) is provided for public comment in accordance with the National Environmental Policy Act of 1969 (NEPA), the President's Council on Environmental Quality (CEQ) NEPA Regulations (40 Code of Federal Regulations [CFR] Parts 1500 - 1508), and 32 CFR Part 989, *Environmental Impact Analysis Process (EIAP)*. This EA was prepared in accordance with the updated September 2020 CEQ NEPA rules (85 *Federal Register* 43304 through 43376), as modified by the *CEQ NEPA Implementing Regulations Revisions Final Rule*, effective 20 May 2022. The EIAP provides an opportunity for public input on Department of the Air Force (DAF) decision-making, allows the public to offer inputs on alternative ways for the DAF to accomplish what it is proposing, and solicits comments on the DAF's analysis of environmental effects.

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 Personal home addresses and phone numbers will not be published in the EA.

Compliance with Section 508 of the Rehabilitation Act

This document complies with Section 508 of the Rehabilitation Act. This compliance allows assistive technology to be used to obtain the available information from the document. Due to the nature of graphics, figures, tables, and images in the document, accessibility is limited to a descriptive title for each item.

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

COVER SHEET
ENVIRONMENTAL ASSESSMENT FOR SLOW ROUTE TRAINING AIRSPACE, NORTH TEXAS

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

b. *Cooperating Agency:* None

c. *Proposals and Actions:* This environmental assessment (EA) analyzes the Proposed Action to use two existing Slow Route (SR) training airspaces, SR-236 and SR-242, to support routine slow-speed and low-altitude pilot training syllabi requirements established by the Air Force Air Education and Training Command (AETC). The Proposed Action would primarily support slow-speed and low-altitude training syllabi requirements for military undergraduate student pilots flying T-6A *Texan* II aircraft from Sheppard Air Force Base (AFB) and Laughlin AFB, Texas. The Proposed Action would also allow limited use of SR-236 and SR-242 by transient C-130 aircraft from other Department of Defense (DoD) installations to support applicable pilot training requirements.

d. *For Additional Information:* Major Levi Davis, Air Force Civil Engineer Center, NEPA Division, in care of Mr. Benjamin Faske at benjamin.faske@us.af.mil.

e. *Report Designation:* Draft Environmental Assessment (EA)

f. *Abstract:* This EA has been prepared pursuant to provisions of the National Environmental Policy Act (NEPA) (Title 42 United States Code §§ 4321-4347), Council on Environmental Quality regulations implementing NEPA (Title 40 Code of Federal Regulations [CFR] Parts 1500 - 1508), and the DAF Environmental Impact Analysis Process (32 CFR Part 989).

The purpose of the Proposed Action is to use existing SRs to support slow-speed and low-altitude military undergraduate pilot training syllabi requirements established by AETC. The Proposed Action is needed to balance operational activity and alleviate demand on other SRs currently operated by Sheppard AFB and Laughlin AFB, which do not provide optimal training requirements because they are constrained by high operational volume, conflicts with other civilian and military aviation traffic and underlying land uses, limited operating hours, vulnerability to unfavorable weather conditions, and other factors.

Under the Proposed Action, T-6 aircraft from Sheppard AFB and Laughlin AFB would fly 440 annual sorties in SR-236 and 240 annual sorties in SR-242. C-130 aircraft from other DoD installations would fly 10 annual sorties in both SRs. T-6 sorties would occur anytime between 7:00 a.m. and 10:00 p.m. local time. C-130 sorties would primarily occur between 10:00 p.m. and 7:00 a.m. with fewer sorties occurring between 7:00 a.m. and 10:00 p.m., local time. Flight operations in both SRs would occur 7 days a week. The Proposed Action does not involve demolition, construction, or other ground-disturbing activities at any DoD installation or on lands underlying SR-236 and SR-242; changes to the number of personnel or to the number or types of aircraft assigned to any DoD installation; or changes to the existing boundaries of any DoD installation.

Based on the analysis of the affected environment and potential environmental consequences presented in the Draft EA, the Proposed Action would have no significant impacts on environmental resources in or under SR-236 and SR-242.

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PROPOSED FINDING OF NO SIGNIFICANT IMPACT (FONSI)
SLOW ROUTE TRAINING AIRSPACE, NORTH TEXAS

Pursuant to provisions of the National Environmental Policy Act (NEPA) (42 United States Code §§ 4321-4347); Council on Environmental Quality (CEQ) NEPA regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508); and the Department of the Air Force (DAF) Environmental Impact Analysis Process (EIAP) (32 CFR Part 989), the DAF has prepared the attached Environmental Assessment (EA) to evaluate the potential environmental consequences from the Proposed Action to use two existing Slow Route (SR) training airspaces, SR-236 and SR-242, to support routine slow-speed and low-altitude pilot training syllabi requirements established by the Air Force Air Education and Training Command (AETC). SR-236 and SR-242 are in north-central Texas near Dyess Air Force Base (AFB) and the city of Abilene, approximately 150 miles west-southwest of Fort Worth. The attached EA is incorporated by reference in this proposed Finding of No Significant Impact (FONSI).

Purpose and Need

The purpose of the Proposed Action is to use existing SRs to support slow-speed and low-altitude military undergraduate pilot training syllabi requirements established by AETC. The Proposed Action is needed to balance operational activity and alleviate demand on other SRs currently operated by Sheppard AFB and Laughlin AFB, which do not provide optimal training requirements because they are constrained by high operational volume, conflicts with other civilian and military aviation traffic and underlying land uses, limited operating hours, vulnerability to unfavorable weather conditions, and other factors. The Proposed Action would reinforce pilot training and readiness by using SR-236 and SR-242 in support of the T-6 program.

Description of Proposed Action and Alternatives

Under the Proposed Action, pilots flying T-6 aircraft from Sheppard AFB would fly 440 annual sorties in SR-236 and pilots from Laughlin AFB would fly 240 annual sorties in SR-242. C-130 pilots from other Department of Defense (DoD) installations would fly 10 annual sorties in both SRs. T-6 sorties would occur between 7:00 a.m. and 10:00 p.m. local time. The majority of C-130 sorties would occur between 10:00 p.m. and 7:00 a.m. with fewer sorties occurring between 7:00 a.m. and 10:00 p.m. Sorties would occur in both SRs 7 days a week. The minimum permitted altitude in both SRs would be 300 feet above ground level (AGL). The actual number of annual aircraft operations occurring in the SRs would be subject to training requirements, weather conditions, pilot and aircraft availability, and other factors but would not exceed the annual totals described above.

Sheppard AFB personnel would schedule and coordinate aircraft operations in SR-236 and Laughlin AFB personnel would schedule and coordinate aircraft operations in SR-242, in accordance with procedures specified in the most current edition of DoD Flight Information Publication AP/1B, *Area Planning, Military Training Routes, North and South America*. Personnel at the originating C-130 installation would schedule the airspace as needed through coordination with Sheppard AFB (for SR-236) and Laughlin AFB (for SR-242) personnel in accordance with AP/1B. As needed, DAF Air Traffic Control (ATC) would coordinate with local/civilian ATC for proposed operations on SR-236 and SR-242.

The Proposed Action does not involve demolition, construction, or other ground-disturbing activities at Sheppard, Laughlin, or Dyess AFBs or on lands underlying SR-236 and SR-242; changes to the number of personnel or to the number or types of aircraft assigned to those installations; or changes to the existing boundaries of those installations. Although flight simulators are used to the extent practicable during pilot training, they ultimately do not provide a fully realistic training experience and cannot replace real-world, in-flight training. Therefore, the use of flight simulators as part of the Proposed Action is not addressed in the EA.

Alternative 1: Use Existing SR-242 and Modify SR-236

Under this alternative, the DAF would use portions of the existing SR-236 footprint but would modify the western and southern segments of the airspace to avoid encroachment from wind turbines and other development that did not exist when SR-236 was originally established in the 1990s. The modified SR-236 airspace would also help to deconflict proposed aircraft operations occurring in SR-236 with those currently occurring in Military Training Routes (MTRs) managed by Sheppard AFB, including Visual Route (VR) 159 and VR-1143. SR-242 would be used in its existing configuration and no changes to that airspace would occur.

Alternative 2: Adjust SR-236 Access Points and Use Existing SR-242

This alternative would modify aircraft entry and exit points for SR-236 to allow for more efficient operations for training aircraft flying in and out of Sheppard AFB. An existing waypoint along the route would be redesignated as the aircraft entry point and subsequent waypoints would be redesignated alphabetically. The latitude and longitude of the redesignated waypoints would not change. Aircraft would exit at a new waypoint designated within the existing boundaries of the SR. No changes to the lateral and vertical extents of SR-236 would be required. SR-242 would be used in its existing configuration and no changes to that airspace would occur.

No Action Alternative

Under the No Action Alternative, SR-236 and SR-242 would remain temporarily closed and would not be used by military undergraduate student pilots from Sheppard AFB and Laughlin AFB or transient C-130 pilots to meet slow-speed and low-altitude training requirements. The No Action Alternative does not meet the purpose and need but is carried forward for detailed analysis in accordance with CEQ NEPA regulations at 40 CFR Parts 1500 - 1508 and 32 CFR Part 989. 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.

Summary of Findings

The summary of findings presented below is based on the detailed analysis provided in the attached EA. Unless otherwise noted, potential impacts from Alternative 1 and Alternative 2 would be the same; these alternatives are collectively referred to as the Proposed Action. Throughout this proposed FONSI and the attached EA, the terms “impacts” and “effects” are used interchangeably and mean the same thing.

Airspace

The Proposed Action would have no or negligible long-term impacts on airspace, including any adjacent military training airspace or other local civil or military operations. Proposed flight operations in SR-236 and SR-242 would have no potential to encroach on or disrupt aviation operations in adjacent or nearby airspace, nor would they reduce the capacity of or require changes to the vertical or lateral extents of such airspace. Pilots operating in SR-236 and SR-242 would avoid obstructions and avoidance areas in accordance with applicable DAF procedures and requirements. Potential impacts on airspace from the Proposed Action would not be significant.

Air Quality, Greenhouse Gases, and Climate Change

The Proposed Action would have negligible effects on air quality, greenhouse gases (GHGs), and climate change. Emissions of criteria pollutants from the Proposed Action would remain well below National Ambient Air Quality Standards (NAAQS) *de minimis* thresholds and would not affect the attainment status of the three US Environmental Protection Agency (USEPA) Air Quality Control Regions that contain the Texas counties that would be crossed by SR-236 and SR-242. Regional haze or visibility would not be a concern because no designated Class I areas are within 6.2 miles (10 kilometers) of the SRs. GHG emissions associated with the Proposed Action would be negligible relative to statewide GHG emissions in Texas, which primarily result from fossil fuel combustion. Therefore, potential effects from the Proposed Action on air quality, GHGs, and climate change would not be significant.

Noise / Acoustic Environment

The Proposed Action would have negligible long-term impacts from noise. Single-event noise levels from T-6 and C-130 overflights would be noticeable in SR-236 and SR-242. However, these exceedances would be brief and relatively infrequent at any particular location in the Region of Influence (ROI) given the low number of proposed T-6 and C-130 flight operations in each SR (i.e., an average of 1.2 T-6 flights per day in SR-236, less than 1.0 T-6 flight per day in SR-242, and 10 annual C-130 flights in either SR). Given the rural and relatively undeveloped character of lands in the ROI, the potential for humans to experience repeated, high single-event noise levels at any particular location would be low.

Individual noise events associated with proposed aircraft operations would be heard occasionally but given their relative infrequency and low sound levels, most events would not be expected to cause annoyance or disrupt common activities any more than typical everyday sound events (automobile noise, lawn mowing, other civil aircraft flyovers, etc.). Additionally, flight paths on SR-236 and SR-242 would normally be distributed across the width of these routes such that the highest expected overflight levels would not occur repeatedly at a single location on the ground.

Cumulatively, noise associated with proposed aircraft operations would not exceed 45 dBA along the SRs in their entirety or at potential noise sensitive receptors and would remain well below the 65 dBA threshold below which most types of land use are compatible with aircraft noise. Although the number of aircraft operations in the SRs would increase under the Proposed Action relative to historic conditions, noise conditions in the ROI would remain similar to existing ambient conditions given the relative infrequency of proposed operations. Noise from proposed aircraft operations under the Proposed Action would not be expected to temporarily or permanently impede or prevent the continued occupation of any land use underlying SR-236 and SR-242.

Therefore, long-term impacts from noise associated with the Proposed Action would not be significant.

Cultural Resources

The Proposed Action would have no physical impacts on archaeological or architectural resources because no construction, demolition, or other ground-disturbing activities would occur. Noise increases associated with the Proposed Action would be low, brief, and infrequent, and would have no potential to affect the character, setting, or historic integrity of historic properties in the Area of Potential Effects (APE). The Proposed Action would have no potential to affect traditional cultural properties because no such properties have been identified in the APE.

Per 36 CFR § 800.5, the DAF determined that the Proposed Action would have no adverse effect on historic properties, including significant architectural resources archaeological sites, or traditional cultural properties/sacred sites. Concurrence with this determination by the Texas State Historic Preservation Officer is pending.

Biological / Natural Resources

The Proposed Action would have the potential to inadvertently injure or destroy individual animals of common wildlife species, primarily as a result of collisions between birds and aircraft. Aircraft operations, associated noise, and visual effects in the SRs could also induce startle responses that could cause some animals to temporarily leave the immediate area or interrupt nesting, breeding, or foraging activities. While these impacts would be adverse, they would be highly localized and limited to individual or small numbers of animals and would not affect the continued propagation of wildlife at the population or species level. 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. Therefore, adverse impacts on domestic animals and common species of wildlife from the Proposed Action would not be significant.

The SRs are within the Central Flyway, a major migratory bird corridor between arctic regions to the north and tropical habitats to the south. Aircraft operating in the SRs would have the potential to inadvertently strike individual migratory birds, some of which are federally listed as threatened and endangered under the Endangered Species Act. Given the relative infrequency of proposed flight operations on SR-236 and SR-242 (an average of 1.2 T-6 flights per day in SR-236, less than 1.0 flight per day in SR-242, and 10 annual C-130 flights in either SR) and the small size of the T-6 aircraft that would represent the majority of proposed operations on the SRs, the DAF has determined that the Proposed Action may affect, but is not likely to adversely affect the federally threatened rufa red knot (*Calidris canutus rufa*), federally threatened piping plover (*Charadrius melodus*), federally endangered golden-cheeked warbler (*Setophaga chrysoparia*), and federally endangered whooping crane (*Grus americana*); and would not jeopardize the continued existence of the tricolored bat (*Perimyotis subflavus*) and monarch butterfly (*Notropis oxyrhynchus*). The Proposed Action would have no effect on federally listed or proposed aquatic species or federally designated or proposed critical habitat in aquatic environments because no activities involving disturbance of land or surface water bodies would occur.

Land Use

The Proposed Action would have no impacts on land use. The Proposed Action would not involve development activities or population changes that could require changes to existing or proposed

land use patterns or be inconsistent with existing land use plans and policies. Proposed aircraft operations would be consistent with the largely rural and agricultural land uses underlying the SRs and would have no or minimal potential to affect or be noticeable to human populations in the ROI. Noise associated with the Proposed Action would not exceed the 65 dBA threshold below which most land uses are compatible with aircraft noise and therefore, would have no potential 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.

Socioeconomics

The Proposed Action would have no impacts on socioeconomic conditions in local jurisdictions underlying SR-236 and SR-242. The Proposed Action does not involve construction or demolition activities or increases in the number or types of personnel or aircraft stationed at Dyess, Sheppard, or Laughlin AFBs. Further, the Proposed Action would not impede or prevent further economic development activity in local jurisdictions underlying the SRs. Therefore, the Proposed Action would have no potential to affect demographics, employment, or income in local jurisdictions underlying the SRs or adjacent to those DAF installations.

Environmental Justice

The Proposed Action would have no disproportionately adverse impact on minority populations, low-income populations, persons younger than 18 years, or persons older than 65 years, in local jurisdictions underlying SR-236 and SR-242 or adjacent to Sheppard, Dyess, and Laughlin AFBs. The Proposed Action does not involve construction or demolition activities, changes to the number or types of personnel or aircraft stationed at Sheppard, Dyess, and Laughlin AFBs, or other activities that would result in population changes or additional financial expenditures that could create or exacerbate conditions that would result in unequal or disproportionate economic conditions in local jurisdictions underlying SR-236 and SR-242.

Noise levels associated with the Proposed Action would remain low and would have no potential to temporarily or permanently interfere with or impede the continued use or occupation of existing land uses underlying the SRs, including residential, educational, and business uses, and sites of cultural, religious, or historic importance.

The Proposed Action would not involve releases of hazardous and toxic materials or waste in local jurisdictions underlying the SRs. Emissions of criteria pollutants would remain well below applicable *de minimis* thresholds and would have no potential to exceed the NAAQS or otherwise contribute to the degradation of local or regional air quality conditions that could exacerbate respiratory or other health conditions in vulnerable populations. Hazardous materials used to operate and maintain the aircraft proposed for use, and corresponding quantities of hazardous waste generated by the use of such materials, would continue to be used, handled, managed, stored, and disposed of by authorized personnel at Sheppard and Laughlin AFBs in accordance with all applicable DoD and DAF regulations and associated federal and state regulatory requirements.

Aircraft flying in the SRs would be operated in accordance with applicable DoD, DAF, and FAA flight safety requirements and would not pose an increased risk to human populations in areas underlying the SRs. The risk of an unexpected landing or crash of an aircraft operating in the SRs would remain low and would be unlikely to adversely affect minority and low-income populations, children under 18 years of age, or persons 65 years of age or older.

Safety

The Proposed Action would have no significant impact on safety. The limited amount of time an aircraft would be over any specific location, combined with sparsely populated areas under SR-236 and SR-242, would minimize the probability that an aircraft mishap would occur over a populated area. All SR 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. Aircrews operating within the SRs would continue to follow applicable procedures in the Laughlin AFB and Sheppard AFB bird/wildlife-aircraft strike hazard (BASH) plans. Flight safety risk including BASH risk would be assessed for flights lower than 1,000 feet AGL, and additional avoidance procedures outlined in the installation BASH plans 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 impacts from BASH remain negligible or minor.

The proposed modification of SR-236 airspace under Alternative 1 would effectively avoid encroachment from wind turbines and other development that is present along the existing configuration of SR-236. The proposed configuration and flight pattern of SR-236 under Alternative 2 would increase the potential for obstructions to flight relative to Alternative 1; however, under either alternative, pilots would avoid these potential obstructions in accordance with all applicable DAF procedures and requirements. Therefore, Alternative 1 would have negligible impacts on safety from obstructions to flight, while safety impacts from potential obstructions to flight under Alternative 2 would be managed in accordance with applicable DAF procedures and would remain negligible or minor. Impacts on safety from the Proposed Action under either alternative would not be significant.

Reasonably Foreseeable Future Actions

When considered with other reasonably foreseeable future actions occurring in around SR-236 and SR-242, the Proposed Action would not contribute to significant cumulative impacts on resources analyzed in the EA.

Mitigation

No project-specific best management practices (BMPs) or environmental commitments are identified in the EA; however, the use of standard BMPs is assumed, when applicable, in the discussion of environmental consequences for each resource analyzed in the EA.

Public Involvement

A Notice of Availability for the Draft EA and proposed FONSI was published in the *Abilene Reporter News*, *Coleman County Chronicle*, *Double Mountain Chronicle*, and *Throckmorton Tribune* inviting the public to review and comment on the Draft EA during the 30-day public comment period. Electronic copies of the Draft EA and proposed FONSI are available for public review and download on the Sheppard, Dyess, and Laughlin AFB websites. Printed copies of the Draft EA and proposed FONSI are available for public review at the Abilene Public Library (Main Branch), Coleman Public Library, Depot Public Library, and Stonewall County Library. Comments on the Draft EA will be addressed in the Final EA and FONSI, as applicable.

Conclusion

Finding of No Significant Impact. After review of the attached EA, which was prepared in accordance with the requirements of NEPA, CEQ regulations, and the DAF EIAP, I have determined that the Proposed Action to use SR-236 and SR-242 to support routine slow-speed and low-altitude pilot training syllabi requirements established by AETC would not have a significant impact on the quality of the human or natural environment. Accordingly, an Environmental Impact Statement will not be prepared. This decision has been made after considering all submitted information, including a review of any public and agency comments received during the 30-day public comment period, and considering a full range of reasonable alternatives that meet project requirements and are within the legal authority of the DAF.

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BIRJU H. PATEL, Major **DATE**
USAF Chief
AETC/A4PC Engineer Requirements

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
47 FTW	47th Flying Training Wing
80 FTW	80th Flying Training Wing
ACAM	Air Conformity Applicability Model
AETC	Air Education and Training Command
AFB	Air Force Base
AFMAN	Air Force Manual
AGL	above ground level
AMC	Air Mobility Command
APE	Area of Potential Effects
AQCR	Air Quality Control Region
ATC	Air Traffic Control
ATCAA	Air Traffic Control Assigned Airspace
BASH	bird/wildlife-aircraft strike hazard
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
DAF	Department of the Air Force
DAFMAN	Department of the Air Force Manual
dBA	A-weighted decibel
DNL	Day-Night Average Sound Level
DoD	Department of Defense
DoDI	Department of Defense Instruction
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EJ	environmental justice
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FLIP	Flight Information Publication
FONSI	Finding of No Significant Impact
ft	feet
FY	fiscal year
GHG	greenhouse gases

GWP	Global Warming Potential
HQ	Headquarters
K	thousand
km	kilometer
L_{dn}	Day-Night Average Sound Level
L_{dnmr}	Onset-Rate Adjusted Monthly Day-Night Average Sound Level
MBTA	Migratory Bird Treaty Act
mm	millimeter
MOA	Military Operations Area
MOU	Memorandum of Understanding
MSL	mean sea level
MTR	Military Training Route
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NM	nautical mile
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRHP	National Register of Historic Places
O_3	ozone
Pb	lead
PM_{10}	particulate matter equal to or less than 10 microns
$PM_{2.5}$	particulate matter equal to or less than 2.5 microns
PSD	Prevention of Significant Deterioration
ROI	Region of Influence
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SR	Slow Route
SUA	special use airspace
TAMU	Texas Agricultural and Mechanical University
tpy	tons per year
TxDOT	Texas Department of Transportation
U.S. or US	United States
U.S.C.	United States Code
USDA	US Department of Agriculture
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Services
VFR	visual flight rules
VR	Visual Route

CHAPTER 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 to use two existing Slow Route (SR) training airspaces, SR-236 and SR-242, to support routine slow-speed and low-altitude pilot training syllabi requirements established by the Air Force Air Education and Training Command (AETC). SR-236 and SR-242 are in north-central Texas near the City of Abilene and Dyess Air Force Base (AFB). The Proposed Action would primarily support slow-speed and low-altitude training syllabi requirements for military undergraduate student pilots flying T-6A *Texan* II aircraft from Sheppard AFB and Laughlin AFB, Texas. The Proposed Action would also allow limited use of SR-236 and SR-242 by transient C-130 aircraft from other Department of Defense (DoD) installations to support applicable pilot training requirements.

This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code [U.S.C.] §§ 4321 - 4347, as amended), Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations [CFR] Parts 1500 - 1508), and the DAF Environmental Impact Analysis Process (EIAP) (32 CFR Part 989). The requirements of other federal, state, and local regulations are also addressed in this EA, as applicable.

1.2 BACKGROUND

SRs are a type of airspace that are used by military aircraft for routine training at relatively slow speeds and low altitudes. Aircraft operating in SRs fly at airspeeds of 250 knots (approximately 288 miles per hour) or less and altitudes at or above 300 feet (ft) above ground level (AGL), depending on terrain, the presence of existing structures or other potential obstructions, underlying land uses, weather and visibility conditions, and other factors. SRs are established and operated in accordance with requirements set forth in Department of the Air Force Manual (DAFMAN) 13-201, *Nuclear, Space, Missile, Command and Control Airspace Management*, dated 10 December 2020 (DAF, 2020a).

SR-236 and SR-242 were established by the Air Force Air Mobility Command (AMC) in the 1990s to support slow-speed and low-altitude training requirements for AMC C-130 pilots. These SRs no longer support AMC training requirements, and both SRs are temporarily closed to air traffic (DoD, 2023). In November 2021, AMC notified Headquarters (HQ) Air Force Airspace that SR-236 and SR-242 were no longer needed for AMC use.

In response to AMC's notification, AETC requested reassignment of SR-236 to Sheppard AFB and SR-242 to Laughlin AFB to support low-altitude and slow-speed training syllabi requirements for T-6 aircraft flown by military student pilots at those installations. Although closer in proximity to Sheppard AFB and Laughlin AFB, other SRs currently operated by those installations do not provide an optimal training experience because they are in high demand due to the intensive tempo of ongoing AETC training operations combined with limited operating hours (i.e., daytime operations only) and the need to schedule and extensively coordinate flight activity among multiple units and military and civilian air traffic operators. The proximity of these existing SRs to each other and their respective operating installations also makes them vulnerable to unfavorable

weather conditions that can require the simultaneous suspension of flight operations in multiple airspaces, further limiting their availability for necessary training operations.

Additionally, training operations and aircraft maneuverability within these SRs are severely constrained due to the presence of existing civilian and military aviation traffic in (i.e., crossing) and near the SRs, and existing development – particularly wind turbines – on underlying lands that must be avoided during training flights. These constraints limit the minimum altitude on some SRs to 500 ft AGL and the width of the flight corridor to less than 10 nautical miles (NM). Pilots are required to maintain a 2 NM radius – laterally and/or vertically, as applicable – around obstructions such as wind turbines, which results in avoidance maneuvers that would otherwise not be required on SR training flights to meet training syllabi requirements.

In February 2022, HQ Air Force concurred with the reassignments of SR-236 to the 80th Flying Training Wing (80 FTW) at Sheppard AFB and SR-242 to the 47th Flying Training Wing (47 FTW) at Laughlin AFB. Administrative and operational responsibilities for SR-236 and SR-242 were subsequently transferred to the 80 FTW and 47 FTW, respectively, in early 2022; however, both SRs remain temporarily closed pending completion of this environmental analysis.

1.3 LOCATION AND SETTING

1.3.1 SR-236 and SR-242

SR-236 and SR-242 are in north-central Texas near the City of Abilene and Dyess AFB (**Figure 1-1**). SR-236 is approximately 60 miles southwest of Sheppard AFB and SR-242 is approximately 162 miles northeast of Laughlin AFB. SR-236 extends primarily to the north and east of Abilene and SR-242 primarily to the south, east, and north (**Figure 1-2** and **Figure 1-3**, respectively). The locations of existing wind turbine development along and near SR-236 and SR-242 are also shown on **Figure 1-2** and **Figure 1-3**.

Both SRs are nearly 200 NM (more than 200 statute miles) long at their centerline and contain more than 2,100 square miles of airspace. The minimum permitted flight altitude in both SRs is 300 ft AGL along their entire length (DAF, 1993). Attributes of SR-236 and SR-242 are summarized in **Table 1-1**.

Table 1-1 Attributes of SR-236 and SR-242

Slow Route	Width (NM / statute miles) [1]	Length (NM / statute miles) [2]	Area (square miles)
SR-236	10 / 11.5	191 / 219.8	2,198
SR-242		189 / 217.5	2,175

Notes:
Source: DAF, 1993
[1] The overall width of each SR comprises 5 NM on either side of the SR centerline.
[2] Total length is measured at the centerline of each SR.
NM = nautical mile; SR = Slow Route

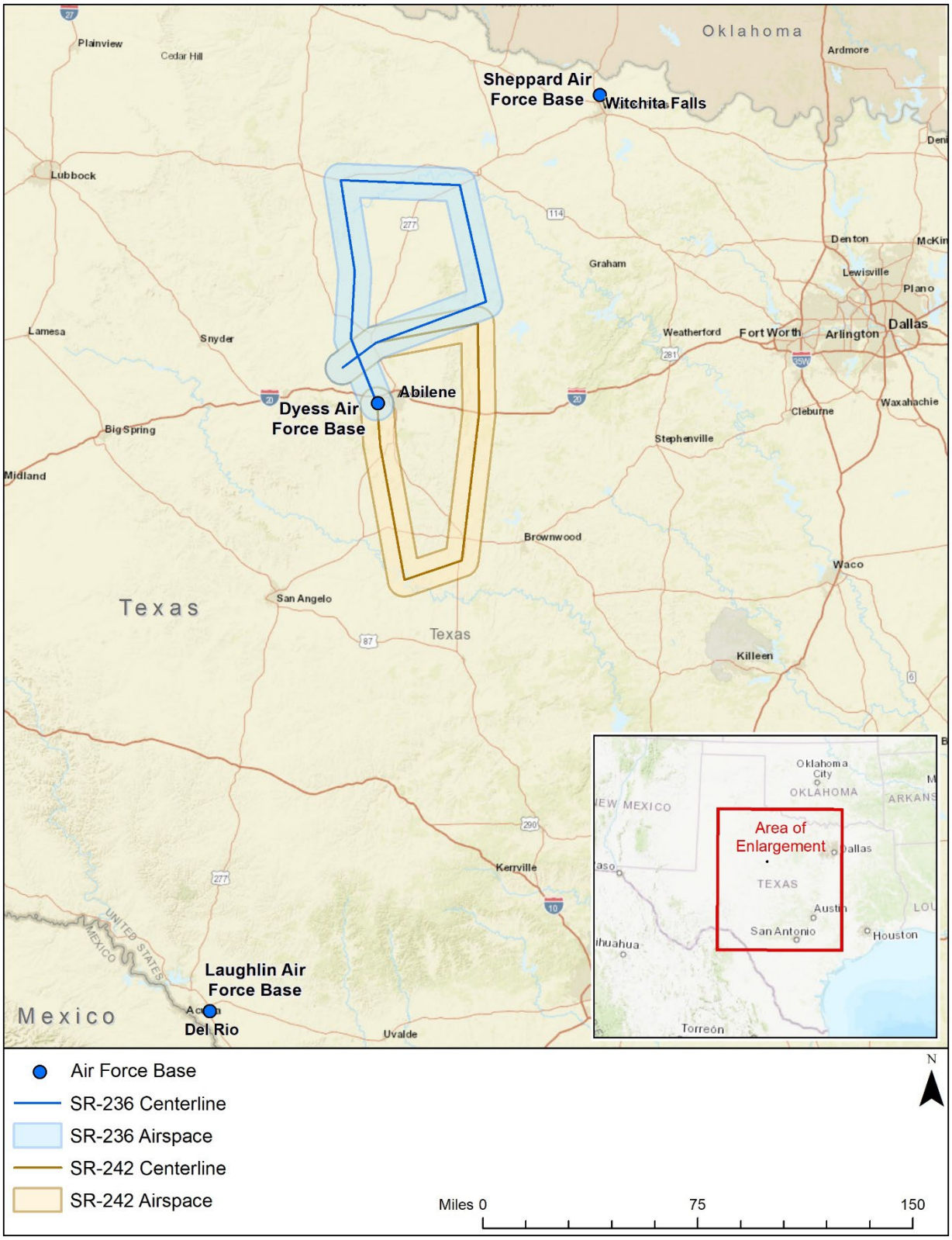

Figure 1-1 Location of SR-236 and SR-242

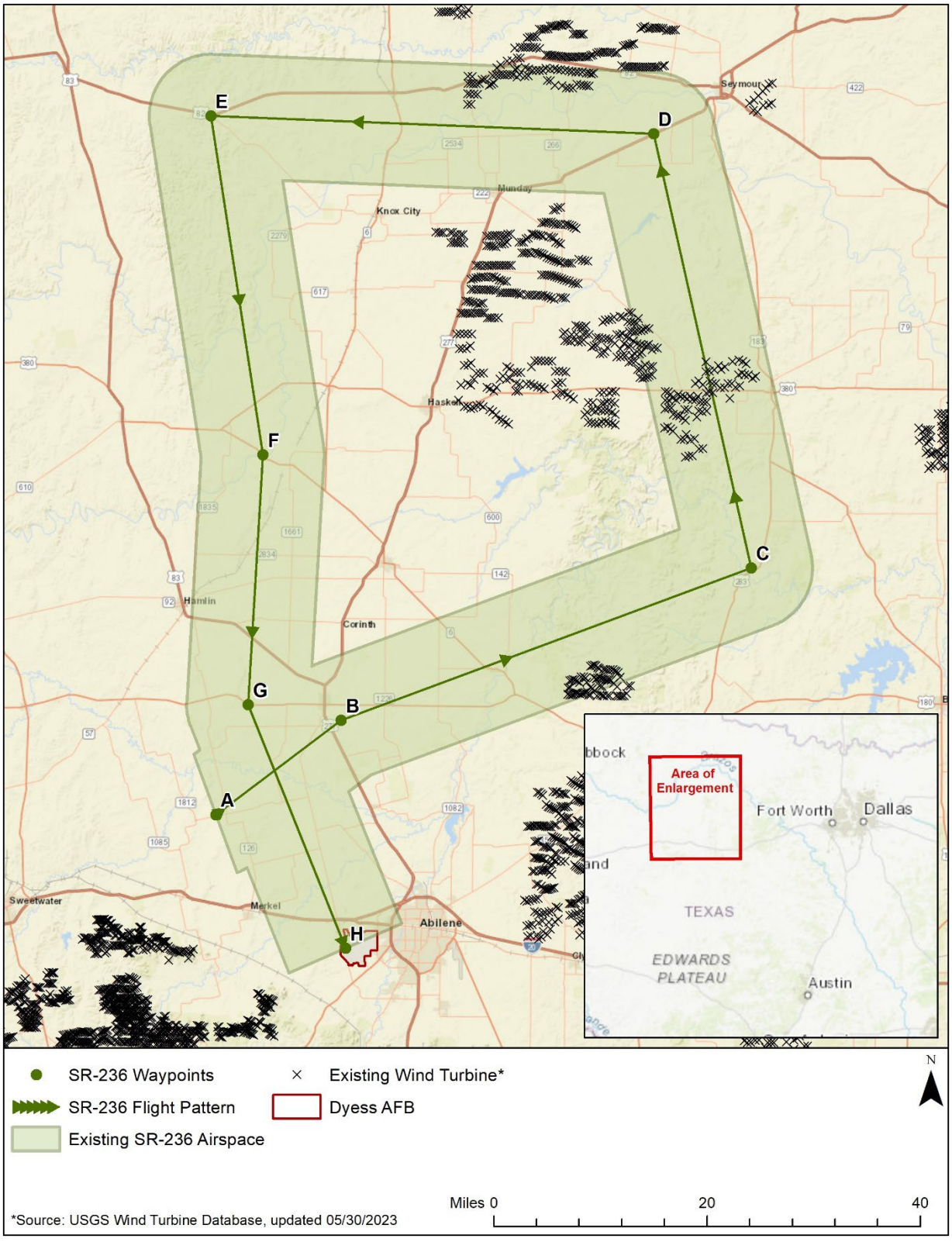

Figure 1-2 Existing Lateral Boundaries and Flight Pattern in SR-236

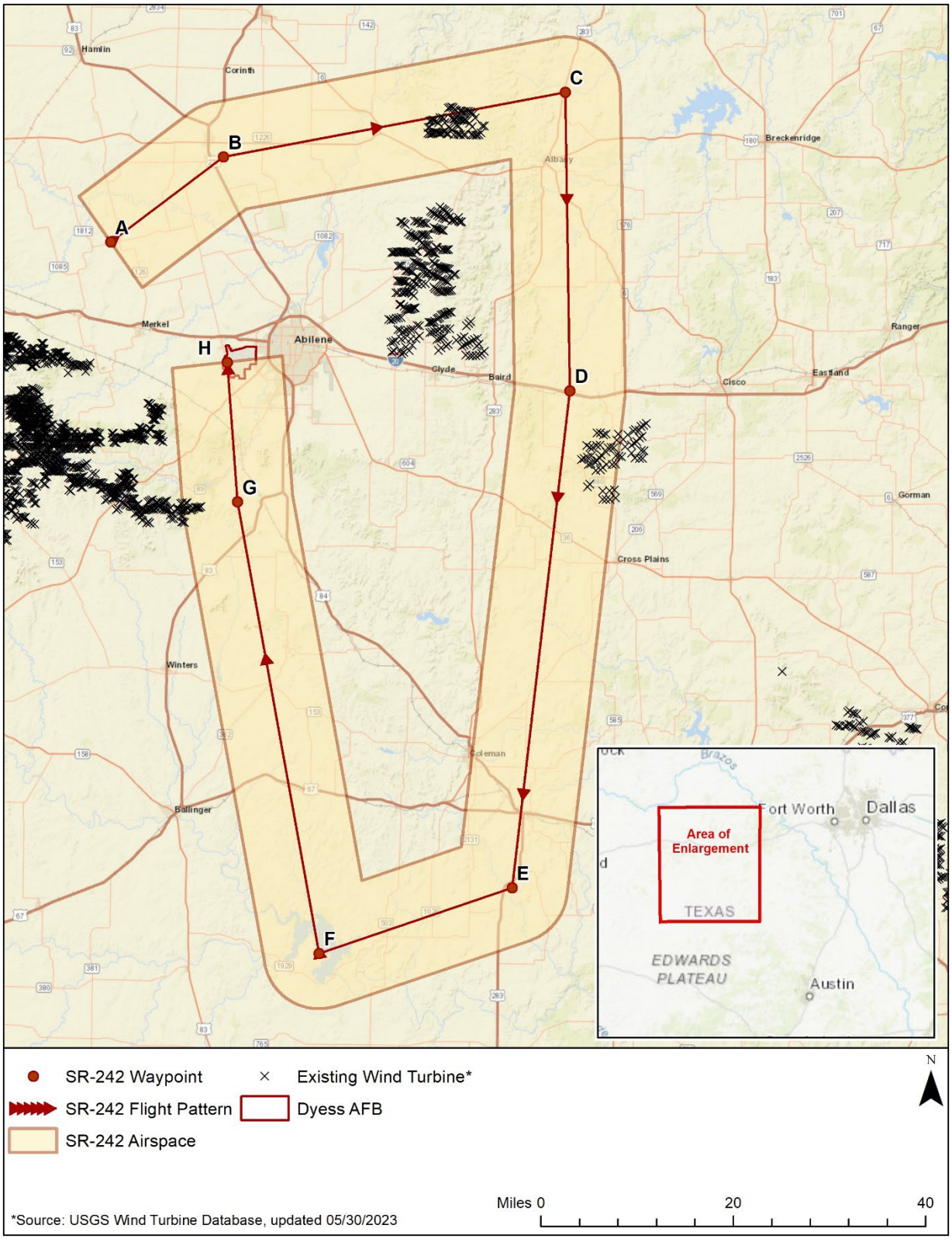

Figure 1-3 Existing Lateral Boundaries and Flight Pattern in SR-242

Lettered waypoints along the SRs provide points of reference for aircraft navigation and orientation. Aircraft in SR-236 fly in a counterclockwise pattern from Waypoint A to Waypoint H (**Figure 1-2**). Aircraft in SR-242 fly in a clockwise pattern from Waypoint A to Waypoint H (**Figure 1-3**) (Waypoints A, B, and H are the same for both SRs). The geographic coordinates of each lettered waypoint in SR-236 and SR-242 are shown in **Table 1-2**.

As noted in **Section 1.2**, SR-236 and SR-242 are both temporarily closed to air traffic pending completion of this environmental analysis because they no longer support training requirements for AMC C-130 pilots.

Table 1-2 Latitude and Longitude of SR-236 and SR-242 Waypoints

Waypoint [1]	SR-236		SR-242	
	Latitude	Longitude	Latitude	Longitude
A	32°36.00'N	100°04.00'W	N32°36.00'N	W100°04.00'W
B	32°44.02'N	99°52.52'W	N32°44.00'N	W99°52.52'W
C	32°56.23'N	99°12.77'W	N32°49.65'N	W99°15.78'W
D	33°32.15'N	99°22.13'W	N32°23.05'N	W99°15.12'W
E	33°33.23'N	100°05.37'W	N31°38.12'N	W31°38.12'W
F	33°05.63'N	100°00.25'W	N31°31.88'N	W99°41.43'W
G	32°45.00'N	100°01.00'W	N32°12.60'N	W99°50.50'W
H	32°25.00'N	99°52.00'W	N32°25.00'N	W99°52.00'W

Notes:
[1] Waypoints A, B, and H are the same for both Slow Routes.

SR-236 and SR-242 were formerly used for routine slow-speed and low-altitude training by AMC C-130 aircraft. Annual C-130 flight operations that previously occurred in SR-236 and SR-242 are summarized in **Table 1-3**. C-130 flights previously occurred along each SR approximately 10 times per year, with 6 flights occurring annually during daytime hours (i.e., 7:00 a.m. to 10:00 p.m. local time) and the remainder occurring annually during nighttime hours (i.e., 10:00 p.m. to 7:00 a.m. local time).

Table 1-3 Summary of Annual Flight Operations Historically Occurring on SR-236 and SR-242

Slow Route	Aircraft Type	Floor / Ceiling (feet above ground level)	Annual Operations		Total
			Daytime [1]	Nighttime [2]	
SR-236	C-130	300 / 1,500	6	4	10
SR-242	C-130	300 / 1,500	6	4	10

Notes:
[1] Daytime hours are defined as 7:00 a.m. to 10:00 p.m. local time.
[2] Nighttime hours are defined as 10:00 p.m. to 7:00 a.m. local time.

1.3.2 Sheppard, Laughlin, and Dyess Air Force Bases

Sheppard AFB is approximately 60 miles northeast of SR-236 near Wichita Falls, Texas. The installation covers approximately 5,297 acres in Wichita County and hosts the 82nd Training Wing in addition to the 80 FTW. Sheppard AFB serves as a joint training base for the DAF, other DoD branches, and allied nation air forces, graduating more than 60,000 students annually, including

nearly 200 pilots (DAF, 2022a). The 80 FTW at Sheppard AFB maintains administrative and operational responsibility for SR-236.

Laughlin AFB is approximately 162 miles southwest of SR-242 near Del Rio, Texas. The installation covers approximately 4,355 acres in Val Verde County less than 7 miles northeast of the United States' international border with Mexico. Laughlin AFB is an AETC installation with the primary mission of Specialized Undergraduate Pilot Training using T-6, T-38, and T-1A aircraft commanded by the 47 FTW (DAF, 2022b). The 47 FTW at Laughlin AFB maintains administrative and operational responsibility for SR-242.

Dyess AFB is approximately 6.5 miles west of Abilene and covers approximately 5,424 acres in Taylor County, Texas. The 7th Bomb Wing is the host unit at Dyess AFB and the 317th Airlift Wing is the installation's major tenant. SR-236 and SR-242 are not currently used or planned for use by units and aircraft based at Dyess AFB.

1.4 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to use existing SRs to support slow-speed and low-altitude military undergraduate pilot training syllabi requirements established by AETC. The Proposed Action is needed to balance operational activity and alleviate demand on other SRs currently operated by Sheppard AFB and Laughlin AFB, which do not provide optimal training requirements because they are constrained by high operational volume, conflicts with other civilian and military aviation traffic and underlying land uses (e.g., wind turbines, noise sensitive receptors), limited operating hours (i.e., daytime only), vulnerability to unfavorable weather conditions, and other factors. The Proposed Action would reinforce pilot training and readiness by using SR-236 and SR-242 in support of the T-6 program.

1.5 DECISION TO BE MADE

This EA evaluates the potential environmental consequences associated with the Proposed Action to use SR-236 and SR-242 to support routine slow-speed and low-altitude training requirements established by AETC. Based on the analysis in this EA, DAF will make one of three decisions regarding the Proposed Action:

1. Determine the Proposed Action and alternatives would have no significant environmental impacts and issue a signed Finding of No Significant Impact (FONSI).
2. Initiate preparation of an Environmental Impact Statement (EIS) if it is determined that implementing the Proposed Action or alternatives would result in significant environmental impacts.
3. Select the No Action Alternative, whereby the Proposed Action would not be implemented.

As required by NEPA and CEQ regulations implementing NEPA (40 CFR Parts 1500 - 1508), preparation of an environmental document must precede final decisions regarding a federal proposed action and be available to inform decision-makers of the potential environmental impacts.

1.6 INTERAGENCY AND INTERGOVERNMENTAL COORDINATION AND CONSULTATIONS

The DAF EIAP, in compliance with NEPA, requires opportunities for the public and agencies to review information relevant to the Proposed Action and alternatives. NEPA also requires federal agencies to consider the effects of their proposed actions in accordance with relevant environmental laws and regulations including Section 7 of the Endangered Species Act (ESA) and Section 106 of the National Historic Preservation Act (NHPA). Consultation with the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) is required, as applicable, to comply with Section 7 of the ESA.

Government-to-government consultation between the DAF and Native American tribes having historic, cultural, or religious ties to areas where the Proposed Action would be implemented is being conducted in accordance with DoD Instruction (DoDI) 4710.02, *Interactions with Federally-Recognized Tribes*; DAF Instruction 90-2002, *Air Force Interaction with Federally-Recognized Tribes*; and DAFMAN 32-7003, *Environmental Conservation*.

Information regarding public, agency, and tribal stakeholder consultation and coordination conducted during preparation of this EA, including copies of relevant correspondence, is provided in **Appendix A**.

1.7 APPLICABLE LAWS AND ENVIRONMENTAL REGULATIONS

This EA has been prepared in accordance with NEPA and the DAF EIAP (32 CFR Part 989). These requirements are briefly described below. The requirements of other laws, regulations, best management practices (BMPs), and permits relevant to resources evaluated in the EA are discussed in **Chapter 3**.

1.7.1 National Environmental Policy Act

NEPA is a federal law enacted in 1969 that requires federal agencies to consider the potential environmental consequences of their proposed actions. The intent of NEPA is to protect, restore, or enhance the environment through well-informed federal decisions. NEPA also established the CEQ to implement and oversee federal policies related to this process. CEQ regulations implementing NEPA (40 CFR Parts 1500 - 1508) specify that an EA be prepared to

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

Adherence to the NEPA process ensures that federal agencies consider the potential environmental effects of their proposed actions, provide opportunities for public and agency input, and comply with the requirements of relevant laws and regulations such as the ESA and NHPA.

1.7.2 The Environmental Impact Analysis Process

The EIAP is the process by which DAF facilitates compliance with relevant environmental laws and regulations, including NEPA, which is the primary legislation affecting the agency's decision-making process.

1.8 PUBLIC AND AGENCY REVIEW

The DAF sent scoping letters to federal, state, and local agencies and officials, and Native American tribes with historic, cultural, or religious ties to lands underlying SR-236 and SR-242, to inform them of the Proposed Action and request their comments and input on potentially affected resources and conditions. These agencies, officials, and tribes are listed in **Appendix A**. Native American tribes were also invited to participate in government-to-government consultation. Letters to the Texas State Historic Preservation Officer (SHPO) and USFWS requested consultation in accordance with Section 106 of the NHPA and Section 7 of the ESA, respectively.

The Draft EA and proposed FONSI is available for a 30-day public review and comment period in accordance with NEPA. Printed copies of the Draft EA are available for review at the following public libraries:

- Abilene Public Library (Main Branch), 202 Cedar St, Abilene Texas 79601
- Coleman Public Library, 402 S Commercial Ave, Coleman, Texas 76834
- Depot Public Library, 120 E Chestnut St, Throckmorton, Texas 76483
- Stonewall County Library, 516 S Washington, Aspermont, Texas 79502

Electronic copies of the Draft EA are available for review or download on the following DAF installation websites:

- **Sheppard AFB:** https://www.sheppard.af.mil/Library/Key-Documents/
- **Dyess AFB:** https://www.dyess.af.mil/ (click on the "Environmental" navigation bar on the lower right side of the page and then click on "Draft Environmental Assessment for Slow Route Training Airspace")
- **Laughlin AFB:** https://www.laughlin.af.mil/ (click on the "Key Documents" navigation bar on the lower right side of the page and then click on "Draft Environmental Assessment for Slow Route Training Airspace")

A Notification of Availability (NOA) for the Draft EA and proposed FONSI was published in the *Abilene Reporter News*, *Coleman County Chronicle*, *Double Mountain Chronicle*, and *Throckmorton Tribune*. Letters announcing the availability of the Draft EA and proposed FONSI for review were distributed to the agencies, officials, and tribes listed in **Appendix A**. Public comments received on the Draft EA and proposed FONSI will be addressed in the Final EA and FONSI, as applicable.

1.9 SCOPE OF ENVIRONMENTAL ANALYSIS

This EA analyzes the potential environmental consequences from the Proposed Action to use SR-236 and SR-242 to support routine slow-speed and low-altitude training requirements established by AETC. The EA analysis focuses on resources that would be measurably or meaningfully affected by the Proposed Action; detailed discussions of these resources and the Proposed Action's potential impacts on them are provided in **Chapter 3**. Cumulative effects are also described for each resource, as applicable. Resources on which the Proposed Action would have no, or no more than, marginal effects are dismissed from detailed analysis in this EA and are briefly described in **Section 3.2**.

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CHAPTER 2 PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This section describes the Proposed Action analyzed in this EA, alternatives for implementing the Proposed Action, and a summary of impacts from the Proposed Action based on the detailed analysis presented in **Chapter 3**.

2.2 PROPOSED ACTION

DAF's Proposed Action is to use existing SR-236 and SR-242 to support routine slow-speed and low-altitude training requirements established by AETC. The Proposed Action would primarily support slow-speed and low-altitude training syllabi requirements for military undergraduate student pilots flying T-6 aircraft from Sheppard AFB and Laughlin AFB, Texas. The Proposed Action would also allow limited use of SR-236 and SR-242 by transient C-130 aircraft from other DoD installations to support applicable pilot training requirements.

The Proposed Action does not involve demolition, construction, or other ground-disturbing activities at Sheppard, Laughlin, or Dyess AFBs or on lands underlying SR-236 and SR-242; changes to the number of personnel or to the number or types of aircraft assigned to those installations; or changes to the existing boundaries of those installations.

The use of flight training simulators to partially or fully meet SR training requirements as part of the Proposed Action was not considered by the DAF. Pilots must have long hours of realistic training to become skilled at low-altitude flight, and many more hours of the same training to remain proficient. Low-altitude flying training provides this realism and is considered one of the DAF's highest training priorities (DAF, 2023a). Although flight simulators are used to the extent practicable during pilot training, they ultimately do not provide a fully realistic training experience and cannot replace real-world, in-flight training. Therefore, the use of flight simulators as part of the Proposed Action is not addressed in this EA.

Proposed flight operations in SR-236 and SR-242 are described below.

2.2.1 Proposed Flight Operations

The Proposed Action would primarily support routine slow-speed and low-altitude flight training for military undergraduate student pilots flying the T-6, a single-engine, two-seat turboprop-powered airplane used to train military pilots in basic flying skills (**Figure 2-1**). The Proposed Action would also support, on a limited-use basis, training flights by various configurations of transient C-130 aircraft from other DoD installations (**Figure 2-2**). SR-236 would be used by aircraft originating from Sheppard AFB and SR-242 would be used by aircraft originating from Laughlin AFB. Both SRs would be available 24 hours a day, 7 days per week for training operations included in the Proposed Action. The minimum permitted altitude in both SRs would be 300 ft AGL.

Scheduling and coordination of aircraft operations in SR-236 would be the responsibility of personnel at Sheppard AFB and of Laughlin AFB personnel for aircraft using SR-242, in accordance with procedures specified in the most current edition of DoD Flight Information Publication AP/1B, *Area Planning, Military Training Routes, North and South America*. Either SR would be available for use by transient C-130 aircraft; personnel at the originating C-130

installation would schedule the airspace as needed through coordination with Sheppard AFB (for SR-236) and Laughlin AFB (for SR-242) personnel in accordance with AP/1B. As needed, DAF Air Traffic Control (ATC) would coordinate with local/civilian ATC for proposed operations on SR-236 and SR-242.

Figure 2-1 Representative Photo of U.S. Air Force T-6 Aircraft (DAF, 2023b)

Figure 2-2 Representative Photo of U.S. Air Force Air National Guard C-130 Aircraft (DAF, 2023c)

The proposed annual usage of SR-236 and SR-242 under the Proposed Action is summarized in **Table 2-1**. Sorties[1] in T-6 aircraft would constitute the majority of operations in both SRs, and all such sorties would occur during daytime hours (i.e., 7:00 a.m. to 10:00 p.m. local time). Most of the proposed C-130 sorties would occur during nighttime hours (i.e., 10:00 pm. to 7:00 a.m. local time), but total C-130 sorties would represent less than 3 percent of the proposed annual usage in SR-236 and less than 4 percent in SR-242. The actual number of aircraft operations occurring annually in SR-236 and SR-242 would be subject to training requirements, weather conditions, pilot and aircraft availability, and other factors but would not exceed the annual totals shown in **Table 2-1**.

Table 2-1 Proposed Annual Usage of SR-236 and SR-242 by Aircraft Type

Aircraft Type	Proposed Annual Sorties [1]			
	SR-236		SR-242	
	Daytime [2]	Nighttime [2]	Daytime [2]	Nighttime [2]
T-6 (Sheppard AFB)	440	0	0	0
T-6 (Laughlin AFB)	0	0	240	0
C-130 (transient)	2	8	2	8
Total	**442**	**8**	**242**	**8**

Notes:

[1] The number of proposed annual sorties shown here is approximate and represents the maximum number that would occur in each SR under the Proposed Action for the purposes of estimating potential impacts in this EA. The actual number of proposed annual sorties that would occur under the Proposed Action could ultimately be less than those shown here based on factors such as weather conditions, the number of pilots undergoing training, training tempo, and/or the number and type of aircraft available at any given time.

[2] For the purposes of the analysis presented in this EA, daytime hours are defined as 7:00 a.m. to 10:00 p.m. local time and nighttime hours are defined as 10:00 p.m. to 7:00 a.m. local time.

2.3 SELECTION STANDARDS AND ALTERNATIVES SCREENING

This section describes selection standards developed by the DAF to identify alternatives that would meet the purpose and need, alternatives that were initially considered by the DAF for implementing the Proposed Action, alternatives retained for analysis in the EA, and alternatives dismissed from further consideration.

2.3.1 Selection Standards

In accordance with 32 CFR § 989.8(c), selection standards were developed to identify reasonable alternatives for implementing the Proposed Action. Alternatives that meet all the selection standards are considered reasonable and would meet the purpose and need (see **Section 1.4**). These alternatives are retained for detailed analysis in this EA. Alternatives that do not meet one or more of the selection standards are not considered reasonable and are eliminated from detailed analysis in this EA.

[1] A sortie is a single military aircraft flight from initial takeoff through final landing.

The following selection standards were developed to identify reasonable alternatives for implementing the Proposed Action evaluated in this EA:

1. **Provide operational flexibility.** The alternative must support training currently conducted on existing SRs operated by Sheppard AFB and Laughlin AFB by providing flexibility to schedule and conduct required SR training in other training airspace that is geographically separated from their existing SRs but still within acceptable operational range and proximity of those installations. Geographic separation would provide options in the event of scheduling conflicts, unfavorable weather conditions, and/or other constraints and restrictions on existing SRs operated by Sheppard AFB and Laughlin AFB.
2. **Use existing, currently available SR airspace.** To the extent feasible, the alternative must make use of existing, currently available SR airspace to meet established AETC and DAF pilot training requirements. Establishing new training airspace is an inefficient expenditure of limited DAF time and resources when airspace that would satisfy the applicable requirements already exists. Airspace is a finite resource, and the Federal Aviation Administration (FAA) encourages the DAF and DoD to use existing, previously established airspace when available. Modification of the airspace may be considered if needed to avoid potential encroachments that did not exist when the airspace was originally established.
3. **Use existing SR airspace that is administered by the units/installations requiring the airspace.** To avoid or minimize scheduling and operational conflicts with aircraft from other units and installations, the alternative must make use of SR airspace that is administered by Sheppard AFB and Laughlin AFB.
4. **Provide airspace with sufficient capacity and availability.** The alternative must be of adequate size and configuration to provide optimized pilot training that supports achievement of the necessary 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 provide airspace that is at least 10 NM wide and supports a minimum operating altitude of 300 ft AGL. The alternative must also be available for daytime and nighttime operations.

2.3.2 Alternatives Screening

DAF initially considered the following alternatives for implementing the Proposed Action:

- **Alternative 1 – Use Existing SR-242 and Modify SR-236.** Under this alternative, the DAF would use portions of the existing SR-236 footprint but would modify the western and southern segments of the airspace to avoid encroachment from wind turbines and other development that did not exist when SR-236 was originally established in the 1990s. The modified SR-236 airspace would also help to deconflict proposed aircraft operations occurring in SR-236 with those currently occurring in Military Training Routes (MTRs) managed by Sheppard AFB, including Visual Route (VR) 159 and VR-1143. The proposed configuration of SR-236 under Alternative 1 is shown on **Figure 2-3**. A comparison of the modified SR-236 configuration to the existing SR-236 configuration is shown on **Figure 2-4**.

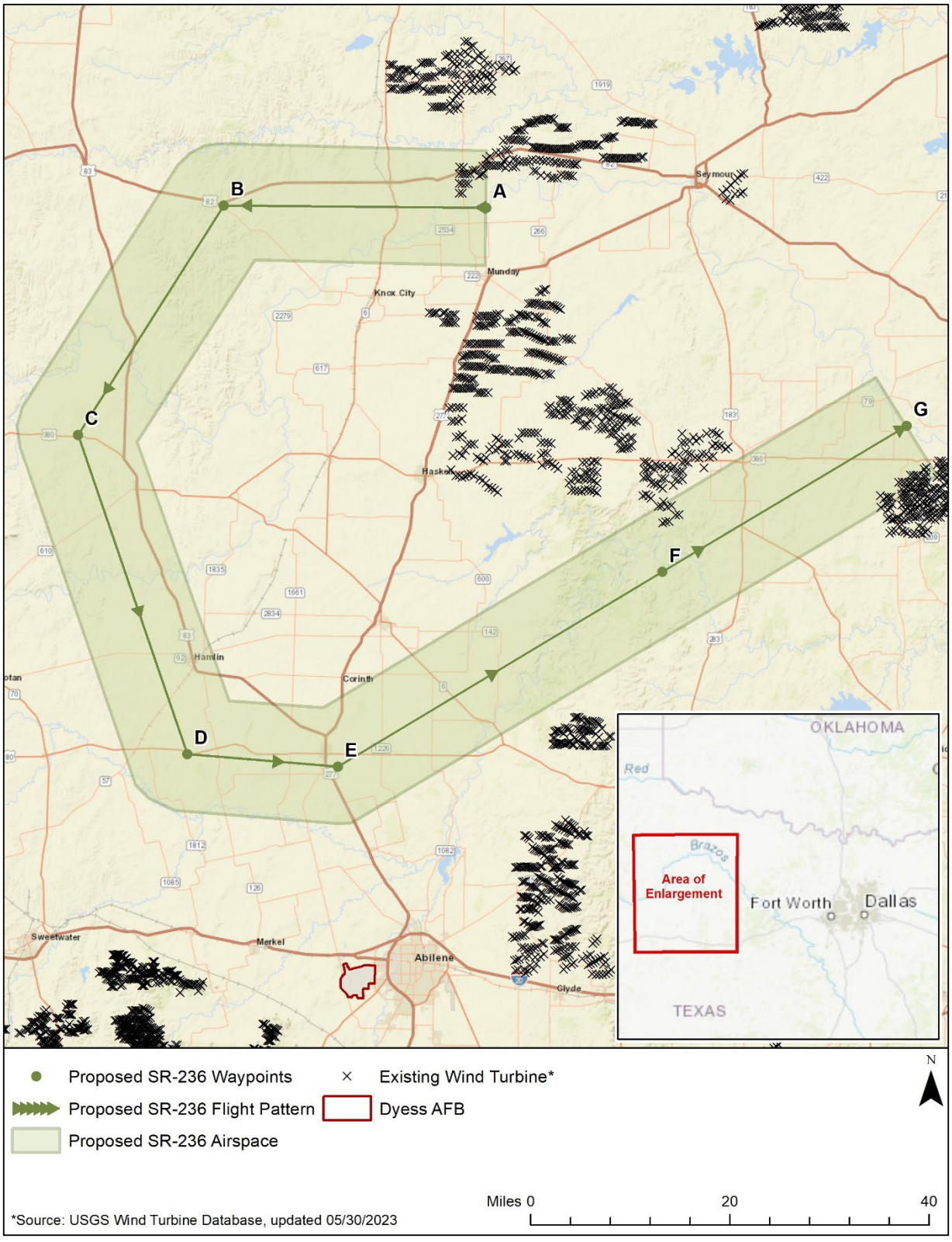

Figure 2-3 Proposed Modification of SR-236 Under Alternative 1

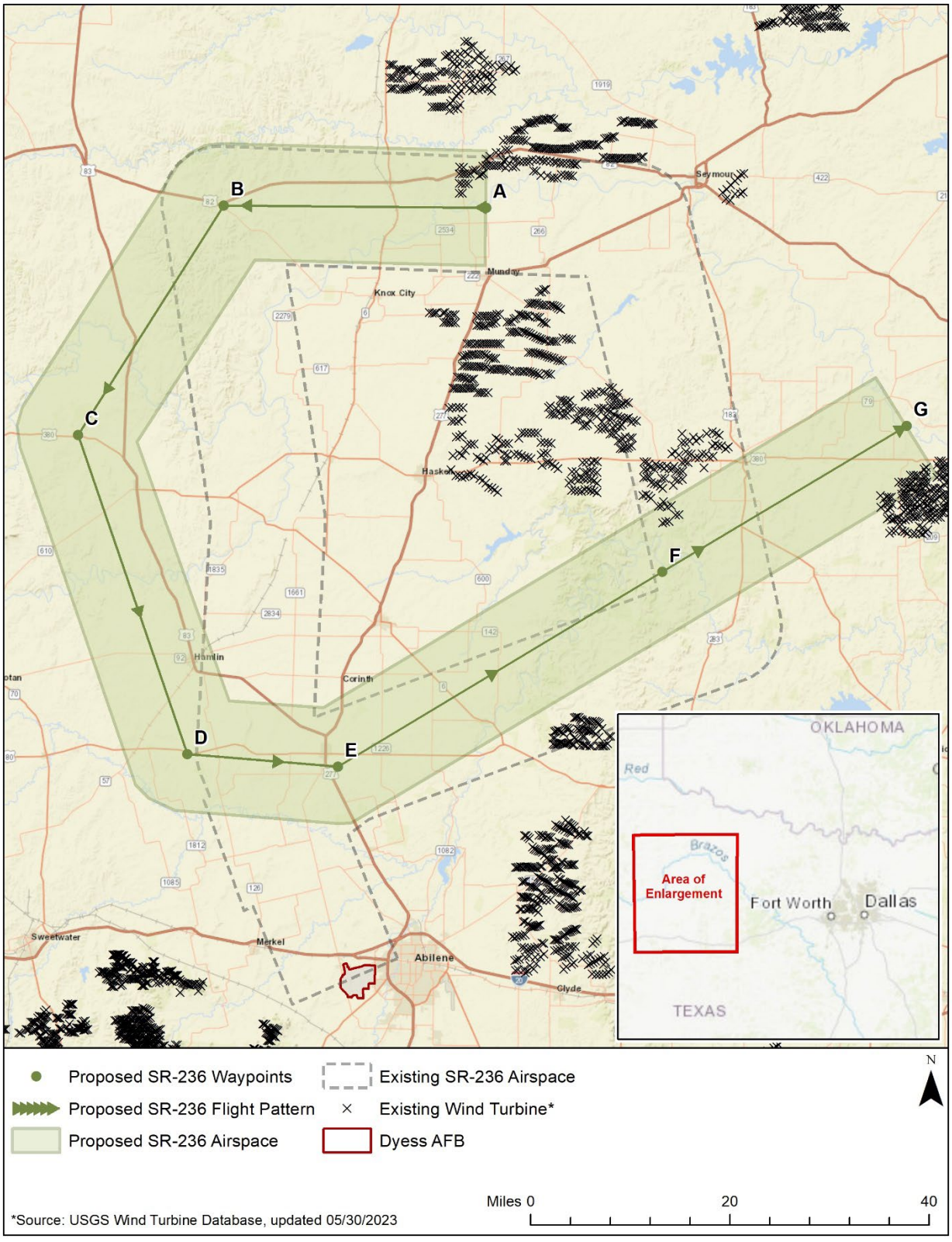

Figure 2-4 Comparison of SR-236 Airspace Proposed for Modification Under Alternative 1 to Existing SR-236 Airspace

The modified SR-236 airspace would be approximately 147 NM long (along its centerline) and contain approximately 1,946 square miles of airspace. New waypoints would be designated along the modified airspace to identify aircraft entry and exit points and aid in wayfinding and navigation; the coordinates of the new waypoints are listed in **Table 2-2**. Under this alternative, aircraft from Sheppard AFB would enter at Waypoint A, traverse the airspace in a counterclockwise direction, and exit at Waypoint G. SR-242 would be used in its existing configuration (**Figure 1-3**) to support training operations by Laughlin AFB-based aircraft and no changes to that airspace would occur. As needed, the reconfigured SR-236 airspace and unmodified SR-242 airspace would also be available support slow-speed and low-altitude training operations by transient C-130 aircraft (see **Section 2.2.1**).

Table 2-2 Proposed SR-236 Waypoints Under Alternative 1

Waypoint	SR-236	
	Latitude	Longitude
A	33°32.90'N	99°37.52'W
B	33°33.23'N	100°05.37'W
C	33°12.76'N	100°20.12'W
D	32°44.94'N	100°08.11'W
E	32°44.02'N	99°52.52'W
F	33°01.17'N	99°19.03'W
G	33°13.94'N	98°53.67'W

- **Alternative 2 – Adjust SR-236 Access Points and Use Existing SR-242.** This alternative would modify aircraft entry and exit points for SR-236 to allow for more efficient operations for training aircraft flying in and out of Sheppard AFB. This would consist of redesignating existing Waypoint D to Waypoint A and redesignating subsequent waypoints alphabetically (**Figure 2-5**). The route would end at proposed new Waypoint G, where aircraft would exit and return to Sheppard AFB. The latitude and longitude of the redesignated waypoints would not change. Existing Waypoints A and H would retain their current designations and remain available for future airspace navigation requirements, if needed. The latitude and longitude of the proposed redesignated and new waypoints in SR-236 are shown in **Table 2-3**. No changes to the lateral and vertical extents of SR-236 would be required. Pilots would adhere to established operating procedures to avoid potential obstructions from existing wind turbines along SR-236, particularly between redesignated Waypoint F and new Waypoint G. SR-242 would be used in its existing configuration to support training operations by Laughlin AFB-based aircraft and no changes to that airspace would occur. As needed, personnel at Sheppard and Laughlin AFBs would coordinate flight operations between Waypoints B and C in SR-242 (**Figure 1-3**), as that segment would partially overlap the segment between redesignated Waypoints E and F in SR-236. SR-236 and the unmodified SR-242 airspace would also be available support slow-speed and low-altitude training operations by transient C-130 aircraft (see **Section 2.2.1**).

Table 2-3 Proposed Redesignated and New Waypoints in SR-236 Under Alternative 2

Proposed Renamed or New Waypoints	Existing Waypoints	Latitude	Longitude
A	D	33°32.15'N	99°22.13'W
B	E	33°33.23'N	100°05.37'W
C	F	33°05.63'N	100°00.25'W
D	G	32°45.00'N	100°01.00'W
E	B	32°44.02'N	99°52.52'W
F	C	32°56.23'N	99°12.77'W
G	(No existing waypoint)	33°25.46'N	99°20.25'W
No Change	A	32°36.00'N	100°04.00'W
No Change	H	32°25.00'N	99°52.00'W

- **Alternative 3 – Use Existing SR Airspace Operated by Other Installations.** Under this alternative, military undergraduate student pilots from Sheppard AFB and Laughlin AFB and transient C-130 pilots would use existing SR airspace operated by other DAF installations to meet AETC slow-speed and low-altitude training requirements.
- **Alternative 4 – Establish New SR Airspace.** Under this alternative, DAF would establish new SR airspace to support AETC slow-speed and low-altitude training requirements for military undergraduate student pilots at Sheppard AFB and Laughlin AFB and transient C-130 pilots. Once established, this new airspace would be operated by Sheppard AFB and Laughlin AFB.
- **Alternative 5 – Repurpose Existing Non-SR Airspace.** Under this alternative, DAF would seek to acquire and repurpose other existing DAF- or DoD-controlled airspace to support slow-speed and low-altitude training requirements for military undergraduate student pilots at Sheppard AFB and Laughlin AFB and transient C-130 pilots. The repurposed airspace would be administered and operated by Sheppard AFB and Laughlin AFB.

As noted in **Section 2.2**, 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, 2023a). 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.

The alternatives listed above were compared against the selection standards described in **Section 2.3.1**. **Table 2-4** summarizes how each alternative described above met or failed to meet the selection standards.

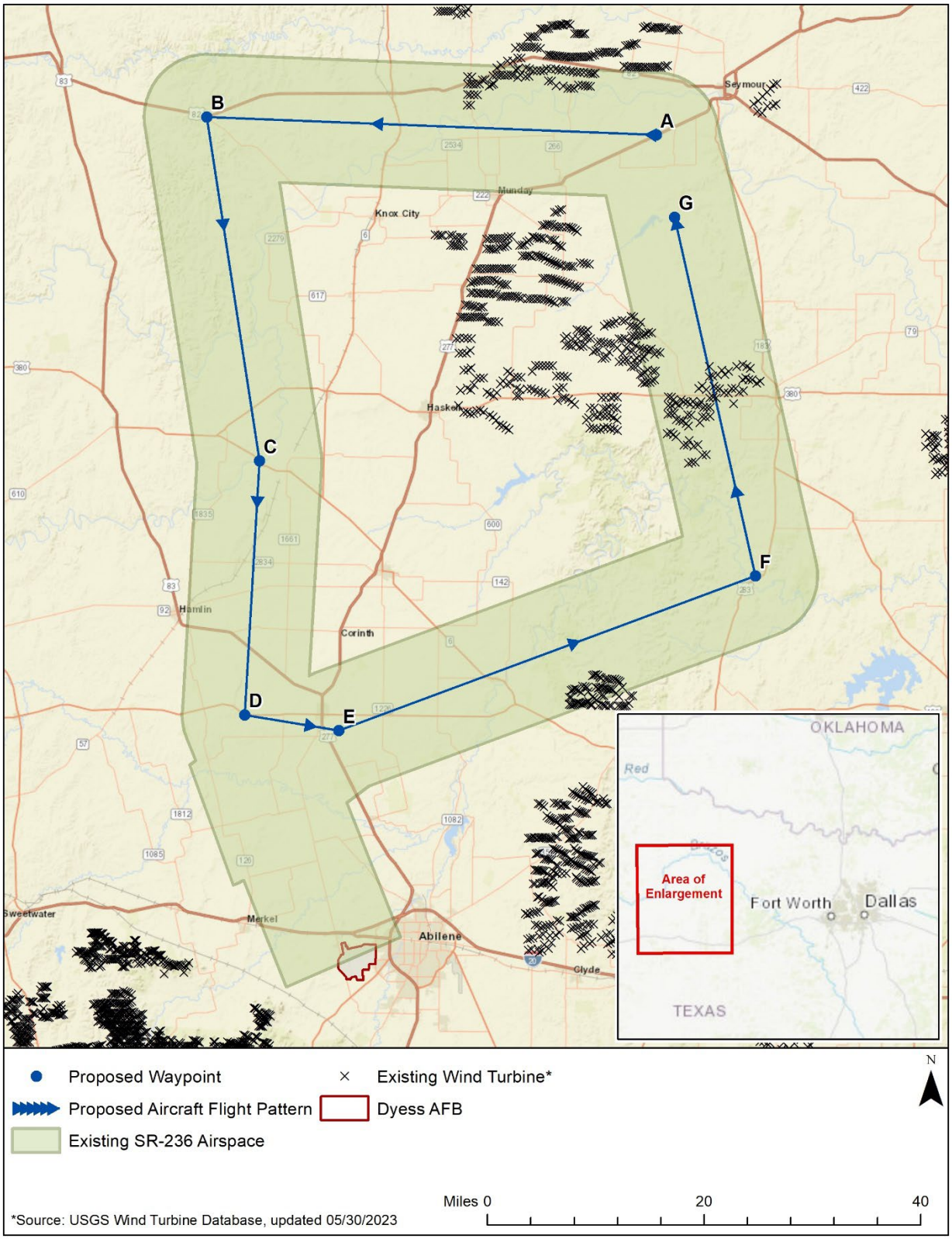

Figure 2-5 Proposed Redesignated Waypoints in SR-236 Under Alternative 2

Table 2-4 Comparison of Alternatives

Alternative	Selection Standards				Meets Purpose and Need?
	1. Operational Flexibility	2. Existing / Available Slow Route Airspace	3. Existing Slow Route Airspace Administered by Sheppard and Laughlin AFBs	4. Capacity and Availability	
1. Use Existing SR-242 and Modify SR-236	Yes	Yes	Yes	Yes	**YES**
2. Adjust SR-236 Access Points and Use Existing SR-242	Yes	Yes	Yes	Yes	**YES**
3. Use Existing Slow Route Airspace Operated by Other Installations	Yes	Yes	No	Yes	**NO**
4. Establish New Slow Route Airspace	Yes	No	Yes	Yes	**NO**
5. Repurpose Existing Non-Slow Route Airspace	Yes	No	Yes	Yes	**NO**

2.3.3 Alternatives Analyzed in the EA

Based on comparison with the selection standards in **Section 2.3.1**, the following alternatives are retained for detailed analysis in the EA.

2.3.3.1 Alternative 1 – Use Existing SR-242 and Modify SR-236

This alternative would meet all four selection standards listed in **Section 2.3.1**. Alternative 1 would provide Sheppard AFB and Laughlin AFB with operational flexibility (Selection Standard 1). To the maximum extent feasible, Alternative 1 would use existing, currently available airspace that was previously established for SR training (Selection Standard 2), although modifications to the existing SR-236 airspace would be needed to avoid existing encroachment that was not present when the airspace was established in the 1990s (see **Figure 2-3** and **Figure 2-4**). This alternative would also use existing SR airspace that is already administered by Sheppard AFB and Laughlin AFB (Selection Standard 3) and provide airspace with sufficient capacity and availability (Selection Standard 4). In addition to meeting the four selection standards, Alternative 1 would allow aircraft to avoid encroachment from wind turbines and other development that did not exist when SR-236 was originally established in the 1990s. Alternative 1 would also help to deconflict proposed aircraft operations occurring in SR-236 with those currently occurring in Sheppard AFB-managed MTRs, including VR-159 and VR-1143. Therefore, Alternative 1 is considered a reasonable alternative and is retained for detailed analysis in this EA.

2.3.3.2 Alternative 2 – Adjust SR-236 Access Points and Use Existing SR-242

This alternative would meet all four selection standards listed in **Section 2.3.1**. Alternative 1 would provide Sheppard AFB and Laughlin AFB with operational flexibility (Selection Standard 1), while using existing, currently available airspace that was previously established for SR training (Selection Standard 2). This alternative would also use existing SR airspace that is already administered by Sheppard AFB and Laughlin AFB (Selection Standard 3) and provide airspace

with sufficient capacity and availability (Selection Standard 4). Therefore, Alternative 2 is considered a reasonable alternative and is retained for detailed analysis in this EA.

2.3.3.3 No Action Alternative

Under the No Action Alternative, SR-236 and SR-242 would remain temporarily closed and would not be used by military undergraduate student pilots from Sheppard AFB and Laughlin AFB or transient C-130 pilots to meet slow-speed and low-altitude training requirements. Sheppard AFB and Laughlin AFB would continue to conduct SR training on existing SRs currently operated by those installations. If not repurposed for another action separate from the Proposed Action (which would be evaluated in NEPA documentation prepared separately from this EA), the DAF could potentially return SR-236 and SR-242 to the National Airspace System administered by the FAA, thereby losing access to a valuable and finite training resource.

The No Action Alternative does not meet the purpose and need but is carried forward for detailed analysis in accordance with CEQ NEPA regulations at 40 CFR Parts 1500 - 1508 and 23 CFR Part 989. 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.

2.3.4 Alternatives Dismissed from Detailed Analysis

The following alternatives were dismissed from further analysis in the EA because they do not meet one or more of the selection standards and therefore, would not meet the purpose of and need for the Proposed Action.

2.3.4.1 Alternative 3 – Use Existing SR Airspace Operated by Other Installations

The use of SR airspace operated by other installations would provide Sheppard AFB and Laughlin AFB with operational flexibility and would make use of existing SR airspace, thereby meeting Selection Standards 1 and 2, respectively. Under this alternative, Sheppard AFB and Laughlin AFB would also select airspace with sufficient capacity and availability to meet Selection Standard 4. However, this alternative would not meet Selection Standard 3 because it would use SR airspace operated by other installations rather than Sheppard AFB and Laughlin AFB. Training requirements of units at the operating installation(s) would take priority in scheduling the airspace, which would continue to limit SR training opportunities and viable options for Sheppard AFB and Laughlin AFB student pilots to offset training flights lost due to unfavorable weather and/or other constraints and restrictions on existing SRs operated by those installations. Therefore, this alternative is not considered reasonable and is dismissed from further consideration in this EA.

2.3.4.2 Alternative 4 – Establish New SR Airspace

This alternative would meet Selection Standards 1 and 4 by providing operational flexibility and providing airspace with sufficient capacity and availability. It would also meet Selection Standard 3 because the new SR airspace would be operated by Sheppard AFB and Laughlin AFB. However, it would not meet Selection Standard 2 because it would not use existing, currently available SR airspace. Generally, this alternative would necessitate increased use and expenditure of limited financial resources, labor, and time, and potentially incur extensive environmental compliance actions and commitments in an effort to propose new airspace with no guarantee of actual establishment. Therefore, this alternative is not considered reasonable and is not evaluated further in this EA.

2.3.4.3 Alternative 5 – Repurpose Existing Non-SR Airspace

Like Alternative 3 and for similar reasons, Alternative 5 would meet Selection Standards 1, 3, and 4, but would fail to meet Selection Standard 2 because it would not use existing, currently available SR airspace. Overall, this alternative presents several uncertainties including a lack of suitable airspace currently available for repurposing, dependance upon other airspace becoming available for repurposing, and the unknown viability of airspace potentially available in the future to support AETC slow-speed and low-altitude pilot training requirements. Therefore, this alternative is not reasonable and is not retained for detailed evaluation in this EA.

2.4 Environmental Commitments and Best Management Practices

The Proposed Action would have no significant adverse impacts on resources evaluated in this EA; therefore, mitigation measures to mitigate significant impacts are not identified. As applicable, environmental commitments and best management practices to prevent or minimize non-significant effects from the Proposed Action are described for environmental resources evaluated in Chapter 3.

2.5 Summary of Potential Environmental Consequences

Potential impacts from the Proposed Action are summarized in **Table 2-5**. This summary is derived from the detailed discussion of potential impacts on each resource presented in **Chapter 3** of this EA.

Table 2-5 Comparison of Potential Environmental Impacts of the Proposed Action

Resource	Proposed Action (Alternative 1 and Alternative 2) [1]	No Action Alternative
Airspace and Airspace Management	No significant long-term impacts on airspace, including any adjacent military training airspace or other local civil or military operations.	No significant long-term impacts because SR-236 and SR-242 would not be available to relieve demand on other existing SR airspaces and could potentially be returned to the National Airspace System if not repurposed for another action separate from the Proposed Action.
Air Quality, Greenhouse Gases, and Climate Change	No significant long-term impacts from emissions of criteria pollutants from aircraft operating in SR-236 and SR-242. These emissions would not affect the attainment status of the three ACQRs that overlap the SRs. No impacts on Class I areas because no such areas are within 6.2 miles of the SRs. GHG emissions would be negligible relative to statewide GHG emissions in Texas. Regulatory thresholds for stationary source permitting do not apply to the Proposed Action.	No change.
Noise / Acoustic Environment	No significant long-term impacts from noise associated with proposed aircraft operations.	No change.

Table 2-5 Comparison of Potential Environmental Impacts of the Proposed Action

Resource	Proposed Action (Alternative 1 and Alternative 2) [1]	No Action Alternative
Cultural Resources	No adverse physical impacts on archaeological or architectural resources because the Proposed Action does not involve construction, demolition, or other ground-disturbing activities. Increased noise levels associated with the Proposed Action would be low and would have no potential to affect the character, setting, or historic integrity of historic properties in the APE. No impacts on traditional cultural properties because no such properties have been identified in the APE.	No change.
Biological / Natural Resources	No significant impacts on individual animals of common wildlife species. The Proposed Action may affect, but is not likely to adversely affect federally listed threatened and endangered species, and would not jeopardize the continued existence of federal proposed or candidate species.	No change.
Land Use	No impacts on land use.	No change.
Socioeconomics	No adverse impacts on socioeconomic conditions.	No change.
Environmental Justice	No disproportionately adverse effects on minority populations, low-income populations, persons younger than 18 years, or persons older than 65 years.	No change.
Safety	No significant adverse impacts on safety, including potential aircraft mishaps, aircraft collisions with birds and wildlife, and obstructions to flight, through adherence to all applicable safety and health procedures.	No change.

Notes:

[1] Impacts from Alternative 1 and Alternative 2 would be the same for all resources, with the exceptions that Alternative 1 would have no potential to affect resources in Baylor County, Texas and Alternative 2 would have no potential to affect resources in Fisher and Young Counties, Texas.

ACQR = Air Quality Control Region; APE = Area of Potential Effects; FAA = Federal Aviation Administration; GHG = greenhouse gases; SR = Slow Route

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CHAPTER 3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the existing conditions of environmental resources in or underlying the SRs and potential impacts on those resources from the Proposed Action and No Action Alternative. The effects of reasonably foreseeable future actions are also considered. Through this EA, the terms "impact" and "effects" are used interchangeably and mean the same thing.

3.1 ANALYZED RESOURCES AND EVALUATION CRITERIA

Table 3-1 lists the environmental resources analyzed in this EA and the Region of Influence (ROI) for each resource. The ROI is the geographic area where potential impacts on a particular resource could occur or be experienced as a result of the Proposed Action or No Action Alternative. The area and extent of the ROI varies for each resource based on the characteristics of the particular resource being evaluated.

Table 3-1 Resources Analyzed in the Environmental Assessment and Region of Influence

Resource	Region of Influence
Airspace and Airspace Management	Airspace within SR-236 and SR-242 under Alternative 1 or 2.
Air Quality, Greenhouse Gases, and Climate Change	Air Quality Control Regions containing Texas counties crossed by SR-236 and SR-242 under Alternative 1 or 2.
Noise / Acoustic Environment	Airspace within, and lands underlying, SR-236 and SR-242 under Alternative 1 or 2.
Cultural Resources	Contiguous with the Area of Potential Effects which consists of lands underlying or intersected by the boundaries of SR-236 and SR-242 under Alternative 1 or 2.
Biological / Natural Resources	Airspace within and lands underlying SR-236 and SR-242 under Alternative 1 or 2.
Land Use	Lands underlying SR-236 and SR-242 under Alternative 1 or 2.
Socioeconomics	Texas counties crossed by SR-236 and SR-242 under Alternative 1 or 2.
Environmental Justice	Texas counties crossed by SR-236 and SR-242 under Alternative 1 or 2.
Safety	Airspace within and below, and lands underlying, SR-236 and SR-242 under Alternative 1 or 2.

3.2 RESOURCES ELIMINATED FROM FURTHER ANALYSIS

In compliance with NEPA, CEQ guidelines, and DAF guidance in 32 CFR Part 989, as amended, the analysis presented in this EA focuses on those resources that may be meaningfully affected by the Proposed Action. Resources that would experience no or only marginal effects were identified through a preliminary screening process and dismissed from detailed analysis. These resources, and the rationale for their dismissal, are summarized in **Table 3-2**.

Table 3-2 Resources Dismissed from Analysis in the Environmental Assessment

Resource Dismissed from Analysis	Rationale for Dismissal
Water Resources	The Proposed Action does not involve activities that would occur in or near surface water bodies, wetlands, and floodplains; require the channeling, diversion or alteration of surface water bodies; require new or additional withdrawals of or discharges to surface water and groundwater; or have the potential to indirectly affect water quality (e.g., the sedimentation and pollution from ground disturbance and associated runoff, or the intentional or accidental release of pollutants or hazardous substance to surface and groundwater). The Proposed Action would not increase or otherwise change the use of water resources in the Region of Influence. Therefore, this resource was dismissed from detailed analysis 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 SR-236 and SR-242. 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 infrastructure and utilities or the alteration of existing infrastructure and utilities on DoD and non-DoD lands. Therefore, this resource was dismissed from detailed analysis in the EA.
Earth Resources	Activities included in 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 this EA.

Notes:
DAF = Department of the Air Force; DoD = Department of Defense; EA = Environmental Assessment

3.3 AIRSPACE AND AIRSPACE MANAGEMENT

3.3.1 Definition of the Resource

Airspace is the area above the earth's surface where aircraft operate. 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. In accordance with 49 U.S.C. § 40103, *Sovereignty and Use of Airspace* and Public Law 103-272, the U.S. government has exclusive sovereignty over the nation's airspace. The FAA is responsible for planning, managing, and controlling the structure and use of all airspace over the United States. FAA rules govern the national airspace system and FAA regulations establish how and where aircraft may fly. Collectively, the FAA uses these rules and regulations to make airspace use safe, effective, and compatible for all types of civilian, commercial, and military aircraft.

Airspace for military use is established by the FAA in coordination with the DAF to meet operational needs for military readiness. The DAF categorizes military airspace into two types of airspace: special use airspace (SUA) and other airspace for military use (non-SUA). SRs are a type

of non-SUA that are used for military air operations training conducted at or below 1,500 ft AGL at airspeeds of 250 knots or less. Pilot and navigation training in SRs simulates low-level and low-speed flying techniques that aircrews may be required to perform in "real-world" situations, including combat conditions. SRs do not require coordination with the FAA for establishment; rather, they are recorded solely in military documents, either locally at the unit with management or operational responsibility, or within DoD Flight Information Publications (FLIPs). SRs are not published on aeronautical charts and there is no overall mechanism to inform military or civilian aviators that an SR is active (DAF, 2020a). Additional information regarding airspace management and use is provided in **Appendix C-1**.

The ROI for airspace management includes airspace within SR-236 and SR-242 under Alternative 1 or Alternative 2.

3.3.2 Affected Environment

Military airfields were established across Texas in the 1940s and training in military airspace has occurred over north-central Texas, including the areas containing SR-236 and SR-242, for more than 80 years. SRs may cross or be crossed by other types of military and non-military airspace, and have been historically compatible with non-military 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 non-military pilots transiting through SR airspace as part of their routine flight operations and patterns must use "see and avoid" techniques to prevent conflicts with military aircraft actively using the SR. Pilots flying under instrument flight rules also rely on their cockpit instruments and communications with ATC when transiting SR airspace.

FAA avoidance rules specify that aircraft must avoid congested areas of a city, town, settlement, or any open-air assembly of persons by 1,000 ft above the highest obstacle within a horizontal radius of 2,000 ft of the aircraft. Outside of congested areas, aircraft must avoid any person, vessel, vehicle, or structure by 500 ft. DoD installations with management and operational responsibility for SRs may also establish additional avoidance restrictions.

Obstacle avoidance procedures for T-6 aircraft note that towers and other manufactured obstacles are more difficult to see than high terrain (DAF, 2016). For wind turbines, communications towers, and other vertical obstructions along the SRs, aircrews would fly a minimum of 500 ft above the highest obstacle within 2 NM of the aircraft until acquired visually. Once the obstacle is acquired visually and positively identified, aircrew will maintain a 2,000 ft lateral clearance.

SR-236 and SR-242 are currently closed to aircraft operations (DoD, 2023). Sheppard AFB and Laughlin AFB are responsible for originating and scheduling activity in SR-236 and SR-242, respectively, in the event that aircraft operations in these SRs resume in the future. Areas along these routes that require avoidance by aircraft, such as noise-sensitive land uses, towns, parks, private airfield, and towers or other vertical obstructions, are not identified in FLIP AP/1B (DoD, 2023). Such areas would typically require avoidance by 500 ft vertically and 1 NM horizontally. Existing wind turbines on or near SR-236 and SR-242 (**Figure 1-2** and **Figure 1-3**) require T-6 pilots to plan for an obstacle clearance buffer of 2 NM until acquired visually. Estimated avoidance areas for existing wind turbines and civilian airports and airfields along SR-236 and SR-242 are shown on **Figure 3-1**.

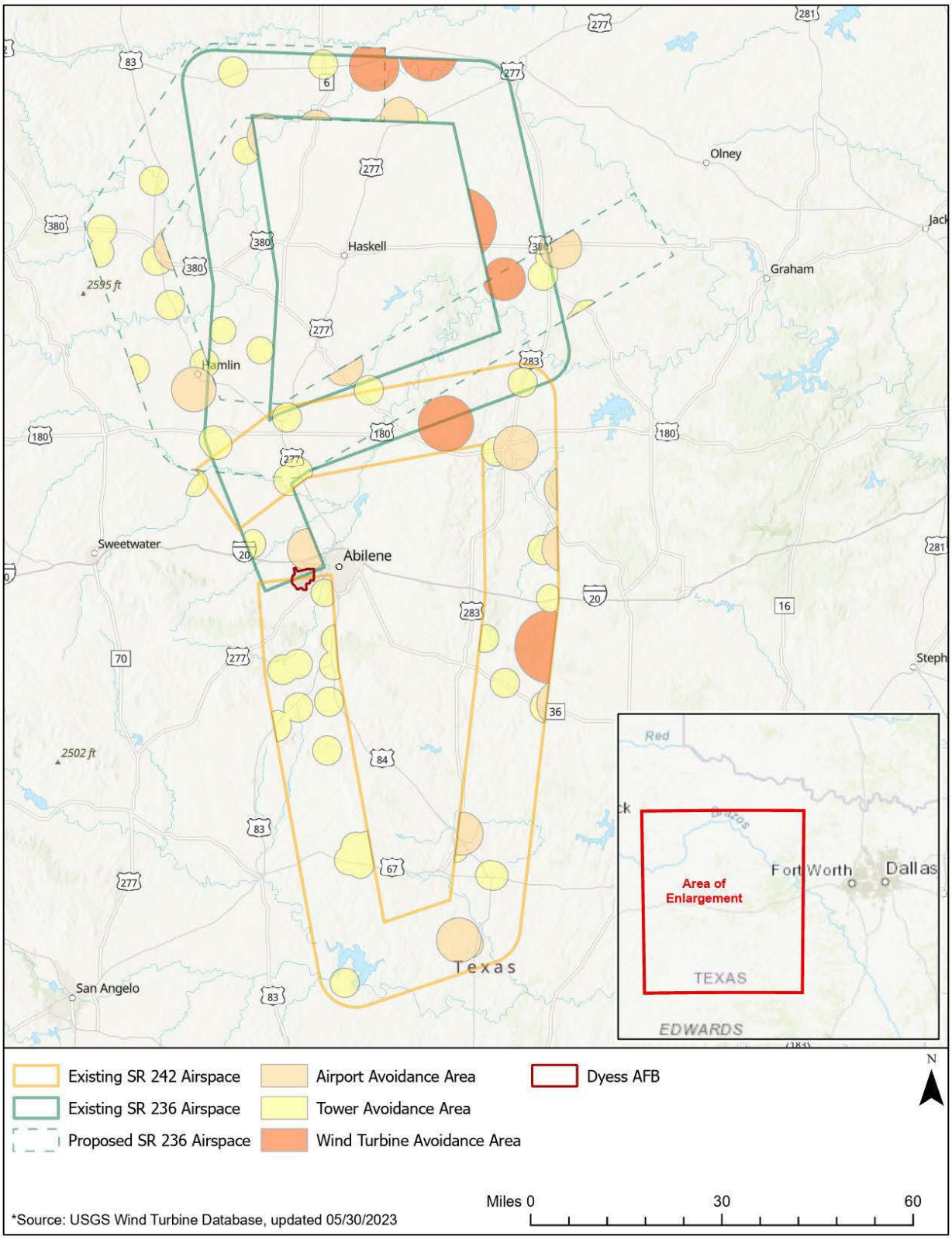

Figure 3-1 Location of Avoidance Areas Within and Adjacent to SR-242 and Existing and Proposed Reconfigured SR-236

3.3.3 Environmental Consequences

3.3.3.1 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 adjacent or nearby military or non-military airspace. An adverse impact would be considered significant if the Proposed Action permanently reduced the capacity of adjacent or nearby military or non-military airspace or required changes to the lateral or horizontal extents of such airspace to continue operation.

3.3.3.2 Alternative 1

To the maximum extent feasible, Alternative 1 would use existing, currently available airspace that was previously established for SR training. This alternative would also use existing SR airspace that is currently administered by Sheppard AFB and Laughlin AFB and provide airspace with sufficient capacity and availability. Alternative 1 would have no potential to encroach on or disrupt aviation operations in adjacent or nearby airspace, including airspace within the proposed reconfigured SR-236 that is not currently within the existing configuration of SR-236, nor would it reduce the capacity of or require changes to the vertical or lateral extents of such airspace. Pilots operating in SR-236 and SR-242 would avoid obstructions and avoidance areas in accordance with the procedures described in **Section 3.3.2** and/or other applicable DAF requirements. Therefore, Alternative 1 would have no significant long-term impacts on airspace, including any adjacent military training airspace or other local civil or military operations.

3.3.3.3 Alternative 2

Impacts on airspace and airspace management from Alternative 2 would be the same as those described for Alternative 1, except airspace with SR-236 would be the same as that previously used by the DAF when SR-236 was active. These impacts would not be significant.

3.3.3.4 No Action Alternative

Under the No Action Alternative, SR-236 and SR-242 would remain temporarily closed and existing conditions would continue. This would have an adverse impact on other existing SR training airspace because SR-236 and SR-242 would not be available as alternative training airspaces to relieve demand on other SRs used by military undergraduate student pilots at Sheppard and Laughlin AFBs and C-130 pilots from other DoD installations. These other SRs would continue to be in high demand due to intensive training tempo, limited operating hours, extensive scheduling and coordination requirements among multiple units and military and civilian air traffic operators, vulnerabilities to unfavorable weather conditions, and constraints from other existing civilian and military aviation traffic and existing development. Ultimately, if not repurposed for another action separate from the Proposed Action, the DAF would return SR-236 and SR-242 to the National Airspace System administered by the FAA, which further represent a long-term adverse impact from the loss of valuable military training airspace. However, while these impacts would be adverse, they would continue to be managed as they currently are. Therefore, these adverse effects would be minor and not significant.

3.3.3.5 Reasonably Foreseeable Future Actions and Other Environmental Considerations

As airspace demand in the region increases, the DAF, in conjunction with other managing agencies, would continue coordination to limit and reduce potential impacts. Therefore, potential

effects on airspace from the Proposed Action, when considered with other reasonably foreseeable future actions, would not be significant.

3.4 AIR QUALITY, GREENHOUSE GASES, AND CLIMATE CHANGE

3.4.1 Definition of the Resource

Air quality is affected by pollutants emitted by numerous natural and man-made sources. The US Environmental Protection Agency (USEPA) is mandated under the Clean Air Act (CAA) to set air quality standards for select pollutants that are known to affect human health and the environment to manage pollutant emission levels in ambient air. The USEPA has established Air Quality Control Regions (AQCRs) throughout the United States to evaluate compliance with the National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50). The NAAQS are currently established for six criteria air pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter (including particulates equal to or less than 10 microns in diameter [PM_{10}] and particulates equal to or less than 2.5 microns in diameter [$PM_{2.5}$]), and lead (Pb). Each AQCR has regulatory areas that are designated as an attainment or nonattainment area for each of the criteria pollutants depending on whether it meets or exceeds the NAAQS. Attainment areas that were reclassified from a previous nonattainment status to attainment are called maintenance areas and are required to prepare a maintenance plan for air quality.

Federal actions in NAAQS nonattainment and maintenance areas are required to comply with USEPA's General Conformity Rule (40 CFR Part 93). These regulations ensure that federal actions do not impede local efforts to achieve or maintain attainment with the NAAQS. Proposed federal actions are evaluated to determine if the total indirect and direct net emissions from the action would be below *de minimis* levels for each of the pollutants as specified in 40 CFR § 93.153. If the *de minimis* levels would not be exceeded for any of the pollutants, no further evaluation is required. However, if net emissions from a proposed action would exceed the *de minimis* thresholds for one or more of the specified pollutants, a demonstration of conformity, as prescribed in the General Conformity Regulations (40 CFR Parts 51 and 93), is required.

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.

Greenhouse gases (GHGs) are gases, occurring from natural processes and human activities, that trap heat in the atmosphere. The accumulation of GHGs in the atmosphere helps regulate the earth's temperature and are believed to contribute to global climate change. The USEPA regulates GHG emissions via permitting and reporting requirements that are applicable mainly to large stationary sources of emissions. 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 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 carbon dioxide (CO_2). The larger the GWP, the more that a given gas warms

the earth compared to CO_2 over the same time period. Analysts cumulatively compare emission estimates of different gases using standardized GWPs.

The ROI for the air quality analysis consists of the Midland-Odessa-San Angelo Intrastate AQCR (40 CFR § 81.137), Amarillo-Lubbock Intrastate AQCR (40 CFR § 81.133), and the Abilene-Wichita Falls Intrastate AQCR (40 CFR § 81.132). These AQCRs contain the Texas counties that would be crossed by SR-236 and SR-242 under Alternative 1 or Alternative 2. The AQCRs comprising the ROI are in attainment for all criteria pollutants regulated under the NAAQS.

Detailed information on air quality regulations, general conformity, climate change, and GHGs is provided in **Appendix C**. Counties that would be crossed by SR-236 and SR-242, and their respective ACQRs, are listed in **Table C-2**. The methodologies, emission factors, and assumptions used to estimate emissions from the Proposed Action are provided in **Appendix C.2.5**.

3.4.2 Affected Environment

3.4.2.1 Regional Climate

The general climate conditions for Abilene, Texas (location chosen to represent the ROI), are classified as Humid Subtropical Climate, which is characterized by relatively high temperature conditions with evenly distributed precipitation throughout the year. The average temperature for the year in Abilene is 64.5 degrees Fahrenheit (°F) (18.1 degrees Celsius [°C]). The warmest month, on average, is July with an average temperature of 83.6°F (28.7°C). The coolest month on average is January, with an average temperature of 44°F (6.7°C). The average amount of annual precipitation in Abilene is 23.9 inches (607.1 millimeters [mm]). The month with the most precipitation on average is May with 3.3 inches (83.8 mm) of precipitation. The month with the least precipitation on average is January with an average of 1.0 inch (25.4 mm). The annual average wind direction and wind speed is south, south-west at 11 miles per hour (Weatherbase, 2023).

3.4.2.2 Regional Air Quality and Current Operational Emissions

The counties crossed by the SRs are part of the Abilene-Wichita Falls Intrastate, the Midland-Odessa-San Angelo Interstate, and the Amarillo-Lubbock Intrastate AQCRs. Per the Air Force's Air Conformity Applicability Model (ACAM), these counties are in attainment for all NAAQS. As a result, General Conformity is not applicable to the ROI. No air quality permits are needed for the SR airspace.

SR-236 and SR-242 were historically used by C-130s but are both temporarily closed to air traffic. Estimated emissions from historic C-130 operations in SR-236 and SR-242 are shown in **Table 3-3.**

Table 3-3 Estimated Criteria Pollutant Emissions from HC-130 Operations in SR-236 and SR-242

Aircraft	Airspace	Emissions (tpy) [1]							
		VOC	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$	Pb	NH_3
C-130	SR-236	0.001	0.277	0.059	0.032	0.044	0.017	0	0
	SR-242	0.001	0.274	0.058	0.032	0.044	0.017	0	0

Notes:

[1] Estimated ACAM output results (see **Appendix C.2.7**)

CO = carbon monoxide; NH_3 = ; NO_x = nitrogen oxide; Pb = lead; $PM_{2.5}$ = particulate matter with a diameter of less than 2.5 micrometers; PM_{10} = particulate matter with a diameter of less than 10 micrometers; SO_x = oxides of sulfur; tpy = tons per year; VOC = volatile organic compound.

The SRs do not occur within or close to designated Class 1 areas where deterioration of air quality relative to PSD criteria is a special concern under the CAA. The two designated Class I areas in Texas, Big Bend National Park and Guadalupe Mountains National Park, are approximately 300 miles from Abilene and would have no potential to be affected by emissions associated with the Proposed Action.

3.4.3 Environmental Consequences

3.4.3.1 Evaluation Criteria

The ROI is designated as attainment (or unclassifiable) for criteria pollutants. Because the Proposed Action would occur within areas designated attainment/unclassifiable, General Conformity requirements are not considered or addressed in this air quality analysis.

Based on guidance in Chapter 4 of the *Air Force Air Quality EIAP Guide*, *Volume II – Advanced Assessments* (Air Force, 2020), project criteria pollutant emissions were compared against the insignificance indicator of 250 tons per year (tpy) for PSD major source permitting threshold for actions occurring in areas that are in attainment for all criteria pollutants (25 tpy for Pb). These "Insignificance Indicators" were used in the analysis to provide an indication of the significance of potential impacts 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 an exceedance of one or more NAAQSs. 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.

3.4.3.2 Alternative 1

Potential emissions from Alternative 1 were estimated to begin in January 2024, with 2025 and beyond being considered "steady state." **Table 3-4** presents the net change in annual operational emissions associated with Alternative 1. The estimated net change in emissions is compared against the 250 tpy indicator of insignificance for criteria pollutants in attainment areas. Emissions would increase from proposed operations under Alternative 1, including areas that would be crossed by the proposed reconfigured SR-236 that are not crossed by the existing configuration of SR-236, but the potential change would be less than the insignificance indicator values. Therefore, estimated increases in criteria pollutant emissions would not be significant.

Regional haze or visibility would not be a concern because the estimated emissions from Alternative 1 would not be significant and no designated Class I areas are within 6.2 miles (10 kilometers [km]) of SR-236 and SR-242.

Table 3-4 Net Change in Criteria Pollutant Emissions from Alternative 1

	Emissions (tpy) [1]								
	VOC	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$	CO_2e	Pb	NH_3
Current Operations	0.001	0.551	0.117	0.064	0.088	0.034	195	0	0
Alternative 1	0.079	1.003	1.293	0.174	0.442	0.106	525	0	0
Net Change in Emissions	0.078	0.452	1.176	0.109	0.354	0.072	330	0	0

Table 3-4 Net Change in Criteria Pollutant Emissions from Alternative 1

	Emissions (tpy) [1]								
	VOC	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$	CO_2e	Pb	NH_3
Insignificance Indicator	250	250	250	250	250	250	N/A	25	N/A
Exceeds Indicator Level?	No	No	No	No	No	No	N/A	No	N/A

Notes:

[1] Estimated ACAM output results (see **Appendix C.2.7**)

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

3.4.3.3 Alternative 2

Potential emissions from Alternative 2 were estimated to begin in January 2024, with 2025 and beyond being considered "steady state." **Table 3-4** presents the net change in annual operational emissions associated with Alternative 2. The estimated net change in emissions is compared against the 250 tpy indicator of insignificance for criteria pollutants in attainment areas. Emissions from Alternative 2 operations would increase, but the potential net change would be less than the indicator values for insignificance. Therefore, the increases in criteria pollutant emissions would not be significant.

Regional haze or visibility would not be a concern because the estimated emissions from Alternative 2 would not be significant and no designated Class I areas are within 6.2 miles (10 km) of SR-236 and SR-242.

Table 3-5 Net Change in Criteria Pollutant Emissions from Alternative 2

	Emissions (tpy) [1]								
	VOC	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$	CO_2e	Pb	NH_3
Current Operations	0.001	0.551	0.117	0.064	0.088	0.034	195	0	0
Alternative 2	0.082	1.022	1.339	0.178	0.456	0.109	538	0	0
Net Change in Emissions	0.081	0.472	1.222	0.114	0.368	0.075	344	0	0
Insignificance Indicator	250	250	250	250	250	250	N/A	25	N/A
Exceeds Indicator Level?	No	No	No	No	No	No	N/A	No	N/A

Notes:

[1] Estimated from ACAM output (see **Appendix C.2.7**)

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

3.4.3.4 No Action Alternative

Under the No Action Alternative, SR-236 and SR-242 would remain temporarily closed and existing conditions would continue. This would have no impact on regional air quality or the attainment status of AQCRs comprising the ROI.

3.4.3.5 Reasonably Foreseeable Future Actions and Other Environmental Considerations

Criteria pollutants regulated by the NAAQs would be emitted during the respective construction and operational phases of the reasonably foreseeable future projects listed in **Table B-1**. Quantities of criteria pollutants emitted during each project would vary widely; however, these emissions would be regulated in accordance with applicable regulatory and permitting requirements to ensure that they do not contribute to the substantial degradation of local or regional air quality or result in a change to an AQCR attainment designation. Therefore, when considered with these reasonably foreseeable future actions, the Proposed Action would not contribute to significant cumulative impacts on air quality.

Climate Change Considerations

To serve as a reference point, projected GHG emissions were compared to Texas' net GHG emissions from various sectors, and to the Title V and PSD major source thresholds for CO_2e applicable to stationary sources **(Table 3-6)**. Based on the relative magnitude of the project's GHG emissions, a general inference can be drawn regarding whether the Proposed Action is meaningful with respect to the discussion regarding climate change.

As **Table 3-6** demonstrates, GHG emissions increases for each alternative would be relatively minor and the regulatory thresholds for stationary source permitting do not apply. At the state level, GHG emissions primarily result from fossil fuel combustion. Based on this analysis, incremental GHG emissions from either alternative would not be significant.

Table 3-6 Comparison of Proposed Action Greenhouse Gas Emissions to 2021 Total Greenhouse Gas Emissions in the State of Texas

Projected CO_2e Emissions Increases (tpy) [1, 2]	CO_2e Regulatory Thresholds (tpy)		Texas 2021 Net GHG Emissions ($MMTCO_2e$) [3]	Proposed Action GHG Emission as a Percentage of Total Texas GHG Emissions
	Title V Permit	PSD New / Modified Source		
Alternative 1: 330.00	100,000	100,000 / 75,000	873.1115	Alternative 1: 0.00003
Alternative 2: 343.70				Alternative 2: 0.00004

Notes:

Source: USEPA, 2023a

[1] Estimated from ACAM output (see **Appendix C.2.7**)

[2] Estimated emissions increase from Slow Route sorties

[3] Represents emissions from transportation, electricity generation, industry, residential and commercial. Also includes projected emissions from waste, agriculture, and land use, land use change and forestry

CO_2e = carbon dioxide equivalent; GHG = greenhouse gas; $MMTCO_2e$ = million metric tons CO_2e; PSD = Prevention of Significant Deterioration; tpy = tons per year

Per CEQ interim guidance released in January 2023, "Agencies should exercise judgment when considering whether to apply this guidance to the extent practicable to an on-going NEPA process" (CEQ, 2023). The DAF guidance on applying and conducting a Social Cost of GHG Analysis is under development and will be released shortly with specifics on applying Social Cost of GHG Analyses to ensure standardization across the DAF. Therefore, a Social Cost of GHG Analysis was not conducted for this EA.

3.5 NOISE / ACOUSTIC ENVIRONMENT

3.5.1 Definition of the Resource

Military aircraft noise consists of sound events from subsonic flight operations, which occur on SRs 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 the SRs 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 3-7**.

Table 3-7 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.
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-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 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).

Notes:
dB = decibel

L_{dn} and L_{dnmr} are the primary noise metrics used in this noise analysis. Proposed aircraft operations on SR-236 and SR-242 would consist of flights at altitudes as low as 300 ft AGL and airspeeds of 250 knots. Therefore, L_{dn} and L_{dnmr} would be expected to be the same; (i.e., no onset rate penalty would be associated with the proposed SR flight operations due to their relatively slow speeds). L_{max} and SEL are used to characterize noise that would result from individual C-130 and T-6 aircraft overflights in the SRs. Noise metrics presented in this EA were calculated using the

NOISEMAP (Czech and Plotkin, 1998; Wasmer and Maunsell, 2022a, 2022b) and MR_NMAP (Lucas and Calamia, 1997) software and are reported as A-weighted decibels (dBA). Detailed information regarding noise metrics, noise models, and other acoustic principles is provided in **Appendix C.1**.

This analysis considers noise levels associated with C-130 operations that previously occurred in SR-236 and SR-242 (i.e., historic operations), which represent existing conditions for the purposes of this analysis, as well as noise levels associated with the operation of T-6 and C-130 aircraft under the Proposed Action (see **Section 2.2**). The Noise ROI consists of airspace within and lands underlying SR-236 and SR-242 under Alternative 1 or Alternative 2.

3.5.2 Affected Environment

The primary source of noise within the SRs is aircraft operations. C-130 operations that historically occurred in SR-236 and SR-242 are summarized in **Table 3-8**; these operations were the same on both SRs. Ten C-130 operations occurred annually in each SR. Sixty percent of those operations occurred during the daytime period (7:00 a.m. to 10:00 p.m.) and forty percent occurred during the nighttime period (10:00 p.m. to 7:00 a.m.). Forty percent of these operations occurred at 300 to 500 ft AGL; 40 percent occurred at 500 to 1,000 ft AGL; and 20 percent occurred at 1,000-2,000 ft AGL. These operations and their associated average airspeeds, power settings, and altitude distribution were used as the primary inputs to the noise models used in this analysis.

Table 3-8 Summary of Historic Annual C-130 Operations on SR-236 and SR-242

SR-236 / SR-242			C-130 [1]				
Segment	Existing (ft AGL)		Annual Operations [2]			Average Speed (knots)	Average Horsepower
	Floor	Ceiling	Day (0700-2200 Local)	Night (2200-0700 Local)	Total		
A-B	300	1,500 +	6	4	10	220	4,500
B-C	300	1,500 +	6	4	10	220	4,500
C-D	300	1,500 +	6	4	10	220	4,500
D-E	300	1,500 +	6	4	10	220	4,500
E-F	300	1,500 +	6	4	10	220	4,500
F-G	300	1,500 +	6	4	10	220	4,500
G-H	300	1,500 +	6	4	10	220	4,500
H-I	300	1,500 +	6	4	10	220	4,500

Notes:
[1] Historically, SR-236 and SR-242 supported C-130 operations only.
[2] One annual operation is one aircraft flying the route.
ft AGL = feet above ground level

Table 3-9 shows estimated single event noise levels (L_{max} and SEL) at representative distances and altitudes from historic C-130 operations along the centerline of SR-236 and SR-242. The estimated SEL values are generally higher than the L_{max} values at all distances from the centerline as the SEL represents both the intensity of noise from the overflight and its duration. For both metrics, estimated noise levels would be the loudest directly below the route centerline and attenuate with increased distance from the centerline; representing the range of levels estimated to occur for C-130 overflights on these routes. Estimated noise levels below 45 dBA, which occurred

5 NM from the route centerline for most flight altitudes, are less reliable because they are comparable with typical ambient or background sound levels.

Table 3-9 Estimated Noise Levels for C-130 Overflights in the Slow Routes at Various Altitudes

Aircraft	Location Relative to the Route Centerline (NM)	Altitude (ft AGL)					
		500	1,000	1,500	500	1,000	1,500
		L_{max} (dBA) [1]			SEL (dBA) [1]		
C-130	0	91.3	84.0	79.7	95.5	90.1	86.6
	1	60.8	61.5	61.4	71.4	72.1	72.2
	2.5	< 45	46.6	47.7	53.0	59.4	60.3
	5	< 45	< 45	< 45	< 45	< 45	47.8

Notes:

[1] Noise levels (L_{max} and SEL) shown in this table were calculated using NOISEMAP for C-130 level flight at the constant speeds, power settings, and annual frequency shown in **Table 3-8**.

dBA = A-weighted decibels; ft AGL = feet above ground level; L_{max} = Maximum Sound Level; NM = nautical mile; SEL = sound exposure level

Table 3-10 shows cumulative noise levels from historic C-130 operations in SR-236 and SR-242 that were estimated using the MR_NMAP program. MR_NMAP is used to estimate noise from aircraft operations in areas, such as SRs, where aircraft flight tracks are not well defined and/or are distributed over wide areas. As shown in **Table 3-10**, estimated cumulative aircraft noise levels would not exceed 65 dBA in any segment of the SRs and therefore, would not exceed the threshold for compatibility of aircraft noise with underlying land uses. Estimated noise levels less than 45 dBA shown in **Table 3-10** would be primarily due to the low number of historic annual aircraft operations (i.e., 10) that occurred in each SR.

Table 3-10 Estimated Cumulative Noise Levels in SR-236 and SR-242 from Historic C-130 Operations

Aircraft	Segment	Estimated L_{dn} and L_{dnmr} (dBA)	
		SR-236	SR-242
C-130	A-B	< 45	< 45
	B-C	< 45	< 45
	C-D	< 45	< 45
	D-E	< 45	< 45
	E-F	< 45	< 45
	F-G	< 45	< 45
	G-H	< 45	< 45
	H-I	< 45	< 45

Notes:

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

Potential noise sensitive receptors in or near SR-236 and SR-242 are listed in **Table 3-11** and shown on **Figure 3-2**. As with the estimated cumulative noise levels shown in **Table 3-10**, estimated noise levels from historic C-130 operations at potential noise sensitive receptors in and near the SRs would be less than 45 dBA and would not exceed the 65 dBA compatibility threshold for underlying land uses.

Table 3-11 Estimated Noise Levels from Historic C-130 Operations at Potential Sensitive Receptors In or Near SR-236 and SR-242

Map ID [1]	Potential Sensitive Receptor	Jurisdiction / Location	Latitude (degrees)	Longitude (degrees)	L_{dn} and L_{dnmr} (dBA)
SR-236					
1	Benjamin ISD	Benjamin	33.583412	-99.789253	< 45
2	Goree ISD	Goree	33.467634	-99.528336	< 45
3	Throckmorton ISD	Throckmorton	33.183438	-99.180347	< 45
4	Lueders-Avoca ISD	Lueders	32.798705	-99.626059	< 45
5	Anson ISD	Anson	32.758781	-99.900656	< 45
6	Benjamin Churches	Benjamin	33.584818	-99.790851	< 45
7	Goree Churches	Goree	33.469006	-99.521723	< 45
8	Throckmorton Churches	Throckmorton	33.181912	-99.176925	< 45
9	Anson Churches	Anson	32.751917	-99.89531	< 45
10	Lueders Churches	Lueders	32.802732	-99.622128	< 45
11	9 Nail Ranch	Albany	32.92005	-99.300165	< 45
12	Bomar Nail Ranch LTD	Lueders	32.876963	-99.442399	< 45
13	Swensen Land & Cattle Co	Old Glory	33.006321	-100.011049	< 45
14	Spike Box Land & Cattle Co Inc	Benjamin	33.527147	-99.943245	< 45
15	Brook Valley Ranch	Guthrie	33.445926	-100.066391	< 45
16	Fort Griffin [2]	Albany vicinity, Shackleford County	32.927633	99.232117	< 45
17	Fort Griffin Brazos River Bridge [2]	Northeast of Fort Griffin	32.934683	99.224250	< 45
18	Old Taylor County Courthouse and Jail [2]	Buffalo Gap, Taylor County	32.446550	99.733617	< 45
19	Shackleford County Courthouse [2]	Albany, Shackleford County	32.722967	99.296550	< 45
SR-242					
20	Abilene ISD (Clack Middle School)	Abilene	32.427463	-99.797027	< 45
21	Abilene State Park	Abilene	32.238514	-99.891414	< 45
22	Jim Ned ISD	Buffalo Gap	32.280147	-99.828377	< 45
23	Albany ISD	Albany	32.732401	-99.291466	< 45
24	Santa Anna ISD	Santa Anna	31.736965	-99.323386	< 45
25	Abilene Churches (Fellowship Baptist Church)	Abilene	32.424541	-99.800061	< 45
26	Albany Churches	Albany	32.728929	-99.294042	< 45
27	Santa Anna Churches	Santa Anna	31.739062	-99.321856	< 45
28	Guitar Ranches LP	Abilene	32.417672	-99.926505	< 45
29	SD3 Land and Cattle LLC	Moran	32.500806	-99.264501	< 45

Table 3-11 Estimated Noise Levels from Historic C-130 Operations at Potential Sensitive Receptors In or Near SR-236 and SR-242

Map ID [1]	Potential Sensitive Receptor	Jurisdiction / Location	Latitude (degrees)	Longitude (degrees)	L_{dn} and L_{dnmr} (dBA)
30	Hays Ranch	Gouldbusk	31.554092	-99.519959	< 45
31	Double T Cattle Co LLC	Gouldbusk	31.609672	-99.392682	< 45
32	Suds Creek Ranch	Santa Anna	31.709193	-99.321745	< 45
33	Foster W L Ranches LTD	Leaday	31.623855	-99.736002	< 45
34	The Mountain Ranch LLC	Winters	32.013511	-99.803767	< 45

Notes:

[1] Numbers listed in this column correspond to those shown on **Figure 3-2**.

[2] Site is listed in the National Register of Historic Places

dBA = A-weighted decibel; Co = Company; Inc = Incorporated; ID = identification; ISD = Independent School District; L_{dn} = Day-Night Average Sound Level; L_{dnmr} = Onset-Rate Adjusted Monthly Day-Night Average Sound Level; LLC = Limited Liability Corporation; LP = Limited Partnership; LTD = Limited

Development, particularly wind turbine farms, has occurred in and near SR-236 and SR-242 since these SRs were established in in the 1990s. The DAF identifies wind turbines, local airfields and airports, towers and other vertical structures, and other types of development or land uses as avoidance areas that are factored into the flight plans for these SRs (**Figure 3-1**). Additional discussion of these avoidance areas and DAF procedures is provided in **Section 3.11**. Vertical and/or lateral aircraft maneuvers that could be necessary to avoid structures and obstacles associated with avoidance areas were accounted for in the noise modeling conducted for this EA.

3.5.3 Environmental Consequences

3.5.3.1 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 dBA threshold below which most types of land use are compatible. Impacts would be significant if noise from the Proposed Action permanently impeded or prevented the continued use or occupation of a land use underlying SR-236 or SR-242.

3.5.3.2 Alternative 1

Table 3-12 presents estimated single event noise levels (L_{max} and SEL) from proposed aircraft operations that would occur at representative altitudes and distances from the SR centerline in SR-242 and the proposed reconfigured SR-236. As shown in **Table 3-12**, the highest noise levels would occur directly below each aircraft at the centerline (i.e., 0 NM) but would attenuate with increased lateral distance from the centerline, representing the range of levels estimated to occur for T-6 and C-130 overflights on these routes. Note that flight paths would typically be distributed across the width of these routes such that higher overflight levels would not be expected to occur repeatedly at a single location on the ground. Noise levels below 45 dBA are shown in **Table 3-12** as "< 45." Estimated noise levels below 45 dBA are less reliable as they are comparable with typical ambient or background sound levels. Information regarding aircraft speeds and power settings used to calculate potential aircraft noise associated with Alternative 1 is provided in **Appendix C-3**.

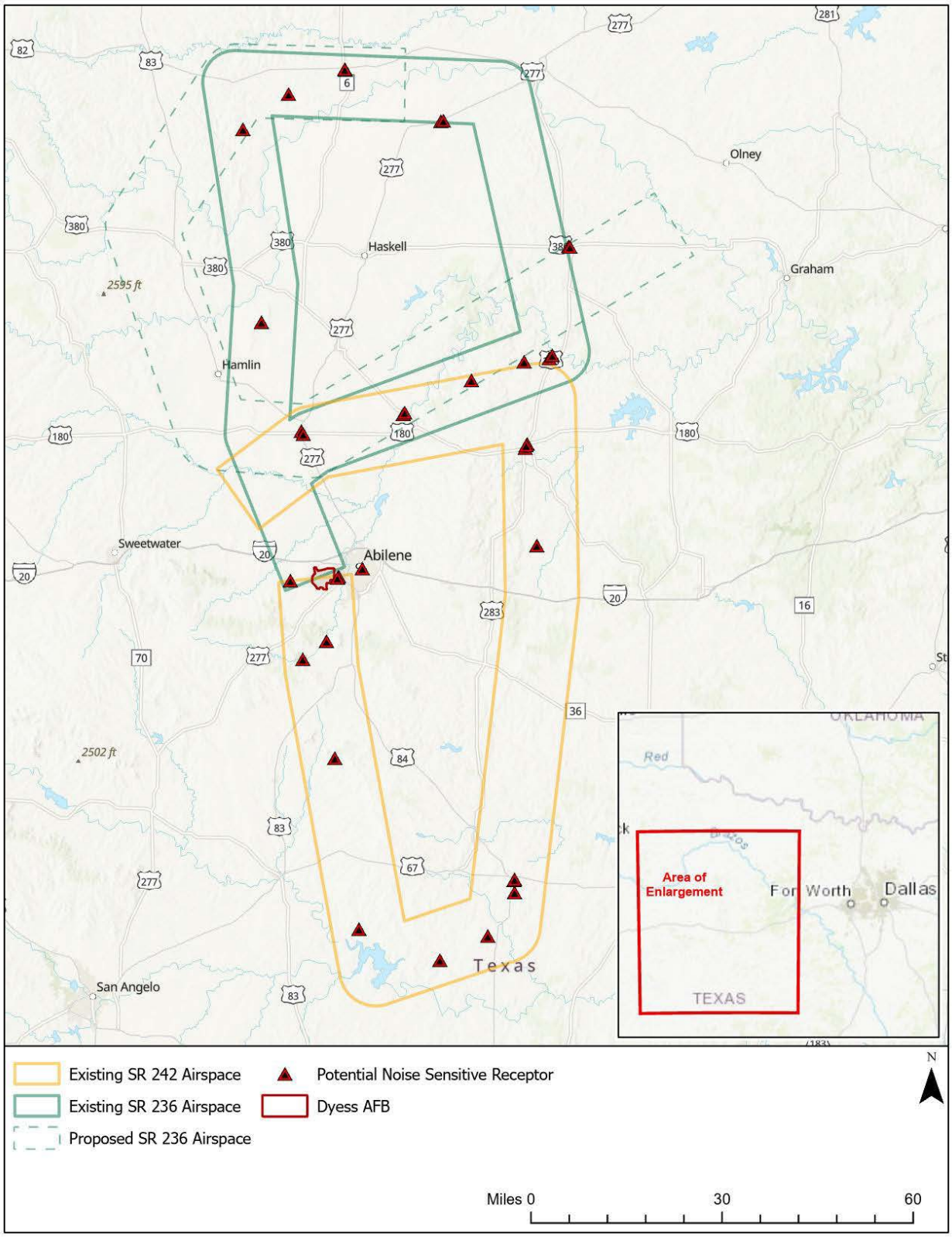

Figure 3-2 Potential Noise Sensitive Receptors In and Near SR-236 and SR-242

Table 3-12 Estimated Noise Levels from Proposed Aircraft Operations in SR-236 and SR-242 Under Alternative 1

Aircraft	Location Relative to the Route Centerline (NM)	Altitude (ft AGL)					
		500	1,000	1,500	500	1,000	1,500
		L_{max} (dBA) [1]			SEL (dBA) [1]		
T-6	0	83.0	75.7	71.5	86.2	80.8	77.4
T-6	1	53.4	54.4	54.4	63.1	64.2	64.2
T-6	2.5	< 45	< 45	< 45	< 45	51.7	53.0
T-6	5	< 45	< 45	< 45	< 45	< 45	< 45
C-130	0	91.3	N/A	N/A	95.5	N/A	N/A
C-130	1	60.8	N/A	N/A	71.4	N/A	N/A
C-130	2.5	< 45	N/A	N/A	53.0	N/A	N/A
C-130	5	< 45	N/A	N/A	< 45	N/A	N/A

Notes:
dBA = A-weighted decibels; ft AGL = feet above ground level; L_{max} = Maximum Sound Level; N/A = not applicable (in the context of this table, C-130s are not expected to fly at 1,000 or 1,500 ft AGL); NM = nautical mile; SEL = sound exposure level

Estimated cumulative noise levels (L_{dn} and L_{dnmr}) from proposed aircraft operations in SR-242 and the proposed reconfigured SR-236 under Alternative 1 are shown in **Table 3-13**. The estimated cumulative noise environment from proposed aircraft operations within all route segments of SR-236 and SR-242, including areas that would be crossed by the proposed reconfigured SR-236 that are not crossed by the existing configuration of SR-236, would be less than 45 dBA, primarily due to the relatively small number of proposed annual operations (i.e., an average of 1.2 T-6 flights per day in SR-236, less than 1.0 T-6 flight per day in SR-242, and 10 annual C-130 flights in either SR). Estimated noise levels in all areas of the proposed SRs would remain well below the 65 dBA threshold below which most types of land uses are compatible with aircraft noise.

Estimated noise levels from proposed aircraft operations that would occur at potential noise sensitive receptors in and near SR-236 and SR-242 under Alternative 1 are presented in **Table 3-14**. These estimated noise levels would not exceed 45 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.

Table 3-13 Estimated Cumulative Noise Levels from Proposed Aircraft Operations in SR-236 and SR-242 Under Alternative 1

Segment	L_{dn} and L_{dnmr} (dBA)	
	SR-236	SR-242
A-B	< 45	< 45
B-C	< 45	< 45
C-D	< 45	< 45
D-E	< 45	< 45
E-F	< 45	< 45
F-G	< 45	< 45
G-H	< 45	< 45
H-I	< 45	< 45

Notes:
dBA = A-weighted decibels; L_{dn} = day-night average sound level; L_{dnmr} = onset-rate adjusted monthly day-night average sound level

Table 3-14 Estimated Noise Levels from Proposed Aircraft Operations at Potential Sensitive Receptors In or Near SR-236 and SR-242 Under Alternative 1

Map ID [1]	Potential Sensitive Receptor	Jurisdiction / Location	Latitude (degrees)	Longitude (degrees)	L_{dn} and L_{dnmr} (dBA)
SR-236					
1	Benjamin ISD	Benjamin	33.583412	-99.789253	< 45
2	Goree ISD	Goree	33.467634	-99.528336	< 45
3	Throckmorton ISD	Throckmorton	33.183438	-99.180347	< 45
4	Lueders-Avoca ISD	Lueders	32.798705	-99.626059	< 45
5	Anson ISD	Anson	32.758781	-99.900656	< 45
6	Benjamin Churches	Benjamin	33.584818	-99.790851	< 45
7	Goree Churches	Goree	33.469006	-99.521723	< 45
8	Throckmorton Churches	Throckmorton	33.181912	-99.176925	< 45
9	Anson Churches	Anson	32.751917	-99.89531	< 45
10	Lueders Churches	Lueders	32.802732	-99.622128	< 45
11	9 Nail Ranch	Albany	32.92005	-99.300165	< 45
12	Bomar Nail Ranch LTD	Lueders	32.876963	-99.442399	< 45
13	Swensen Land & Cattle Co	Old Glory	33.006321	-100.011049	< 45
14	Spike Box Land & Cattle Co Inc	Benjamin	33.527147	-99.943245	< 45
15	Brook Valley Ranch	Guthrie	33.445926	-100.066391	< 45
16	Fort Griffin [2]	Albany vicinity, Shackleford County	32.927633	99.232117	< 45
17	Fort Griffin Brazos River Bridge [2]	Northeast of Fort Griffin	32.934683	99.224250	< 45
18	Old Taylor County Courthouse and Jail [2]	Buffalo Gap, Taylor County	32.446550	99.733617	< 45
19	Shackleford County Courthouse [2]	Albany, Shackleford County	32.722967	99.296550	< 45
SR-242					
20	Abilene ISD (Clack Middle School)	Abilene	32.427463	-99.797027	< 45
21	Abilene State Park	Abilene	32.238514	-99.891414	< 45
22	Jim Ned ISD	Buffalo Gap	32.280147	-99.828377	< 45
23	Albany ISD	Albany	32.732401	-99.291466	< 45
24	Santa Anna ISD	Santa Anna	31.736965	-99.323386	< 45
25	Abilene Churches (Fellowship Baptist Church)	Abilene	32.424541	-99.800061	< 45
26	Albany Churches	Albany	32.728929	-99.294042	< 45
27	Santa Anna Churches	Santa Anna	31.739062	-99.321856	< 45
28	Guitar Ranches LP	Abilene	32.417672	-99.926505	< 45
29	SD3 Land and Cattle LLC	Moran	32.500806	-99.264501	< 45
30	Hays Ranch	Gouldbusk	31.554092	-99.519959	< 45

Table 3-14 Estimated Noise Levels from Proposed Aircraft Operations at Potential Sensitive Receptors In or Near SR-236 and SR-242 Under Alternative 1

Map ID [1]	Potential Sensitive Receptor	Jurisdiction / Location	Latitude (degrees)	Longitude (degrees)	L_{dn} and L_{dnmr} (dBA)
31	Double T Cattle Co LLC	Gouldbusk	31.609672	-99.392682	< 45
32	Suds Creek Ranch	Santa Anna	31.709193	-99.321745	< 45
33	Foster W L Ranches LTD	Leaday	31.623855	-99.736002	< 45
34	The Mountain Ranch LLC	Winters	32.013511	-99.803767	< 45

Notes:

[1] Numbers listed in this column correspond to those shown on **Figure 3-2**.

[2] Site is listed in the National Register of Historic Places

dBA = A-weighted decibel; Co = Company; Inc = Incorporated; ID = identification; ISD = Independent School District; Ldn = Day-Night Average Sound Level; Ldnmr = Onset-Rate Adjusted Monthly Day-Night Average Sound Level; LLC = Limited Liability Corporation; LP = Limited Partnership; LTD = Limited

Individual noise events from proposed aircraft operations under Alternative 1 would be heard occasionally but given their relative infrequency and low sound levels, most events would not be expected to cause annoyance or disrupt common activities any more than typical everyday sound events (e.g., automobile noise, lawn mowing, other civil aircraft flyovers). Additionally, flight paths on SR-236 and SR-242 would normally be distributed across the width of these routes such that the highest expected overflight levels would not occur repeatedly, at a single location on the ground.

Cumulative noise levels associated with proposed aircraft operations under Alternative 1 would not exceed 45 dBA within the SRs, including areas that would be crossed by the proposed reconfigured SR-236 that are not crossed by the existing configuration of SR-236, or at potential noise sensitive receptors. These cumulative noise levels would remain well below the 65 dBA threshold below which most types of land use are compatible with aircraft noise. Although the number of aircraft operations in the SRs would substantially increase under Alternative 1 relative to historic conditions, including new areas not crossed by the existing configuration of SR-236, noise conditions in the ROI would remain similar to existing ambient conditions given the relative infrequency of proposed operations (i.e., an average of 1.2 T-6 flights per day in SR-236, less than 1.0 T-6 flight per day in SR-242, and 10 annual C-130 flights in either SR). 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 SR-242 or the proposed reconfigured SR-236. Therefore, long-term impacts from noise under Alternative 1 would not be significant.

3.5.3.3 Alternative 2

Impacts from noise under Alternative 2 would be the same as those described for Alternative 1. Noise impacts associated with Alternative 2 would not be significant.

3.5.3.4 No Action Alternative

Under the No Action Alternative, SR-236 and SR-242 would remain temporarily closed and existing conditions would continue. This would have no impacts from noise.

3.5.3.5 Reasonably Foreseeable Future Actions and Other Environmental Considerations

Reasonably foreseeable actions listed in **Table B-1** 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 receptors. However, through consultation with applicable regulatory agencies and in accordance with applicable regulatory requirements, those projects would incorporate BMPs and other measures to prevent or minimize noise and ensure impacts from noise remain negligible or minor and not significant. Therefore, when considered with other reasonably foreseeable future actions, the Proposed Action would not contribute to cumulatively significant impacts from noise.

3.6 CULTURAL RESOURCES

3.6.1 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 law protecting cultural resources is the 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 (i.e., any district, site, building, structure, or object that is listed or eligible for listing in the 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 the state of Texas.

Generally, if under Section 106 an action would have an adverse effect on a historic property listed in or eligible for 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 Area of Potential Effect (APE) for this undertaking consists of lands underlying or intersected by SR-236 and SR-242 under Alternative 1 or Alternative 2. In a letter dated 3 October 2023, the DAF initiated consultation with the Texas SHPO in accordance with Section 106 and requested concurrence with the APE; SHPO concurrence with the APE is pending. Copies of relevant Section 106 correspondence are provided in **Appendix A**.

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. 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 (National Park Service [NPS], 2021). DoDI 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 EO 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. Copies of relevant government-to-government correspondence are included in **Appendix A**.

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 or not identified as traditional cultural properties are not addressed in this EA.

3.6.2 Affected Environment

SR-242 and the proposed configurations of SR-236 under Alternative 1 and Alternative 2 have a combined area of approximately 5,300 square miles within the North Central Plains region of Texas. This region is characterized by low, north-south trending ridges underlain by limestone, sandstone, and shale (Bureau of Economic Geology, 1996). Vegetation consists of grasslands with live oak-ashe juniper communities grading westward to mesquite–lotebush brush communities. From north to south, the plains are dissected by tributaries of the Red, Brazos, and Colorado Rivers. Elevations vary between 900 and 3,000 ft above mean sea level (MSL).

Three historic districts and 10 architectural resources listed in the NRHP are within the APE (NPS, 2023; Texas Department of Transportation [TxDOT], 2023). These districts and resources are listed in **Table 3-15**. The historic districts represent a frontier fort, a historic transportation route, and a courthouse complex. The architectural resources consist of residential and courthouse buildings and bridges. These NRHP-listed resources are mostly located in Shackelford and Taylor Counties, with single resources in Jones, Knox, and Throckmorton Counties. In addition, 29 NRHP-eligible historic properties underlie SR-236 and SR-242 (TxDOT, 2023). These properties include bridges, residences, churches, local government facilities, and commercial buildings. These properties are distributed across Shackelford, Taylor, Jones, Knox, Throckmorton, Callahan, Coleman, and Fisher Counties.

Table 3-15 National Register of Historic Places-Listed Resources in the Area of Potential Effect

Resource	Slow Route Airspace Overlying Resource	County	Reference No.
Jones County Courthouse	SR-242, SR-236 (Alt 1 and Alt 2)	Jones	03000330
State Highway 16 Bridge at the Brazos River	SR-236 (Alt 1 and Alt 2)	Knox	96001123
Fort Griffin Historic District	SR-236 (Alt 2)	Shackelford	71000962
Fort Griffin Brazos River Bridge	SR-236 (Alt 2)	Shackelford	79003006
Hubbard Creek Bridge	SR-242	Shackelford	96001105
Shackelford County Courthouse Historic District	SR-242	Shackelford	76002065
State Highway 23 Bridge at the Clear Fork of the Brazos River	SR-236 (Alt 2)	Shackelford	96001106
Fort Griffin Brazos River Bridge	SR-236 (Alt 2)	Shackelford	79003006
Bankhead Highway Historic District	SR-242, SR-236 (Alt 2)	Taylor	98001414
Blanton, Thomas L., House	SR-242	Taylor	92000234
Old Taylor County Courthouse and Jail	SR-242	Taylor	78002984
Blanton, Thomas L., House	SR-242, SR-236 (Alt 2)	Taylor	92000234
Throckmorton County Courthouse and Jail	SR-236 (Alt 1 and Alt 2)	Throckmorton	78002987

Notes:
Source: NPS, 2023; TxDOT, 2023
Alt = Alternative; No. = number

No federally recognized tribal lands underlie SR-236 and SR-242 (Bureau of Indian Affairs, 2023). Native American tribes with ancestral ties to land underlying the SRs are listed in **Appendix A.5**. The DAF initiated government-to-government consultation with these tribes via letters dated September 25, 2023. To date, no traditional cultural properties have been identified on lands underlying SR-236 and SR-242.

3.6.3 Environmental Consequences

3.6.3.1 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 is considered adverse if it would alter the integrity of a NRHP-listed or eligible resource such that the resource would no longer be eligible for listing in the NRHP, or if it has the potential to adversely affect traditional cultural properties and the practices associated with the property.

3.6.3.2 Alternative 1

Noise analysis conducted for the Proposed Action indicates that noise levels associated with Alternative 1 would not exceed 45 dBA in any area of the APE (see **Section 3.5**), including areas that would be crossed by the proposed reconfigured SR-236 that are not crossed by the existing configuration of SR-236. Noise levels that can negatively affect buildings and structures typically exceed 130 dBA (US Navy, 2018), and noise levels at or below 45 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 45 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-listed historic districts and individual historic structures underlying the APE. Alternative 1 would have no potential to affect traditional cultural properties, as no such properties have been identified in the APE.

Therefore, per guidance set forth in 36 CFR § 800.4(d)(1), the DAF has determined that Alternative 1 would have no adverse effect on historic properties. Concurrence with this determination by the Texas SHPO is pending.

3.6.3.3 Alternative 2

Potential impacts on historic properties from Alternative 2 are the same as those described for Alternative 1, except that activities included in Alternative 2 would have no potential to affect NRHP-eligible historic properties in Fisher County because that county would not be crossed by either SR under the alternative. Concurrence with this determination by the Texas SHPO is pending.

3.6.3.4 No Action Alternative

Under the No Action Alternative, SR-236 and SR-242 would remain temporarily closed and existing conditions would continue. This would have no impact on historic properties.

3.6.3.5 Reasonably Foreseeable Future Actions and Other Environmental Considerations

Reasonably foreseeable future actions listed in **Table B-1** would have the potential to affect historic properties, including architectural and archaeological resources, and/or traditional cultural properties. It is anticipated that 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 SHPO, tribal governments, local authorities, and/or the Advisory Council on Historic Preservation, if applicable. Therefore, when considered with these reasonably foreseeable future actions, the Proposed Action would not be anticipated to contribute to cumulatively significant impacts on historic properties.

3.7 BIOLOGICAL / NATURAL RESOURCES

3.7.1 Definition of the Resource

Biological resources include native or naturalized plant and animal species and the habitats within which they occur. Vegetation types include all existing terrestrial plant communities as well as their individual component species that occur or may occur within the project area. Wildlife generally includes commonly occurring species of mammals, birds, reptiles and amphibians, and fish that are not protected under the ESA or other statutes.

Special status species include plant and animal species that are listed as endangered, threatened, candidate, or proposed for listing under the ESA; birds protected under the Migratory Bird Treaty Act (MBTA) and Bald and Golden Eagle Protection Act (BGEPA); and species protected under other federal statutes. Federal candidate species and species proposed for listing are those species that could be federally listed as threatened or endangered in the near-term but receive no 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 airspace within and lands underlying SR-236 and SR-242 under Alternative 1 or Alternative 2.

3.7.2 Affected Environment

3.7.2.1 Vegetation

The ROI is primarily in the Southwestern Table Plains and Central Great Plains Level III EPA Ecoregions of Texas (Griffith et al., 2007). Level IV EPA ecoregions underlying the SRs include Flat Tablelands and Valleys, Caprock Canyons, Badlands, and Breaks, Red Prairie, Broken Red Plains, and Limestone Plains. These areas are vegetatively characterized as mesquite-buffalo grass (McNab and Avers, 1994; Cleland et al., 2007). The predominant vegetation form is medium-tall grassland with a sparse shrub cover. The vegetative community consists of sand and little bluestems and sagebrush. The ROI also includes small areas of Cross Timbers and Edwards Plateau. The Western Cross Timbers ecoregion is characterized as woodland, grassland, and

shrubland. The Semiarid Edwards Plateau ecoregion is characterized as shrubland and woodland on mesa tops and in canyons as well as grassland with brushy overstory.

3.7.2.2 Wildlife

Common species of mammals, birds, reptiles, and amphibians potentially occurring in the ROI are listed in **Table 3-16.** 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 in airspace within, above, or below SR-236 and SR-242 during migration or foraging activities.

Table 3-16 Common Wildlife Species Potentially Occurring in the Region of Influence

Common Name	Scientific Name	Common Name	Scientific Name
Mammals			
mule deer	*Odocoileus hemionus*	wild boar	*Sus scrofa*
white-tailed deer	*Odocoileus virginianus*	cave myotis	*Myotis velifer*
pronghorn	*Antilocapra americana*	Mexican free-tailed bat	*Tadarida brasiliensis*
coyote	*Canis latrans*	eastern cottontail	*Sylvilagus floridanus*
bobcat	*Lynx rufus*	desert cottontail	*Sylvilagus audubonii*
ringtail	*Bassariscus astutus*	black-tailed jackrabbit	*Lepus californicus*
collared peccary	*Pecari tajacu*	striped skunk	*Mephitis mephitis*
North American river otter	*Lontra canadensis*	muskrat	*Ondatra zibethicus*
red fox	*Vulpes vulpes*	North American porcupine	*Erethizon dorsatum*
gray fox	*Urocyon cinereoargenteus*	North American beaver	*Castor canadensis*
raccoon	*Procyon lotor*	Virginia opossum	*Didelphis virginiana*
American badger	*Taxidea taxus*	plains harvest mouse	*Reithrodontomys montanus*
nine-banded armadillo	*Dasypus novemcinctus*	fox squirrel	*Sciurus niger*
nutria	*Myocastor coypus*	Eastern gray squirrel	*Sciurus carolinensis*
Birds			
wild turkey	*Meleagris gallopavo*	red-tailed hawk	*Buteo jamaicensis*
mourning dove	*Zenaida macroura*	turkey vulture	*Cathartes aura*
ring-necked pheasant	*Phasianus colchicus*	black vulture	*Coragyps atratus*
scaled quail	*Callipepla squamata*	Swainson's hawk	*Buteo swainsoni*
blue quail	*Synoicus adansonii*	American kestrel	*Falco sparverius*
sandhill crane	*Antigone canadensis*	burrowing owl	*Athene cunicularia*
bobwhite	*Colinus virginianus*	Cooper's hawk	*Accipiter cooperii*
cedar waxwing	*Bombycilla cedrorum*	osprey	*Pandion haliaetus*
canyon wren	*Catherpes mexicanus*	ferruginous hawk	*Buteo regalis*
common raven	*Corvus corax*	prairie falcon	*Falco mexicanus*
white-necked raven	*Corvus cryptoleucus*	merlin	*Falco columbarius*

Table 3-16 Common Wildlife Species Potentially Occurring in the Region of Influence

Common Name	Scientific Name	Common Name	Scientific Name
lesser prairie chicken	*Tympanuchus pallidicinctus*	western barn owl	*Tyto alba*
American crow	*Corvus brachyrhynchos*	great blue heron	*Ardea herodias*
common grackle	*Quiscalus quiscula*	mallard	*Anas platyrhynchos*
red-winged blackbird	*Agelaius phoeniceus*	American coot	*Fulica americana*
killdeer	*Charadrius vociferus*	blue-winged teal	*Spatula discors*
house sparrow	*Passer domesticus*	pied-billed grebe	*Podilymbus podiceps*
black-capped vireo	*Vireo atricapilla*	wood duck	*Aix sponsa*
golden-fronted woodpecker	*Melanerpes aurifrons*	snowy egret	*Egretta thula*
Harris's sparrow	*Zonotrichia querula*	Wilson's snipe	*Gallinago delicata*
rock pigeon	*Columba livia*	cattle egret	*Bubulcus ibis*
red-headed woodpecker	*Melanerpes erythrocephalus*	Canada goose	*Branta canadensis*
great horned owl	*Bubo virginianus*		
Reptiles and Amphibians			
Texas toad	*Bufo speciosus*	Great Plains skink	*Plestiodon obsoletus*
Couch’s spadefoot toad	*Schaphiopus couchii*	prairie skink	*Plestiodon septentrionalis*
Great Plains toad	*Bufo cognatus*	western hooknose snake	*Gyalopion canum*
Great Plains narrow-mouthed frog	*Gastrophryne olivacea*	Brazos water snake	*Nerodia harteri*
spotted chorus frog	*Pseudacris clarkii*	Plains black-headed snake	*Tantilla nigriceps*
North American green toad	*Anaxyrus debilis*	Texas diamond-back	*Crotalus atrox*
red-spotted toad	*Anaxyrus punctatus*	prairie rattlesnake	*Crotalus viridis*
Western tiger salamander	*Ambystoma mavortium*	Great Plains rat snake	*Pantherophis emoryi*
lesser earless lizard	*Holbrookia maculata*	Western hognose snake	*Heterodon nasicus*
Texas spiny lizard	*Sceloporus olivaceus*	yellow mud turtle	*Kinosternon flavescens*
Texas spotted whiptail	*Cnemidophorus gularis*	ornate box turtle	*Terrapene ornata*

Source: USDA, 2009; McNab and Avers, 1994; iNaturalist, 2023a; iNaturalist, 2023b

In addition to the species listed in **Table 3-16**, big and exotic game hunting ranches are present in the ROI. These ranches offer hunting opportunities for mule deer, whitetail deer, aoudad, axis, blackbuck, sika, javelin, quail, dove, duck, and predators (West Texas Hunt Organization, 2023).

3.7.2.3 Domestic Animals

Much of the area underlying SR 236 supports ranching and agriculture (US Department of Agriculture [USDA], 2017). Domestic livestock supported in the region include cattle, horses, sheep, goats, pigs, and poultry.

3.7.2.4 Migratory Flyways

The Southwestern Tablelands and Central Great Plains Ecoregions of Texas support a large number of migratory birds due to varied habitat (desert to mountains) and location within the Central Flyway. The Central Flyway is a migratory bird corridor between Arctic breeding grounds to the north and tropical overwintering habitat to the south. In the United States, the Central Flyway spans more than one million square miles across all or portions of 10 states between the Canadian and Mexican international borders (Ducks Unlimited, 2023). At least 16 migratory birds of conservation concern utilize the Central Flyway, which contains the entirety of the biological resources ROI (USFWS, 2023a). Migration periods and flight elevations within the Central Flyway vary by species.

Both the 80 FTW and 47 FTW adhere to bird/wildlife aircraft strike hazard (BASH) programs whereby information and assistance is freely shared between pilots, operations and civil engineering staff, and local air traffic controllers to identify risks and minimize the potential for collisions between aircraft and birds.

3.7.2.5 Special Status Species

Federally Listed, Proposed, and Candidate Species

The purpose of the ESA is to conserve the ecosystems upon which threatened and endangered species depend and to recover listed species. Section 7 of the ESA requires action proponents to consult with USFWS (and/or the National Oceanic and Atmospheric Administration [NOAA], as applicable) to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species or result in the destruction or adverse modification of designated critical habitat. The USFWS has primary responsibility for terrestrial and freshwater organisms, while NOAA is primarily responsible for marine organisms and anadromous fish. Species listed as "endangered" under the ESA are those that are in danger of extinction throughout all or a significant portion of their range. "Threatened" species are those that are likely to become endangered within the foreseeable future.

Federally listed, proposed, and candidate species known or having potential to occur in the ROI include four species of birds, one mammal species, and one insect species (USFWS, 2023a). These species are listed in **Table 3-17**. No federal critical habitat has been designated in the ROI for any of these species.

No federally listed plant species are known to occur in the ROI. The Proposed Action does not include land- or water-disturbing activities and would have no potential to affect federally listed aquatic species known or having potential to occur in the ROI.

Table 3-17 Federally Listed, Proposed, and Candidate Species Known or Having Potential to Occur in the Region of Influence

Common Name	Scientific Name	Federal Status	Critical Habitat Present in the ROI?	Description
Birds				
rufa red knot	*Calidris canutus rufa*	Threatened	No	Suitable habitat for this species is not present in the ROI but the species may occur in the ROI as a transient during migration.
piping plover	*Charadrius melodus*	Endangered / Threatened	No	Species is endangered within the Great Lakes watershed and threatened in all other locations. Suitable habitat for this species is not present in the ROI but the species may occur in the ROI as a transient during migration.
golden-cheeked warbler	*Dendroica chrysoparia*	Endangered	No	Suitable habitat for this species is not present in the ROI but the species may occur in the ROI as a transient during migration.
whooping crane	*Grus americana*	Endangered	No	Breeds, migrates, winters, and forages in a variety of wetland and other habitats, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows and rivers, and agricultural fields. During migration, whooping cranes use a variety of habitats; however, wetland mosaics appear to be the most suitable. For feeding, whooping cranes primarily use shallow, seasonally and semi-permanently flooded palustrine wetlands for roosting, and various cropland and emergent wetlands.
Mammals				
tricolored bat	*Perimyotis subflavus*	Proposed Endangered	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 species of bat exhibits slow, erratic, fluttery flight while foraging and commonly forage over waterways and forest edges.

Table 3-17 Federally Listed, Proposed, and Candidate Species Known or Having Potential to Occur in the Region of Influence

Common Name	Scientific Name	Federal Status	Critical Habitat Present in the ROI?	Description
Insects				
monarch butterfly	*Notropis oxyrhynchus*	Candidate	No	Adult monarch butterflies are large and conspicuous, with bright orange wings surrounded by a black border and covered with black veins. Monarchs lay their eggs on their obligate milkweed host plant (primarily *Asclepias spp.*), and larvae emerge after 2 to 5 days. In many regions where monarchs are present, monarchs breed year-round. Individual monarchs in temperate climates, such as eastern and western North America, 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.

Notes:
Source: All About Birds, 2023; Kroll, 1980; USFWS, 2023b; USFWS, 2023c
ROI = Region of Influence

Federally Designated Critical Habitat

Federal critical habitat has been designated in the ROI for two species of fish, the federally endangered sharpnose shiner (*Notropis oxyrhynchus*) and smalleye shiner (*Notropis buccula*), and proposed for three freshwater mussel species, the federally threatened Texas fawnsfoot (*Truncilla macrodon*) and the federally endangered Texas fatmucket (*Lampsilis bracteate*) and Texas pimpleback (*Cyclonaias petrina*) (USFR, 2014; USFR, 2021). The Proposed Action does not include land- or water-disturbing activities and would have no potential to affect water resources or federally designated critical habitat within surface water bodies.

Migratory Bird Treaty Act

Most bird species are protected under the MBTA, and their protection by federal agencies is mandated by EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*. Under the MBTA, it is 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. Under EO 13186, federal agency actions that have, or are likely to have, a measurable negative effect on migratory bird populations are directed to develop and implement a Memorandum of Understanding (MOU) with the USFWS that promotes the conservation of migratory bird populations.

An MOU between the DoD and USFWS, signed in July 2006, identified specific activities (e.g., Partners in Flight, Integrated Natural Resources Management Plans) where cooperation between the DoD and USFWS will contribute to the conservation of migratory birds and their habitats. In February 2022, 50 CFR § 21.42 authorized the take of migratory birds incidental to military readiness activities. It states that the Armed Forces may take migratory birds incidental to military

readiness activities provided that, for those ongoing or proposed activities that the Armed Forces determine may result in a significant adverse effect on a population of a migratory bird species, the Armed Forces must confer and cooperate with the USFWS to develop and implement appropriate conservation measures to minimize or mitigate such significant adverse effects. Military readiness activities include all training and operations of the Armed Forces that relate to combat, and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use (Public Law 107-314, section 315(f) of the 2003 National Defense Authorization Act).

Bald and Golden Eagle Protection Act

The BGEPA prohibits anyone, without a permit issued by the Secretary of the Interior, from taking eagles, including their parts, nests, or eggs. The act 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 degreethat 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" (16 U.S.C. §§ 668-668d).

No nesting bald eagles (*Haliaeetus leucocephalus*) have been identified within the ROI (Texas Agricultural and Mechanical University [TAMU], 2007a). However, bald eagles have the potential to occur in the ROI, primarily during the winter when they nest between October and July. Bald eagles primarily occur near water sources as they feed primarily on fish, but also eat a variety of waterfowl, small mammals, and turtles (Campbell, 2003). This species could also be a potential migrant through the Central Flyway (USFWS, 2023d). Although Golden eagles (*Aquila chrysaetos*) are resident in Texas, they primarily occur in mountainous and canyon habitats and have not been documented as a migrant through the ROI (TAMU, 2007b).

3.7.3 Environmental Consequences

3.7.3.1 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; or could affect, but would not 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 would result in either USFWS concurrence with the DAF's determination of effect on listed species, or a biological opinion with either an Incidental Take Statement that authorizes a specified amount of "take" (or adverse modification of designated critical habitat) or a jeopardy determination.

3.7.3.2 Alternative 1

Several factors, including direct strikes and visual effects associated with approaching aircraft, could potentially impact wildlife in the ROI, including areas that would be crossed by the proposed reconfigured SR-236 that are not crossed by the existing configuration of SR-236. Any impacts from visual sightings of approaching aircraft would likely occur along SR segments below 1,000 ft 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, 1995).

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

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

Much of the area underlying SR-236 and SR-242, including areas that would be crossed by the proposed reconfigured SR-236 that are not crossed by the existing configuration of SR-236, supports ranching and agriculture. Studies examining the effects of aircraft overflights and their associated noise on a wide range of livestock including poultry, cattle, sheep, pigs, goats, and mink have determined that (Gladwin and Manci, 1988; United States Forest Service [USFS], 1992):

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

Inconclusive results have been obtained in some cases because the effect observed is no different than any other disturbance livestock experience on a daily basis, such as from motorized 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 ft AGL. No evidence exists that the health or well-being of the cattle have been threatened. The animals, including calves, show all indications of habituating to the noise and overflights.

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

Although the low floor (300 ft AGL) in the SR segments may increase the potential for bird strikes, given the large area where the training would occur, that most training would occur during daytime hours, and the relatively low numbers of sorties that would occur, the likelihood for birds to encounter aircraft during training operations would remain low. When BASH risk increases, additional avoidance procedures would be followed during low-altitude training.

For the reasons described above, Alternative 1 would have the potential to inadvertently injure or destroy individual animals of common wildlife species, primarily as a result of collisions between birds and aircraft. Aircraft operations, associated noise, and visual effects in the SRs, including those occurring in areas that would be crossed by the proposed reconfigured SR-236 that are not crossed by the existing configuration of SR-236, could also induce startle responses that could cause some animals to temporarily leave the immediate area or interrupt nesting, breeding, or foraging activities. While these impacts would be adverse, they would be highly localized and limited to individual or small numbers of animals and would not affect the continued propagation of wildlife at the population or species level. It is expected that most or all animals, including domestic livestock and wild animals, would resume typical behavior within a few minutes of an aircraft overflight. 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. Therefore, adverse impacts on domestic animals and common species of wildlife from Alternative 1 would not be significant.

Given the relative infrequency of proposed flight operations on SR-236 and SR-242 (an average of 1.2 T-6 flights per day in SR-236, less than 1.0 T-6 flight per day in SR-242, and 10 annual C-130 flights in either SR) and the small size of the T-6 aircraft that would represent the majority of proposed operations on the SRs, the DAF has determined that Alternative 1 may affect, but is not likely to adversely affect the rufa red knot, piping plover, golden-cheeked warbler, and whooping crane; and would not jeopardize the continued existence of the tricolored bat and monarch butterfly. USFWS concurrence with this determination is pending. Alternative 1 would have no effect on federally listed or proposed aquatic species or federally designated or proposed critical habitat in aquatic environments because no activities involving disturbance of land or water bodies would occur.

3.7.3.3 Alternative 2

Impacts on common species of wildlife from Alternative 2 would be the same as those described for Alternative 1, with the exception that Alternative 2 would have no potential to affect species present or potentially occurring in Fisher and Young Counties. Alternative 2 may affect, but is not likely to adversely affect the rufa red knot, piping plover, golden-cheeked warbler, and whooping crane; and would not jeopardize the continued existence of the tricolored bat and monarch butterfly. USFWS concurrence with this determination is pending. Alternative 2 would have no effect on federally listed or proposed aquatic species or federally designated or proposed critical habitat in aquatic environments.

3.7.3.4 No Action Alternative

Under the No Action Alternative, SR-236 and SR-242 would remain temporarily closed and existing conditions would continue. This would have no effect on biological resources.

3.7.3.5 Reasonably Foreseeable Future Actions and Other Environmental Considerations

Other reasonably foreseeable actions listed in **Table B-1** would have the potential to adversely affect biological resources. It is likely that potential adverse effects on biological resources from those projects would be avoided or minimized to the extent practicable through adherence to BMPs and through consultation with USFWS and/or Texas Parks and Wildlife Department with respect to special status species. Therefore, when considered with the reasonably foreseeable actions listed in **Table B-1**, the Proposed Action would not be anticipated to contribute to cumulatively significant adverse impacts on biological resources.

3.8 LAND USE

3.8.1 Definition of the Resource

The term "land use" generally refers to real property classifications that indicate either natural conditions or the types of human activity occurring on a parcel. No nationally recognized convention or uniform terminology has been adopted for describing land use categories; rather, land use descriptions are often codified in local zoning laws. As a result, the meanings of various land use descriptions, labels, and definitions typically vary among jurisdictions.

The land use ROI consists of lands underlying SR-236 and SR-242 under Alternative 1 or Alternative 2. Given the large geographic areas and multiple political jurisdictions covered by the SRs, data from the US Geological Survey's (USGS) National Land Cover Database (USGS, 2021) is used to characterize existing land use in the ROI. 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.

3.8.2 Affected Environment

Land cover in the ROI is summarized in **Table 3-18**. Vegetated, uncultivated, and otherwise undeveloped lands are the predominant land cover type in the ROI, representing more than 70 percent of lands underlying SR-242, the proposed configuration of SR-236 under Alternative 1, and all lands underlying both SRs under either Alternative 1 or Alternative 2. Remaining lands in the ROI primarily consist of agricultural lands and croplands. Wetlands and open water represent

less than 1 percent of lands within the ROI, while developed lands are less than 2 percent of all lands in the ROI under either alternative.

Table 3-18 Land Cover Types in the Region of Influence

Land Cover Type	SR-236 Alternative 1 (percent)	SR-236 Alternative 2 (percent)	SR-242 (percent)	Total Alternative 1 (percent)	Total Alternative 2 (percent)
Developed Land	0.4	2.3	1.1	0.8	1.7
Agricultural / Cropland	22.2	30.4	17.4	19.6	23.3
Vegetated / Uncultivated / Undeveloped Land	77.1	66.2	80.6	79.0	74.2
Wetlands / Open Water	0.3	0.9	0.9	0.6	0.9

Source: USGS, 2021

SR-242 and both proposed configurations of SR-236 largely avoid cities, towns, and other densely or moderately populated areas. Portions of SR-242 overlie the city of Tye, the western side of the city of Abilene, and the towns of Albany and Coleman. The town of Anson is overlain by SR-242 and both proposed configurations of SR-236. The town of Throckmorton is also overlain by both proposed configurations of SR-236.

No special management areas, such as lands owned or managed by the NPS and Texas Parks and Wildlife Department, USFWS, USFS, or similar entities are present in the ROI.

3.8.3 Environmental Consequences

3.8.3.1 Evaluation Criteria

Potential impacts on land use would be considered adverse if the Proposed Action resulted in one or more of the following:

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

3.8.3.2 Alternative 1

Proposed aircraft operations included in Alternative 1 would have no potential to result in development activities or population changes in the ROI that could require changes to existing or proposed land use patterns or be inconsistent with existing land use plans and policies, including areas that would be crossed by the proposed reconfigured SR-236 that are not crossed by the existing configuration of SR-236. 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 (see **Section 3.5**). Proposed aircraft operations would avoid populated and developed areas within the ROI to the extent practicable (see **Section 3.11**). As such, proposed aircraft operations under Alternative 1 would be consistent with the largely rural and agricultural land uses underlying the SRs and would have no or minimal potential to affect or be noticeable to human populations in the ROI. Overall, Alternative 1 would have no potential 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, Alternative would have no impacts on land use.

3.8.3.3 Alternative 2

Impacts on land use from Alternative 2 would be the same as those described for Alternative 1. Alternative 2 would have no impacts on land use.

3.8.3.4 No Action Alternative

Under the No Action Alternative, SR-236 and SR-242 would remain temporarily closed and existing conditions would continue. This would have no impact on land use.

3.8.3.5 Reasonably Foreseeable Future Actions and Other Environmental Considerations

Reasonably foreseeable future actions listed in **Table B-1** could require changes to existing or planned land uses or result in inconsistencies with existing land use planning plans and policies. It is expected that project proponents would coordinate with local officials to ensure these projects remain consistent with existing and planned land uses and applicable land use plans and policies. Therefore, when considered with other reasonably foreseeable future actions, the Proposed Action would not contribute to cumulatively significant impacts on land use.

3.9 SOCIOECONOMICS

3.9.1 Definition of the Resource

Socioeconomic resources addressed in this section 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. Impacts on either of these socioeconomic indicators are typically accompanied by changes in other components, such as altered housing availability, property values, demand for public services, and/or local and regional trends in economy and industry. Socioeconomic data is presented in this section at the county and state level to characterize existing socioeconomic conditions in the context of regional and state trends.

The socioeconomics ROI consists of the 17 Texas counties crossed by SR-236 and SR-242 under Alternative 1 or Alternative 2. These counties are listed in **Table 3-19** and shown on **Figure 3-3**. Populations of these counties are those that would be most likely to experience potential effects from the Proposed Action.

Table 3-19 Texas Counties Crossed by SR-236 and SR-242 Under Alternative 1 or Alternative 2

County	Crossed by SR-236 – Proposed Configuration Under Alternative 1	Crossed by SR-236 – Proposed Configuration Under Alternative 2	Crossed by SR-242 Alternative 1 or Alternative 2
Baylor		✓	
Fisher	✓		
Haskell	✓	✓	
Jones	✓	✓	✓
King	✓	✓	
Knox	✓	✓	
Shackleford	✓	✓	✓
Stonewall	✓	✓	
Throckmorton	✓	✓	
Young	✓		
Brown			✓
Callahan			✓
Coleman			✓
Concho			✓
McCulloch			✓
Runnels			✓
Taylor			✓

As shown in **Table 3-19** and **Figure 3-3**, portions of nine counties (Jones, Shackleford, Brown, Callahan, Coleman, Concho, McCulloch, Runnels, and Taylor) would be crossed by SR-242 under Alternative 1 or Alternative 2. Portions of two counties (Jones and Shackleford) would be crossed by SR-242 and either proposed configuration of SR-236 under Alternative 1 and Alternative 2. Portions of Baylor County would be crossed only by SR-236 under Alternative 2, while portions of Fisher and Young Counties would be crossed only by SR-236 under Alternative 1. Portions of five counties (Haskell, King, Knox, Stonewall, and Throckmorton) would be crossed by SR-236 under either Alternative 1 or Alternative 2.

3.9.2 Affected Environment

3.9.2.1 Population and Housing

Population

The population of the ROI and individual counties within the ROI, and population changes that occurred between 2020 and 2022, are presented in **Table 3-20**. The change in population for the state of Texas is provided for comparison. Overall, the ROI is home to more than a quarter million people. The total population of the ROI grew by 1.1 percent between 2020 and 2022, somewhat less than the statewide population increase of 3.0 percent during that time. Taylor County, which includes the city of Abilene and Dyess AFB, is the most populated county in the ROI, while King County, which underlies the northwestern corner of existing SR-236, has the smallest population. Population growth within the individual counties in the ROI varied between 2020 and 2022, with 10 counties gaining population and 7 losing population. The largest population increase occurred in Throckmorton County (7.5 percent), which surpassed statewide population growth, while King County experienced the largest population decrease (-11.1 percent).

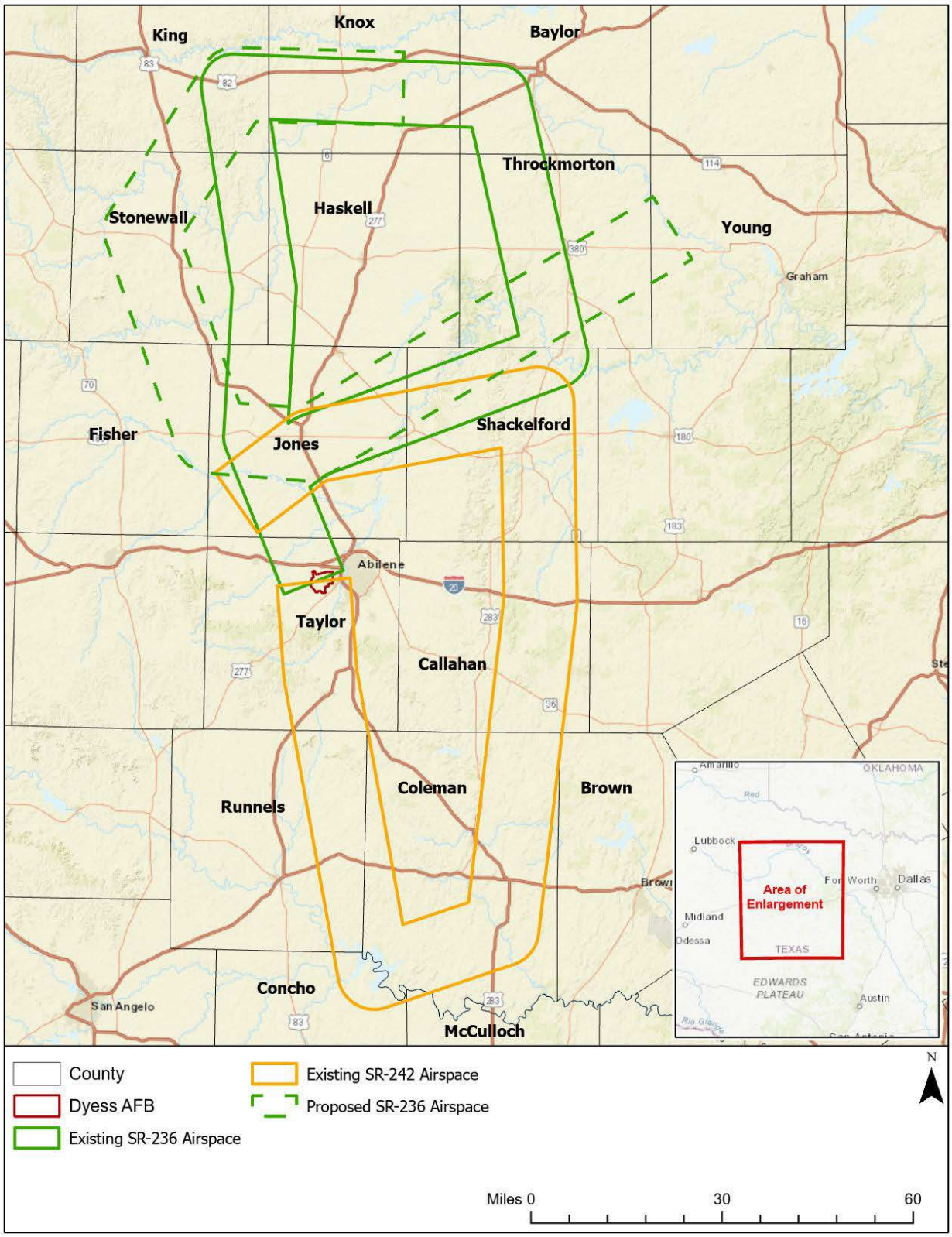

Figure 3-3 Counties Crossed by SR-242 and Proposed Configurations of SR-236

Table 3-20 Population Change in Region of Influence Counties, 2020 to 2022

Jurisdiction	Population		
	2020	2022	Percent Change
Texas	29,145,428	30,029,572	3.0
Counties Crossed by SR-236			
Baylor [1]	3,465	3,466	0.02
Fisher [2]	3,671	3,622	-1.33
Haskell [3]	5,412	5,403	-0.2
Jones [4]	19,653	19,935	1.4
King [4]	262	233	-11.1
Knox [4]	3,353	3,273	-2.4
Shackelford [4]	3,102	3,186	2.7
Stonewall [4]	1,246	1,182	-5.1
Throckmorton [4]	1,442	1,550	7.5
Young [2]	17,867	17,962	0.5
Counties Crossed by SR-242			
Brown [5]	38,101	38,373	0.7
Callahan [5]	13,703	14,210	3.7
Coleman [5]	7,686	7,850	2.1
Concho [5]	3,303	3,340	1.1
McCulloch [5]	7,634	7,497	-1.8
Runnels [5]	9,899	9,859	-0.4
Taylor [5]	143,205	145,163	1.4
ROI Total	**283,004**	**286,104**	**1.1**

Notes:
Source: US Census Bureau, 2022
[1] County would be crossed by SR-236 under Alternative 2 only.
[2] County would be crossed by SR-236 under Alternative 1 only.
[3] County would be crossed by SR-236 under Alternative 1 or Alternative 2.
[4] County would be crossed by SR-236 under Alternative 1 or Alternative 2 and by SR-242 under either alternative.
[5] County would be crossed by SR-242 under Alternative 1 or Alternative 2.

Housing

In Texas, property is required to be assessed at market value unless otherwise specified by law. Market value is defined as the price at which a property could transfer for cash or its equivalent under prevailing market conditions (Texas Comptroller, Texas Property Tax Code 2022). Several factors can affect the market value of property, including ambient noise levels (see **Section 3.5**). Factors directly related to the property, such as the size, improvements, and location of the property, as well as current conditions in the real estate market, interest rates, and housing sales in the area, are more likely to have a direct adverse impact on property values. A regression analysis of property values as they relate to aircraft noise at two military installations found that, while aircraft noise at installations may have had minor impacts on property values, it was difficult to quantify that impact (Fidell et al., 1996). Other factors, such as the quality of the housing near the installations and the local real estate market, had a larger impact on property values.

Housing characteristics in the ROI are presented in **Table 3-21**. The ROI contains 127,793 housing units, of which approximately 84 percent are occupied and 16 percent are vacant. The vacancy rate in the ROI exceeds the statewide rate by almost 7 percentage points. None of the occupancy rates in the individual counties of the ROI exceed the statewide percentage, although Taylor County has the highest occupancy rate at 89.6 percent, less than 1 percentage point less than the state. Most of the counties in the ROI exceed the statewide vacancy rate by double digits, with King County having the highest vacancy rate in the ROI (36.8 percent).

Table 3-21 Housing Occupancy in the Region of Influence

Jurisdiction	Total Housing Units	Occupied Housing Units		Vacant Housing Units	
		Number	Percent	Number	Percent
Texas	11,589,324	10,491,147	90.5	1,098,177	9.5
Counties Crossed by SR-236					
Baylor [1]	2,094	1,503	71.8	591	28.2
Fisher [2]	2,109	1,555	73.7	554	26.3
Haskell [3]	3,073	2,112	68.7	961	31.3
Jones [4]	7,037	5,735	81.5	1,302	18.5
King [4]	171	108	63.2	63	36.8
Knox [4]	1,801	1,321	73.3	480	26.7
Shackleford [4]	1,570	1,265	80.6	305	19.4
Stonewall [4]	840	550	65.5	290	34.5
Throckmorton [4]	964	647	67.1	317	32.9
Young [2]	8,539	7,249	84.9	1,290	15.1
Counties Crossed by SR-242					
Brown [5]	18,897	15,074	79.8	3,823	20.2
Callahan [5]	6,487	5,582	86.0	905	14.0
Coleman [5]	4,875	3,480	71.4	1,395	28.6
Concho [5]	1,407	977	69.4	430	30.6
McCulloch [5]	4,220	3,231	76.6	989	23.4
Runnels [5]	4,986	3,953	79.3	1,033	20.7
Taylor [5]	60,817	54,489	89.6	6,328	10.4
ROI Total	**127,793**	**107,328**	**83.8**	**21,056**	**16.2**

Notes:

Source: US Census Bureau, 2022

[1] County would be crossed by SR-236 under Alternative 2 only.

[2] County would be crossed by SR-236 under Alternative 1 only.

[3] County would be crossed by SR-236 under Alternative 1 or Alternative 2.

[4] County would be crossed by SR-236 under Alternative 1 or Alternative 2 and by SR-242 under either alternative.

[5] County would be crossed by SR-242 under Alternative 1 or Alternative 2.

3.9.2.2 Economic Activity

Labor force statistics in the ROI are presented in **Table 3-22**. The ROI labor force includes 129,193 employable persons, of whom 124,356 are employed. The unemployment rate in the ROI is 3.7 percent, which is less than the statewide unemployment rate of 4.0 percent. Unemployment in the individual ROI counties is generally lower than the statewide unemployment rate with the

exception of Jones (5.1 percent), Brown (4.5 percent), Coleman (5.0 percent), and McCulloch (4.2 percent). Median household income does not exceed the statewide figure in any of the ROI counties, and Haskell County is the only county in the ROI where per capita income exceeds the state. Generally, median household income and per capita income in the ROI are approximately 22 percent and 20 percent less than corresponding statewide figures, respectively.

Table 3-22 Employment and Income of County Populations within the Reconfigured Region of Influence

Jurisdiction	Median Household Income (dollars)	Per Capita Income (dollars)	Number in Labor Force	Number Employed	Unemployment Rate (percent)
Texas	67,321	34,255	14,898,100	14,298,300	4.0
Counties Crossed by SR-236					
Baylor [1]	43,705	26,586	2,044	1,994	2.4
Fisher [2]	55,862	31,291	1,693	1,630	3.7
Haskell [3]	48,432	34,429	2,859	2,767	3.2
Jones [4]	55,575	19,153	6,007	5,703	5.1
King [4]	42,125	19,835	642	637	0.8
Knox [4]	50,163	24,555	1,543	1,491	3.4
Shackleford [4]	54,896	31,474	1,871	1,819	2.8
Stonewall [4]	62,273	24,660	808	785	2.8
Throckmorton [4]	47,500	30,232	675	651	3.6
Young [2]	52,074	26,586	8,158	7,861	3.6
Counties Crossed by SR-242					
Brown [5]	49,232	27,819	15,599	14,903	4.5
Callahan [5]	55,820	28,303	6,423	6,183	3.7
Coleman [5]	47,216	26,700	3,179	3,021	5.0
Concho [5]	46,719	22,225	1,376	1,331	3.3
McCulloch [5]	46,552	25,897	3,237	3,102	4.2
Runnels [5]	52,103	27,519	4,853	4,657	4.0
Taylor [5]	57,811	29,698	70,270	67,816	3.5
Total ROI	**52,290**	**27,369**	**129,193**	**124,357**	**3.7**

Notes:
Source: US Bureau of Labor Statistics
[1] County would be crossed by SR-236 under Alternative 2 only.
[2] County would be crossed by SR-236 under Alternative 1 only.
[3] County would be crossed by SR-236 under Alternative 1 or Alternative 2.
[4] County would be crossed by SR-236 under Alternative 1 or Alternative 2 and by SR-242 under either alternative.
[5] County would be crossed by SR-242 under Alternative 1 or Alternative 2.

3.9.2.3 Air Travel and Transport

Aviation Industry

The Texas aviation industry comprises 289 airports making it one of the largest airport systems in the United States. It consists of 25 commercial service airports and 264 general aviation airports. In 2017 the Texas aviation industry employed nearly 780,000 people with a total payroll of more than $30 billion (TxDOT, 2018). More than 73 million passengers were enplaned at Texas

commercial airports in 2021. Dallas-Fort Worth International Airport and George Bush International Airport are 2 of the 24 airports of entry which collectively accounted for nearly $740 billion in international trade in 2018 (Texas Comptroller of Public Accounts, 2023).

Seventeen airports or airfields are within the ROI. Abilene Regional Airport is the largest commercial airport; the remaining 16 airports are considered private or general aviation airports. Services provided by these airports include local and regional passenger and cargo transport, medical support, glider services, pilot training, crop dusting, local travel, sightseeing, and varied capacities for accommodating (e.g., fuel, oxygen, and parking) aircraft transiting the region.

Military Installations

The Texas aviation industry includes 14 military installations which directly and indirectly employ 622,790 persons. In 2021, the two DAF installations associated with the Proposed Action, Laughlin and Sheppard AFBs, collectively employed approximately 28,622 military and civilian personnel which accounted for approximately 4 percent of total employment in the Texas aviation industry (**Table 3-23**). These installations have a total economic output of more than $5 billion and generate disposable personal income of almost $3 billion (Texas Comptroller, 2021).

Table 3-23 Summary of Economic Contributions to the Texas Aviation Industry from DAF Installations Included in the Proposed Action

DAF Installation	Number of Persons Employed	Economic Output (billions of dollars)	Disposable Personal Income (billions of dollars)
Laughlin Air Force Base	8,694	1.59	1.59
Sheppard Air Force Base	19,928	3.68	1.24
Texas Aviation Industry	**778,955**	**94.3**	**30**

Source: Texas Comptroller, 2021; Texas Department of Transportation, 2018

3.9.3 Environmental Consequences

3.9.3.1 Evaluation Criteria

Impacts on socioeconomics would be considered significant if they resulted in substantial changes in the local or regional population, housing, community general services (health, police, and fire services), or social conditions from the demands of additional population/population shifts, (i.e., local, or regional economy, employment, or spending or earning patterns), or prevented or impeded economic development activity in local jurisdictions in the ROI.

3.9.3.2 Alternative 1

The proposed use of existing SR-242 and the reconfigured SR-236 under Alternative 1 would not result in significant impacts on socioeconomics. Alternative 1 would not result in changes in population, employment, or income within the ROI, including areas that would be crossed by the proposed reconfigured SR-236 that are not crossed by the existing configuration of SR-236. Anticipated long-term adverse impacts from proposed training operations would include the increased presence of and associated noise from military aircraft flying at lower altitudes in areas underlying the SRs. Noise levels associated with the proposed operations would not exceed 45 dBA in any area along the SRs and therefore, would be comparable to existing conditions and not

frequent enough, or loud enough, to create conditions that would adversely affect property values of underlying lands or impede or prevent continued economic development activity in local jurisdictions in the ROI. Given the large geographic area covered by the SRs, relatively small populations of the counties crossed by the SRs, small size of the aircraft relative to the overall size of the SRs, relative infrequency of training flights per day (an average of 1.2 T-6 flights per day in SR-236, less than 1.0 T-6 flight per day in SR-242, and 10 annual C-130 flights in either SR), and short duration of noise increases that would potentially be experienced by a listener as an aircraft flies overhead, it is likely that only a small number of people in each underlying county would be exposed to noise from the proposed aircraft operations.

Under Alternative 1, civilian and commercial flights may be delayed or may be required to deviate slightly for avoidance of training activities in the airspace. However, the DAF would schedule training activities appropriately and coordinate with civilian ATC as needed to prevent conflicts with other aircraft transiting or operating near the SRs. Therefore, impacts on socioeconomics from Alternative 1 would not be significant.

3.9.3.3 Alternative 2

Impacts on socioeconomics from Alternative 2 would be the same as those described for Alternative 1, with the exception that populations in Fisher and Youg Counties would not be potentially exposed to noise from aircraft operating in SR-236. Socioeconomic impacts from Alternative 2 would not be significant.

3.9.3.4 No Action Alternative

Under the No Action Alternative, SR-236 and SR-242 would remain temporarily closed and existing conditions would continue. This would have no impact on socioeconomics.

3.9.3.5 Cumulative Impacts

Reasonably foreseeable future projects with the potential to contribute to cumulative impacts on socioeconomics include multiple road improvement projects, parks and recreation projects, and the beddown of B-21 aircraft at Dyess AFB (**Table B-1**). Construction activities associated with these projects could temporarily increase local populations, income, and employment as workers temporarily relocate to these areas to be close to the project sites. The Bridgestone Bandag Expansion would also provide temporary increases during construction activities and permanent increases in employment opportunities, income, and population size in the ROI. Although the number of jobs created from the expansion is not known, the expansion is expected to increase productivity by 16 percent and increase operations from 5 days a week to 6 (Bridgestone Americas, 2022). Road improvement projects could contribute to the development of new businesses and housing which could contribute to an increase in employment opportunities, income, and population size. Additionally, the proposed beddown of B-21 at Dyess AFB could temporarily increase employment opportunities, income, and population size in the ROI during demolition and construction activities, with smaller associated increases in employment, income, and population in the long-term from additional personnel needed to fly and maintain the aircraft. It is anticipated that these temporary and permanent increases in local employment and population would be within the capacity of local jurisdictions to accommodate them and that they would not substantively affect demography or housing availability. Overall, impacts from these projects on employment, poverty, and economic activity would likely be beneficial. Therefore, when considered with these

other reasonably foreseeable projects, the Proposed Action would not contribute to significant adverse cumulative impacts on socioeconomics.

3.10 ENVIRONMENTAL JUSTICE

3.10.1 Definition of the Resource

Environmental justice (EJ) is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (USEPA, 2023b). EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (February 11, 1994), directs all federal departments and agencies to incorporate EJ considerations in achieving their mission. Each federal department or agency should accomplish this by conducting programs, policies, and activities that substantially affect human health or the environment in a manner that does not exclude communities from participation in, deny communities the benefits of, nor subject communities to discrimination under such actions because of their race, color, or national origin. EO 14008, *Tackling the Climate Crisis at Home and Abroad* (January 27, 2021) directs federal agencies to make the achievement of EJ part of their missions by developing programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts.

EO 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 or safety risks."

According to CEQ guidance on EO 12898, "minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis […] Low income populations in an affected area should be identified using the annual statistical poverty thresholds from the Bureau of the Census."

EJ is evaluated in DAF NEPA documents in accordance with guidance set forth in the *Guide for Environmental Justice (EJ) Analysis Under the Environmental Impact Analysis Process* (DAF, 2020b).

Given the large geographic areas covered by the existing and proposed reconfigured SRs, the EJ analysis presented in this EA is based on US Census Bureau data at the county level. Therefore, the ROI for this EJ analysis consists of Texas counties that would be crossed by SR-236 and SR-242 under Alternative 1 or Alternative 2. Counties that would be crossed by the SRs under each alternative are listed in **Table 3-19** and shown on **Figure 3-3**.

3.10.2 Affected Environment

3.10.2.1 Race and Ethnicity

As shown in **Table 3-24**, the percentage of the population identifying as White in most of the counties underlying the proposed configurations of SR-236 and SR-242 is greater than 80 percent and exceeds the statewide percentage of 77.4 percent. The exception is Concho County, where those identifying as White represent less than 70 percent of the population, while those identifying as Two or More Races and Hispanic/Latino account for 26.7 percent and 39.7 percent of the population, respectively. These percentages exceed or are comparable to the statewide percentages for those categories of 2.3 percent and 40.2 percent, respectively.

Table 3-24 Race and Ethnicity as a Percent of the Total Population in Counties Crossed by SR-236 and SR-242

Jurisdiction	Race/Ethnicity (percent)						
	White Alone	Black or African American	American Indian or Alaska Native	Asian	Native Hawai'ian or Other Pacific Islander	Two or More Races	Hispanic / Latino [6]
Texas	77.4	13.4	1.1	5.7	0.2	2.3	40.2
SR-236 Counties							
Baylor [1]	92.2	3.3	1.1	0.3	0.2	2.9	15.3
Fisher [2]	90.9	4.5	1.4	0.4	0.0	2.8	29.9
Haskell [3]	89.2	5.7	1.4	1.0	0.0	2.7	28.6
Jones [4]	82.5	13.3	1.6	0.8	0.1	1.9	28.7
King [4]	92.7	2.6	1.3	0.0	0.4	3.0	22.3
Knox [4]	87.5	6.3	1.7	0.8	0.1	3.7	34.9
Shackleford [4]	93.4	2.6	1.1	0.6	0.1	2.2	12.9
Stonewall [4]	90.8	3.6	1.5	1.9	0.1	2.1	20.4
Throckmorton [4]	95.9	1.1	1.1	0.7	0.0	1.2	13.5
Young [2]	94.1	1.8	1.4	0.8	0.1	1.8	20.5
SR-242 Counties							
Brown [5]	92.1	4.2	1.1	0.8	0.1	1.8	23.8
Callahan [5]	93.4	2.2	1.2	0.8	0.1	2.4	11.9
Coleman [5]	91.4	3.7	1.5	1.2	Z	2.2	18.9
Concho [5]	65.2	2.8	2.2	2.2	0.8	26.7	39.7
McCulloch [5]	92.5	3.4	1.3	0.9	0.1	1.9	32.0
Runnels [5]	92.1	3.1	2.0	1.2	Z	1.6	35.8
Taylor [5]	84.6	8.6	1.0	2.2	0.2	3.4	26.0

Notes:

Source: US Census Bureau, 2022

[1] County would be crossed by SR-236 under Alternative 2 only.

[2] County would be crossed by SR-236 under Alternative 1 only.

[3] County would be crossed by SR-236 under Alternative 1 or Alternative 2.

[4] County would be crossed by SR-236 under Alternative 1 or Alternative 2 and by SR-242 under either alternative.

[5] County would be crossed by SR-242 under Alternative 1 or Alternative 2.

[6] Persons identifying as Hispanic and Latino may be of any race and are included in the percentages of other categories shown in this table.

Z = Value greater than zero but less than half unit of measure shown.

In Jones County, 13.3 percent of the people identify as Black or African American, which is comparable to the statewide average of 13.4 percent and substantially higher than the percentage of Black or African Americans living in other counties that would be crossed by SR-236 and SR-242. Generally, the percentage of persons identifying as Hispanic/Latino and Asian in counties crossed by the SRs is lower than the corresponding statewide percentages for these groups.

3.10.2.2 Age

The percentage of persons younger than 18 years in counties underlying SR-236 and SR-242 is comparable to or lower than the statewide percentage (24.8 percent), as shown in **Table 3-25**. The percentage of persons older than 18 years in King County (26.6 percent) and Knox County (26.8 percent) somewhat exceeds the statewide percentage. On average, the percentage of persons younger than 18 years in counties underlying both SR-236 (20.9 percent) and SR-242 (22.6 percent) is lower than the statewide percentage. This indicates that populations of children in counties underlying SR-236 and SR-242 are not unusually high relative to the statewide percentage; however, high concentrations of children could potentially be present at particular schools, day care facilities, recreation centers, or similar child-oriented facilities in areas underlying the SRs.

As shown in **Table 3-25**, the percentage of persons older than 65 years in counties crossed by the SRs exceeds the statewide percentage (13.4 percent). These exceedances range from a low of approximately 2 percentage points in Jones and Taylor Counties, to a high of more than 10 percentage points in Fisher, Stonewall, Throckmorton, Coleman, Concho, and McCulloch Counties. The average percentage of persons older than 65 years in counties underlying SR-236 (19.7 percent) exceeds the statewide percentage by more than 6 percent and is 4 percent higher than in the other counties underlying SR-242. This indicates that counties crossed by the SRs have higher concentrations of persons older than 65 years relative to other Texas counties.

Table 3-25 Percent of Persons Younger Than 18 Years and Older Than 65 Years in Counties Crossed by SR-236 and SR-242

Jurisdiction	Persons Younger Than 18 Years (percent)	Persons Older Than 65 Years (percent)
Texas	24.8	13.4
SR-236 Counties		
Baylor [1]	22.8	23.2
Fisher [2]	22.1	24.6
Haskell [3]	17.6	22.5
Jones [4]	17.1	15.7
King [4]	26.6	21.0
Knox [4]	26.8	19.7
Shackleford [4]	23.2	20.7
Stonewall [4]	20.6	27.1
Throckmorton [4]	23.2	25.4
Young [2]	23.6	20.6
Average	**20.9**	**19.7**

Table 3-25 Percent of Persons Younger Than 18 Years and Older Than 65 Years in Counties Crossed by SR-236 and SR-242

Jurisdiction	Persons Younger Than 18 Years (percent)	Persons Older Than 65 Years (percent)
SR-242 Counties		
Brown [5]	20.3	20.8
Callahan [5]	21.4	21.6
Coleman [5]	20.6	25.8
Concho [5]	18.4	26.1
McCulloch [5]	20.8	24.5
Runnels [5]	23.4	20.4
Taylor [5]	24.3	15.0
Average	**22.6**	**17.4**

Notes:
Source: US Census Bureau, 2023
[1] County would be crossed by SR-236 under Alternative 2 only.
[2] County would be crossed by SR-236 under Alternative 1 only.
[3] County would be crossed by SR-236 under Alternative 1 or Alternative 2.
[4] County would be crossed by SR-236 under Alternative 1 or Alternative 2 and by SR-242 under either alternative.
[5] County would be crossed by SR-242 under Alternative 1 or Alternative 2.

3.10.2.3 Income and Poverty

Median household income and per capita income in counties underlying SR-236 and SR-242 are lower than the state of Texas as a whole ($67,321 and $34,255 in 2021 dollars, respectively), with the exception of per capita income in Haskell County ($34,429), which is comparable to that of the state (**Table 3-26**). On average, median household income and per capita income in counties underlying the SRs are approximately $16,000 and $7,000 less (in 2021 dollars) than the state of Texas as a whole.

Table 3-26 Median Household Income, Per Capita Income, and Persons in Poverty in Texas Counties Crossed by SR-236 and SR-242

Jurisdiction	Median Household Income, 2017 to 2021	Per Capita Income in Past 12 Months, 2017 to 2021	Persons in Poverty (percent of population)
Texas	$67,321	$34,255	14.2
SR-236 Counties			
Baylor [1]	$43,705	$26,586	17.6
Fisher [2]	$55,862	$31,291	15.3
Haskell [3]	$48,432	$34,429	20.6
Jones [4]	$55,575	$19,153	19.7
King [4]	$42,125	$19,835	11.6
Knox [4]	$50,163	$24,555	17.1
Shackleford [4]	$54,896	$31,474	12.0
Stonewall [4]	$62,273	$24,660	15.5
Throckmorton [4]	$47,500	$30,232	15.0

Table 3-26 Median Household Income, Per Capita Income, and Persons in Poverty in Texas Counties Crossed by SR-236 and SR-242

Jurisdiction	Median Household Income, 2017 to 2021	Per Capita Income in Past 12 Months, 2017 to 2021	Persons in Poverty (percent of population)
Young [2]	$52,074	$31,127	14.8
Average	**$51,261**	**$27,334.20**	**17.1**
SR-242 Counties			
Brown [5]	$49,232	$27,819	15.3
Callahan [5]	$55,820	$28,303	12.1
Coleman [5]	$47,216	$26,700	19.3
Concho [5]	$46,719	$22,225	14.9
McCulloch [5]	$46,552	$25,897	17.3
Runnels [5]	$52,103	$27,519	15.3
Taylor [5]	$57,811	$29,698	17.9
Average	**$51,769**	**$26,532**	**17.1**

Notes:
Source: US Census Bureau, 2023
Median Household Income and Per Capita Income in Past 12 Months (2017 to 2021) values are based on 2021 dollars.
[1] County would be crossed by SR-236 under Alternative 2 only.
[2] County would be crossed by SR-236 under Alternative 1 only.
[3] County would be crossed by SR-236 under Alternative 1 or Alternative 2.
[4] County would be crossed by SR-236 under Alternative 1 or Alternative 2 and by SR-242 under either alternative.
[5] County would be crossed by SR-242 under Alternative 1 or Alternative 2.

With the exception of King (11.6 percent), Shackleford (12.0 percent), and Callahan (12.1 percent) Counties, the percentage of persons in poverty exceeds the statewide percentage (14.2 percent) in all counties underlying SR-236 and SR-242. These exceedances vary from approximately 1 percentage point above the statewide percentage in Fisher County (15.3 percent), to more than 6 percentage points in Haskell County (20.6 percent). This indicates that economic conditions in counties underlying the SRs are generally less prosperous relative to the overall state.

3.10.3 Environmental Consequences

3.10.3.1 Evaluation Criteria

Adverse effects on minority and low-income populations, persons younger than 18 years, or persons older than 65 years would be disproportionately high and adverse, and therefore significant, if the Proposed Action resulted in one or more of the following:

- Temporary or permanent interference with or impediment to the continued use or occupation of an existing residential, business, or educational land use or site of cultural, religious, or historic importance.
- Temporary or permanent exposure to hazardous and toxic substances that exceeds applicable federal or state regulatory standards.
- Increased exposure to hazardous or dangerous safety conditions that cannot be mitigated through adherence to established safety standards and operational procedures.

- Changes in local or regional demography or socioeconomic conditions that result in unequal access by or the exclusion of minority or low-income populations, children under 18 years of age, or persons 65 years of age or older from affordable housing, employment, or community facilities and services (including health care, police, fire, and emergency services, and educational programs or facilities).

3.10.3.2 Alternative 1

Alternative 1 would not result in population changes in local jurisdictions underlying SR-236 and SR-242, including those that would be crossed by the proposed reconfigured SR-236 that are not crossed by the existing configuration of SR-236, or those that are adjacent to Sheppard, Dyess, and Laughlin AFBs because it does not involve changes to the number of personnel stationed at those installations. As such, Alternative 1 would have no potential to affect local demography or socioeconomic conditions in those local jurisdictions. Further, Alternative 1 would not result in additional financial expenditures in any of the towns, cities, or counties underlying SR-236 and SR-242 and would not result in additional expenditures in communities adjacent to Sheppard, Dyess, and Laughlin AFBs. Therefore, Alternative 1 would have no potential to create or exacerbate conditions that would result in unequal or disproportionate economic conditions in local jurisdictions underlying the SRs or adjacent to the installations.

Noise levels generated by aircraft using SR-236 and SR-242 under Alternative 1 would remain low and would have no potential to create conditions that would result in the temporary or permanent interference with or impediment to the continued use or occupation of existing land uses underlying the SRs, including residential, educational, and business uses, and sites of cultural, religious, or historic importance (also see **Section 3.5**). This includes land uses and sites in areas that would be crossed by the proposed reconfigured SR-236 that are not crossed by the existing configuration of SR-236. Aircraft operating in SR-236 and SR-242 would avoid populated areas and concentrations of existing buildings and structures to the extent practicable, further minimizing noise impacts on potential human receptors.

Other than emissions of criteria pollutants in aircraft exhaust, Alternative 1 would not involve releases of hazardous and toxic materials or waste in local jurisdictions underlying the SRs. Emissions of criteria pollutants would remain well below applicable *de minimis* thresholds and would have no potential to exceed the NAAQS or otherwise contribute to the degradation of local or regional air quality conditions that could exacerbate respiratory or other health conditions in vulnerable populations (see **Section 3.4**). Hazardous materials used to operate and maintain the aircraft proposed for use under Alternative 1, such as petroleum, oils, and lubricants, and corresponding quantities of hazardous waste generated by their use, would continue to be used, handled, managed, stored, and disposed of by authorized personnel at Sheppard and Laughlin AFBs in accordance will all applicable DoD and DAF regulations and associated federal and state regulatory requirements. The use of these hazardous materials and the generation and disposal of associated hazardous waste would have no potential to affect human populations on or outside the boundaries of Sheppard AFB and Laughlin AFB, including minority and low-income populations, children under 18 years of age, and persons 65 years of age and older.

All aircraft flying in the SRs would be operated in accordance with all applicable DoD, DAF, and FAA flight safety requirements and would not pose an increased risk to human populations in areas underlying the SRs. In the event of an in-flight emergency, pilots operating in the SRs would attempt to land the aircraft at the nearest airport or airfield, or an open area away from human

populations and development. DAF or other DoD emergency personnel, assisted by local emergency services personnel as needed, would respond to the scene of a downed aircraft as quickly as possible to rescue the pilots, provide emergency medical treatment as needed, contain and clean up accidental releases of fuel or other hazardous substances, and ultimately remove or recover the aircraft (see **Section 3.11**). As such, the unexpected landing or crash of an aircraft operating in the SRs would remain low and would be unlikely to adversely affect minority and low-income populations, persons younger than 18 years, or persons older than 65 years.

Therefore, for the reasons described above, Alternative 1 would have no temporary or permanent effects on minority and low-income populations, persons younger than 18 years, and persons older than 65 years.

3.10.3.3 Alternative 2

Potential impacts on minority and low-income populations, persons younger than 18 years, and persons older than 65 years from Alternative 2 would be the same as those described for Alternative 1, with the exception that such populations in Fisher and Young Counties would not be potentially exposed. Alternative 2 would have no adverse impacts on these groups.

3.10.3.4 No Action Alternative

Under the No Action Alternative, SR-236 and SR-242 would remain temporarily closed and existing conditions would continue. This would have no impacts on minority and low-income populations, persons younger than 18 years, and persons older than 65 years.

3.10.3.5 Reasonably Foreseeable Future Actions and Other Environmental Considerations

Reasonably foreseeable future actions listed in **Table B-1** (**Appendix B**) would have the potential to affect minority and low-income populations, persons younger than 18 years, and persons older than 65 years from noise, emissions of criteria pollutants and generation of fugitive dust, and the use of hazardous and toxic materials and generation of hazardous waste. It is assumed that these projects would be implemented in a manner that prevents or minimizes adverse impacts on such groups to ensure such impacts remain less than significant. Therefore, as the Proposed Action would have no adverse impacts on these groups, it would have no potential to contribute to significant cumulative adverse impacts when considered with the other reasonably foreseeable future actions listed in **Table B-1**.

3.11 SAFETY

3.11.1 Definition of the Resource

Safe, effective, and disciplined flying training operations are a critical priority of the 80 FTW at Sheppard AFB and 47 FTW at Laughlin AFB. Safety concerns associated with SR 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 SR-236 and SR-242.

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 (**Section 3.11.2.2**) and BASH (**Section 3.11.2.3**) with airspace utilization.

The ROI for safety includes areas in and under SR-236 and SR-242 under Alternative 1 or Alternative 2. The Proposed Action does not involve changes to and would have no impacts on ground safety, which considers the safety of personnel and facilities supporting flight operations at Sheppard and Laughlin AFBs; therefore, ground safety is not addressed further.

3.11.2 Affected Environment

3.11.2.1 SR Operating Procedures

Aircraft flight operations on SRs are governed by standard rules of flight. Additional information and Special Operating Procedures applicable to SRs, including SR-236 and SR-242, are provided in FLIP AP/1B (DoD, 2023). Units responsible for scheduling flight training activities on SRs must ensure that information and procedures listed in FLIP AP/1B are complete and accurate for the safe and efficient operation of aircraft in the SRs for which they are responsible. At a minimum, Special Operating Procedures or remarks provided in FLIP AP/1B typically include the following:

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

Special Operating Procedures are not currently provided for SR-236 and SR-242 in FLIP AP/1B because the SRs are temporarily closed (DoD, 2023).

Basic airmanship procedures have also been established for handling any deviations from air traffic control procedures due to an in-flight emergency; these procedures are defined in Air Force Manual (AFMAN) 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.

3.11.2.2 Aircraft Mishaps

Aircraft mishaps and their prevention represent a prime concern of the 80 FTW, 47 FTW, and DAF as a whole. A mishap is an unplanned occurrence or series of occurrences, that result in damage or injury and meets Class A, B, C, D, and Class E event reporting criteria as defined in AFMAN 91-224, *Ground Safety Investigation and Hazard Reporting* (DAF, 2019). Class A mishaps are the most severe with total property damage of $2 million or more or a fatality and/or permanent total disability. Mishap classes are defined in **Table 3-27**.

Table 3-27 Aircraft Class Mishaps

Mishap Class	Mishap Criteria[1]
A	1. Direct mishap cost totaling $2,000,000 or more. 2. A fatality or permanent total disability. 3. Destruction of a Department of Defense 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; however, see discipline-specific safety manuals for a list of events requiring mandatory reporting.

Notes:
Source: DAF, 2019
[1] Mishap criteria defined as resulting in one or more item listed by Class.

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, the 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, the 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 2017 through 2021, T-6 aircraft have had 2 Class A mishaps (a rate of 0.24 per 100,000 flight hours) and no Class B mishaps over the same period (Air Force Safety Center, 2021a). C-130 aircraft have had 3 Class A mishaps (a rate of 0.36 per 100,000 flight hours) and 6 Class B mishaps (a rate of 0.71 per 100,000 flight hours) (Air Force Safety Center, 2021b).

The AETC 47 FTW Safety Annual Program Management Review for fiscal year (FY) 2020 (AETC, 2020) lists as a primary flight safety goal to have zero Class A or B mishaps. As such, this EA focuses on Class A and B mishaps which are the two categories with the most severe outcomes

with regard to property damage, including destroyed aircraft, and fatalities and injuries. Laughlin AFB reports several Class A flight mishaps and no Class B flight mishaps during the period of FY 2015 through FY 2020; these flight mishaps include all flight activities; however, none are associated with 47 FTW operations in SRs. Similarly, the 317 AW Flight Safety Office at Dyess AFB reported no records of mishaps on SR-236 or SR-242 when those SRs were formerly used for training by AMC C-130s.

SR-236 is included in the Sheppard AFB Area of Responsibility and SR-242 is included in the Laughlin AFB Area of Responsibility. The 47 FTW maintains the Laughlin AFB Mishap Response Plan (HQ 47 FTW, 2020) which outlines procedures for tasked agencies' time-critical response to mishaps requiring safety investigation and reporting; similarly, the 80 FTW maintains the Sheppard AFB Mishap Response Plan. Upon initial notification of a possible Class A or Class B mishap within either Area of Responsibility, the 47 FTW and 80 FTW Wing Flight Safety Officers would respond in accordance with the Mishap Response Plan.

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

The Air Force BASH program was established to minimize the risk for collisions of birds and wildlife with aircraft and the potential for subsequent human injury or loss of life, and property damage. In accordance with Air Force Instruction 91-202, *The US Air Force Mishap Prevention Program* (DAF, 2020c), 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 issues at the airfield by creating an integrated hazard abatement program through monitoring, avoidance, and actively controlling bird and animal population movements.

Laughlin, Sheppard, and Dyess AFBs are all located on the western edge of the Central Migratory Bird Flyway, resulting in the increased potential for in-flight encounters with birds during migration. The areas of SR-236 and SR-242 in north-central Texas proposed for use by the 80 FTW, 47 FTW, and potential transient C-130 operators 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 (HQ 47 FTW, 2023) provides an installation program designed to minimize local and transient aircraft exposure to potentially hazardous bird/wildlife strikes at or near Laughlin AFB but does not include hazard abatement measures for SRs. However, BASH incidents that occur on SRs and other SUA are reported and included in each installation's BASH statistics. Three bird strikes have been reported for Laughlin AFB flight operations on MTRs over the last 5 years, including one T-1 incident on IR-169 and two T-1 incidents on VR-1108. Four bird strikes have been reported for Sheppard AFB flight operations over the last 3 years. No historical bird strike information is available from Dyess AFB for SR-236 or SR-242.

3.11.2.4 Obstructions to Flight

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

Proposed flight operations on SR-236 and SR-242 would begin and end outside the airfield traffic pattern airspace area or Class B, C, and D airspace areas. FAA considerations/guidance for evaluating obstructions in airspace where aircraft are operating under visual flight rules (VFR) (such as the SRs) include (FAA, 2011):

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

With low, rolling plains in and around the ROI, the most notable flight obstructions in or near these airspaces include commercial wind power generation from wind turbines which are prevalent throughout north-central Texas. Existing wind turbine locations in or near SR-236 and SR-242 are shown in **Figures 1-2** and **1-3**, respectively. 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 11-2T-6V3, T-6 *Operations Procedures* (DAF, 2016) notes the following regarding obstacle clearances for T-6 aircraft: "Towers and other manufactured obstacles are more difficult to see than high terrain. For towers on or near the route, aircrews will plan to fly a minimum of 500 ft above the highest obstacle within 2 NM of the aircraft until acquired visually. Once the obstacle is acquired visually and positively identified, aircrew will maintain a 2,000 ft lateral clearance."

Based on this guidance, avoidance areas along SR-242 and the proposed configurations of SR-236 are shown on **Figure 3-1**.

3.11.3 Environmental Consequences

3.11.3.1 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 might include implementing new flight procedures on SR-236 and SR-242 that result in greater flight safety risk. For the purposes of this EA, an impact is considered significant if the proposed safety measures are not consistent with Air Force Office of Safety and Health and Occupational Safety and Health Administration standards resulting in unacceptable safety risks. Analysis of aircraft flight safety risks correlates projected Class A mishaps and potential collisions between birds and wildlife with current airspace use to consider the magnitude of the change in risk associated with the Proposed Action.

3.11.3.2 Alternative 1

Aircraft Mishaps

Under Alternative 1, the pilots from the 80 FTW would overfly terrain within the proposed reconfigured boundaries of SR-236 that is different from terrain located within the existing lateral boundaries of SR-236. The proposed modification to the lateral boundaries of SR-236 would reduce the number of wind turbines and windmills in the airspace, which would increase the space for vertical maneuverability and improve flight safety. As such, fewer potential mishaps would occur on SR-236 due to flight obstructions. However, potential aircraft mishaps due to BASH incidents, weather-related accidents, mechanical failure, or pilot error would have the potential to increase on SR-236 due to the higher number of proposed annual operations by T-6 aircraft (440) compared with annual C-130 operations that previously occurred on this route (10).

Under Alternative 1, the 47 FTW would overfly the same terrain under existing SR-242 and other flight obstructions associated with existing wind turbines (see **Section 3.11.2.5** and **Figure 3-1**). Potential aircraft mishaps due to BASH incidents, weather-related accidents, mechanical failure, or pilot error would have the potential to increase on SR-242 due to the higher number of proposed annual operations by T-6 aircraft (240) compared with annual C-130 operations that previously occurred on this route (10).

The limited amount of time an aircraft would be over any specific location, combined with sparsely populated areas under SR-236 and SR-242, including areas that would be crossed by the proposed reconfigured SR-236 that are not crossed by the existing configuration of SR-236, would minimize the probability that an aircraft mishap would occur over a populated area. All SR 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 impacts on flight safety.

Bird/Wildlife-Aircraft Strike Hazards

T-6 and C-130 aircrews operating within SR-236 and SR-242 would continue to follow applicable procedures outlined in the Laughlin AFB and Sheppard AFB BASH Plans. General flight safety risks and BASH risks would be assessed for flights lower than 1,000 ft AGL, and additional

avoidance procedures outlined in the installation BASH plans 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 remain insignificant.

Obstructions to Flight

Under Alternative 1, the proposed modification of SR-236 airspace would effectively avoid encroachment from wind turbines and other development along the existing configuration of SR-236. Pilots would avoid potential obstructions in accordance with all applicable DAF procedures and requirements. As such, potential impacts on safety from flight obstructions under Alternative 1 would not be significant.

3.11.3.3 Alternative 2

Aircraft Mishaps

The potential for aircraft mishaps under Alternative 2 is higher than the potential for mishaps under Alternative 1 (**Section 3.11.3.2**), primarily due to higher potential impacts on SR-236 from flight obstructions (existing wind turbines and towers). All SR 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. Strict control and use of established safety procedures would minimize the potential for aircraft mishaps and safety risks in general.

Bird/Wildlife Aircraft Strike Hazard

The potential for BASH under Alternative 2 is similar to the potential for these strike hazards under Alternative 1 (**Section 3.11.3.2**). T-6 and C-130 aircrews operating within SR-236 and SR-242 would continue to follow applicable procedures outlined in the Laughlin AFB and Sheppard AFB BASH Plans. Flight safety risk in general and BASH risk should be assessed for flights lower than 1,000 ft AGL. When risk increases, additional avoidance procedures outlined in the Sheppard AFB and Laughlin AFB BASH Plans would be followed during low-altitude training. Continued adherence to current safety procedures, and taking preventive action when BASH risk increases, would result in no significant change in BASH impacts under Proposed Action Alternative 2.

Obstructions to Flight

Under Alternative 2, commercial wind turbines would be the most notable flight obstruction within SR-236 and SR-242 airspace. Under Alternative 2, the proposed redesignation of waypoints on SR-236 would not change the encroachment from wind turbines and other development relative to existing conditions. While the proposed configuration of and flight pattern in SR-236 under Alternative 2 would increase the potential for obstructions to flight relative to Alternative 1, pilots would avoid these obstructions in accordance with all applicable DAF procedures and requirements. Therefore, impacts on safety from obstructions to flight under Alternative 2 would remain negligible or minor. These impacts would not be significant.

3.11.3.4 No Action Alternative

Under the No Action Alternative, SR-236 and SR-242 would remain temporarily closed and existing conditions would continue. Sheppard AFB and Laughlin AFB would continue to conduct

SR training on existing SRs currently operated by those installations in accordance with all applicable safety requirements. This would have no impact on safety.

3.11.3.5 Reasonably Foreseeable Future Actions and Other Environmental Considerations

No reasonably foreseeable future projects or aircraft operations were identified in or near SR-236 and SR-242 that would contribute to cumulatively significant impacts on safety when considered with the Proposed Action.

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APPENDIX A
INTERAGENCY AND INTERGOVERNMENTAL COORDINATION AND CONSULTATIONS

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APPENDIX A – INTERAGENCY AND INTERGOVERNMENTAL COORDINATION AND CONSULTATIONS

A.1 INTRODUCTION

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 Executive Order (EO) 12372, *Intergovernmental Review of Federal Programs*, as amended by EO 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 Intergovernmental Coordination Act and EO 12372 require federal agencies to cooperate with and consider state and local views in implementing a federal proposal. Through the coordination process, potentially interested and affected government agencies, government representatives, elected officials, and interested parties that could be affected by the Proposed Action and alternatives were notified during the development of this EA. The stakeholders inventory and agency and intergovernmental coordination letters and responses are included in this Appendix.

A.1.1 Agency Consultations

Implementation of the Proposed Action involves coordination with several organizations and agencies. Compliance with Section 7 of the Endangered Species Act and implementing regulations (50 Code of Federal Regulations [CFR] Part 402), requires communication with the US Fish and Wildlife Service in cases where a federal action could affect listed threatened or endangered species, species proposed for listing, or candidates for listing. The primary focus of this consultation is to request a determination of whether any of these species occur in the proposal area. If any of these species is present, a determination would be made of any potential adverse impacts on the species.

The National Historic Preservation Act (NHPA) of 1966 (54 United States Code 300101 et seq.) established the National Register of Historic Places (NRHP) and outlined procedures for managing cultural resources on federal property. NHPA requires federal agencies to consider the potential impacts of federal undertakings on historic properties that are: listed, nominated to, or eligible for listing on the NRHP; designated 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 impact historic properties and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings.

A.1.2 Government-to-Government Consultation

Consistent with the NHPA's implementing regulations (36 CFR Part 800), Department of Defense Instruction 4710.02, *Interactions with Federally-Recognized Tribes*, Department of the Air Force (DAF) Instruction 90-2002, *Air Force Interaction 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 the National Environmental Protection Act consultation and the intergovernmental coordination processes and requires separate notification to 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 (ITLO). The ITLO 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. The proponent of the Proposed Action evaluated in this EA, Air Education and Training Command, is organized within the 19th Air Force. Therefore, Colonel Aaron B. Brown of the 19th Air Force served as the DAF's government-to-government point of contact for tribal consultation conducted during this EA.

Government-to-government consultation is included in this Appendix.

A.2 Public and Agency Review of Environmental Assessment

A Notice of Availability of the Draft EA and proposed Finding of No Significant Impact (FONSI) was published in the *Abilene Reporter News*, *Coleman County Chronicle*, *Double Mountain Chronicle*, and *Throckmorton Tribune* inviting the public to review and comment on the Draft EA during the 30-day review period.

Printed copies of the Draft EA and proposed FONSI are available for review at the following public libraries:

- Abilene Public Library (Main Branch), 202 Cedar St, Abilene Texas 79601
- Coleman Public Library, 402 S Commercial Ave, Coleman, Texas 76834
- Depot Public Library, 120 E Chestnut St, Throckmorton, Texas 76483
- Stonewall County Library, 516 S Washington, Aspermont, Texas 79502

The Draft EA and proposed FONSI are available electronically for review on the following DAF installation websites:

- **Sheppard AFB:** https://www.sheppard.af.mil/Library/Key-Documents/
- **Dyess AFB:** https://www.dyess.af.mil/ (click on the "Environmental" navigation bar on the lower right side of the page and then click on "Draft Environmental Assessment for Slow Route Training Airspace")
- **Laughlin AFB:** https://www.laughlin.af.mil/ (click on the "Key Documents" navigation bar on the lower right side of the page and then click on "Draft Environmental Assessment for Slow Route Training Airspace")

A.3 INTERGOVERNMENTAL AND STAKEHOLDER COORDINATION

A.3.1 Sample Agency Scoping Letter

DEPARTMENT OF THE AIR FORCE
AIR FORCE CIVIL ENGINEER CENTER
JOINT BASE SAN ANTONIO LACKLAND TEXAS

October 3, 2023

Major Levi Davis
U.S. Air Force Civil Engineer Center (AFCEC)
NEPA Division (AFCEC/CIE)

Kristin Jacobsen
Manager
Texas Commission on Environmental Quality; Air Quality Planning Section
Mail Code 206 PO Box 13087
Austin, TX 78711-3087

SUBJECT: Request for scoping comments to support National Environmental Policy Act process for slow route training airspace, North Texas

Dear Ms. Jacobsen:

The Department of the Air Force (DAF) Air Education and Training Command (AETC) is preparing an Environmental Assessment (EA) to evaluate potential environmental impacts from the Proposed Action to use two Slow Route (SR) training airspaces, SR-236 and SR-242, to support routine slow-speed and low-altitude training syllabi requirements for military undergraduate student pilots at Sheppard Air Force Base (AFB) and Laughlin AFB, Texas and transient C-130 pilots at other Department of Defense (DoD) installations. The EA is being prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, Council of Environmental Quality NEPA regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508), and the Air Force Environmental Impact Analysis Process (32 CFR Part 989). SR-236 and SR-242 are in north-central Texas near the city of Abilene and Dyess AFB, approximately 150 miles west-southwest of Fort Worth (Attachment 1).

SRs are a type of airspace used by military aircraft for routine training at relatively slow speeds and low altitudes (i.e., 250 knots or less and at or above 300 feet above ground level). SR-236 and SR-242 were established by the Air Force Air Mobility Command (AMC) in the 1990s to support slow-speed and low-altitude training requirements for AMC C-130 pilots. These routes are no longer used by AMC and are temporarily closed to air traffic. However, they are appropriate to support ongoing AETC training syllabi requirements for military undergraduate student pilots flying T-6A Texan II aircraft at Sheppard and Laughlin AFBs and C-130 pilots at other DoD installations.

SR-236 extends primarily to the north and east of Abilene while SR-242 extends primarily to the south, east, and north (Attachments 2 and 3). Both SRs are nearly 200 nautical miles long and contain approximately 2,200 square miles of airspace. Sheppard AFB is approximately 60 miles northeast of SR-236 near Wichita Falls, Texas. Laughlin AFB is approximately 164 miles south-southwest of SR-242 near Del Rio, Texas.

Under the Proposed Action, the DAF would use SR-242 in its existing configuration (Attachments 1 and 3) and is considering the use of SR-236 either in its existing configuration (Attachments 1 and 2) or modifying its lateral boundaries (Attachment 4) to avoid encroachment from existing wind turbines and other development that were not present when these SRs were originally established in the 1990s. No changes to the vertical extents of SR-236 and SR-242 would occur under the Proposed Action. The Proposed Action does not include and would not require construction, demolition, or other ground-disturbing activities at Sheppard, Laughlin, or Dyess AFBs, or on land underlying SR-242 or SR-236 in its existing or proposed configuration. Further, the Proposed Action would not require changes to the existing boundaries of Sheppard, Laughlin, or Dyess AFBs or changes to the number and type of personnel and aircraft assigned to those installations. The DAF is coordinating with the Federal Aviation Administration throughout the NEPA process for this Proposed Action.

Please send your written comments or requests for additional information regarding the Proposed Action to my attention at AFCEC CIE, 13 Willis Way, Conway, Arkansas 72032 or by email in care of Mr. Benjamin Faske at benjamin.faske@us.af.mil. Your comments are requested within 30 days of receipt of this letter to ensure that they are addressed during the environmental impact analysis process. Thank you for your assistance.

Sincerely

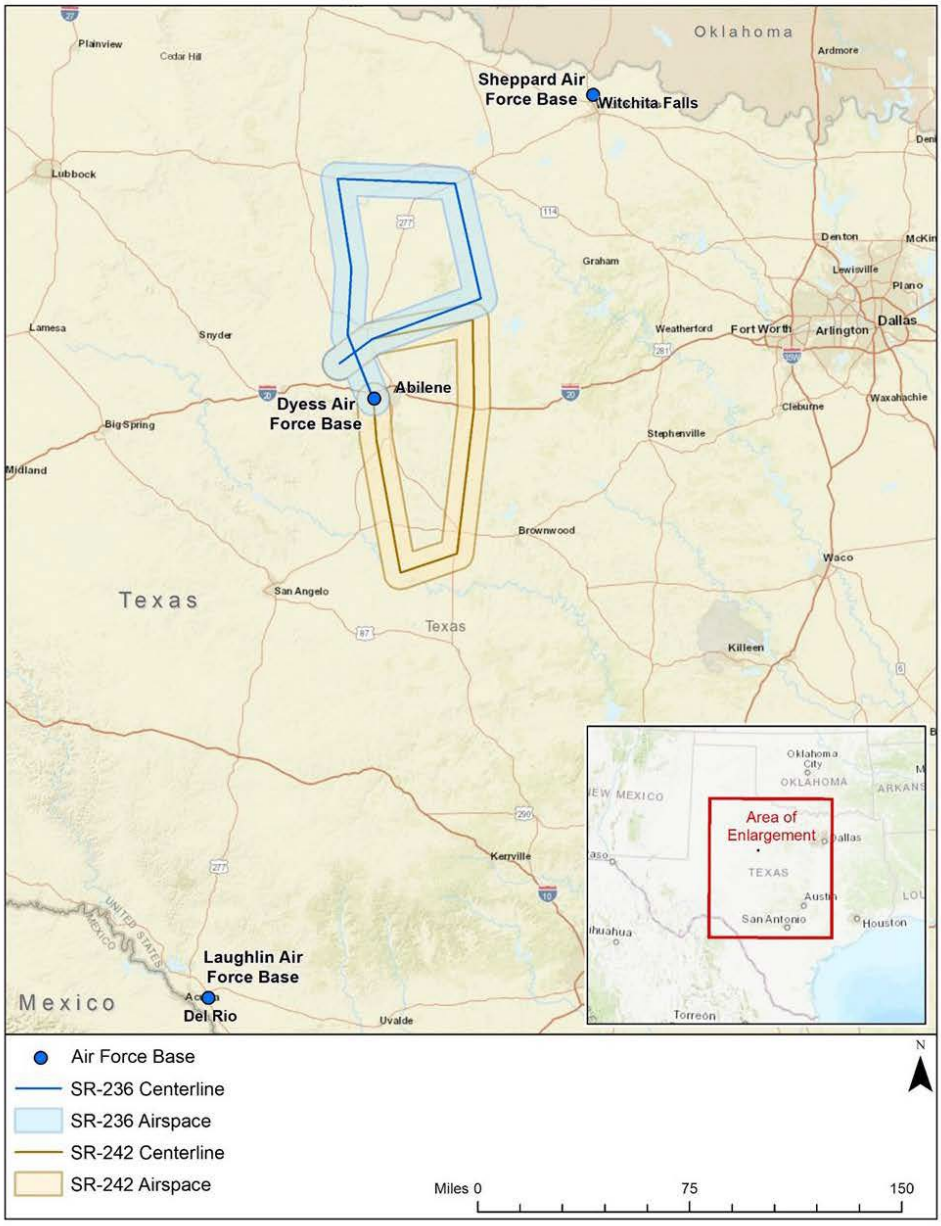
DAVIS.LEVI.NATHAN.1276193470 Digitally signed by DAVIS.LEVI.NATHAN.1276193470 Date: 2023.10.03 19:22:20 -05'00'

LEVI DAVIS, Major, USAF
NEPA Division

Attachments
1. Regional Location of SR-236 and SR-242
2. Existing Lateral Boundaries and Flight Pattern in SR-236
3. Existing Lateral Boundaries and Flight Pattern in SR-242
4. Proposed Modification of SR-236 Lateral Boundaries

3

Attachment 1 – Regional Location of SR-236 and SR-242



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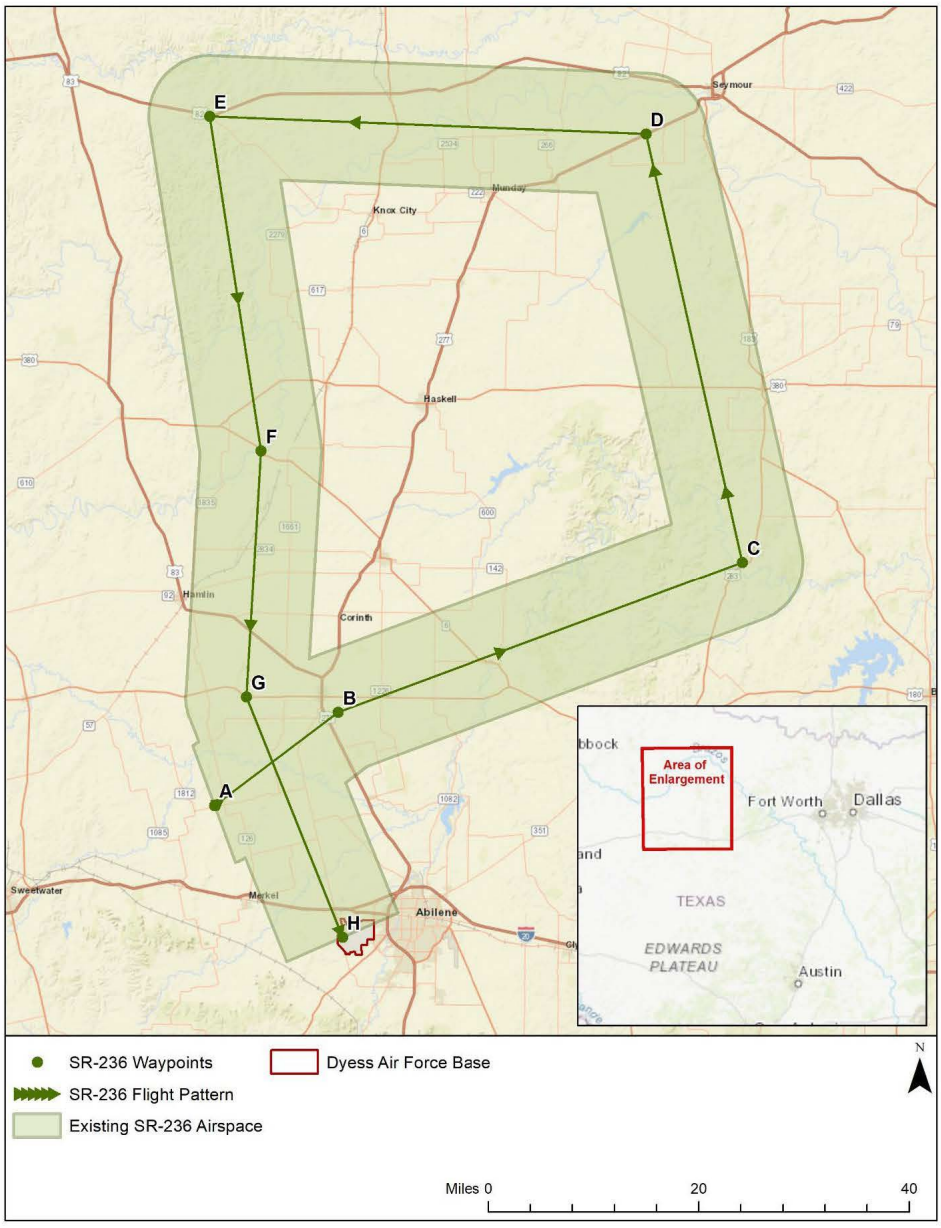
Attachment 2 – Existing Lateral Boundaries and Flight Pattern in SR-236



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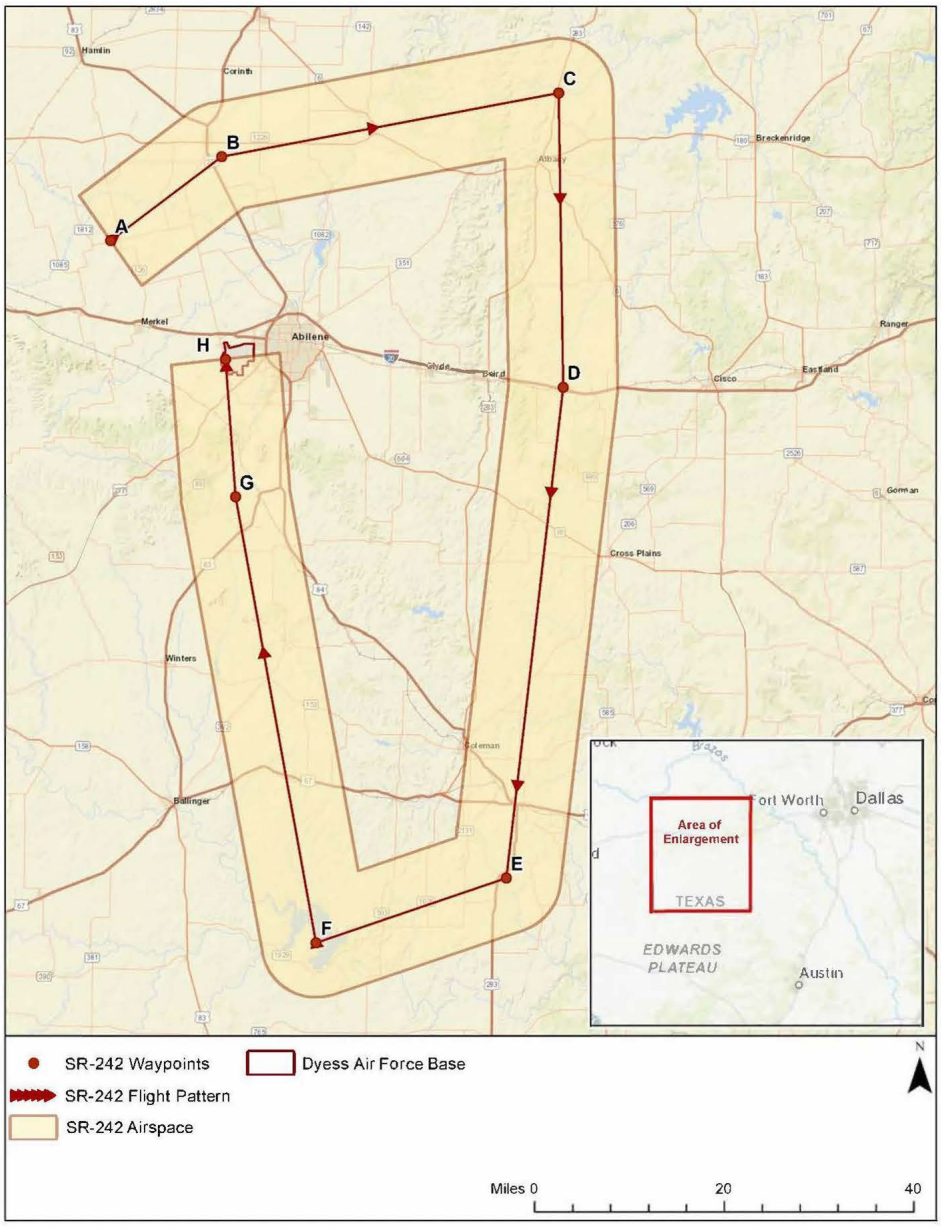
Attachment 3 – Existing Lateral Boundaries and Flight Pattern in SR-242



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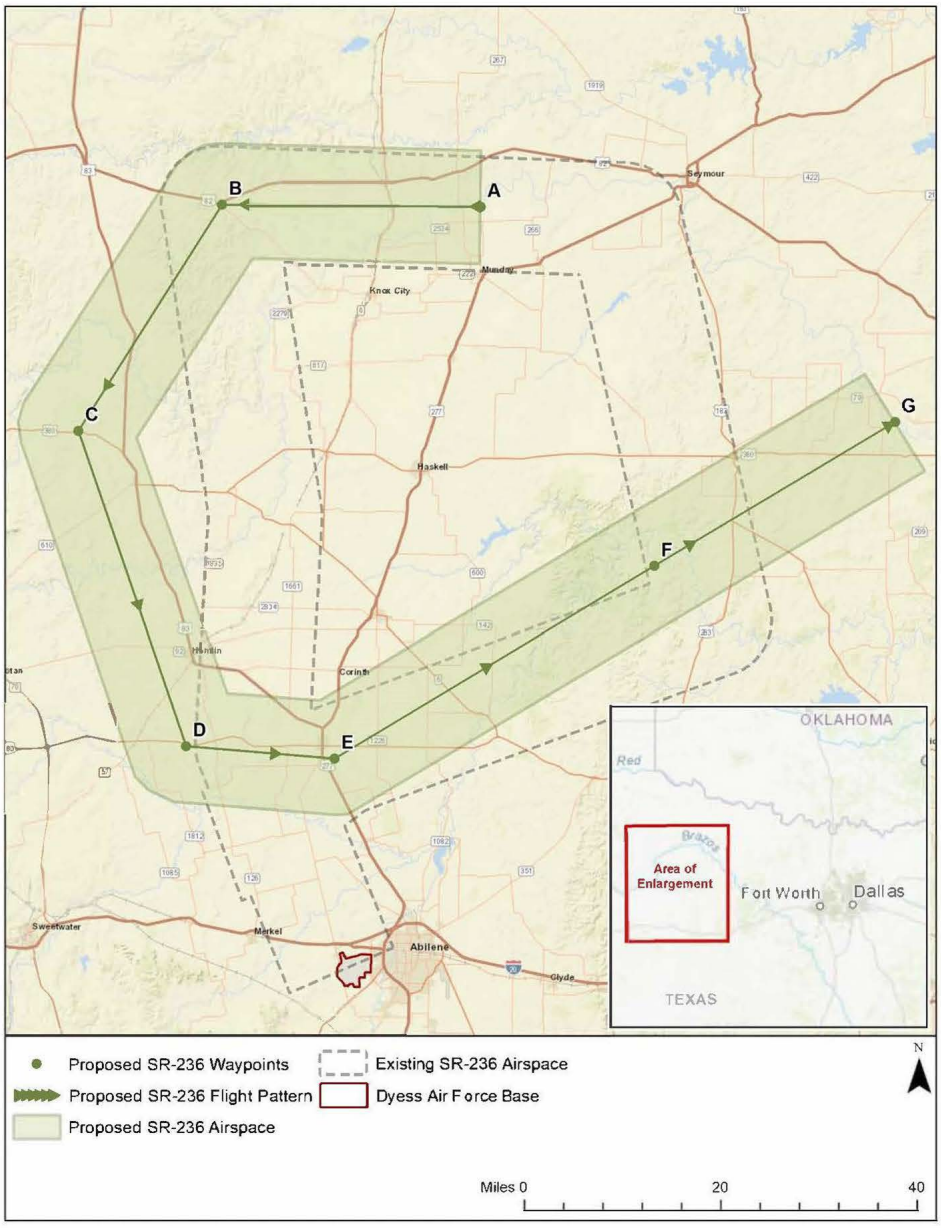
Attachment 4 – Proposed Modification of SR-236 Lateral Boundaries



A.3.2 Sample Government-to-Government Scoping Letter

DEPARTMENT OF THE AIR FORCE
NINETEENTH AIR FORCE
JOINT BASE SAN ANTONIO-RANDOLPH

September 25, 2023

Colonel Aaron B. Brown
Operations Support Division Chief
Directorate of Operations
Nineteenth Air Force
555 E Street, East Suite B 1
JBSA Randolph AFB, TX 78150-4139

Devon Frazier
Tribal Historic Preservation Officer (THPO)
Absentee-Shawnee Tribe of Indians of Oklahoma
2025 S Gordon Cooper Drive
Shawnee, OK 74801

SUBJECT: Invitation to participate in government-to-government consultation and provide comments to support the National Historic Preservation Act Section 106 process for slow route training airspace, North Texas

Dear THPO Frazier:

The Department of the Air Force (DAF) Air Education and Training Command (AETC) is preparing an Environmental Assessment (EA) to evaluate potential environmental impacts from the Proposed Action to use two Slow Route (SR) training airspaces, SR-236 and SR-242, to support routine slow-speed and low-altitude training syllabi requirements for military undergraduate student pilots at Sheppard Air Force Base (AFB) and Laughlin AFB, Texas and transient C-130 pilots at other Department of Defense (DoD) installations. The EA is being prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, Council of Environmental Quality NEPA regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508), and the Air Force Environmental Impact Analysis Process (32 CFR Part 989). SR-236 and SR-242 are in north-central Texas near the city of Abilene and Dyess AFB, approximately 150 miles west-southwest of Fort Worth (Attachment 1).

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.

SRs are a type of airspace used by military aircraft for routine training at relatively slow speeds and low altitudes (i.e., 250 knots or less and at or above 300 feet above ground level). SR-236 and SR-242 were established by the Air Force Air Mobility Command (AMC) in the 1990s to support slow-speed and low-altitude training requirements for AMC C-130 pilots. These routes are no longer used by AMC and are temporarily closed to air traffic. However, they are appropriate to support ongoing AETC training syllabi requirements for military undergraduate student pilots flying T-6A Texan II aircraft at Sheppard and Laughlin AFBs and C-130 pilots from other DoD installations.

SR-236 extends primarily to the north and east of Abilene while SR-242 extends primarily to the south, east, and north (Attachments 2 and 3, respectively). Both SRs are nearly 200 nautical miles long and contain approximately 2,200 square miles of airspace. Sheppard AFB is approximately 60 miles northeast of SR-236 near Wichita Falls, Texas. Laughlin AFB is approximately 164 miles south-southwest of SR-242 near Del Rio, Texas.

Under the proposed undertaking, the DAF would use SR-242 in its existing configuration (Attachments 1 and 3) and is considering the use of SR-236 either in its existing configuration (Attachments 1 and 2) or modifying its lateral boundaries (Attachment 4) to avoid encroachment from existing wind turbines and other development that were not present when these SRs were originally established in the 1990s. No changes to the vertical extents of SR-236 and SR-242 would occur under the proposed undertaking. The proposed undertaking does not include and would not require construction, demolition, or other ground-disturbing activities at Sheppard, Laughlin, or Dyess AFBs, or on land underlying SR-242 or SR-236 in its existing or proposed modified configuration. Further, the Proposed Action would not require changes to the existing boundaries of Sheppard, Laughlin, or Dyess AFBs, or changes to the number and type of personnel and aircraft assigned to those installations. The DAF is coordinating with the Federal Aviation Administration throughout the NEPA process for this Proposed Action.

The inadvertent discovery of archaeological resources or human remains during the proposed undertaking is not anticipated because no ground-disturbing activities would occur. However, in the event such a discovery occurs during the proposed undertaking, you will be informed immediately 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 Office with respect to the proposed undertaking.

Please forward your comments or requests for additional information to the attention of my designated point of contact, Major Levi Davis, at the Air Force Civil Engineer Center, NEPA Division, 13 Willis Way, Conway, Arkansas, 72032 or by email in care of Mr. Benjamin Faske at benjamin.faske@us.af.mil. Your comments are requested at your earliest convenience to ensure sufficient time to address them during preparation of the Draft EA. I look forward to receiving any input you may have regarding the Proposed Action. Thank you in advance for your assistance with this request.

Sincerely

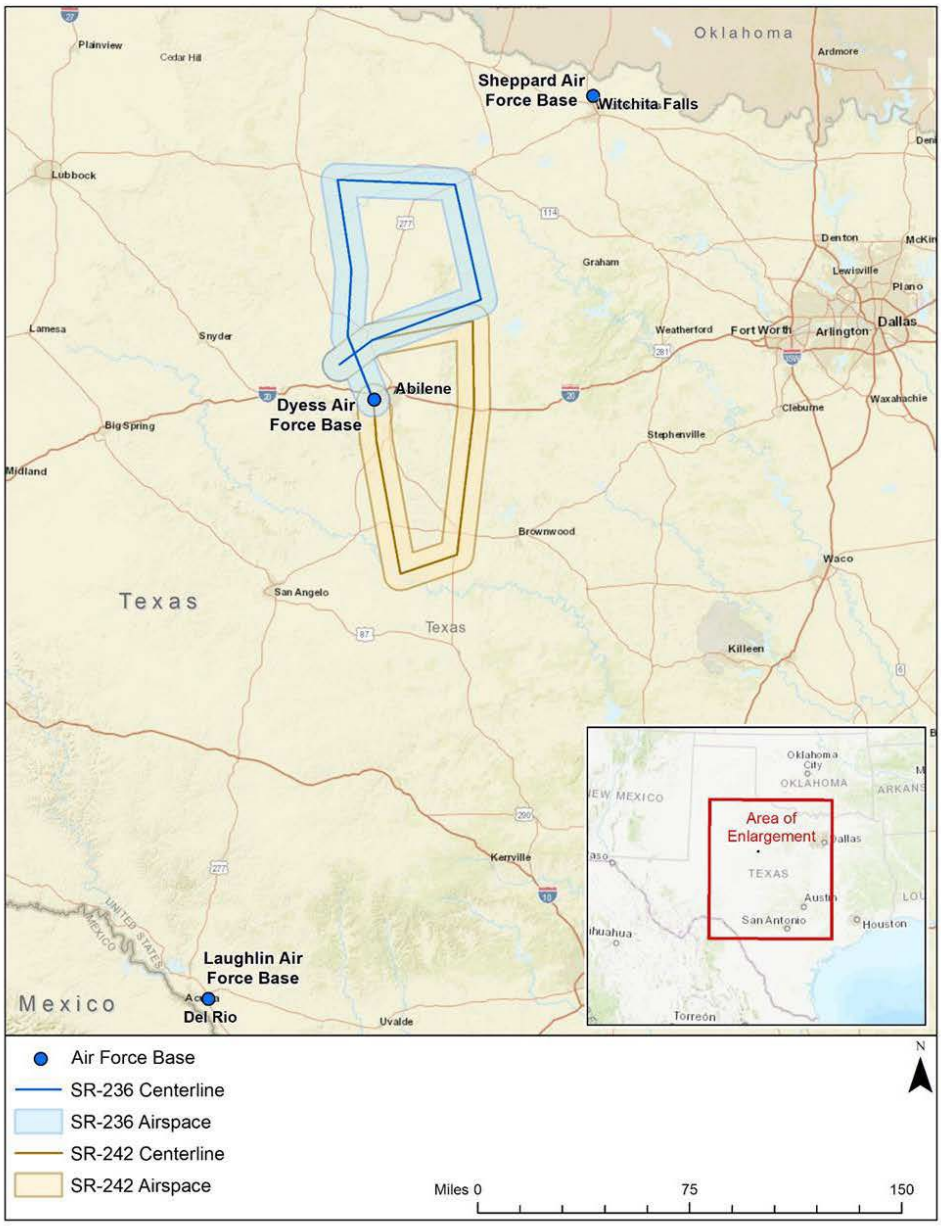
BROWN.AARON.B.1129052186 Digitally signed by BROWN.AARON.B.1129052186 Date: 2023.09.25 13:12:25 -05'00'

AARON B. BROWN, Colonel, USAF
Chief, Operations Support Division
Nineteenth Air Force

Attachments
1. Regional Location of SR-236 and SR-242
2. Existing Lateral Boundaries and Flight Pattern in SR-236
3. Existing Lateral Boundaries and Flight Pattern in SR-242
4. Proposed Modification of SR-236 Lateral Boundaries

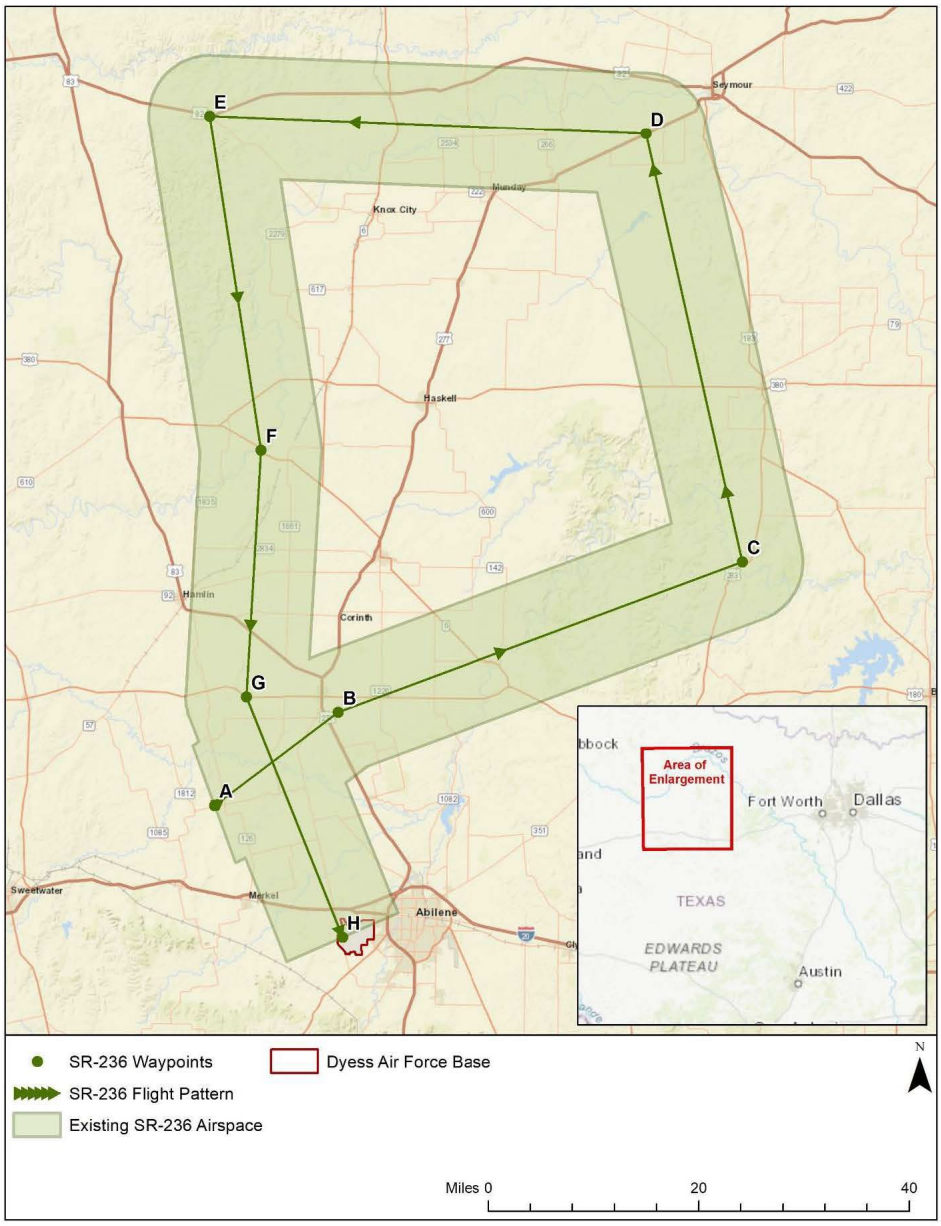
3

Attachment 1 – Regional Location of SR-236 and SR-242



4

Attachment 2 – Existing Lateral Boundaries and Flight Pattern in SR-236



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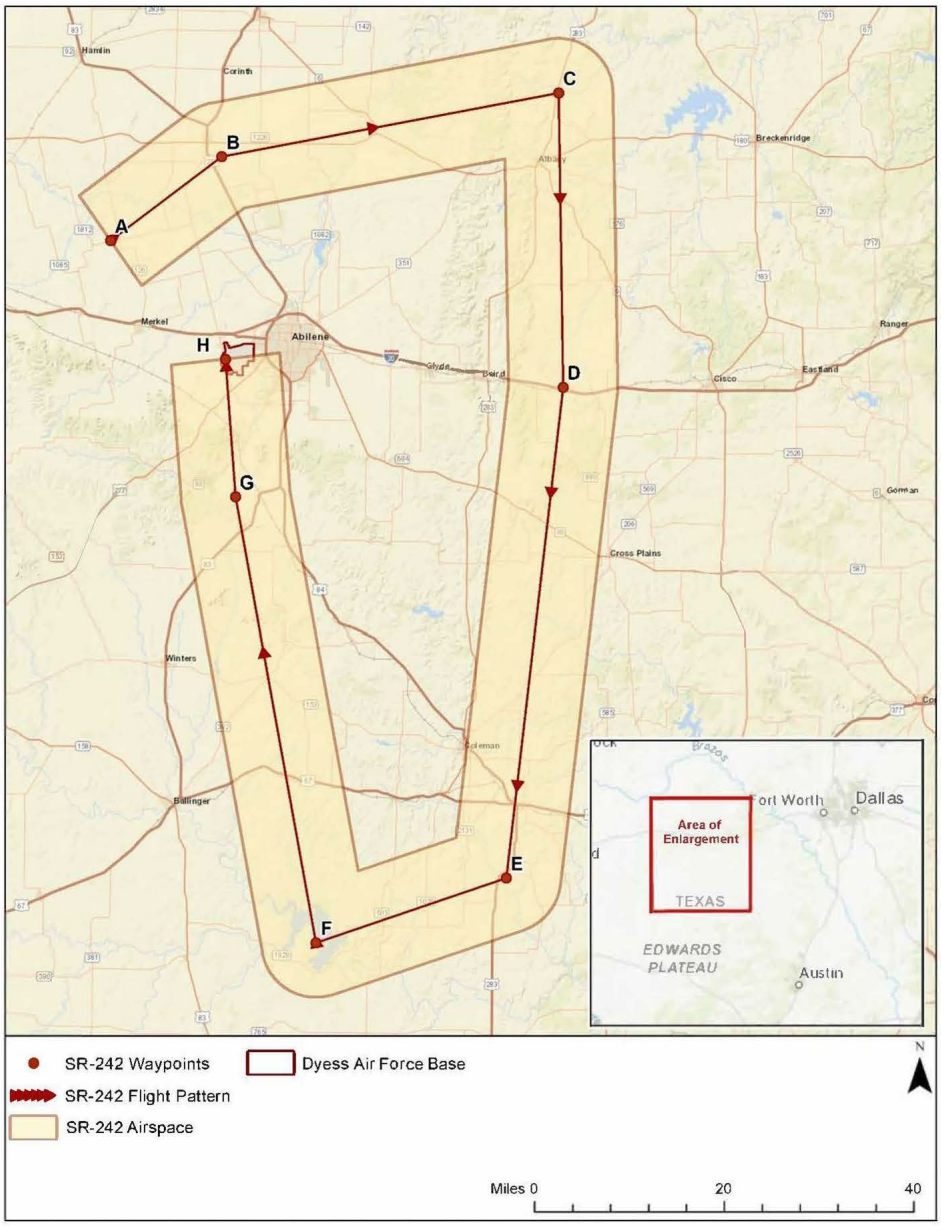
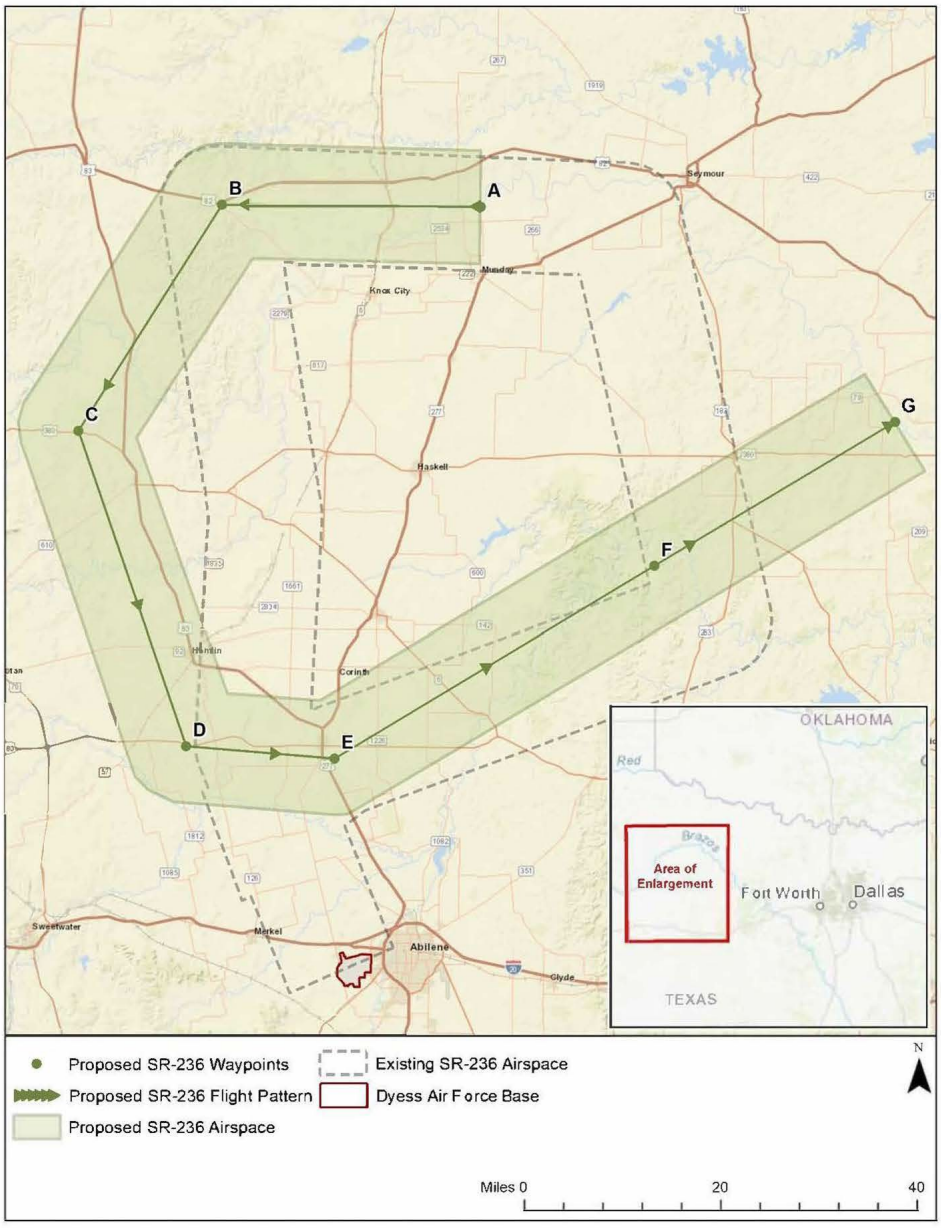
Attachment 3 – Existing Lateral Boundaries and Flight Pattern in SR-242



6

Attachment 4 – Proposed Modification of SR-236 Lateral Boundaries



A.3.3 Sample General Scoping Letter

DEPARTMENT OF THE AIR FORCE
AIR FORCE CIVIL ENGINEER CENTER
JOINT BASE SAN ANTONIO LACKLAND TEXAS

October 3, 2023

Major Levi Davis
U.S. Air Force Civil Engineer Center (AFCEC)
NEPA Division (AFCEC/CIE)

Military Affairs Committee
Abilene Chamber of Commerce
400 Pine Street, 5th Floor
Abilene, TX 79601

SUBJECT: Request for scoping comments to support National Environmental Policy Act process for slow route training airspace, North Texas

To Whom it May Concern:

The Department of the Air Force (DAF) Air Education and Training Command (AETC) is preparing an Environmental Assessment (EA) to evaluate potential environmental impacts from the Proposed Action to use two Slow Route (SR) training airspaces, SR-236 and SR-242, to support routine slow-speed and low-altitude training syllabi requirements for military undergraduate student pilots at Sheppard Air Force Base (AFB) and Laughlin AFB, Texas and transient C-130 pilots at other Department of Defense (DoD) installations. The EA is being prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, Council of Environmental Quality NEPA regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508), and the Air Force Environmental Impact Analysis Process (32 CFR Part 989). SR-236 and SR-242 are in north-central Texas near the city of Abilene and Dyess AFB, approximately 150 miles west-southwest of Fort Worth (Attachment 1).

SRs are a type of airspace used by military aircraft for routine training at relatively slow speeds and low altitudes (i.e., 250 knots or less and at or above 300 feet above ground level). SR-236 and SR-242 were established by the Air Force Air Mobility Command (AMC) in the 1990s to support slow-speed and low-altitude training requirements for AMC C-130 pilots. These routes are no longer used by AMC and are temporarily closed to air traffic. However, they are appropriate to support ongoing AETC training syllabi requirements for military undergraduate student pilots flying T-6A Texan II aircraft at Sheppard and Laughlin AFBs and C-130 pilots at other DoD installations.

SR-236 extends primarily to the north and east of Abilene while SR-242 extends primarily to the south, east, and north (Attachments 2 and 3). Both SRs are nearly 200 nautical miles long and contain approximately 2,200 square miles of airspace. Sheppard AFB is approximately 60 miles northeast of SR-236 near Wichita Falls, Texas. Laughlin AFB is approximately 164 miles south-southwest of SR-242 near Del Rio, Texas.

Under the Proposed Action, the DAF would use SR-242 in its existing configuration (Attachments 1 and 3) and is considering the use of SR-236 either in its existing configuration (Attachments 1 and 2) or modifying its lateral boundaries (Attachment 4) to avoid encroachment from existing wind turbines and other development that were not present when these SRs were originally established in the 1990s. No changes to the vertical extents of SR-236 and SR-242 would occur under the Proposed Action. The Proposed Action does not include and would not require construction, demolition, or other ground-disturbing activities at Sheppard, Laughlin, or Dyess AFBs, or on land underlying SR-242 or SR-236 in its existing or proposed configuration. Further, the Proposed Action would not require changes to the existing boundaries of Sheppard, Laughlin, or Dyess AFBs or changes to the number and type of personnel and aircraft assigned to those installations. The DAF is coordinating with the Federal Aviation Administration throughout the NEPA process for this Proposed Action.

Please send your written comments or requests for additional information regarding the Proposed Action to my attention at AFCEC CIE, 13 Willis Way, Conway, Arkansas 72032 or by email in care of Mr. Benjamin Faske at benjamin.faske@us.af.mil. Your comments are requested within 30 days of receipt of this letter to ensure that they are addressed during the environmental impact analysis process. Thank you for your assistance.

Sincerely

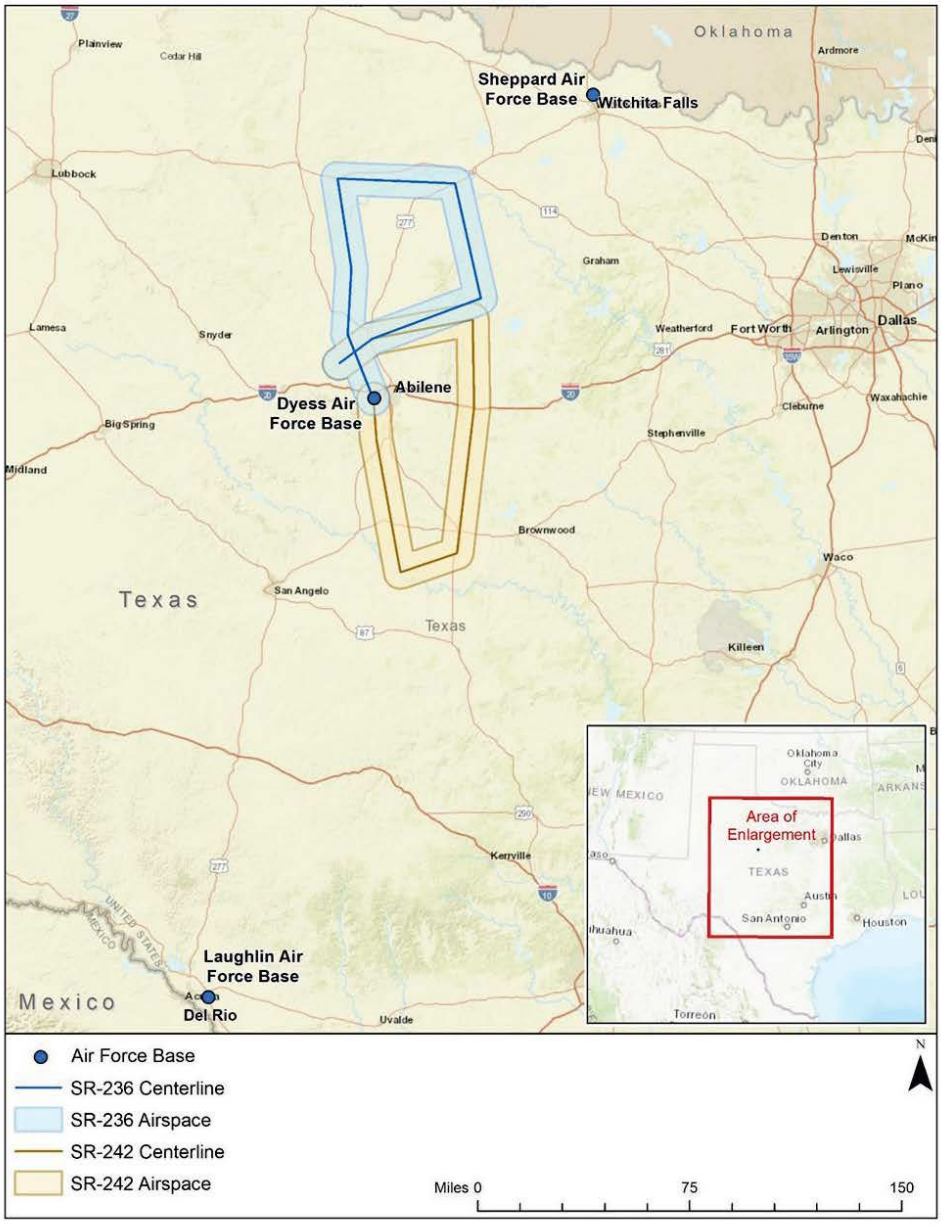
DAVIS.LEVI.NATHAN.1276193470 Digitally signed by DAVIS.LEVI.NATHAN.1276193470 Date: 2023.10.03 15:24:47 -05'00'

LEVI DAVIS, Major, USAF
NEPA Division

Attachments
1. Regional Location of SR-236 and SR-242
2. Existing Lateral Boundaries and Flight Pattern in SR-236
3. Existing Lateral Boundaries and Flight Pattern in SR-242
4. Proposed Modification of SR-236 Lateral Boundaries

3

Attachment 1 – Regional Location of SR-236 and SR-242



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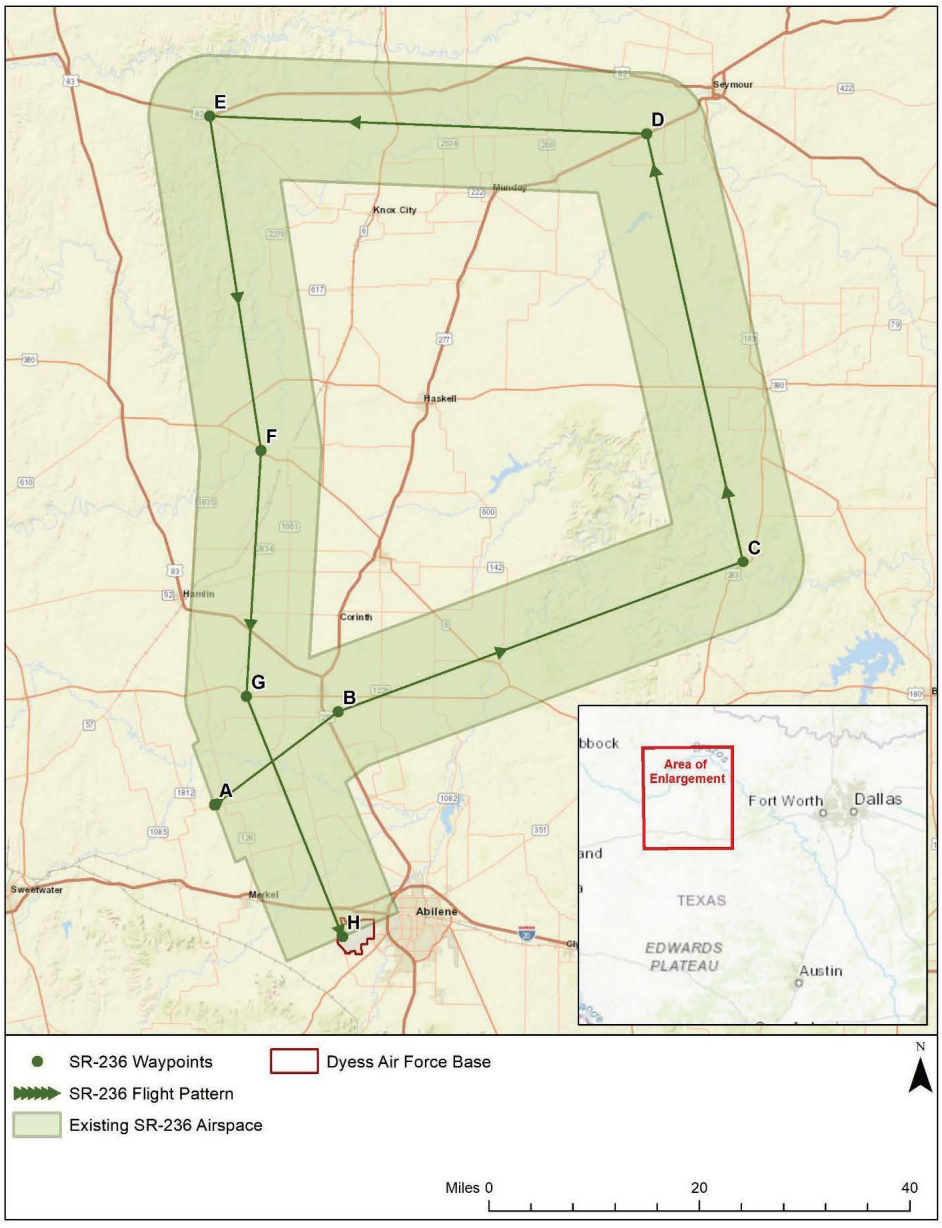
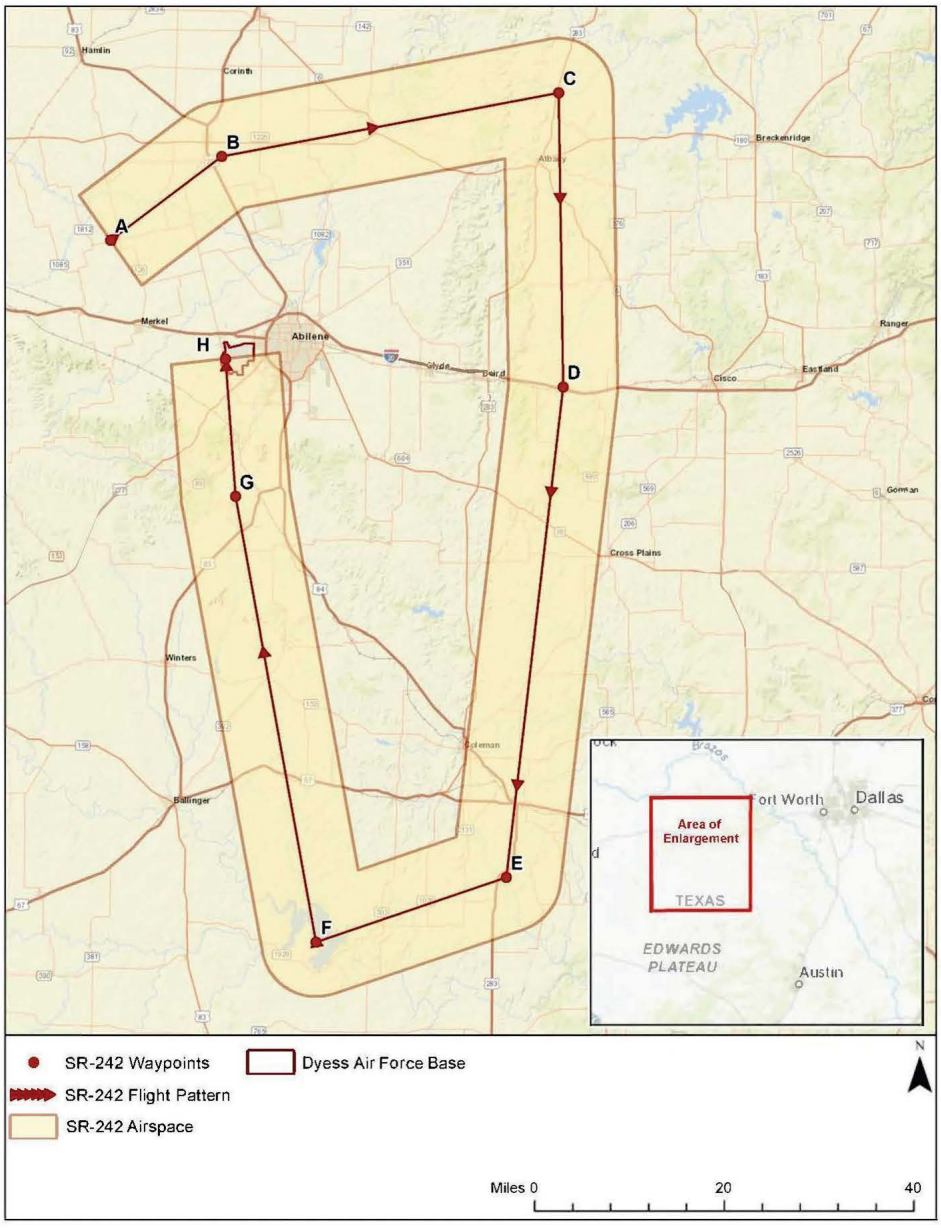
Attachment 2 – Existing Lateral Boundaries and Flight Pattern in SR-236



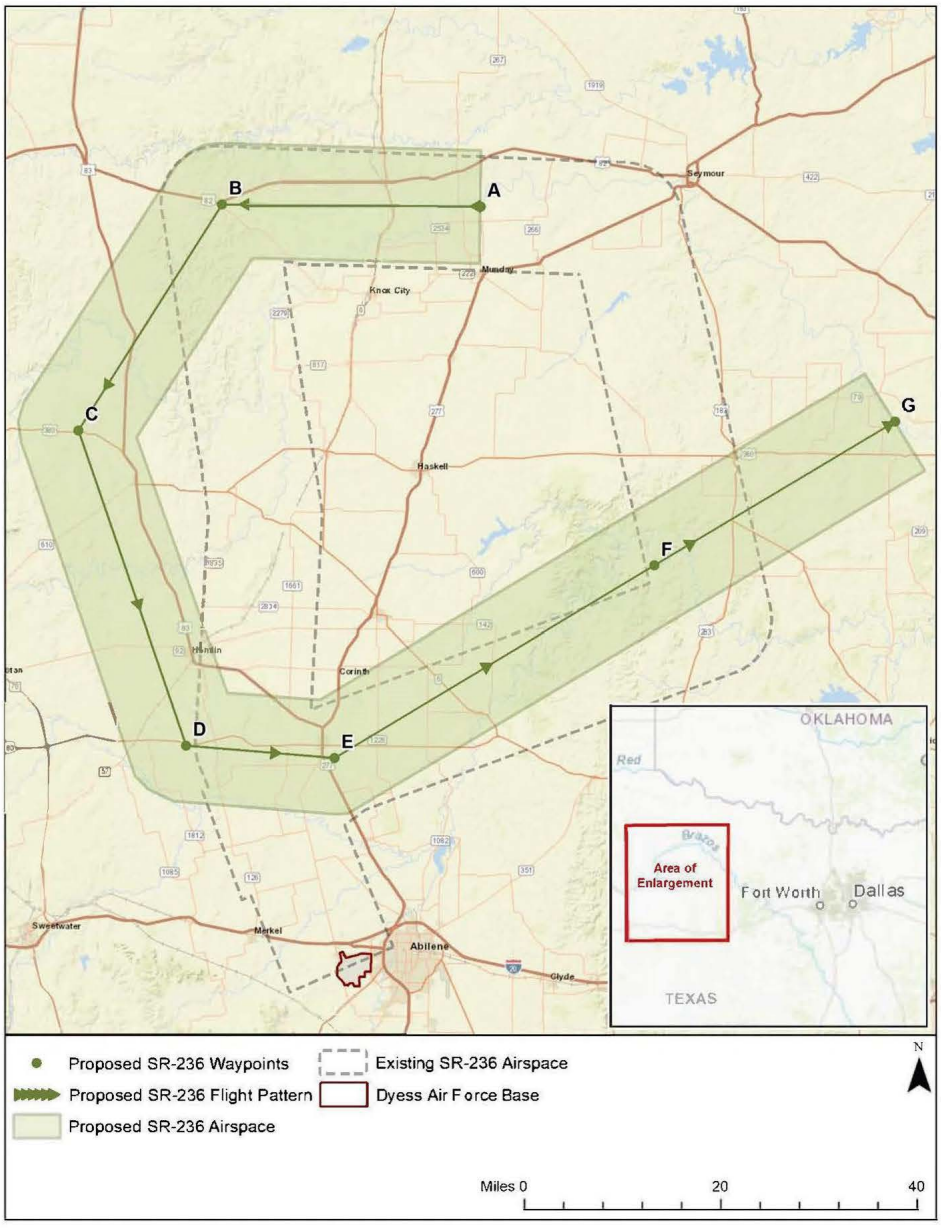
5

Attachment 3 – Existing Lateral Boundaries and Flight Pattern in SR-242



6

Attachment 4 – Proposed Modification of SR-236 Lateral Boundaries



A.3.4 USFWS Scoping Letter

DEPARTMENT OF THE AIR FORCE
AIR FORCE CIVIL ENGINEER CENTER
JOINT BASE SAN ANTONIO LACKLAND TEXAS

October 3, 2023

Major Levi Davis
U.S. Air Force Civil Engineer Center
NEPA Division (AFCEC/CIE)

U.S. Fish and Wildlife Service
Arlington Ecological Services Field Office
(via email: arles@fws.gov)

SUBJECT: Request for information and initiation of informal Endangered Species Act Section 7 consultation with the U.S. Fish and Wildlife Service for slow route training airspace, North Texas

Dear Sir or Madam:

The Department of the Air Force (DAF) Air Education and Training Command (AETC) is preparing an Environmental Assessment (EA) to evaluate potential environmental impacts from the Proposed Action to use two Slow Route (SR) training airspaces, SR-236 and SR-242, to support routine slow-speed and low-altitude training syllabi requirements for military undergraduate student pilots at Sheppard Air Force Base (AFB) and Laughlin AFB, Texas and transient C-130 pilots at other Department of Defense (DoD) installations. The EA is being prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, Council of Environmental Quality NEPA regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508), and the Air Force Environmental Impact Analysis Process (32 CFR Part 989). SR-236 and SR-242 are in north-central Texas near the city of Abilene and Dyess AFB, approximately 150 miles west-southwest of Fort Worth (Attachment 1).

The purpose of this letter is to initiate informal consultation between the DAF and U.S. Fish and Wildlife Service (USFWS) for the Proposed Action in accordance with Section 7 of the Endangered Species Act (ESA). The DAF will obtain an Official Species List for the Proposed Action area from the USFWS Information for Planning and Consultation website; therefore, the DAF also requests any additional information on federally listed threatened and endangered species and/or critical habitat that could potentially be affected by the Proposed Action.

SRs are a type of airspace used by military aircraft for routine training at relatively slow speeds and low altitudes (i.e., 250 knots or less and at or above 300 feet above ground level). SR-236 and SR-242 were established by the Air Force Air Mobility Command (AMC) in the 1990s to support slow-speed and low-altitude training requirements for AMC C-130 pilots. These routes are no longer used by AMC and are temporarily closed to air traffic. However, they are appropriate to support ongoing AETC training syllabi requirements for military undergraduate student pilots flying T-6A Texan II aircraft at Sheppard and Laughlin AFBs and C-130 pilots from other DoD installations.

SR-236 extends primarily to the north and east of Abilene, while SR-242 extends primarily to the south, east, and north (Attachments 2 and 3). Both SRs are nearly 200 nautical miles long and contain approximately 2,200 square miles of airspace. Sheppard AFB is approximately 60 miles northeast of SR-236 near Wichita Falls, Texas. Laughlin AFB is approximately 164 miles south-southwest of SR-242 near Del Rio, Texas.

Under the Proposed Action, the DAF would use SR-242 in its existing configuration (Attachments 1 and 3) and is considering the use of SR-236 either in its existing configuration (Attachments 1 and 2) or modifying its lateral boundaries (Attachment 4) to avoid encroachment from existing wind turbines and other development that were not present when these SRs were originally established in the 1990s. No changes to the vertical extents of SR-236 and SR-242 would occur under the Proposed Action. The Proposed Action does not include and would not require construction, demolition, or other ground-disturbing activities at Sheppard, Laughlin, or Dyess AFBs, or on land underlying SR-242 or SR-236 in its existing or proposed modified configuration. Further, the Proposed Action would not require changes to the existing boundaries of Sheppard, Laughlin, or Dyess AFBs, or changes to the number and type of personnel and aircraft assigned to those installations. The DAF is coordinating with the Federal Aviation Administration throughout the NEPA process for this Proposed Action.

To support the NEPA process and compliance with Section 7 of the ESA, we request information on federally listed threatened and endangered species and/or critical habitat that could potentially be affected by the Proposed Action. Please send this information to my attention at AFCEC/CIE, 13 Willis Way, Conway, Arkansas, 72032 or by email in care of Mr. Benjamin Faske at benjamin.faske@us.af.mil. If we determine the Proposed Action may have an effect on any federally listed species or critical habitat we will follow up with additional consultation and seek your concurrence with our determinations. In addition, we will provide you an opportunity review the Draft EA in which the DAF's determinations appear. Thank you for your assistance.

Sincerely

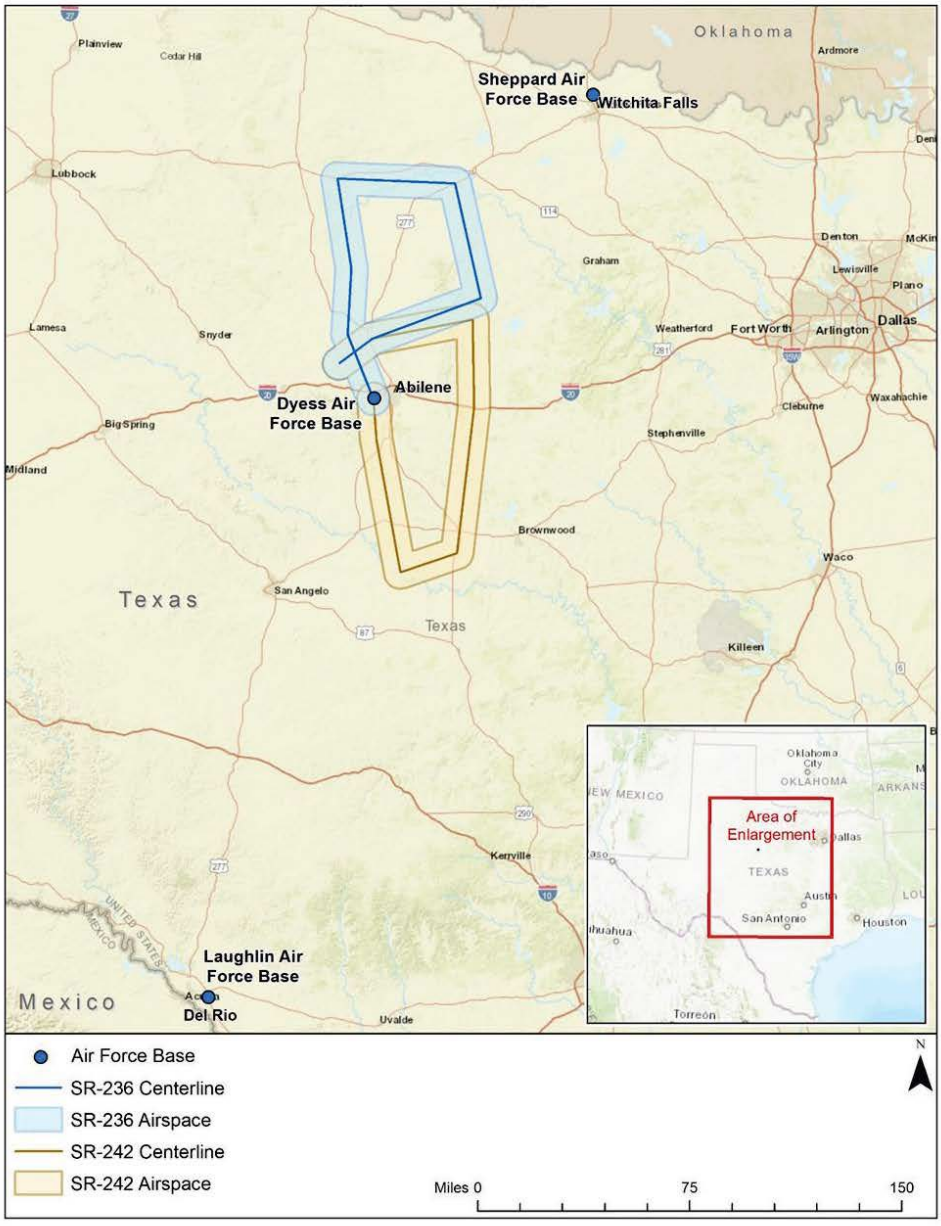
DAVIS.LEVI.NATHAN.1276193470 Digitally signed by DAVIS.LEVI.NATHAN.1276193470 Date: 2023.10.03 09:24:37 -05'00'

LEVI DAVIS, Major, USAF
NEPA Division

Attachments
1. Regional Location of SR-236 and SR-242
2. Existing Lateral Boundaries and Flight Pattern in SR-236
3. Existing Lateral Boundaries and Flight Pattern in SR-242
4. Proposed Modification of SR-236 Lateral Boundaries

3

Attachment 1 – Regional Location of SR-236 and SR-242



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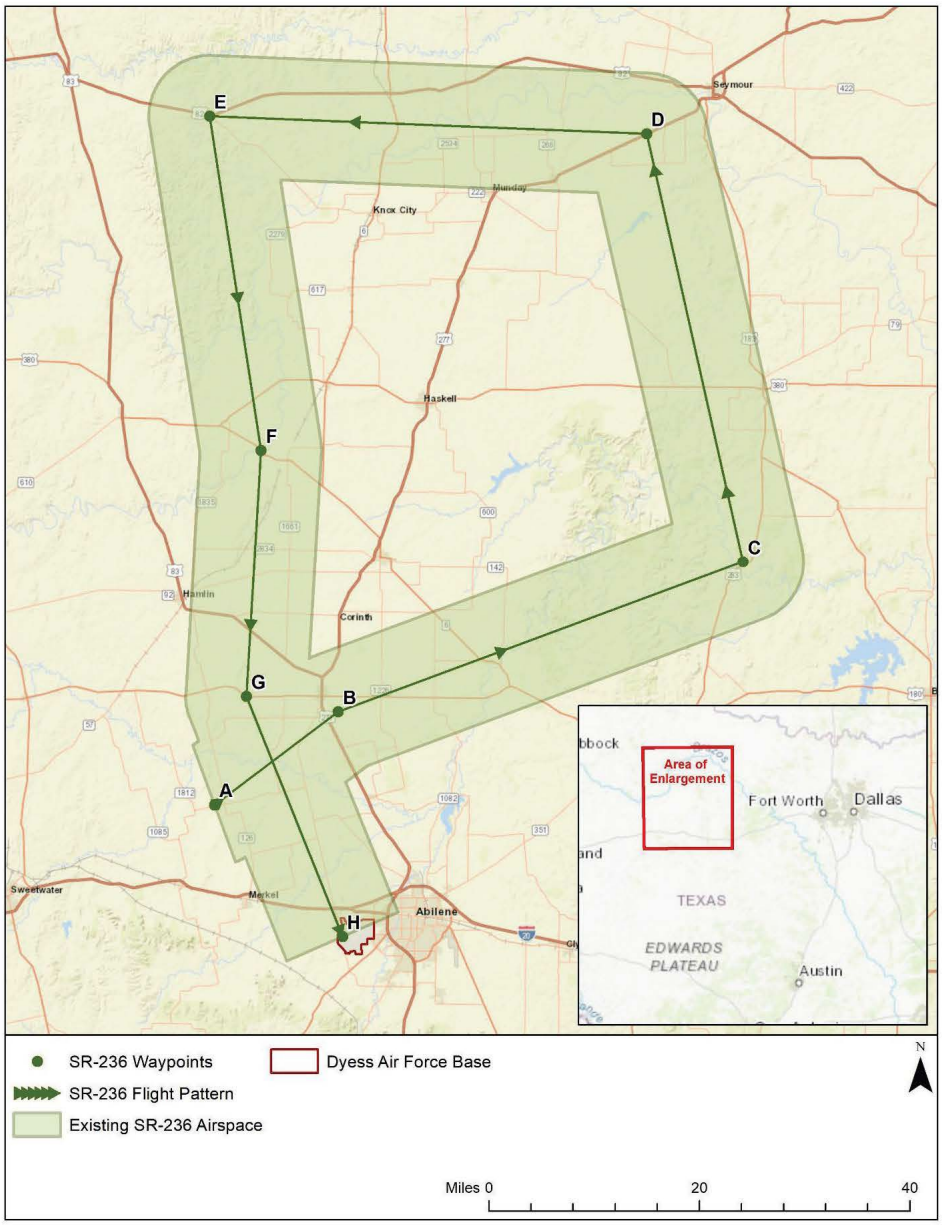
Attachment 2 – Existing Lateral Boundaries and Flight Pattern in SR-236



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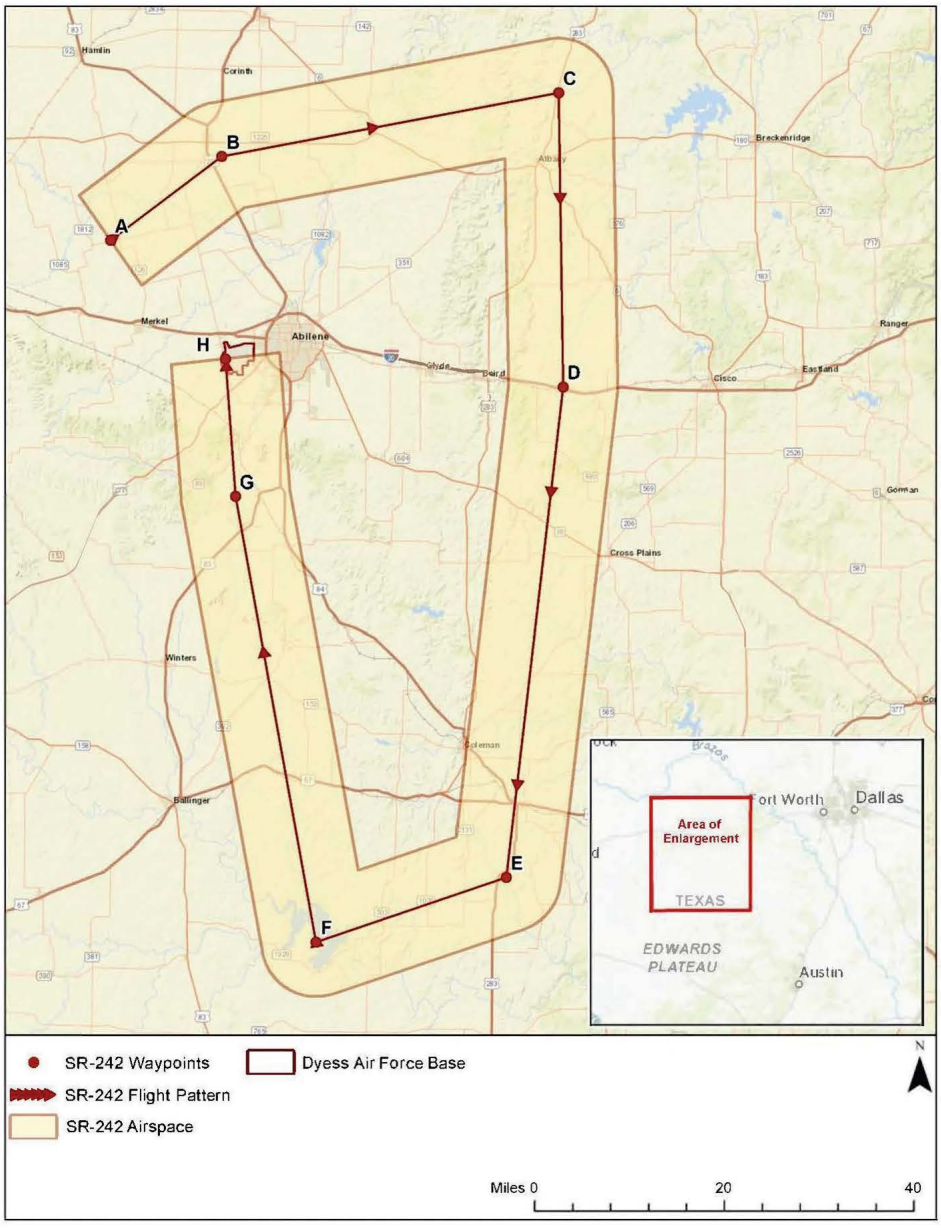
Attachment 3 – Existing Lateral Boundaries and Flight Pattern in SR-242



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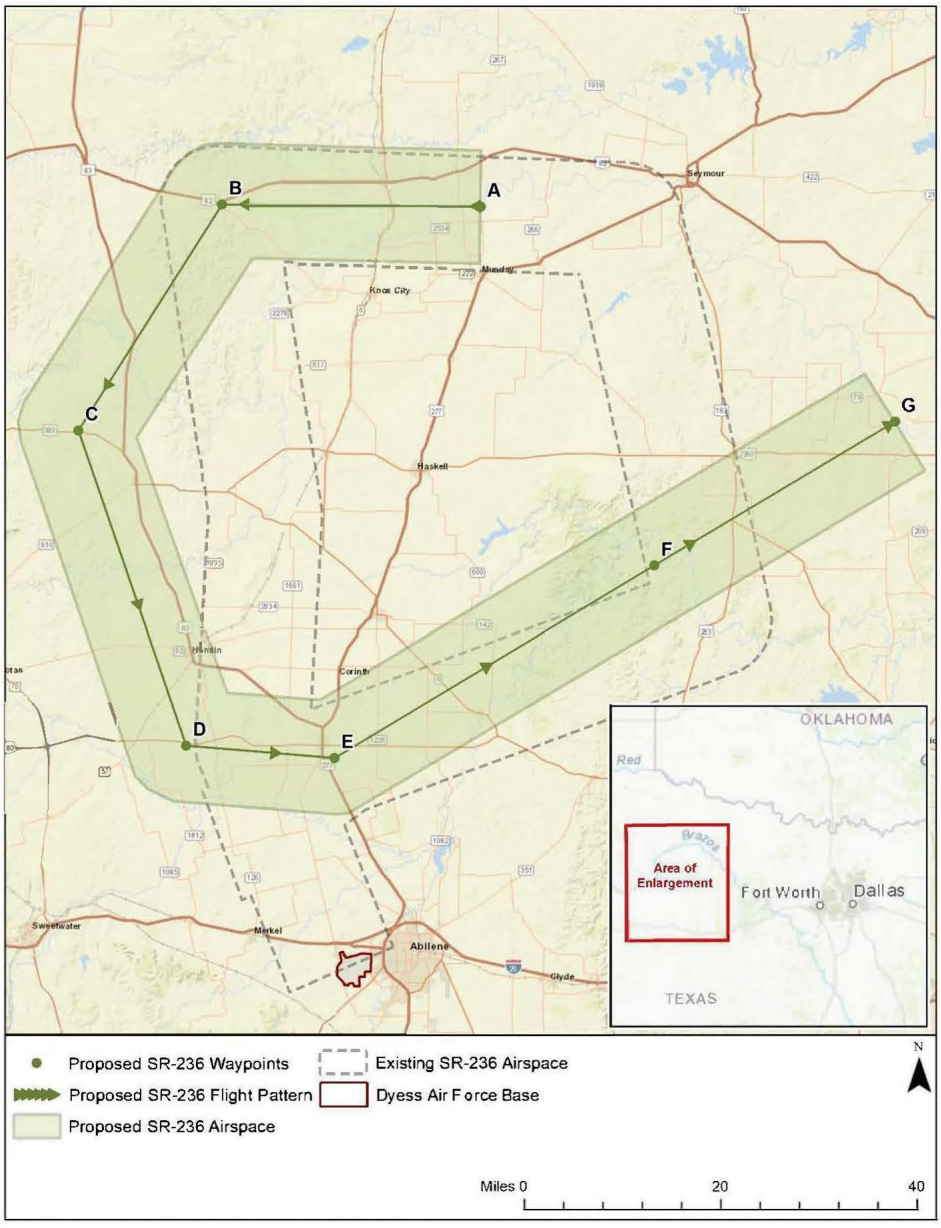
Attachment 4 – Proposed Modification of SR-236 Lateral Boundaries



A.3.5 SHPO Scoping Letter

DEPARTMENT OF THE AIR FORCE
AIR FORCE CIVIL ENGINEER CENTER
JOINT BASE SAN ANTONIO LACKLAND TEXAS

October 3, 2023

Major Levi Davis
U.S. Air Force Civil Engineer Center (AFCEC)
NEPA Division (AFCEC/CIE)

Mark Wolfe
State Historic Preservation Officer (SHPO)
Texas Historical Commission
PO Box 12276
Austin, TX 78711-2276

SUBJECT: Request to initiate National Historic Preservation Act Section 106 consultation and receive Texas State Historic Preservation Office concurrence on the Area of Potential Effect for slow route training airspace, North Texas

Dear SHPO Wolfe:

The Department of the Air Force (DAF) Air Education and Training Command (AETC) is preparing an Environmental Assessment (EA) to evaluate potential environmental impacts from the Proposed Action to use two Slow Route (SR) training airspaces, SR-236 and SR-242, to support routine slow-speed and low-altitude training syllabi requirements for military undergraduate student pilots at Sheppard Air Force Base (AFB) and Laughlin AFB, Texas and transient C-130 pilots at other Department of Defense (DoD) installations. The EA is being prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, Council of Environmental Quality NEPA regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508), and the Air Force Environmental Impact Analysis Process (32 CFR Part 989). SR-236 and SR-242 are in north-central Texas near the city of Abilene and Dyess AFB, approximately 150 miles west-southwest of Fort Worth (Attachment 1).

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.

SRs are a type of airspace used by military aircraft for routine training at relatively slow speeds and low altitudes (i.e., 250 knots or less and at or above 300 feet above ground level). SR-236 and SR-242 were established by the Air Force Air Mobility Command (AMC) in the 1990s to support slow-speed and low-altitude training requirements for AMC C-130 pilots. These routes are no longer used by AMC and are temporarily closed to air traffic. However, they are appropriate to support ongoing AETC training syllabi requirements for military undergraduate student pilots flying T-6A Texan II aircraft at Sheppard and Laughlin AFBs and C-130 pilots at other DoD installations.

SR-236 extends primarily to the north and east of Abilene while SR-242 extends primarily to the south, east, and north. Both SRs are nearly 200 nautical miles long and contain approximately 2,200 square miles of airspace. Sheppard AFB is approximately 60 miles northeast of SR-236 near Wichita Falls, Texas. Laughlin AFB is approximately 164 miles south-southwest of SR-242 near Del Rio, Texas.

Under the proposed undertaking, the DAF would use SR-242 in its existing configuration and is considering the use of SR-236 either in its existing configuration or modifying its lateral boundaries to avoid encroachment from existing wind turbines and other development that were not present when these SRs were originally established in the 1990s. No changes to the vertical extents of SR-236 and SR-242 would occur under the proposed undertaking. The proposed undertaking does not include and would not require construction, demolition, or other ground-disturbing activities at Sheppard, Laughlin, or Dyess AFBs, or on land underlying SR-242 or SR-236 in its existing or proposed modified configuration. Further, the proposed undertaking would not require changes to the existing boundaries of Sheppard, Laughlin, or Dyess AFBs, or changes to the number and type of personnel and aircraft assigned to those installations.

The APE for the proposed undertaking is defined as lands underlying or intersected by the existing boundaries of SR-242 (Attachment 2) and the existing and proposed modified boundaries of SR-236 (Attachments 3 and 4, respectively). 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 your office feels 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 my attention at AFCEC CIE, 13 Willis Way, Conway, Arkansas 72032 or by email in care of Mr. Benjamin Faske at benjamin.faske@us.af.mil. Your response is requested within 30 days of receiving this letter to ensure 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

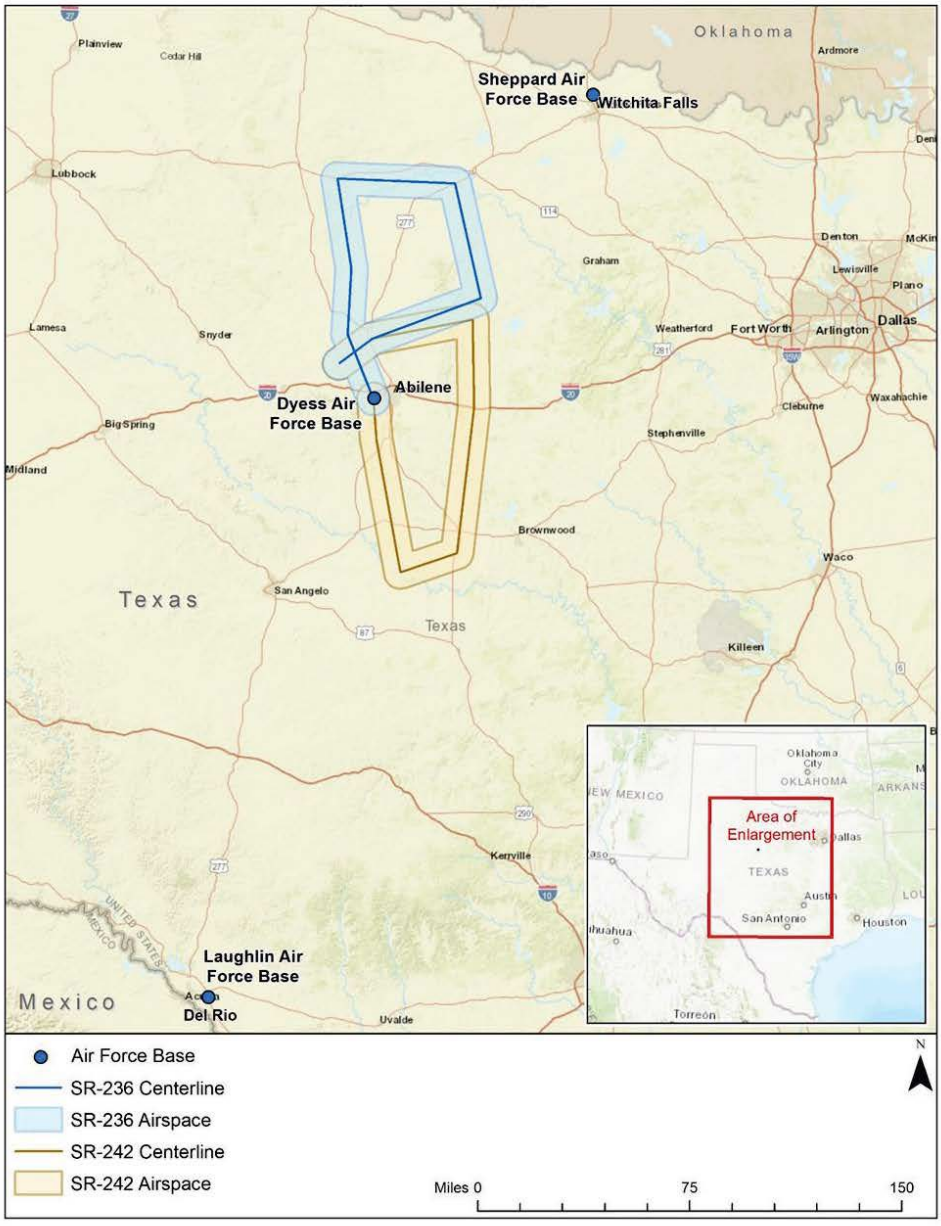
DAVIS.LEVI.NATHAN.1276193470 Digitally signed by DAVIS.LEVI.NATHAN.1276193470 Date: 2023.10.03 19:25:56 -05'00'

LEVI DAVIS, Major, USAF
NEPA Division

Attachments
1. Regional Location of SR-236 and SR-242
2. Existing Lateral Boundaries and Flight Pattern in SR-242 (Proposed Area of Potential Effects)
3. Existing Lateral Boundaries and Flight Pattern in SR-236 (Proposed Area of Potential Effects)
4. Proposed Modification of SR-236 Lateral Boundaries and Flight Pattern (Proposed Area of Potential Effects)

3

Attachment 1 – Regional Location of SR-236 and SR-242



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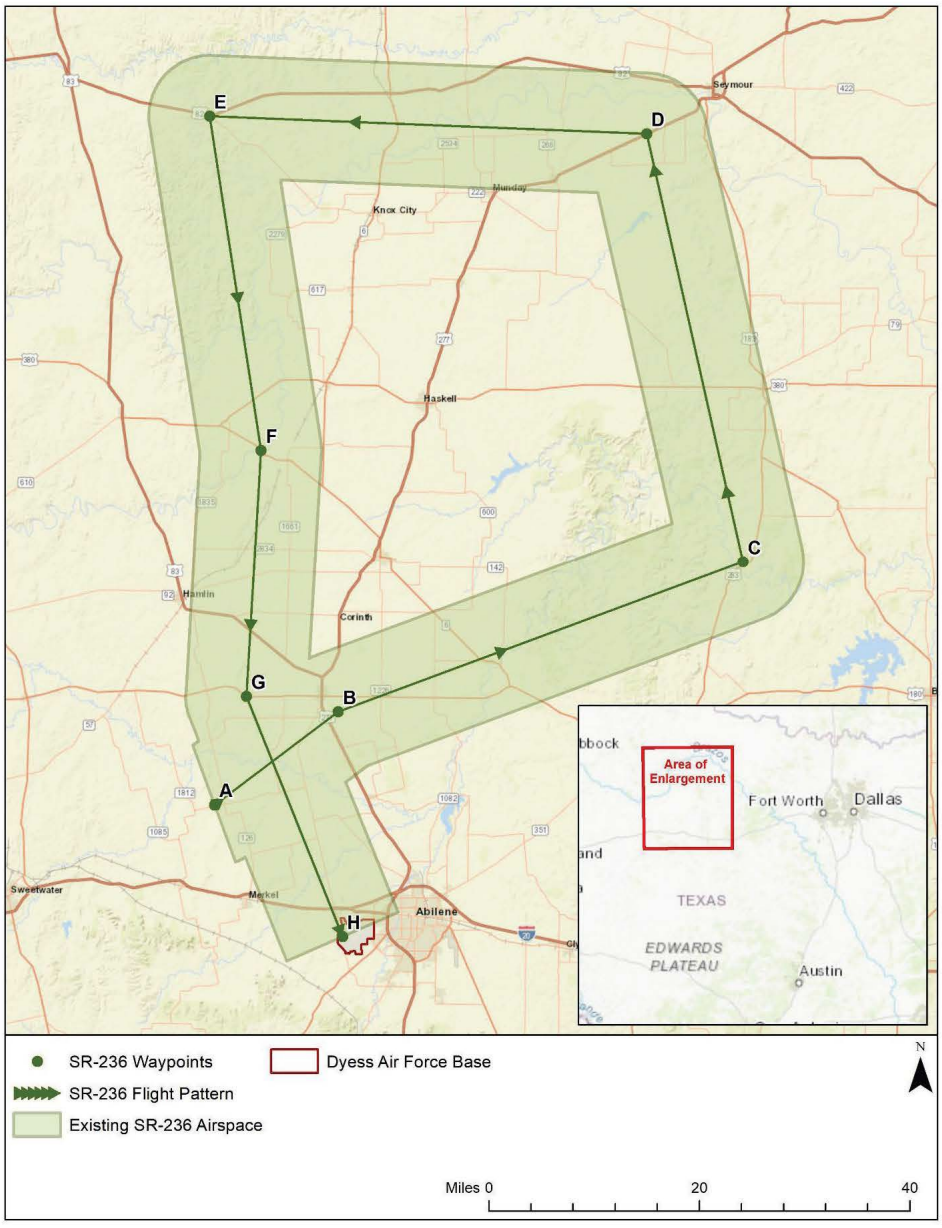
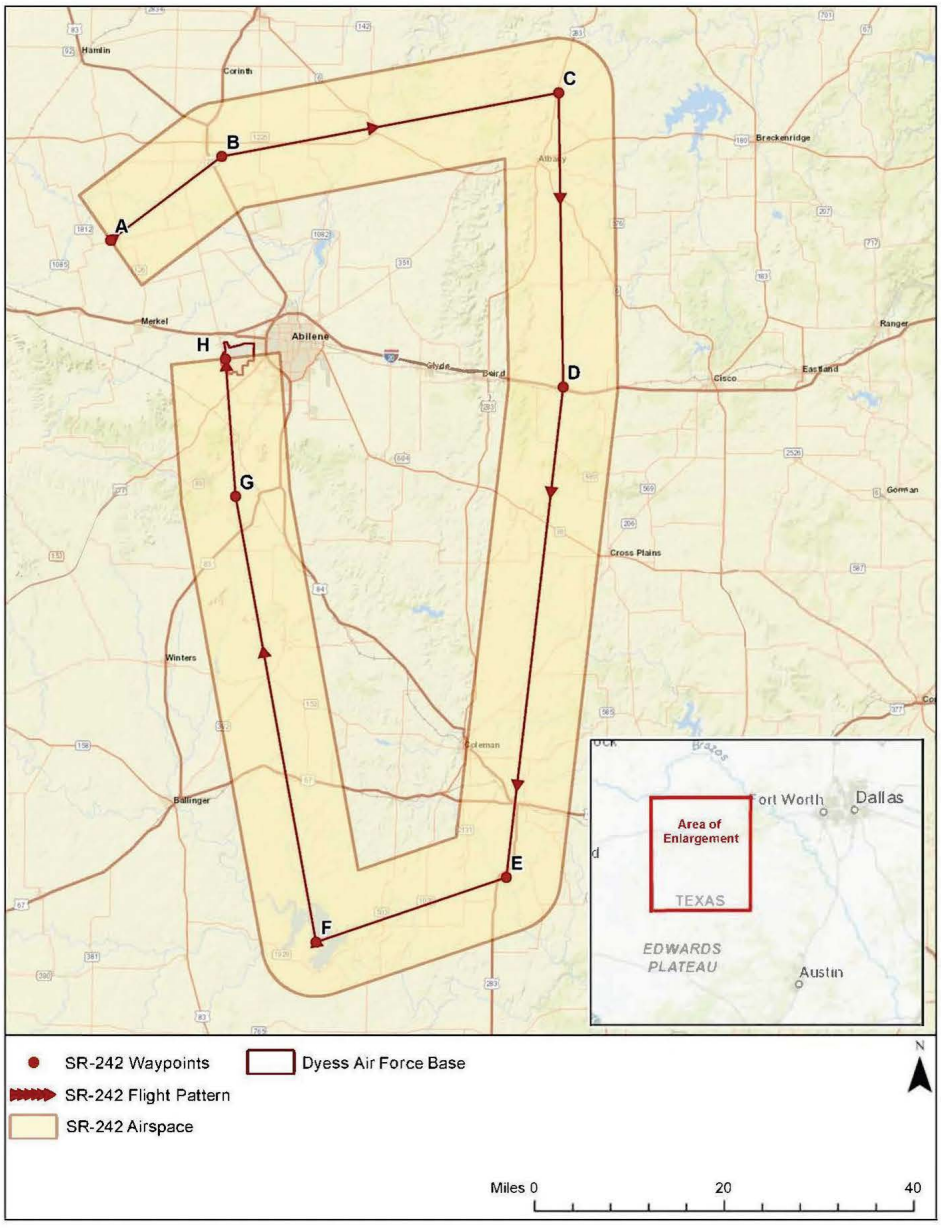
Attachment 2 – Existing Lateral Boundaries and Flight Pattern in SR-236



5

Attachment 3 – Existing Lateral Boundaries and Flight Pattern in SR-242



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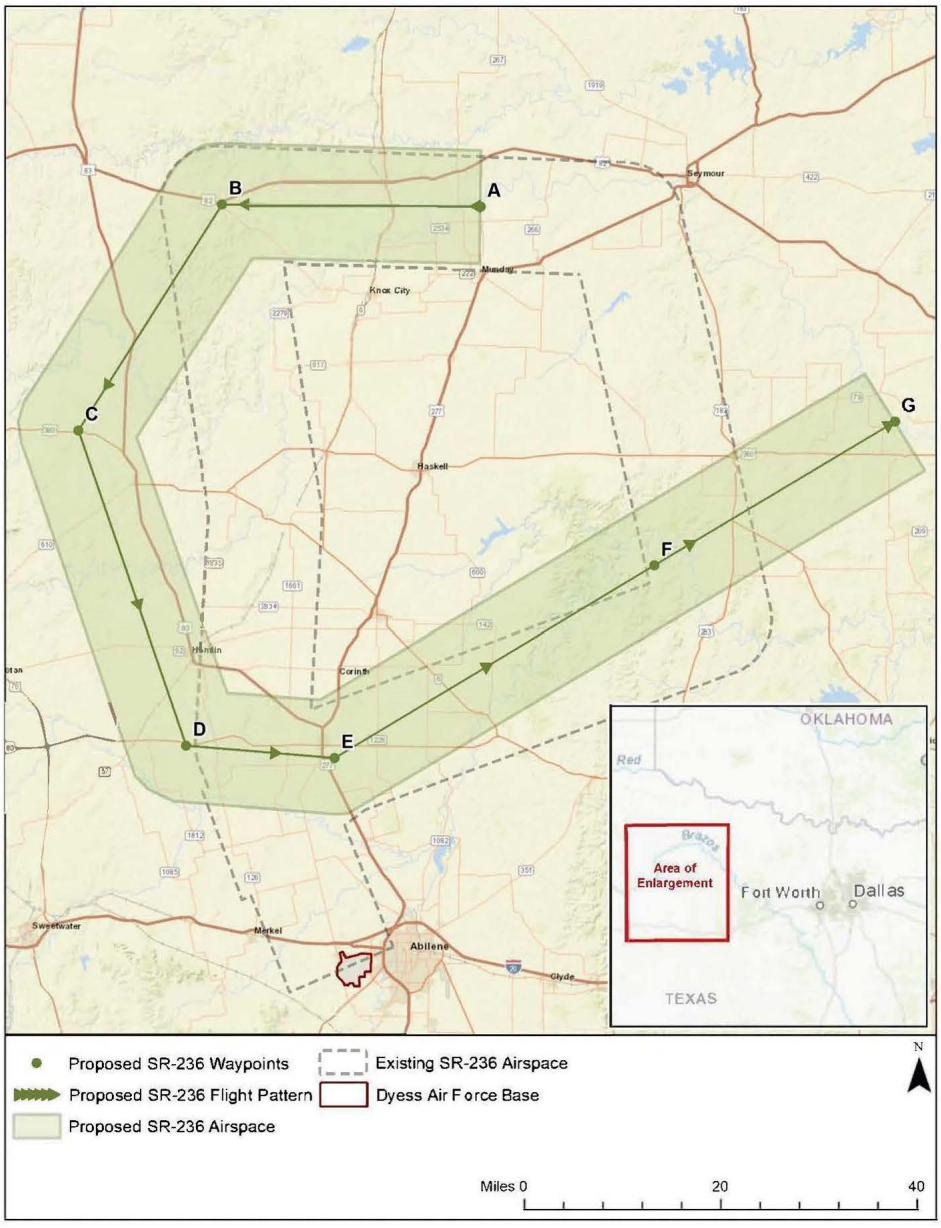
Attachment 4 – Proposed Modification of SR-236 Lateral Boundaries



A.4 STAKEHOLDERS INVENTORY

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

City of Abilene
Planning and Development Service
555 Walnut Street, Suite 100
Abilene, TX 79601

Abilene Chamber of Commerce
Gray Bridwell
Military Affairs Committee
400 Pine, 5th Floor, Suite 500
Abilene, TX 79601

City of Tye
Hon. Kenny Dry, Mayor Pro Tem
PO Box 369
649 Scott Street
Tye, TX 79563

City of Tye
Planning and Zoning Commission
PO Box 369
649 Scott Street
Tye, TX 79563

City of Clyde
Rodger Brown, Mayor
PO Box 1155
Clyde, TX 79510

City of Baird
Jeff Barton, Mayor
328 Market Street
Baird, TX 79504-6410

Taylor County
Hon. Phil Crowley, County Judge
Taylor County Plaza
400 Oak St., Suite 300
Abilene, TX 79602

Taylor County Environmental Department
400 Oak St.,
Suite 107
Abilene, TX 79602

Jones County
Hon. Dale Spurgin, County Judge
P.O Box 148
Anson, TX 79501

Stonewall County
Hon. Ronnie Moorhead, County Judge
P O Box 366
Aspermont, TX 79502

Haskell County
Hon. Kenny Thompson, County Judge
Haskell County Courthouse
1 Ave D
Haskell, TX 79521

King County
Hon. Duane Lee Daniel, County Judge
PO Box 127
Guthrie, TX 79236

Knox County
Hon. Stan Wojcik, County Judge
PO Box 77
Benjamin, TX 79505-0077

Baylor County Appraisal District
Bryan Baldwin, Chairman
Board of Directors
211 N. Washington St.
Seymour, TX 76380

City of Seymour (Baylor County seat)
Dr. Jeff Brasher, City Administrator
301 N Washington St.
Seymour, TX 76380

Throckmorton County
Hon. Caleb Hodges, County Judge
105 North Minter
P.O Box 700
Throckmorton, TX 76483
Shackleford County

Hon. John Viertel, County Judge
PO Box 2797
Albany, TX 76430

Fisher County
Hon. Ken Holt, County Judge
112 N. Concho
PO Box 306
Roby, TX 79543

Young County
Hon. Edwin S. Graham IV, County Judge
516 Fourth Street
Graham, TX 76450

Brown County
Hon. Shane Britton, County Judge
200 South Broadway Street, Room 111
Brownwood, TX 76801

McCulloch County
Hon. Frank Trull, County Judge
199 Courthouse Square, Room 302
Brady, TX 76825

Callahan County
Nicki Harle, County Judge
100 W. 4th Street, Suite 200
Baird, TX 79504

Coleman County
Hon. Stacey Mendoza, County Judge
100 W. Live Oak Street, Suite 105
Coleman, TX 76834

Concho County
Hon. David Dillard, County Judge
PO Box 158
Paint Rock, TX 76866

Runnels County
Julia Miller, County Judge
613 Hutchings Avenue, Room 103
Ballinger, TX 76821

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

Comanche Nation of Oklahoma
Martina Minthorn, Tribal Historic Preservation Officer
PO Box 908
Lawton, OK 73502-0908

Apache Tribe of Oklahoma
Durell Cooper, Tribal Chairman
PO Box 1330
Anadarko, OK 73005

Tonkawa Tribe of Oklahoma
Russell Martin, President
1 Rush Buffalo Rd
Tonkawa OK 74653

Wichita and Affiliated Tribes
Terri Parton, President
PO Box 729
Anadarko, OK 73005

Wichita and Affiliated Tribes
Gary McAdams, THPO
PO Box 729
Anadarko, OK 73005

Delaware Nation, Oklahoma
Sonnie Allen
Director of Cultural Preservation
PO Box 825
Anadarko, OK 73005

Caddo Nation of Oklahoma
Jonathan Rohrer, THPO
PO Box 487
Binger, OK 73009

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

Julie Wicker
Branch Chief
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, TX 78744

Laura Zebehazy
Program Leader
Texas Parks and Wildlife Department
Wildlife Division
Wildlife Habitat Assessment Program
4200 Smith School Road
Austin, TX 78744

Kristin Jacobsen
Manager
Texas Commission on Environmental Quality; Air Quality Planning Section
Mail Code 206
PO Box 13087
Austin, TX 78711-3087

Randy Gee
Acting Director
USEPA Region 6; Office of Communities, Tribes and Environmental Assessment
1201 Elm Street
Dallas, TX 75270

U.S. Fish and Wildlife Service
Arlington Ecological Services Field Office
(via email)

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APPENDIX B
REASONABLY FORESEEABLE FUTURE ACTIONS

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APPENDIX B – REASONABLY FORESEEABLE FUTURE ACTIONS

Table B-1 Reasonably Foreseeable Future Actions

Scheduled Project	Project Summary	Implementation Date	Relevance to Proposed Action
I-20 Corridor Study [1]	Several projects are active including expanding lanes along I-20, overpass structure replacement, and ramp lengthening/spacing.	2017 - 2027	Action could occur within the same timeframe. Construction and operations could impact air quality, noise, biological and cultural resources, and socioeconomics.
Various Road Projects, Texas Department of Transportation / Abilene Metropolitan Planning Organization [2]	Projects include the following road modifications: seal coating, rehabilitation, restoration, widening of freeway/non-freeway, overlay, creation of additional lanes, relocation, safety improvement projects, new/constructed interchange, bridge replacement; and installation of traffic control devices, pedestrian sidewalks, and curb ramps.	Current - 2033	Actions could occur within the same timeframe. Construction and operations could impact air quality, noise, biological and cultural resources, and socioeconomics.
Cedar Creek Waterway [3]	The Parks and Recreation facilities along Cedar Creek Waterway and Lytle Creek Project will create nature trails along Cedar and Lyle Creeks from East South 11th Street to North 10th Street. Abilene, Texas.	Spring 2016 - ongoing	Action could occur within the same timeframe. Construction could impact air quality, noise, biological and cultural resources, and socioeconomics.
Bridgestone Bandag Expansion [4]	A 50,000-square-foot expansion of the Abilene Bridgestone plant.	September 2022 - January 2025	Action would occur within the same timeframe. Construction and operations could impact air quality, noise, and socioeconomics.
FM 89 (Buffalo Gap Road) Project [5]	Construction on FM 89, Buffalo Gap Road. FM 89 is the main arterial highway between Abilene and Wylie.	January 2022 - June 2024	Action could occur within the same timeframe. Construction and operations could impact air quality, noise, biological and cultural resources, and socioeconomics.

Table B-1 Reasonably Foreseeable Future Actions

Scheduled Project	Project Summary	Implementation Date	Relevance to Proposed Action
Beddown of B-21 at Main Operating Base 2 (MOB 2)/MOB 3 at Dyess Air Force Base [6]	The proposed beddown would include B-21 Operations Squadrons, Weapons Instructor Course, and Operational Test and Evaluation Squadron, as well as a Weapons Generation Facility, including 4.2 million square feet of construction; 600,000 square feet of renovation; and 300,000 square feet of demolition.	Fall 2024	Action could occur within the same timeframe. Construction and operations could impact air quality, noise, airspace and airspace management, safety, biological and cultural resources, and socioeconomics.
Wind Turbine Development [7]	Development of a 48-unit wind turbine farm is proposed in King County, Texas approximately 7 miles southeast of Guthrie. This location is crossed by the northwestern corner of existing and proposed reconfigured SR-236. It is anticipated the project would be constructed in the next 2 to 5 years, pending regulatory approval.	2025-2028	Action could occur within the same timeframe. Construction and operations could impact air quality, noise, airspace and airspace management, safety, biological and cultural resources, and socioeconomics.

Sources:

[1] I-20 corridor study. Texas Department of Transportation. (n.d.). Retrieved 21 December 2022 from https://www.txdot.gov/projects/projects-studies/abilene/i20.html

[2] Texas Department of Transportation (TxDOT). 2023. Project Tracker. Retrieved 24 August 2023 from https://www.txdot.gov/projects/project-tracker.html

[3] Cedar Creek Waterway in Abilene, Texas. (n.d.). Retrieved 21 December 2022 from http://www.cedarcreekwaterway.org/

[4] Owens, B. (n.d.). Bridgestone invests $60 million to expand Abilene Bandag retread tire plant. Press Release Details. Retrieved 19 December 2022 from https://www.bridgestoneamericas.com/en/newsroom/press-releases/2022/bandag-abilene-plant-expansion

[5] TxDOT. (n.d.). FM 89 Buffalo Gap Road Project. Retrieved 24 August 2023, from https://www.txdot.gov/projects/projects-studies/abilene/fm89.html

[6] Federal Register. 2023. Notice of Intent to Prepare an Environmental Impacts Statement for the B-21 Beddown Main Operating Base 2 (Mob 2)/Main Operating Base 3 (Mob 3) at Dyess Air Force Base, Texas or Whiteman Air Force Base, Missouri. Retrieved 24 August 2023 from https://www.federalregister.gov/documents/2023/03/27/2023-06175/notice-of-intent-to-prepare-an-environmental-impact-statement-for-the-b-21-beddown-main-operating

[7] Federal Aviation Administration. 2023. Obstruction Evaluation/Airport Airspace Analysis, Case Numbers 2023-WTW-12534-OE through 2023-WTW-12670-OE. Accessed on 2 November 2023 at https://oeaaa.faa.gov/oeaaa/external/searchAction.jsp?action=showCircleSearchForm

APPENDIX C
FURTHER DEFINITIONS OF RESOURCE AREAS ANALYZED, METHODOLOGIES, AND MODELING

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APPENDIX C – FURTHER DEFINITIONS OF RESOURCE AREAS ANALYZED, METHODOLOGIES, AND MODELING

C.1 AIRSPACE MANAGEMENT AND USE

C.1.1 Definition of the Resource

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 US 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. FAA rules govern the national airspace system, and FAA regulations establish how and where aircraft may fly. Collectively, the FAA uses these rules and regulations to make airspace use as safe, effective, and compatible as possible for all types of aircraft, from private propeller-driven planes to large, high-speed commercial and military jets.

Terminal airspace around civil airports is defined by the terminal airspace area designations for each airport (USDOT; FAA, 2022). These airspace designations include Class A through G, which specify the airspace within which all aircraft operators are subject to operating rules and equipment requirements of Part 91 of the Federal Aviation Regulations (see 14 Code of Federal Regulations [CFR] § 91.130). General descriptions of the airspace classifications common to civil airports, including Class C, D, and E airspace, are described following. More specific rules may apply to Sheppard and Laughlin Air Force Bases (AFBs).

Class C. Generally, this is the airspace from the surface to 4,000 feet (ft) above the airport elevation (charted in mean sea level [MSL]) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and have a certain number of Instrument Flight Rules (IFR) operations or passenger enplanements. Although the configuration of each Class C area is individually tailored, the airspace usually consists of a surface area with a 5-nautical mile (NM) radius, an outer circle with a 10 NM radius that extends from 1,200 to 4,000 ft above the airport elevation, and an outer area. Each aircraft must establish two-way radio communications with the Air Traffic Control (ATC) facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while within the airspace.

Class D. Generally, this is the airspace from the surface to 2,500 ft 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. Arrival extensions for instrument approach procedures may be Class D or Class E airspace. 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 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 ft 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 ft MSL. Unless designated at a lower altitude, Class E airspace begins at 14,500 ft 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 ft MSL, and the airspace above flight level 600.

Aircraft use different kinds of airspace according to the specific rules and procedures defined by the FAA or Department of Defense (DoD) for each type of airspace. For the Proposed Action, Slow -Speed Low-Altitude Route (SR) training activities would utilize other airspace for military use proximate to Sheppard AFB (SR-236) and Laughlin AFB (SR-242). Other airspace for military use (non-special use airspace) includes Aerial Refueling Tracks/Anchors, Air Traffic Control Assigned Airspace, Low Altitude Tactical Navigation areas, Temporary Flight Restriction, Orbit Areas, Military Training Routes (MTRs), Instrument Routes, and Visual Routes (DAF, 2020). An SR is designated airspace outside of Class A airspace used to separate or segregate certain nonhazardous military activities from IFR traffic and to identify Visual Flight Rules traffic where these activities are conducted (14 CFR § 1.1). Activities in SRs include but are not limited to low-altitude navigation and tactics. The defined vertical and lateral limits vary for each SR. While SRs generally extend from 300 ft AGL to 1,500 ft AGL, the ceiling may extend above 1,500 ft AGL if there is a mission requirement and minimal adverse aeronautical effect. SRs allow military aircraft to practice maneuvers and tactical flight training at airspeeds not exceeding 250 knots indicated airspeed (approximately 285 miles per hour). SRs are not technically part of the MTR system and therefore have no directive guidance in the Aeronautical Information Manual or FAA Order JO 7610.4. SRs do not require coordination with the FAA for establishment. These airspaces are described solely in military documents, either locally at the unit or within DoD Flight Information Publications. SRs are not published on aeronautical charts and there is no overall mechanism to inform military or civilian aviators that an SR is active, as Automated Flight Services Stations are not notified (DAF, 2020).

SRs 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 SR and military aircrews build them into daily flight plans.

The primary operational airspace that would be used by Sheppard AFB is SR-236 (with lateral boundary and entry/exit point modifications being considered under Alternative 1 and waypoint modifications being considered under Alternative 2. The primary operational airspace that would be used by Laughlin AFB is SR-242 as it currently exists.

The Region of Influence (ROI) for airspace management and use consists of airspace within SR-242 and the proposed configurations of SR-236 under Alternative 1 and Alternative 2.

C.1.2 References

DAF. 2020. *Department of the Air Force Manual 13-201, Nuclear, Space, Missile, Command and Control Airspace Management*, 10 December 2020. Accessed on February 10, 2023 at https://www.e-publishing.af.mil/Product-Index/#/?view=search&keyword=13-201&isObsolete=false&modID=449&tabID=131..

USDOT, FAA. 2022. Order JO 7400.11G, *Airspace Designations and Reporting Points.*

C.2 AIR QUALITY

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

C.2.1 Criteria Pollutants and National Ambient Air Quality Standards

The CAA directed the US Environmental Protection Agency (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 C-1**.

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 which precursors are considered significant for $PM_{2.5}$ formation are identified for ultimate control.

Table C-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]		12 µg/m^3	Primary
Annual arithmetic mean [4]		15 µg/m^3	Secondary
24-hour average [4]		35 µg/m^3	Primary and Secondary
Sulfur Dioxide (SO_2)			
1-hour average [5]	0.075 ppm	(196 µg/m^3)	Primary
3-hour average [5]	0.5 ppm	(1,300 µg/m^3)	Secondary

Notes:

Source: USEPA, 2023a

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

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

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

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

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

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

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

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. The Texas Commission on Environmental Quality (TCEQ) oversees the state's air pollution

control program under the authority of the federal CAA and Amendments, federal regulations, and state laws. Texas has adopted the federal NAAQS (TAC Title 30 § 101.21). Each AQCR has regulatory areas that are designated as an attainment area or nonattainment area for each of the criteria pollutants depending on whether it meets or exceeds the NAAQS. 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 ROI for this Proposed Action potentially impacts a large spatial area consisting of multiple AQCRs with various counties crossed by SR-242 and SR-236. The counties are spread over three AQCRs. Concho and McCulloch Counties are in the Midland-Odessa-San Angelo Intrastate AQCR (40 CFR §81.137). King County is in the Amarillo-Lubbock Intrastate AQCR (40 CFR § 81.133). All remaining counties, Knox, Baylor, Runnels, Callahan, Shackelford, Coleman, Throckmorton, Fischer, Taylor, Haskell, Stonewall, Jones, Young, and Brown are in the Abilene-Wichita Falls Intrastate AQCR (40 CFR § 81.132). The ROI that includes the three AQCRs with the counties underlying the two SRs is in attainment with the NAAQS for all criteria pollutants.

For determining potential air quality impacts, it is the volume of air extending up to the mixing height (3,000 ft above ground level) 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.

For the airspaces, after applying the 3,000 ft criteria, there are several areas that are identified for air quality impact analysis. These areas, their underlying counties, and the AQCRs along with their air quality status are listed in **Table C-2**. The underlying land areas for these portions have relatively good air quality (not in nonattainment or maintenance areas for any criteria pollutants).

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, 2023).

Table C-2 Airspace Region of Influence and Air Quality Designation

Airspace with Operations ≤3,000 feet AGL	Counties Crossed by Slow Route	Air Quality Control Regions	Air Quality Designation
SR-236 (existing)	Baylor, Haskell, Jones, King, Knox, Shackelford, Stonewall, Taylor, Throckmorton	Amarillo-Lubbock Intrastate (40 CFR § 81.133), and Abilene-Wichita Falls Intrastate (40 CFR § 81.132)	Attainment for all Criteria Pollutant NAAQS
SR-236 (proposed for reconfiguration)	Baylor, Fischer, Haskell, Jones, King, Knox, Shackelford, Stonewall, Taylor, Throckmorton, Young		
SR-242	Brown, Callahan, Coleman, Concho, Jones, McCulloch, Runnels, Shackelford, Taylor	Abilene-Wichita Falls Intrastate (40 CFR § 81.132) Midland-Odessa-San Angelo Intrastate AQCR (40 CFR § 81.137)	Attainment for all Criteria Pollutant NAAQS

Notes:
Source: 40 CFR Part 81 Subpart B
Airspace listed is applicable to training from Sheppard AFB and Laughlin AFB.
AGL = above ground level; CFR = Code of Federal Regulations; NAAQS = National Ambient Air Quality Standards

Conformity Rules

The CAA required the USEPA draft general conformity regulations that are applicable in nonattainment areas, or in designated maintenance areas. Federal actions in NAAQS nonattainment areas required to comply with USEPA's General Conformity Rule. These regulations are designed to ensure that federal actions do not impede local efforts to achieve or maintain attainment with the NAAQS. 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 airspaces is in attainment with the NAAQS for all criteria pollutants.

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.

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, 2023b). 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 I 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 I areas (40 CFR Part 81), where any appreciable deterioration in air quality is considered significant. Class I 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 I 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 Slow Route airspaces in North Texas do not occur within or close to a designated PSD Class I area. The two designated Class I areas in Texas, Big Bend National Park and Guadalupe Mountains National Park, are approximately 300 miles from the city of Abilene and Dyess AFB.

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. However, emissions from the Proposed Action have the potential to impact visibility in Class I areas, including Texas's national parks and wilderness areas. Thus, they are considered for this EA.

C.2.2 Greenhouse Gases and Climate Change Considerations

Greenhouse gases (GHGs) are gases that trap heat in the atmosphere. These emissions are generated by both natural processes and human activities. The accumulation of GHGs in the

atmosphere helps regulate the earth's temperature and are believed to contribute to global climate change. GHGs include water vapor, carbon dioxide (CO_2), methane, nitrous oxide, O_3, and several hydrocarbons and chlorofluorocarbons. Each GHG has an estimated global warming potential (GWP), which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the earth's surface. The GWP of a particular gas provides a relative basis for calculating its carbon dioxide equivalent (CO_2e) or the amount of CO_2e to the emissions of that gas. CO_2 has a GWP of 1 and is, therefore, the standard by which all other GHGs are measured.

The USEPA regulates GHG primarily through a permitting program known as the GHG Tailoring Rule. This rule applies to GHG emissions from large stationary sources. In addition to the GHG Tailoring Rule in 2009, the USEPA promulgated a rule requiring sources to report their GHG emissions if they emit more than 25,000 metric tons or more of CO_2e per year (40 CFR § 98.2[a][2]). This rule only applies to large stationary sources of emissions, including fuel combustion sources. The activities of Proposed Action are limited to aircraft operations (mobile sources) that are not subject to GHG reporting.

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

GHG emissions in Texas are primarily contributed by the energy sector and their emissions have remained mostly steady over the past two decades. For 2021, Texas' gross GHG emissions totaled 873.11 million metric tons carbon dioxide equivalent ($MMTCO_2e$), with power plants accounting for 84.84 percent of gross emissions (USEPA, 2023c). To serve as a reference point, projected GHG emission increases from Proposed Action were compared against Texas's GHG emissions (**Table 3-5)** in the EA. Based on the relative magnitude of the project's GHG emissions, a general inference can be drawn regarding whether the Proposed Action GHG emissions meaningful with respect to the discussion regarding climate change.

Per the Council on Environmental Quality's interim guidance released January 2023, "Agencies should exercise judgment when considering whether to apply this guidance to the extent practicable to an on-going NEPA process." The DAF guidance on applying and conducting a Social Cost of GHG Analysis is under development and will be released shortly with specifics on applying Social Cost of GHG Analyses to ensure standardization across the DAF. Therefore, no Social Cost of GHG Analysis is conducted for EAs and Environmental Impact Statements that are currently in progress.

C.2.3 Air Conformity Applicability Analysis

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

general conformity analysis is required for areas of nonattainment or maintenance where a federal action is proposed.

The action can be shown to conform by demonstrating that the total direct and indirect emissions are below the *de minimis* levels (**Table C-3**), 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.

Table C-3 General Conformity Rule *De Minimis* Emission Thresholds

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

Notes:
Source: USEPA, 2022
NO_2 = nitrogen dioxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulates equal to or less than 2.5 microns in diameter; PM_{10} = particulates equal to or less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound

C.2.4 Significance Indicators and Evaluation Criteria

The Council on Environmental Quality defines significance in terms of context and intensity in 40 CFR § 1508.27. This requires that the significance of the action be analyzed with respect to the setting of the Proposed Action and based relative to the severity of the impact. The Council on Environmental Quality National Environmental Policy Act regulations (40 CFR § 1508.27[b]) provide 10 key factors to consider in determining an impact's intensity.

Based on guidance in Chapter 4 of the *Air Force Air Quality Environmental Impact Analysis Process (EIAP) Guide*, *Volume II – Advanced Assessments*, for air quality impact analysis, project criteria pollutant emissions were compared against the insignificance indicator of 250 tons per year (tpy) for 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 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 ACAM v5.0.17b was used to estimate criteria and precursor pollutant emissions for flight operations in the SRs. There are no stationary sources are associated with this action, nor would chaff and flares be used, and the air quality analysis focused on emissions associated with sorties in the SR. A sample Detailed ACAM report and ACAM documentation in the form of a Record of Air Analysis for Proposed Action alternatives are provided in **Appendix C.2.7**.

Emissions from the Proposed Action in the airspaces were assessed in **Section 3.4.3** and compared to applicable significance indicators. An overview of ACAM inputs and the methodologies used to estimate emissions are summarized in the following sections.

C.2.5 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. No installation of new air emission sources or modification of existing emission sources at either Sheppard AFB, Dyess AFB, or Laughlin AFB would be associated with the Proposed Action.
3. ACAMv5.0.17b was used rather than v.5.0.21a (most recent version) for the air quality impacts assessment as there was an issue with the software with generating the Detail ACAM reports.
4. For the purposes of ACAM, aircraft flight operations were assumed to start January 2024. Emissions were estimated for the Proposed Action in ACAM beginning in January 2024, with 2025 and beyond being considered "steady state".
5. Existing SR-236 and SR-242 are both temporarily closed to air traffic and no longer support training requirements for C-130 pilots. Thus, net change in annual operational emissions for the proposed alternatives were estimated in ACAM by deducting or removing estimated

historical emissions of C-130 operations and adding estimated emissions of C-130 and T-6 operations in the proposed reconfigured SR-236 and SR-242 airspaces. The total estimated net change in emissions from the Proposed Action is used for analyzing air quality impacts.

6. Mixing height of 3,000 ft (this matches USEPA and Department of the Air Force [Air Force] Guidance) was assumed. For consideration of potential air quality impacts, it is the volume of air extending up to the mixing height (3,000 ft AGL) and coinciding with the spatial distribution of the ROI that is considered. Pollutants that are released above the mixing height typically would not disperse downward and thus would have little or no effect on ground level concentrations of pollutants. The mixing height is the altitude at which the lower atmosphere undergoes mechanical or turbulent mixing, producing a nearly uniform air mass. The height of the mixing level determines the volume of air within which pollutants can disperse. Mixing heights at any one location or region can vary by the season and time of day, but for air quality applications an average mixing height of 3,000 ft AGL is an acceptable default value (40 CFR § 93.153[c][2]).
7. SR-236 would be used by aircraft originating from Sheppard AFB and SR-242 would be used by aircraft originating from Laughlin AFB. Flights traveling to and from the Slow Route airspaces are assumed to operate at altitudes above mixing height of 3,000 ft AGL and are thus not considered in the analyses.
8. Air quality analyses for flight operations was performed using operational data collected and compiled for the airspace flight operations (0 to 3,000 ft AGL). Data were provided for annual operations by altitude band, engine power, airspeed, and time in minutes and percent time spent in airspace and sub-airspace.
9. Time-in-mode (TIM) estimates were calculated using the total distance traveled in each SR and the average speed of the aircraft through the SR. TIM data are shown in **Table C-4**.
10. Aircraft emissions at or below 3,000 ft AGL do not appreciably differ by altitude. In other words, the emissions rate at 3,000 ft AGL is assumed to be the same as that at 500 ft AGL. Moreover, ACAM does not distinguish between aircraft operations at different altitudes.
11. ACAM does not have separate inputs for time spent within airspace. To represent the time spent at or below 3,000 ft AGL, time spent in minutes for each low altitude operation in the airspace was assigned to Climb out/Intermediate power mode within the ACAM LTO input fields. 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.

Table C-4 Air Conformity Applicability Model Time-in-Mode Data Inputs

Airspace ID	ACAM Default Power Mode	C-130					T-6				
		Sorties	Distance (miles)	Speed [1] (mph)	Time in Mode [2]		Sorties	Distance (miles)	Speed (mph)	Time in Mode	
					(hours)	(minutes)				(hours)	(minutes)
Existing Conditions											
SR-236	Climbout or Intermediate	10	219.8	253.2	0.87	52.09	0.00	N/A	N/A	N/A	N/A
SR-242		10	217.5	253.2	0.86	51.55	0.00	N/A	N/A	N/A	N/A
Proposed Action - Alternative 1 (Use Existing SR-242 and Modify SR-236)											
SR-236	Climbout or Intermediate	10	169.2	253.2	0.67	40.10	440	169.2	276.2	0.61	36.76
SR-242		10	217.5	253.2	0.86	51.55	240	217.5	241.7	0.90	54.00
Proposed Action - Alternative 2 (Adjust SR-236 Access Points and Use Existing SR-242)											
SR-236	Climbout or Intermediate	10	169.2	253.2	0.67	40.10	440	181.0	276.2	0.66	39.32
SR-242		10	217.5	253.2	0.86	51.55	240	217.5	241.7	0.90	54.00

Notes:

[1] Average speed in knots is converted to miles per hour, as shown, by multiplying speed in knots by 1.15078 (Knots to Miles per hour conversion: knots to mph calculator (metric-conversions.org).

[2] Time-in-mode calculated using the total distance (miles) traveled in each SR and average speed (mph) of the aircraft through SR segments.

ACAM = Air Conformity Applicability Model; ID = identification; mph = miles per hour; SR = Slow Route

C.2.6 References

Texas Commission on Environmental Quality (TCEQ). 2023. *Air Quality and Monitoring, Ambient Air Monitoring*. <https://www.tceq.texas.gov/airquality/monops>. Website Last Modified 2023-08-22. Accessed September 2023.

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

USEPA. 2022. *General Conformity: De Minimis Tables*. <https://www.epa.gov/general-conformity/de-minimis-tables>. July.

USEPA. 2023a. *NAAQS Table*. < https://www.epa.gov/criteria-air-pollutants/naaqs-table>. 15 March.

USEPA. 2023b. *Prevention of Significant Deterioration (PSD) Basic Information*. <https://www.epa.gov/nsr/prevention-significant-deterioration-basic-information> 23 January

USEPA. 2023c. USEPA's Annual *Inventory of U.S. Greenhouse Gas Emissions and Sinks* and the new *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2021.* <https://cfpub.epa.gov/ghgdata/inventoryexplorer/#iallsectors/allsectors/allgas/inventsect/current>. Accessed September 2023.

C.2.7 Detailed ACAM Report, Record of Conformity Analysis (ROCA) and Record of No Applicability (RONA)

C.2.7.1 Detailed Air Conformity Applicability Model Report

ALTERNATIVE 1

1. General Information

- Action Location
Base: DYESS AFB
State: Texas
County(s): Baylor; Haskell; King; Knox; Jones; Shackelford; Taylor; Throckmorton; Stonewall; Brown; Callahan; Coleman; Concho; McCulloch; Runnels; Fisher; Young
Regulatory Area(s): NOT IN A REGULATORY AREA

- Action Title: Slow Route Training Airspace, North Texas

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

- Projected Action Start Date: 1 / 2024

- Action Purpose and Need:
The purpose of the Proposed Action is to use SR-236 and SR-242 to support slow-speed and low-altitude military undergraduate pilot training syllabi requirements established by AETC.

The Proposed Action is needed to balance operational activity and alleviate demand on other SRs currently operated by Sheppard AFB and Laughlin AFB, which do not provide optimal training requirements because they are constrained by high operational volume, conflicts with other civilian and military aviation traffic and underlying land uses (e.g., wind turbines, noise sensitive receptors), limited operating hours (i.e., daytime only), vulnerability to unfavorable weather conditions, and other factors.

The Proposed Action would reinforce pilot training and readiness by using SR-236 and SR-242 in support of the T-6A program.

- Action Description:
The Proposed Action would primarily support slow-speed and low-altitude training syllabi requirements for military undergraduate student pilots flying T-6A aircraft from Sheppard AFB and Laughlin AFB, Texas. SR-236 would be used by aircraft originating from Sheppard AFB and SR-242 would be used by aircraft originating from Laughlin AFB. The Proposed Action would also allow limited use of SR-236 and SR-242 by transient C-130 aircraft from other DoD installations to support applicable pilot training requirements.

Under Alternative 1 of the Proposed Action, the Air Force would use portions of the existing SR-236 footprint but would modify the western and southern segments of the airspace and would use existing SR-242.

Under Alternative 2 of the Proposed Action, the Air Force would modify aircraft entry and exit points for SR-236 to allow for more efficient operations for training aircraft flying in and out of Sheppard AFB and would use existing SR-242.

No ground-disturbing activities would occur under the Proposed Action. There would be no changes to overall flight operations or patterns out of Sheppard AFB or Laughlin AFB and no changes to flight training hours.

- Point of Contact

Name: Radhika Narayanan
Title: Contractor
Organization: Versar
Email: rnarayanan@versar.com
Phone Number: (757) 557-0810

- Activity List:

Activity Type		Activity Title
2.	Aircraft	C-130: Existing Flight Operations in SR-236
3.	Aircraft	C-130 Existing Flight Operations in SR-242
4.	Aircraft	C-130: Alternative 1 Proposed Operations in SR-236
5.	Aircraft	C-130: Alternative 1 Proposed Operations in SR-242
6.	Aircraft	T-6A: Alternative 1 Proposed Operations in SR-236
7.	Aircraft	T-6A: Alternative 1 Proposed Operations in SR-242

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

[redacted]

2.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Remove

- Activity Location

County: Baylor; Haskell; King; Knox; Jones; Shackelford; Taylor; Throckmorton; Stonewall
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: C-130: Existing Flight Operations in SR-236

- Activity Description:

SR-236 was formerly used for routine slow-speed and low-altitude training by AMC C-130 aircraft. It is now temporarily closed to air traffic because the route no longer supports training requirements for AMC C-130 pilots.

- Activity Start Date

Start Month: 1
Start Year: 2024

- Activity End Date

Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	-0.000665
SO_x	-0.032362
NO_x	-0.276743
CO	-0.058676
PM 10	-0.044097

Pollutant	Emissions Per Year (TONs)
PM 2.5	-0.016847
Pb	0.000000
NH_3	0.000000
CO_2e	-97.8

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

Pollutant	Emissions Per Year (TONs)
VOC	-0.000665
SO_x	-0.032362
NO_x	-0.276743
CO	-0.058676
PM 10	-0.044097

Pollutant	Emissions Per Year (TONs)
PM 2.5	-0.016847
Pb	0.000000
NH_3	0.000000
CO_2e	-97.8

2.2 Aircraft & Engines

2.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine

Aircraft Designation: WC-130J
Engine Model: AE2100D3
Primary Function: Transport - Bomber
Aircraft has After burn: No
Number of Engines: 4

- Aircraft & Engine Surrogate

Is Aircraft & Engine a Surrogate? No

Original Aircraft Name:
Original Engine Name:

2.2.2 Aircraft & Engines Emission Factor(s)

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

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	723.60	0.08	1.07	7.58	5.06	3.64	1.88	3234
Approach	880.20	0.06	1.07	7.54	3.89	3.85	2.18	3234
Intermediate	1741.90	0.02	1.07	9.15	1.94	1.46	0.56	3234
Military	2261.70	0.01	1.07	12.46	2.30	1.22	0.33	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

2.3 Flight Operations

2.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 1
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 10
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)
Taxi/Idle Out [Idle] (mins): 0
Takeoff [Military] (mins): 0
Takeoff [After Burn] (mins): 0
Climb Out [Intermediate] (mins): 52.09
Approach [Approach] (mins): 0
Taxi/Idle In [Idle] (mins): 0

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

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

2.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year

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

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

- Aircraft Emissions for LTOs per Year

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

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

- Aircraft Emissions per Mode for TGOs per Year

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

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

- Aircraft Emissions for TGOs per Year

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

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

- Aircraft Emissions per Mode for Trim per Year

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

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

- Aircraft Emissions for Trim per Year
$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

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

2.4 Auxiliary Power Unit (APU)

2.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: No

- Auxiliary Power Unit (APU)

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

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

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

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

2.4.3 Auxiliary Power Unit (APU) Formula(s)

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

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)

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

3. Aircraft

[redacted]

3.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Remove

- Activity Location
County: Brown; Callahan; Coleman; Concho; Jones; McCulloch; Runnels; Shackelford; Taylor
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: C-130 Existing Flight Operations in SR-242

- Activity Description:
SR-242 was formerly used for routine slow-speed and low-altitude training by AMC C-130 aircraft. It is now temporarily closed to air traffic because the route no longer supports training requirements for AMC C-130 pilots.

This activity accounts for annual C-130 flight operations that previously occurred in the existing SR-242.

- Activity Start Date
Start Month: 1
Start Year: 2024

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

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	-0.000658
SO_x	-0.032027
NO_x	-0.273875
CO	-0.058067
PM 10	-0.043640

Pollutant	Emissions Per Year (TONs)
PM 2.5	-0.016672
Pb	0.000000
NH_3	0.000000
CO_2e	-96.8

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

Pollutant	Emissions Per Year (TONs)
VOC	-0.000658
SO_x	-0.032027
NO_x	-0.273875
CO	-0.058067
PM 10	-0.043640

Pollutant	Emissions Per Year (TONs)
PM 2.5	-0.016672
Pb	0.000000
NH_3	0.000000
CO_2e	-96.8

3.2 Aircraft & Engines

3.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: WC-130J
Engine Model: AE2100D3
Primary Function: Transport - Bomber
Aircraft has After burn: No
Number of Engines: 4

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

3.2.2 Aircraft & Engines Emission Factor(s)

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

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	723.60	0.08	1.07	7.58	5.06	3.64	1.88	3234
Approach	880.20	0.06	1.07	7.54	3.89	3.85	2.18	3234
Intermediate	1741.90	0.02	1.07	9.15	1.94	1.46	0.56	3234
Military	2261.70	0.01	1.07	12.46	2.30	1.22	0.33	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

3.3 Flight Operations

3.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 1
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 10
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi/Idle Out [Idle] (mins):	0
Takeoff [Military] (mins):	0
Takeoff [After Burn] (mins):	0
Climb Out [Intermediate] (mins):	51.55
Approach [Approach] (mins):	0
Taxi/Idle In [Idle] (mins):	0

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

- Trim Test

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

3.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year

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

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

- Aircraft Emissions for LTOs per Year

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

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

- Aircraft Emissions per Mode for TGOs per Year

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

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

- Aircraft Emissions for TGOs per Year

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

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

- Aircraft Emissions per Mode for Trim per Year

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

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

- Aircraft Emissions for Trim per Year

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

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

3.4 Auxiliary Power Unit (APU)

3.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: No

- Auxiliary Power Unit (APU)

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

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

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

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

3.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year

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

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

4. Aircraft

4.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location

County: Jones; Haskell; King; Knox; Baylor; Throckmorton; Shackelford; Stonewall; Fisher; Young

Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: C-130: Alternative 1 Proposed Operations in SR-236

- Activity Description:

This activity accounts for proposed annual transient C-130 aircraft operations in modified SR-236.

SR-236 would be used by aircraft originating from Sheppard AFB.

- Activity Start Date
Start Month: 1
Start Year: 2024

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

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.000512
SO_x	0.024913
NO_x	0.213043
CO	0.045170
PM 10	0.033947

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.012969
Pb	0.000000
NH_3	0.000000
CO_2e	75.3

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

Pollutant	Emissions Per Year (TONs)
VOC	0.000512
SO_x	0.024913
NO_x	0.213043
CO	0.045170
PM 10	0.033947

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.012969
Pb	0.000000
NH_3	0.000000
CO_2e	75.3

4.2 Aircraft & Engines

4.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: WC-130J
Engine Model: AE2100D3
Primary Function: Transport - Bomber
Aircraft has After burn: No
Number of Engines: 4

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

4.2.2 Aircraft & Engines Emission Factor(s)

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

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	723.60	0.08	1.07	7.58	5.06	3.64	1.88	3234
Approach	880.20	0.06	1.07	7.54	3.89	3.85	2.18	3234
Intermediate	1741.90	0.02	1.07	9.15	1.94	1.46	0.56	3234
Military	2261.70	0.01	1.07	12.46	2.30	1.22	0.33	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

4.3 Flight Operations

4.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft: 1
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 10
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi/Idle Out [Idle] (mins): 0
Takeoff [Military] (mins): 0
Takeoff [After Burn] (mins): 0
Climb Out [Intermediate] (mins): 40.1
Approach [Approach] (mins): 0
Taxi/Idle In [Idle] (mins): 0

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

- Trim Test

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

4.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year

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

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)

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

- Aircraft Emissions for LTOs per Year

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

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

- Aircraft Emissions per Mode for TGOs per Year

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

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

- Aircraft Emissions for TGOs per Year

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

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

- Aircraft Emissions per Mode for Trim per Year

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

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)

1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year

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

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

4.4 Auxiliary Power Unit (APU)

4.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: No

- Auxiliary Power Unit (APU)

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

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

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

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

4.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year

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

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

5. Aircraft

[redacted]

5.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Brown; Callahan; Coleman; Concho; Jones; McCulloch; Runnels; Shackelford; Taylor
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: C-130: Alternative 1 Proposed Operations in SR-242

- Activity Description:
This activity accounts for proposed annual transient C-130 aircraft operations in existing SR-242.
SR-242 would be used by aircraft originating from Laughlin AFB.

- Activity Start Date
Start Month: 1
Start Year: 2024

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

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.000658
SO_x	0.032027
NO_x	0.273875
CO	0.058067
PM 10	0.043640

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.016672
Pb	0.000000
NH_3	0.000000
CO_2e	96.8

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

Pollutant	Emissions Per Year (TONs)
VOC	0.000658
SO_x	0.032027
NO_x	0.273875
CO	0.058067
PM 10	0.043640

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.016672
Pb	0.000000
NH_3	0.000000
CO_2e	96.8

5.2 Aircraft & Engines

5.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: WC-130J
Engine Model: AE2100D3
Primary Function: Transport - Bomber
Aircraft has After burn: No
Number of Engines: 4

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

5.2.2 Aircraft & Engines Emission Factor(s)

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

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	723.60	0.08	1.07	7.58	5.06	3.64	1.88	3234
Approach	880.20	0.06	1.07	7.54	3.89	3.85	2.18	3234
Intermediate	1741.90	0.02	1.07	9.15	1.94	1.46	0.56	3234
Military	2261.70	0.01	1.07	12.46	2.30	1.22	0.33	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

5.3 Flight Operations

5.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 1
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 10
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)
Taxi/Idle Out [Idle] (mins): 0
Takeoff [Military] (mins): 0
Takeoff [After Burn] (mins): 0
Climb Out [Intermediate] (mins): 51.55
Approach [Approach] (mins): 0
Taxi/Idle In [Idle] (mins): 0

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

- Trim Test

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

5.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year

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

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

- Aircraft Emissions for LTOs per Year

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

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

- Aircraft Emissions per Mode for TGOs per Year

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

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

TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year

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

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

- Aircraft Emissions per Mode for Trim per Year

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

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

- Aircraft Emissions for Trim per Year

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

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

5.4 Auxiliary Power Unit (APU)

5.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: No

- Auxiliary Power Unit (APU)

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

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

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

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

5.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year

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

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

6. Aircraft

[redacted]

6.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Fisher; Jones; Stonewall; Haskell; King; Knox; Baylor; Throckmorton; Shackelford; Young
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: T-6A: Alternative 1 Proposed Operations in SR-236

- Activity Description:
This activity accounts for proposed annual T-6A aircraft operations in modified SR-236. SR-236 would be used by aircraft originating from Sheppard AFB.

- Activity Start Date
Start Month: 1
Start Year: 2024

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

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.043150
SO_x	0.064756
NO_x	0.286256
CO	0.660265
PM 10	0.202134

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.042363
Pb	0.000000
NH_3	0.000000
CO_2e	195.7

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

Pollutant	Emissions Per Year (TONs)
VOC	0.043150
SO_x	0.064756
NO_x	0.286256
CO	0.660265
PM 10	0.202134

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.042363
Pb	0.000000
NH_3	0.000000
CO_2e	195.7

6.2 Aircraft & Engines

6.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine

Aircraft Designation: T-6A
Engine Model: PT6A-68
Primary Function: Trainer
Aircraft has After burn: No
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 Emissions Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	156.00	7.89	1.07	1.77	117.85	3.95	2.16	3234
Approach	328.00	3.29	1.07	5.03	33.69	4.15	1.23	3234
Intermediate	449.00	0.71	1.07	4.73	10.91	3.34	0.70	3234
Military	612.00	0.20	1.07	8.18	3.88	4.30	0.61	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

6.3 Flight Operations

6.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft:	1
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft:	440
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft:	0
Number of Annual Trim Test(s) per Aircraft:	0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi/Idle Out [Idle] (mins):	0
Takeoff [Military] (mins):	0
Takeoff [After Burn] (mins):	0
Climb Out [Intermediate] (mins):	36.76
Approach [Approach] (mins):	0
Taxi/Idle In [Idle] (mins):	0

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

- Trim Test

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

6.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year

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

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

- Aircraft Emissions for LTOs per Year

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

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

- Aircraft Emissions per Mode for TGOs per Year

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

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

- Aircraft Emissions for TGOs per Year

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

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

- Aircraft Emissions per Mode for Trim per Year

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

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

- Aircraft Emissions for Trim per Year

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

AE_{TRIM}: Aircraft Emissions (TONs)

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

6.4 Auxiliary Power Unit (APU)

6.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: No

- Auxiliary Power Unit (APU)

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

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

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

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

6.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year

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

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

7. Aircraft

[redacted]

7.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location

County: Brown; Callahan; Coleman; Concho; Jones; McCulloch; Runnels; Shackelford; Taylor

Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: T-6A: Alternative 1 Proposed Operations in SR-242

- Activity Description:
This activity accounts for proposed annual T-6A aircraft operations in existing SR-242. SR-242 would be used by aircraft originating from Laughlin AFB.

- Activity Start Date
Start Month: 1
Start Year: 2024

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

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.034575
SO_x	0.051886
NO_x	0.229367
CO	0.529048
PM 10	0.161963

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.033944
Pb	0.000000
NH_3	0.000000
CO_2e	156.8

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

Pollutant	Emissions Per Year (TONs)
VOC	0.034575
SO_x	0.051886
NO_x	0.229367
CO	0.529048
PM 10	0.161963

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.033944
Pb	0.000000
NH_3	0.000000
CO_2e	156.8

7.2 Aircraft & Engines

7.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: T-6A
Engine Model: PT6A-68
Primary Function: Trainer
Aircraft has After burn: No
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 Emissions Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	156.00	7.89	1.07	1.77	117.85	3.95	2.16	3234
Approach	328.00	3.29	1.07	5.03	33.69	4.15	1.23	3234
Intermediate	449.00	0.71	1.07	4.73	10.91	3.34	0.70	3234
Military	612.00	0.20	1.07	8.18	3.88	4.30	0.61	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

7.3 Flight Operations

7.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 1
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 240
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)
Taxi/Idle Out [Idle] (mins): 0
Takeoff [Military] (mins): 0
Takeoff [After Burn] (mins): 0
Climb Out [Intermediate] (mins): 54
Approach [Approach] (mins): 0
Taxi/Idle In [Idle] (mins): 0

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

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

7.3.2 Flight Operations Formula(s)

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

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

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

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

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

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

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

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

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

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

- Aircraft Emissions for Trim per Year
$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

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

7.4 Auxiliary Power Unit (APU)

7.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: No

- Auxiliary Power Unit (APU)

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

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

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

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

7.4.3 Auxiliary Power Unit (APU) Formula(s)

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

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

C.2.8 Record of Air Analysis (ROAA)

C.2.8.1 Alternative 1

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

a. Action Location:
Base: DYESS AFB
State: Texas
County(s): Baylor; Haskell; King; Knox; Jones; Shackelford; Taylor; Throckmorton; Stonewall; Brown; Callahan; Coleman; Concho; McCulloch; Runnels; Fisher; Young
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Slow Route Training Airspace, North Texas

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 1 / 2024

e. Action Description:

The Proposed Action would primarily support slow-speed and low-altitude training syllabi requirements for military undergraduate student pilots flying T-6A aircraft from Sheppard AFB and Laughlin AFB, Texas. SR-236 would be used by aircraft originating from Sheppard AFB and SR-242 would be used by aircraft originating from Laughlin AFB. The Proposed Action would also allow limited use of SR-236 and SR-242 by transient C-130 aircraft from other DoD installations to support applicable pilot training requirements.

Under Alternative 1 of the Proposed Action, the Air Force would use portions of the existing SR-236 footprint but would modify the western and southern segments of the airspace and would use existing SR-242.

Under Alternative 2 of the Proposed Action, the Air Force would modify aircraft entry and exit points for SR-236 to allow for more efficient operations for training aircraft flying in and out of Sheppard AFB and would use existing SR-242.

No ground-disturbing activities would occur under the Proposed Action. There would be no changes to overall flight operations or patterns out of Sheppard AFB or Laughlin AFB and no changes to flight training hours.

f. Point of Contact:
Name: Radhika Narayanan

Title: Contractor
Organization: Versar
Email: rnarayanan@versar.com
Phone Number: (757) 557-0810

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total net direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the start of the action through achieving "steady state" (i.e., net gain/loss upon action fully implemented) emissions. The ACAM analysis used the latest and most accurate emission estimation techniques available; all algorithms, emission factors, and methodologies used are described in detail in the USAF Air Emissions Guide for Air Force Stationary Sources, the USAF Air Emissions Guide for Air Force Mobile Sources, and the USAF Air Emissions Guide for Air Force Transitory Sources.

"Insignificance Indicators" were used in the analysis to provide an indication of the significance of potential impacts to air quality based on current ambient air quality relative to the National Ambient Air Quality Standards (NAAQSs). These insignificance indicators are the 250 ton/yr Prevention of Significant Deterioration (PSD) major source threshold for actions occurring in areas that are "Clearly Attainment" (i.e., not within 5% of any NAAQS) and the GCR de minimis values (25 ton/yr for lead and 100 ton/yr for all other criteria pollutants) for actions occurring in areas that are "Near Nonattainment" (i.e., within 5% of any NAAQS). These indicators do not define a significant impact; however, they do provide a threshold to identify actions that are insignificant. Any action with net emissions below the insignificance indicators for all criteria pollutant is considered so insignificant that the action will not cause or contribute to an exceedance on one or more NAAQSs. For further detail on insignificance indicators see chapter 4 of the Air Force Air Quality Environmental Impact Analysis Process (EIAP) Guide, Volume II - Advanced Assessments.

The action's net emissions for every year through achieving steady state were compared against the Insignificance Indicator and are summarized below.

Analysis Summary:

2024

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.078	250	No
NOx	0.452	250	No
CO	1.176	250	No

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
SOx	0.109	250	No
PM 10	0.354	250	No
PM 2.5	0.072	250	No
Pb	0.000	25	No
NH3	0.000	250	No
CO2e	330.0		

2025 - (Steady State)

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.078	250	No
NOx	0.452	250	No
CO	1.176	250	No
SOx	0.109	250	No
PM 10	0.354	250	No
PM 2.5	0.072	250	No
Pb	0.000	25	No
NH3	0.000	250	No
CO2e	330.0		

None of estimated annual net emissions associated with this action are above the insignificance indicators, indicating no significant impact to air quality. Therefore, the action will not cause or contribute to an exceedance on one or more NAAQSs. No further air assessment is needed.

Radhika

Radhika Narayanan, Contractor

10/31/2023
DATE

C.2.8.2 Alternative 2

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

a. Action Location:

Base: DYESS AFB
State: Texas
County(s): Baylor; Haskell; King; Knox; Jones; Shackelford; Taylor; Throckmorton; Stonewall; Brown; Callahan; Coleman; Concho; McCulloch; Runnels; Fisher; Young
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Slow Route Training Airspace, North Texas

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 1 / 2024

e. Action Description:

The Proposed Action would primarily support slow-speed and low-altitude training syllabi requirements for military undergraduate student pilots flying T-6A aircraft from Sheppard AFB and Laughlin AFB, Texas. SR-236 would be used by aircraft originating from Sheppard AFB and SR-242 would be used by aircraft originating from Laughlin AFB. The Proposed Action would also allow limited use of SR-236 and SR-242 by transient C-130 aircraft from other DoD installations to support applicable pilot training requirements.

Under Alternative 1 of the Proposed Action, the Air Force would use portions of the existing SR-236 footprint but would modify the western and southern segments of the airspace and would use existing SR-242.

Under Alternative 2 of the Proposed Action, the Air Force would modify aircraft entry and exit points for SR-236 to allow for more efficient operations for training aircraft flying in and out of Sheppard AFB and would use existing SR-242.

No ground-disturbing activities would occur under the Proposed Action. There would be no changes to overall flight operations or patterns out of Sheppard AFB or Laughlin AFB and no changes to flight training hours.

f. Point of Contact:

Name: Radhika Narayanan
Title: Contractor
Organization: Versar

Email: rnarayanan@versar.com
Phone Number: (757) 557-0810

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total net direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the start of the action through achieving "steady state" (i.e., net gain/loss upon action fully implemented) emissions. The ACAM analysis used the latest and most accurate emission estimation techniques available; all algorithms, emission factors, and methodologies used are described in detail in the USAF Air Emissions Guide for Air Force Stationary Sources, the USAF Air Emissions Guide for Air Force Mobile Sources, and the USAF Air Emissions Guide for Air Force Transitory Sources.

"Insignificance Indicators" were used in the analysis to provide an indication of the significance of potential impacts to air quality based on current ambient air quality relative to the National Ambient Air Quality Standards (NAAQSs). These insignificance indicators are the 250 ton/yr Prevention of Significant Deterioration (PSD) major source threshold for actions occurring in areas that are "Clearly Attainment" (i.e., not within 5% of any NAAQS) and the GCR de minimis values (25 ton/yr for lead and 100 ton/yr for all other criteria pollutants) for actions occurring in areas that are "Near Nonattainment" (i.e., within 5% of any NAAQS). These indicators do not define a significant impact; however, they do provide a threshold to identify actions that are insignificant. Any action with net emissions below the insignificance indicators for all criteria pollutant is considered so insignificant that the action will not cause or contribute to an exceedance on one or more NAAQSs. For further detail on insignificance indicators see chapter 4 of the Air Force Air Quality Environmental Impact Analysis Process (EIAP) Guide, Volume II - Advanced Assessments.

The action's net emissions for every year through achieving steady state were compared against the Insignificance Indicator and are summarized below.

Analysis Summary:

2024

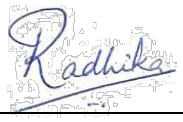
Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.081	250	No
NOx	0.472	250	No
CO	1.222	250	No
SOx	0.114	250	No
PM 10	0.368	250	No

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
PM 2.5	0.075	250	No
Pb	0.000	25	No
NH3	0.000	250	No
CO2e	343.7		

2025 - (Steady State)

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.081	250	No
NOx	0.472	250	No
CO	1.222	250	No
SOx	0.114	250	No
PM 10	0.368	250	No
PM 2.5	0.075	250	No
Pb	0.000	25	No
NH3	0.000	250	No
CO2e	343.7		

None of estimated annual net emissions associated with this action are above the insignificance indicators, indicating no significant impact to air quality. Therefore, the action will not cause or contribute to an exceedance on one or more NAAQSs. No further air assessment is needed.



Radhika Narayanan, Contractor

10/31/2023
DATE

C.3 NOISE

The following sections describe input data used in the noise modeling process.

C.3.1 Sound, Noise, and Potential Effects

C.3.1.1 Introduction

Section C.3.1 discusses sound and noise and their potential effects on the human and natural environment. **Section C.3.1.2** provides an overview of the basics of sound and noise. **Section C.3.1.3** defines and describes the different metrics used to describe noise. The largest section, **Section C.3.1.4**, reviews the potential effects of noise, focusing on effects on humans but also addressing effects on property values, terrain, structures, and animals. **Section C.3.6** contains the list of references cited. **Section C.3.2** contains data used in the noise modeling process. A number of noise metrics are defined and described in this appendix. Some metrics are included for the sake of completeness when discussing each metric and to provide a comparison of cumulative noise metrics.

C.3.1.2 Basics of Sound

C.3.1.2.1 Sound Waves and Decibels

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

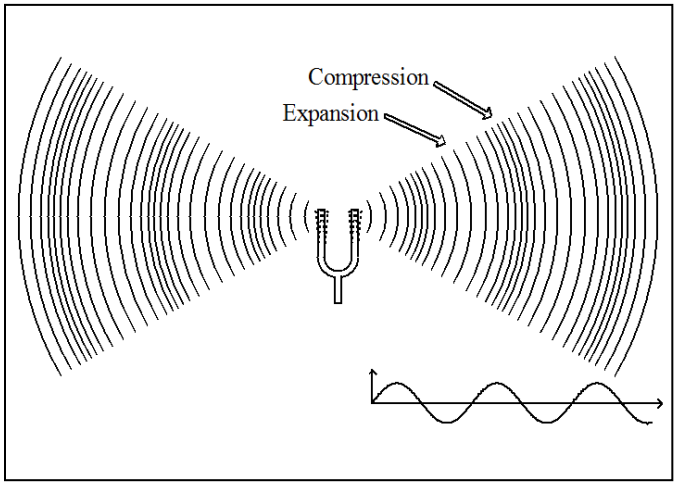


Figure C-1 Sound Waves from a Vibrating Tuning Fork

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

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

The loudest sounds that can be comfortably heard by the human ear have intensities a trillion times higher than those of sounds barely heard. Because of this vast range, it is unwieldy to use a linear scale to represent the intensity of sound. As a result, a logarithmic unit known as the decibel (abbreviated dB) is used to represent the intensity of a sound. Such a representation is called a sound level. A sound level of 0 dB is approximately the threshold of human hearing and barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above 120 dB begin to be felt inside the human ear as discomfort. Sound levels between 130 and 140 dB are felt as pain (Berglund and Lindvall, 1995).

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

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

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

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

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

60.0 dB + 70.0 dB = 70.4 dB.

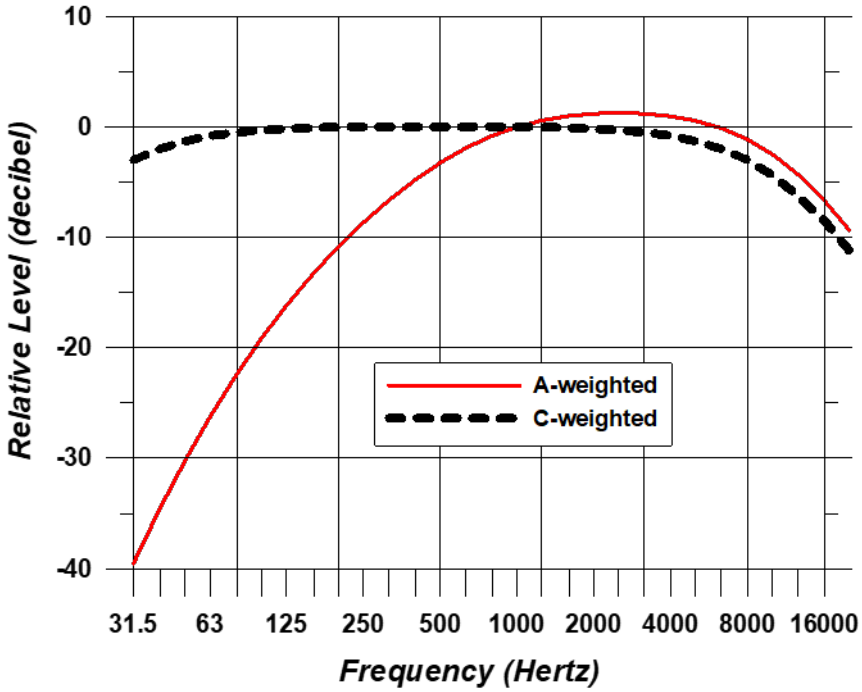
Because the addition of sound levels is different than that of ordinary numbers, this process is often referred to as "decibel addition."

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

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

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

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



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

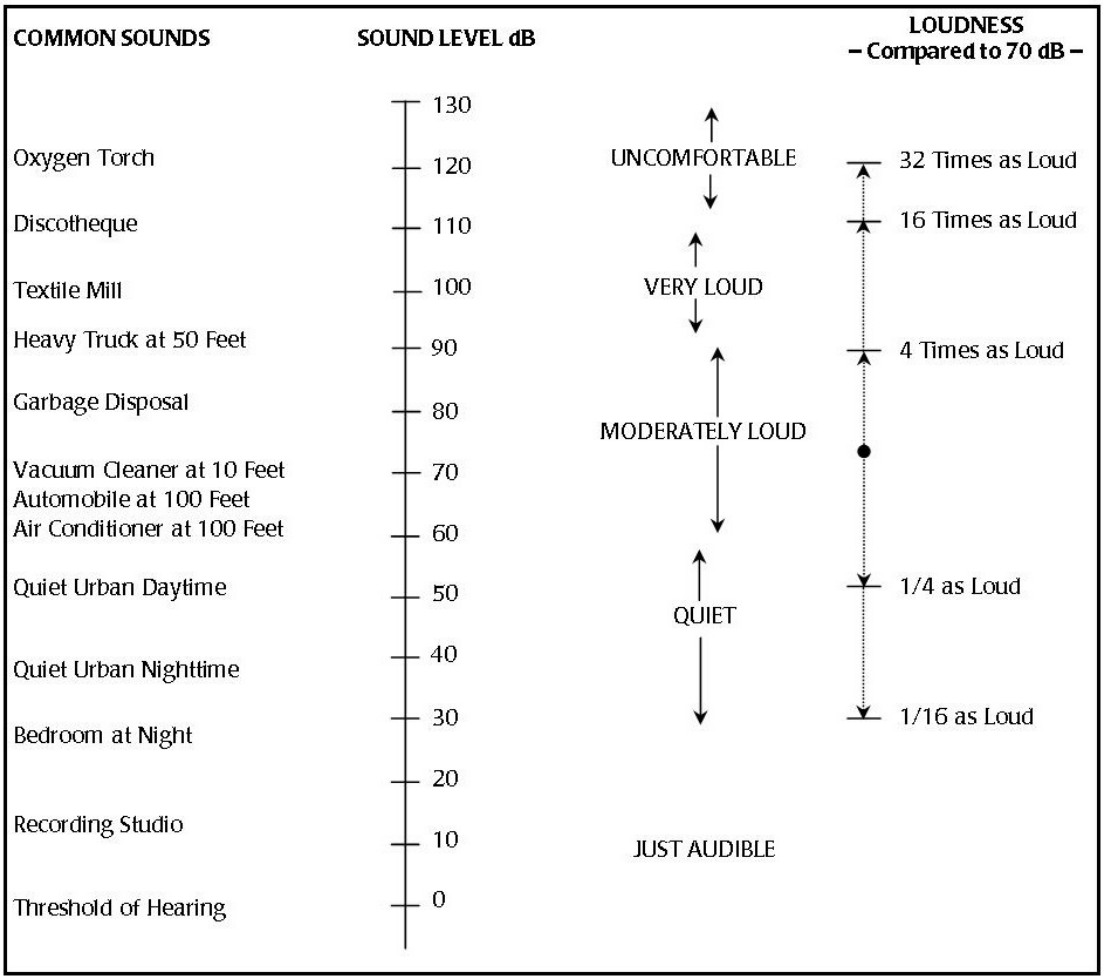
Figure C-2 Frequency Characteristics of A- and C-Weighting

C.3.1.2.2 Sound Levels and Types of Sounds

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

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

Figure C-3 shows A-weighted sound levels from common sources. Some sources, like the air conditioner and vacuum cleaner, are continuous sounds whose levels are constant for some time. Some sources, like the automobile and heavy truck, are the maximum sound during an intermittent event like a vehicle pass-by. Some sources like "urban daytime" and "urban nighttime" are averages over extended periods. A variety of noise metrics have been developed to describe noise over different time periods. These are discussed in detail in **Section C.3.1.3**.



Source: Harris, 1979

Figure C-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).

C.3.1.3 Noise Metrics

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

C.3.1.3.1 Single Events

Maximum Sound Level

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

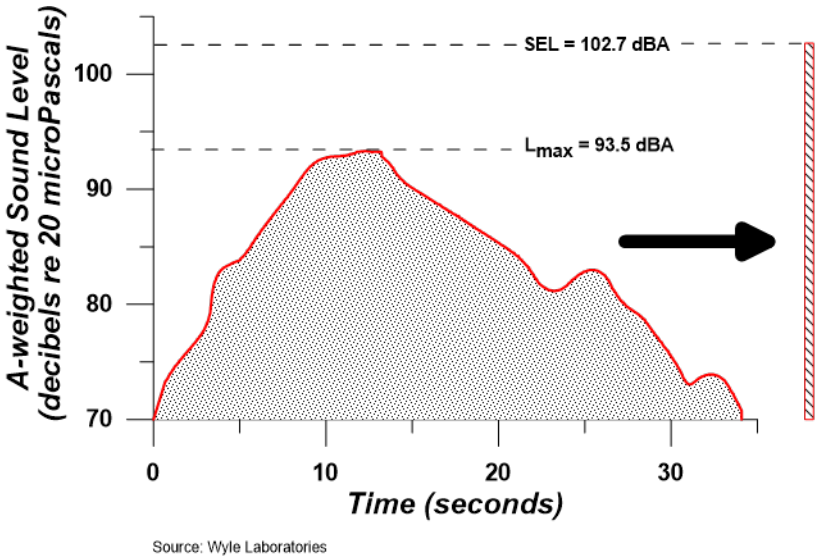
Peak Sound Pressure Level

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 C-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 C-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 sketched on **Figure C-4**, which also indicates two metrics (L_{max} and SEL) that are described above. Over time there can be a number of events, not all the same. Because aircraft noise events last more than a few seconds, the SEL value is larger than L_{max}. It does not directly represent the sound level heard at any given time but rather the entire event. SEL provides a much better measure of aircraft flyover noise exposure than L_{max} alone.

Overpressure

The single event metrics commonly used to assess supersonic noise 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 ft 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 C.3.1.2.2**) except that C-weighting places more emphasis on low frequencies below 1,000 Hz.

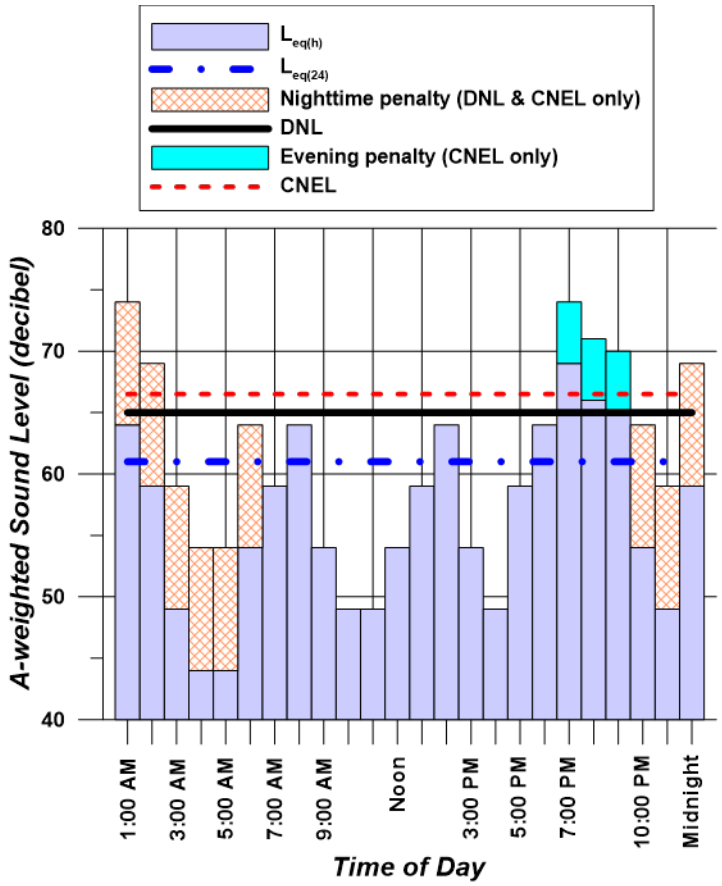
C.3.1.3.2 Cumulative Events

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



Source: Wyle Laboratories

Figure C-5 Example of Equivalent Sound Level over 24 hours, Day-Night Average Sound Level, 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 C-5 gives an example of DNL and CNEL using notional hourly average noise levels ($L_{eq}[h]$) for each hour of the day as an example. Note the $L_{eq}(h)$ for the hours between 10:00 p.m. and 7:00 a.m. have a 10-dB penalty assigned. For CNEL, the hours between 7:00 p.m. and 10:00 p.m. have a 4.8-dB penalty assigned. The DNL for this example is 65 dB. The CNEL for this example is 66 dB.

Figure C-6 shows the ranges of DNL or CNEL that occur in various types of communities. Under a flight path at a major airport, the DNL may exceed 80 dB while rural areas may experience DNL less than 45 dB. The decibel summation nature of these metrics causes the noise levels of the loudest events to control the 24-hour average. As a simple example, consider a case in which only one aircraft overflight occurs during the daytime over a 24-hour period, creating a sound level of 100 dB for 30 seconds. During the remaining 23 hours, 59 minutes, and 30 seconds of the day, the ambient sound level is 50 dB. The DNL for this 24-hour period is 65.9 dB. Assume, as a second example that 10 such 30-second overflights occur during daytime hours during the next 24-hour period, with the same ambient sound level of 50 dB during the remaining 23 hours and 55 minutes of the day. The DNL for this 24-hour period is 75.5 dB. Clearly, the averaging of noise over a 24-hour period does not ignore the louder single events and tends to emphasize both the sound levels and number of those events.

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

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

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

Military aircraft utilizing special use airspace 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 special use airspace 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.

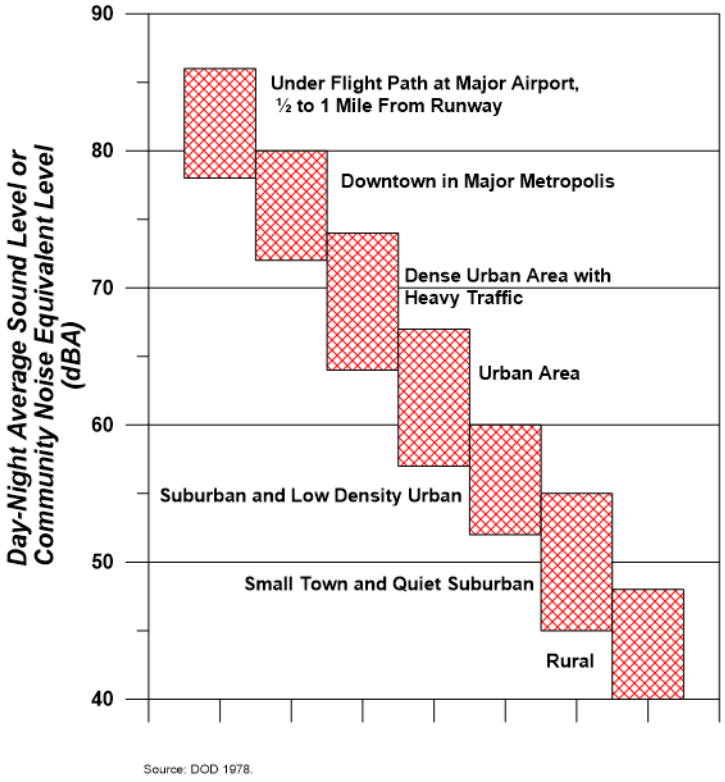


Figure C-6 Typical Day-Night Average Sound Level or Community Noise Equivalent Level Ranges in Various Types of Communities

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 special use airspace activity is the Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}). Onset rates between 15 and 150 dB per second require an adjustment of 0 to 11 dB to the event's SEL while onset rates below 15 dB per second require no adjustment to the event's SEL (Stusnick et al., 1992). The term 'monthly' in L_{dnmr} refers to the noise assessment being conducted for the month with the most operations or sorties -- the so-called busiest month.

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

C.3.1.3.3 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.

C.3.1.4 Noise Effects

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

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

C.3.1.4.1 Annoyance

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

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

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

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

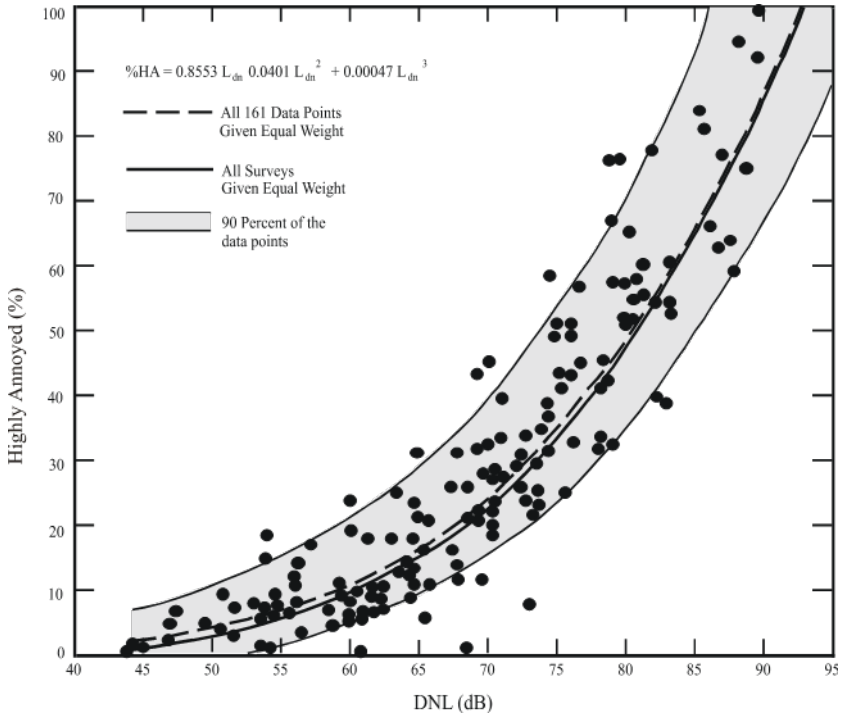


Figure C-7 Schultz Curve Relating Noise Annoyance to Day-Night Average Sound Level (Schultz, 1978)

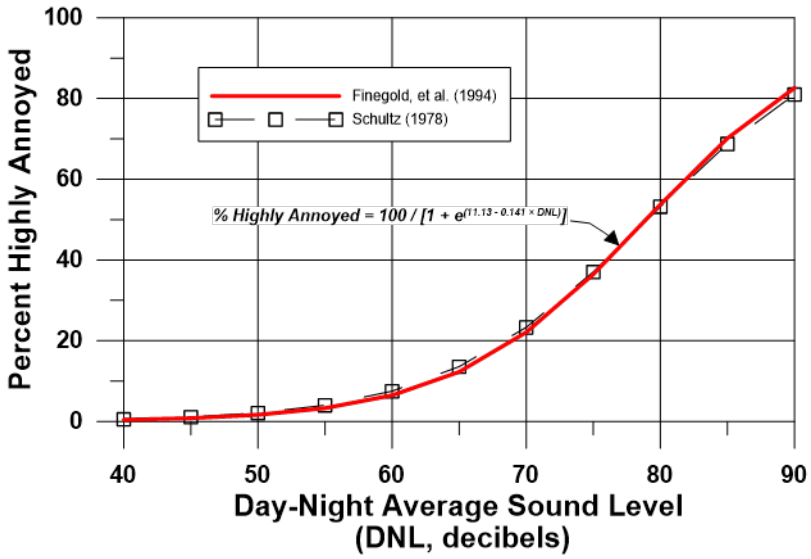


Figure C-8 Response of Communities to Noise; Comparison of Original Schultz (1978) with Finegold et al. (1994)

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 to 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 C-5**.

Table C-5 Nonacoustic 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 C-6** summarizes their results. Comparing the updated Schultz curve suggests that the percentage of people highly annoyed by aircraft noise may be higher than previously thought. Miedema and Oudshoorn (2001) authors supplemented that investigation with further derivation of percent of population highly annoyed as a function of either DNL or DENL along with the corresponding 95 percent confidence intervals with similar results.

Table C-6 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 C-9** depicts the estimated percentage of people highly annoyed for a given DNL using both the ISO 1996-1 estimation and the older FICON 1992 method. The results suggest that the percentage of people highly annoyed may be greater than previous thought and reliance solely on DNL for impact analysis may be insufficient if utilizing the FICON 1992 method.

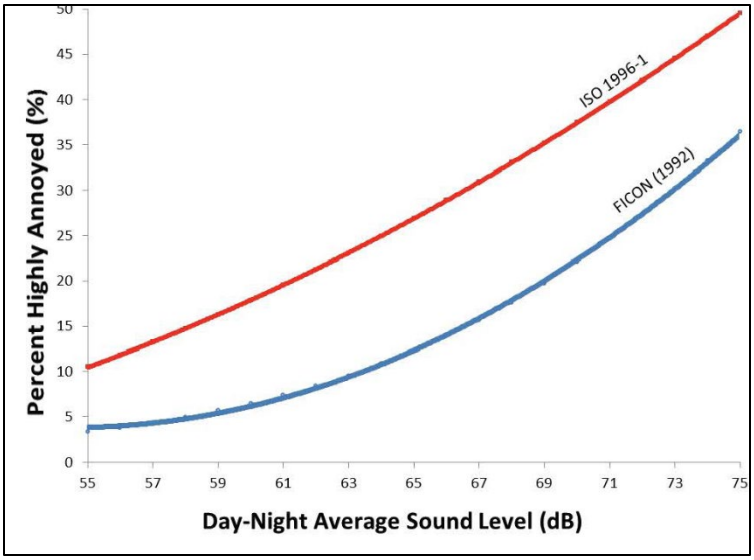


Figure C-9 Percent Highly Annoyed Comparison of International Standard 1996-1 to Federal Interagency Committee on Noise (1992)

C.3.1.4.2 Speech Interference

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

There are two measures of speech comprehension:

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

United States Federal Criteria for Interior Noise

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

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

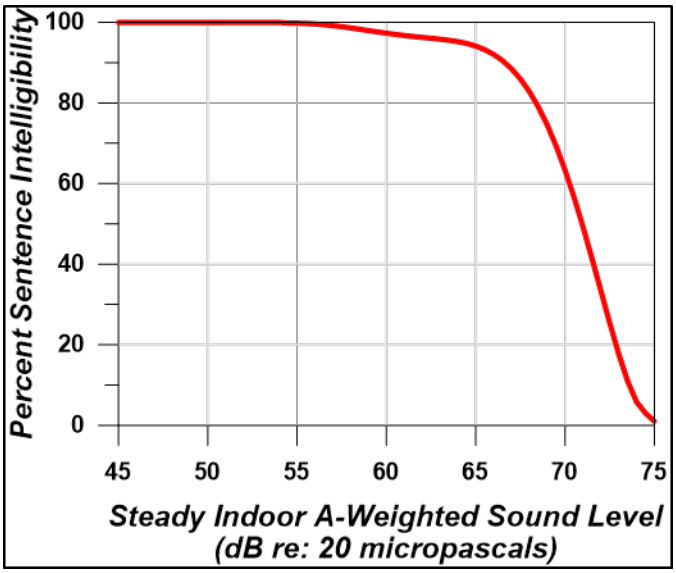


Figure C-10 Speech Intelligibility Curve (digitized from USEPA, 1974)

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

A 1984 study by Wyle for the Port Authority of New York and New Jersey recommended using Speech Interference Level (SIL) for classroom noise criteria (Sharp and Plotkin, 1984). SIL is based on the maximum sound levels in the frequency range that most affects speech communication (500 to 2,000 Hz). The study identified an SIL of 45 dB as the goal. This would provide 90 percent word intelligibility for the short time periods during aircraft overflights. While

SIL is technically the best metric for speech interference, it can be approximated by an L_{max} value. An SIL of 45 dB is equivalent to an A-weighted L_{max} of 50 dB for aircraft noise (Wesler, 1986).

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

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

Table C-7 summarizes the criteria discussed. Other than the FAA (1985) 45 dB L_{max} criterion, they are consistent with a limit on indoor background noise of 35 to 40 dB L_{eq} and a single event limit of 50 dB L_{max}. It should be noted that these limits were set based on students with normal hearing and no special needs. At-risk students may be adversely affected at lower sound levels.

Table C-7 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.

Notes:
dB = decibels; L_{eq} = Equivalent Sound Level; L_{max} = Maximum Sound Level

C.3.1.4.3 Sleep Disturbance

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

1. Initial studies performed in the 1960s and 1970s, where the research was focused on sleep observations performed under laboratory conditions.

2. Later studies performed in the 1990s up to the present, where the research was focused on field observations.

Initial Studies

The relation between noise and sleep disturbance is complex and not fully understood. The disturbance depends not only on the depth of sleep and the noise level but also on the 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 C-11** shows FICAN's curve, the red line, which is based on the results of three field studies shown in the figure (Ollerhead et al., 1992; Fidell et al., 1994, 1995a, 1995b), along with the data from six previous field studies.

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

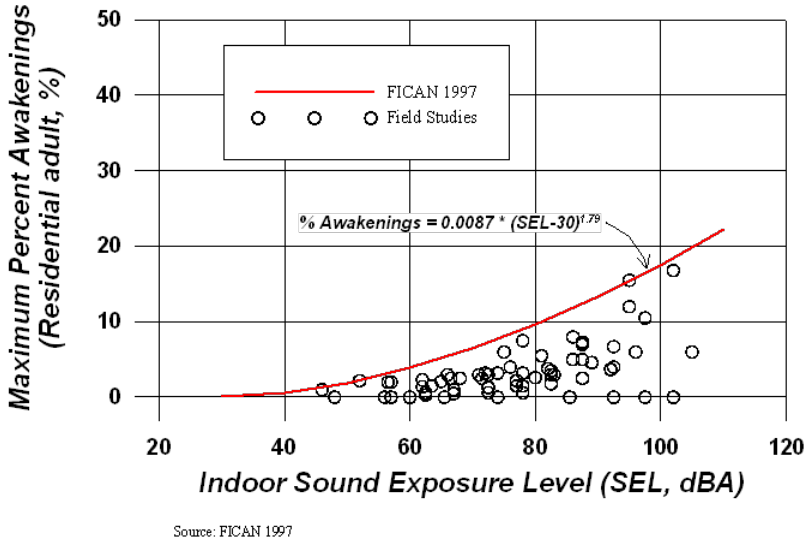


Figure C-11 Federal Interagency Committee on Aviation Noise 1997 Recommended Sleep Disturbance Dose-Response Relationship

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 C-10** rather than the upper envelope to predict average awakening from one event. Probability theory is then used to project the awakening from multiple noise events.

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

population awakening at least once from multiple aircraft events at the 90-dB SEL is shown in **Table C-8**.

Table C-8 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.

C.3.1.4.4 Noise Effects on Children

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

Effects on Learning and Cognitive Abilities

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

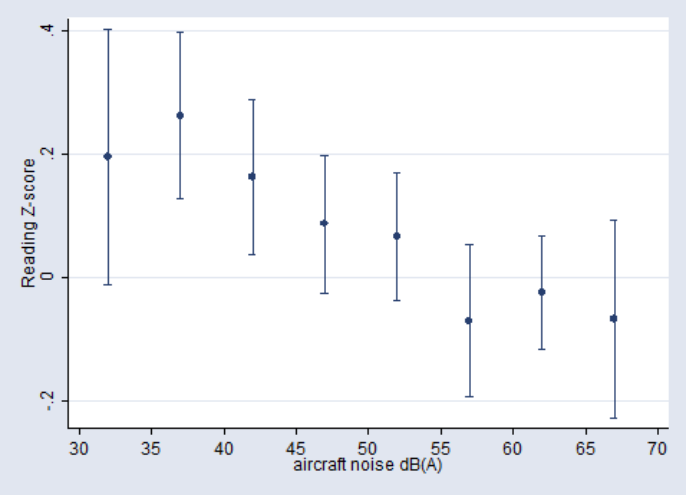
A longitudinal study reported by Evans et al. (1998), conducted prior to relocation of the old Munich airport in 1992, reported that high noise exposure was associated with deficits in long-term memory and reading comprehension in children with a mean age of 10.8 years. Two years after the closure of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

More recently, the Road Traffic and Aircraft Noise Exposure and Children's Cognition and Health (RANCH) study (Stansfeld et al., 2005; Clark et al., 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 C-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 C-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.

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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).

C.3.1.4.5 Noise Effects on Animals and Wildlife

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

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

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

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

C.3.2 Noise Models

This section summarizes analysis tools used to calculate the noise levels, as applicable to the Proposed Action evaluated in the EA.

C.3.2.1 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, 2022a, 2022b). 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.

C.3.2.2 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, 1996). In this report, MR_NMAP Version 3.0 was used to model subsonic aircraft noise in special use airspace. For airspace environments where noise levels are calculated to be less than 45 dB, the noise levels are stated as "<45 dB."

C.3.2.3 Proposed Operations

Alternative 1 proposed T-6 annual operations and flight parameters on SR-236 are shown in **Table C-9** and proposed C-130 operations on this route are shown in **Table C-10.** These include 440 T-6 and 10 C-130 operations, which is greater than the 10 C-130 operations representing existing conditions; however, these proposed operations average just over 1 flight per day. Proposed annual operations on SR-242 include 240 T-6 and 10 C-130 operations (see **Tables C-11** and **C-12)** and average less than 1 flight operation per day.

Proposed T-6 operations on SR-236 would have the following altitude distribution:

- 300 to 500 ft AGL (5 percent)
- 500 to 1,000 feet AGL (75 percent)
- 1,000 to 2,000 ft AGL (15 percent)
- and 2,000 to 3,000 ft AGL (5 percent)

Proposed C-130 operations would all be conducted from 300 to 500 ft AGL.

Proposed T-6 operations on SR-242 would have the following altitude distribution:

- 500 to 1,000 ft AGL (75 percent)
- 1,000 to 2,000 ft AGL (25 percent)

Proposed C-130 operations would all be conducted from 300 to 500 ft AGL.

These Alternative 1 proposed operations along with their associated average airspeeds, power settings, and altitude distribution were the primary inputs to the noise models.

Table C-9 Alternative 1 Proposed T-6 Annual Operations on SR-236

SR-236			T-6				
Segment	Existing (ft AGL)		Annual Operations [1]			Average Speed (knots)	Average Torque (percent)
	Floor	Ceiling	Day (0700-2200 Local)	Night (2200-0700 Local)	Total		
A-B	300	1,500 +	440	0	440	240	60
B-C	300	1,500 +	440	0	440	240	60
C-D	300	1,500 +	440	0	440	240	60
D-E	300	1,500 +	440	0	440	240	60
E-F	300	1,500 +	440	0	440	240	60
F-G	300	1,500 +	440	0	440	240	60
G-H	300	1,500 +	440	0	440	240	60
H-I	300	1,500 +	440	0	440	240	60

Notes:
[1] One annual operation is one aircraft flying the route.
ft AGL = feet above ground level

Table C-10 Alternative 1 Proposed C-130 Annual Operations on SR-236

SR-236			C-130				
Segment	Existing (ft AGL)		Annual Operations [1]			Average Speed (knots)	Average Horsepower
	Floor	Ceiling	Day (0700-2200 Local)	Night (2200-0700 Local)	Total		
A-B	300	1,500 +	2	8	10	220	4500
B-C	300	1,500 +	2	8	10	220	4500
C-D	300	1,500 +	2	8	10	220	4500
D-E	300	1,500 +	2	8	10	220	4500
E-F	300	1,500 +	2	8	10	220	4500
F-G	300	1,500 +	2	8	10	220	4500
G-H	300	1,500 +	2	8	10	220	4500
H-I	300	1,500 +	2	8	10	220	4500

Notes:
[1] One annual operation is one aircraft flying the route.
ft AGL = feet above ground level

Table C-11 Alternative 1 Proposed T-6 Annual Operations on SR-242

SR-242			T-6				
Segment	Existing (ft AGL)		Annual Operations [1]			Average Speed (knots)	Average Torque (percent)
	Floor	Ceiling	Day (0700-2200 Local)	Night (2200-0700 Local)	Total		
A-B	300	1,500 +	240	0	240	210	60
B-C	300	1,500 +	240	0	240	210	60
C-D	300	1,500 +	240	0	240	210	60

Table C-11 Alternative 1 Proposed T-6 Annual Operations on SR-242

SR-242			T-6				
Segment	Existing (ft AGL)		Annual Operations [1]			Average Speed (knots)	Average Torque (percent)
	Floor	Ceiling	Day (0700-2200 Local)	Night (2200-0700 Local)	Total		
D-E	300	1,500 +	240	0	240	210	60
E-F	300	1,500 +	240	0	240	210	60
F-G	300	1,500 +	150	0	150	210	60
G-H	300	1,500 +	100	0	100	210	60
H-I	300	1,500 +	0	0	0	N/A	N/A

Notes:
[1] One annual operation is one aircraft flying the route.
ft AGL = feet above ground level; N/A = not applicable

Table C-12 Alternative 1 Proposed C-130 Annual Operations on SR-242

SR-242			C-130				
Segment	Existing (ft AGL)		Annual Operations [1]			Average Speed (knots)	Average Horsepower
	Floor	Ceiling	Day (0700-2200 Local)	Night (2200-0700 Local)	Total		
A-B	300	1,500 +	2	8	10	220	4550
B-C	300	1,500 +	2	8	10	220	4550
C-D	300	1,500 +	2	8	10	220	4550
D-E	300	1,500 +	2	8	10	220	4550
E-F	300	1,500 +	2	8	10	220	4550
F-G	300	1,500 +	2	8	10	220	4550
G-H	300	1,500 +	2	8	10	220	4550
H-I	300	1,500 +	2	8	10	220	4550

Notes:
[1] One annual operation is one aircraft flying the route.
ft AGL = feet above ground level

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APPENDIX D
LIST OF PREPARERS AND CONTRIBUTORS

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APPENDIX D – LIST OF PREPARERS AND CONTRIBUTORS

The following individuals assisted in the preparation of this Environmental Assessment:

Jessica Botte
Versar, Inc.
MA.S. Environmental Policy and Management
B.S. Environmental Biology
Years of Experience: 14
Contribution: Stakeholder Coordination

Christopher Bowen
Versar, Inc.
M.A. Archaeology and Heritage
B.S. Interdisciplinary Studies
Years of Experience: 31
Contribution: Cultural Resources

Kevin Bradley
KBRWyle
M.S. Aerospace Engineering
B.S. Aerospace Engineering
Years of Experience: 23 years
Contribution: Noise, Airspace, and Safety

Mackenzie Caldwell Rohm
Versar, Inc.
M.A. Anthropology/Archaeology
B.A. Anthropology/Archaeology/Sociology
Years of Experience: 22
Contribution: Cultural Resources

Craig Carver
Versar, Inc.
Master of Urban and Regional Planning
B.A. Music
Years of Experience: 13
Contribution: Project Management, QC, Environmental Justice

Rahul Chettri
Versar, Inc.
M.S. Environmental Studies
B.S. Economics
Years of Experience: 36
Contribution: Air Quality

Steven Douglas
Versar, Inc.
M.S. Environmental Science
B.S. Environmental Science, minor GIS
Years of Experience: 8
Contribution: GIS/Cartography

Kenneth Erwin
Versar, Inc.
M.S. Natural Resources
B.S. Wildlife Science
Years of Experience: 10
Contribution: Cumulative Impacts

John Gifford
Montrose Environmental
LL.B Law
Years of Experience: 35
Contribution: QC, Socioeconomics

Christopher Jones
Montrose Environmental
B.S. Forestry
Years of Experience: 6
Contribution: Socioeconomics

Christian Miller
Montrose Environmental
MBA
B.S. Agriculture, Entomology, Medical Entomology
Years of Experience: 36
Contribution: Biological Resources

Leslie Moore
Montrose Environmental
B.S. Environmental Science
Years of Experience: 10
Contribution: Socioeconomics

Radhika Narayanan
Versar, Inc.
M.S. Environmental Science
B.S. Chemistry
Years of Experience: 28
Contribution: Air Quality

Angela Northrop
Versar, Inc.
B.S. Marketing
Years of Experience: 25
Contribution: Technical Editing

Laura Odenthal
QRI, LLC
MBA Management
B.A. Geology
Years of Experience: 35
Contribution: Public Involvement, QA/QC

Christa Stumpf
Versar, Inc.
M.S. Forest Resource and Land Use Planning
B.S. Wildland Management
Years of Experience: 28
Contribution: Program Management; QA/QC

Kendra Tremain
Montrose Environmental
B.S. Marine Biology, Certificate
Environmental Policy, and Management
Years of Experience: 20
Contribution: QC, Biological/Natural Resources, Land Use

Vanessa Vasquez
Montrose Environmental
B.S. Environmental Studies
Years of Experience: 1
Contribution: Biological /Natural Resources

Michael Waters
Versar, Inc.
Years of Experience: 10
Contribution: GIS/Cartography

APPENDIX E
GLOSSARY OF TERMS

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APPENDIX E – GLOSSARY OF TERMS

Above ground level (AGL): Altitude expressed in feet (ft) measured above the surface of the ground. Altitudes are referred to as mean sea level (MSL) when flying above water; while flying over land, both MSL and AGL are used to delineate airspace structure.

Bald and Golden Eagle Protection Act (BGEPA): Prohibits anyone, without a permit issued by the Secretary of the Interior, from taking eagles, including their parts, nests, or eggs.

Council on Environmental Quality (CEQ): Established by NEPA within the Executive Office of the President to ensure that federal agencies meet their obligations under NEPA.

Day-Night Average Sound Level (DNL or L_{dn}): A cumulative metric that accounts for all noise events in a 24-hour period. A 10-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.

Environmental Impact Analysis Process (EIAP): Department of the Air Force procedures to ensure compliance with the requirements of NEPA.

Environmental justice (EJ): The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Flight Information Publication (FLIP) AP/1B: Provides textual and graphic descriptions and operating instructions for IFR Military Training Routes (IR), VFR Military Training Routes (VR), and Slow Speed Low Altitude Training Routes (SR), as well as Aerial Refueling Tracks/Anchors and VFR Helicopter Refueling Tracks/Anchors.

Latitude: The measurement of distance north or south of the Equator.

Longitude: The measurement east or west of the prime meridian.

Maximum Sound Level (L_{max}): The highest A-weighted sound level measured during a single event in which the sound changes with time.

Migratory Bird Treaty Act (MBTA): The MBTA 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. Most bird species are protected under the MBTA.

Military Training Route (MTR): Training airspace established below 10,000 feet above mean seal level for operations at speeds in excess of 250 knots.

National Ambient Air Quality Standards (NAAQS): Thresholds established by the U.S. Environmental Protection Agency under the Clean Air Act to regulate emissions of six criteria 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]).

National Environmental Policy Act (NEPA) of 1969: Law requiring federal agencies to assess the environmental effects of proposed major federal actions prior to making decisions.

Nautical mile (NM): Unit of length used in air, marine, and space navigation that is equivalent to approximately 1.15 statute miles.

Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}): 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 aircraft operations in training and operational airspace.

Operation: A single aircraft takeoff or landing.

Region of Influence (ROI): Geographic area where potential impacts from a proposed action would be anticipated to occur or be experienced.

Slow Route (SR): Airspace used for slow speed low-level training at or below 1,500 feet above ground level and airspeeds of 250 knots or less. SRs are listed in Department of Defense Flight Information Publication AP/1B but are not part of the Military Training Route system and are not shown on aeronautical charts. There is no overall mechanism to inform military or civilian aviators that an SR is active. Coordination with the Federal Aviation Administration to establish or modify SRs is not required.

Sortie: A single military aircraft flight from initial takeoff through final landing.

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.

Special use airspace (SUA): Consists of airspace wherein activities must be confined because of their nature, or wherein limitations are imposed upon aircraft operations that are not a part of those activities, or both. SUA consist of Military Operations Areas, warning areas, restricted areas, and alert areas. SUA descriptions are contained in FAA Order Joint Order 7400.10E, Special Use Airspace.