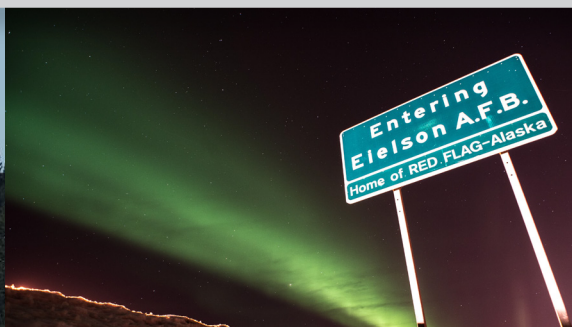


FINAL

EIELSON AIR FORCE BASE, ALASKA

Air Installations Compatible Use Zones (AICUZ) Study

July 2018





**DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES**

18 JUL 2018

MEMORANDUM FOR AREA GOVERNMENTS

FROM: 354 FW/CC
354 Broadway Ave
Eielson Air Force Base, AK 99705

SUBJECT: Air Installations Compatible Use Zones (AICUZ) Study

1. The 2018 AICUZ Study for Eielson Air Force Base (AFB) is an update of the AICUZ Study dated 1992. This update was initiated because of the future beddown of two squadrons of F-35A aircraft at Eielson AFB with first aircraft arriving in April 2020. It is a reevaluation of aircraft noise and accident potential related to United States Air Force (Air Force) flying operations. The Air Force provides the AICUZ to aid local planning mechanisms to protect the public safety and health as well as preserve the operational capabilities of Eielson AFB.
2. The AICUZ Study contains a description of the affected area around the installation. It outlines the location of runway Clear Zones (CZs), Accident Potential Zones (APZs), and noise contours, and provides recommendations for development compatible with military flight operations. It is our recommendation that local governments incorporate these recommendations into community plans, zoning ordinances, subdivision regulations, building codes, and other related documents.
3. This update provides noise contours based upon the Day-Night Average Sound Level (DNL) metric and utilizes a planning noise contour. Long-range planning by local land use authorities involves strategies to influence present and future uses of land. Due to the long-range nature of planning, the Air Force provides planning contours—noise contours based on reasonable projections of future missions and operations. AICUZ studies using planning contours provide a description of the long-term (five to ten years) aircraft noise environment for projected aircraft operations that is more consistent with the planning horizon used by state, tribal, regional, and local planning bodies.
4. We greatly value the positive relationship Eielson AFB has experienced with its neighbors over the years. As a partner in the process, we have attempted to minimize noise disturbances through such actions as minimizing night flying and avoiding flights over populated areas. We solicit your cooperation in implementing the recommendations and guidelines presented in this AICUZ Study update.



BENJAMIN W. BISHOP, Colonel, USAF
Commander

Table of Contents

Section

List of Tables.....	iii
List of Figures	iv
Abbreviations and Acronyms.....	v
1.0 Introduction	1
1.1 AICUZ Program	1
1.2 Scope and Authority	1
1.2.1 Scope	1
1.2.2 Authority.....	2
1.3 Previous AICUZ Efforts and Related Studies.....	2
1.4 Changes that Require an AICUZ Study Update.....	2
2.0 Eielson AFB, Alaska	4
2.1 Location	4
2.2 History	4
2.3 Mission	4
2.4 Host and Tenant Organizations	6
2.4.1 354th Fighter Wing	6
2.4.2 1st Air Support Operations Group.....	6
2.4.3 Detachment 1, 66th Training Squadron, Arctic Survival Training	7
2.4.4 Detachment 460, Air Force Technical Applications Center	7
2.4.5 Detachment 632, Air Force Office of Special Investigations	7
2.4.6 Detachment 1, 210th Rescue Squadron, Alaska Air National Guard.....	7
2.4.7 168th Wing, Alaska Air National Guard	7
2.5 Airfield Environment	7
2.6 Local Economic Impacts	8
3.0 Aircraft Operations	12
3.1 Aircraft Types	12
3.1.1 Assigned Aircraft.....	12
3.1.2 Transient Aircraft.....	13
3.2 Maintenance Operations.....	13
3.3 Flight Operations.....	14
3.4 Annual Aircraft Operations	15
3.5 Runway Utilization and Flight Tracks	19
3.5.1 Runway Utilization.....	19
3.5.2 Flight Tracks	19
3.6 Noise Abatement.....	23
3.7 Noise Complaints.....	24
4.0 Aircraft Noise	25
4.1 What is Sound/Noise?	25
4.2 How Sound is Perceived	26
4.3 The Day-night Average Sound Level.....	27
4.4 Noise Contours	27

4.4.1	Planning Contours	28
4.4.2	Eielson AFB Noise Contours.....	31
5.0	Community and Aircraft Safety	34
5.1	Clear Zones and Accident Potential Zones	34
5.2	Imaginary Surfaces	37
5.3	Hazards to Aircraft Flight Zone.....	40
6.0	Land Use Compatibility Analysis.....	43
6.1	Land Use Compatibility Guidelines and Classifications	43
6.2	Planning Authorities	43
6.2.1	Fairbanks North Star Borough	43
6.2.2	Other Planning Authorities	44
6.3	Land Use and Proposed Development	44
6.3.1	Existing Land Uses.....	44
6.3.2	Current Zoning.....	45
6.3.3	Future Land Use.....	45
6.4	Compatibility Concerns	48
6.4.1	Land Use Analysis	48
6.4.2	Existing Land Use Compatibility Concerns.....	49
7.0	Implementation	55
7.1	Air Force Role	55
7.2	State/Regional Roles	56
7.3	Local Government Role	56
7.4	Community Roles	58
8.0	References	60
Appendix A	Land Use Compatibility Tables	
Appendix B	Key Terms	

List of Tables

Table

Table 2-1. Total Military Personnel and Dependents by Classification and Housing (Total Persons) in FY15	10
Table 2-2. Total Civilian Personnel by Appropriated and Non-appropriated Funds (Total Persons) in FY15	10
Table 2-3. Annual Military Payroll by Category and Housing Location in FY15	10
Table 2-4. Annual Civilian Payroll by Appropriated and Non-appropriated Funds in FY15	10
Table 2-5. Summary of Construction, Contracts, and Expenditures for Materials, Equipment, and Supplies in FY15	11
Table 3-1. CY14 [Current] Annual Flight Operations.....	17
Table 3-2. Current Runway Usage and Routing	19
Table 4-1. Subjective Response to Changes in Sound Level	27
Table 4-2. Projected Annual Aircraft Flight Operations for 2018 AICUZ Noise Contours (Planning Contours for CY2021)	29
Table 4-3. Off-installation Land Area and Estimated Population within Noise Zones for the 2018 AICUZ Noise Contours at Eielson AFB.....	31
Table 5-1. Off-installation Land Area and Estimated Population within the Clear Zones and Accident Potential Zones.....	35
Table 5-2. Descriptions of Imaginary Surfaces for Military Airfields	38
Table 6-1. Generalized Land Use Categories and Noise/Safety Compatibility	51
Table 6-2. Off-installation Comprehensive Plan Land Use Acreage within AICUZ Noise Zones	52
Table 6-3. Off-installation Comprehensive Plan Land Use Acreage within Clear Zones/Accident Potential Zones	53

List of Figures

Figure

Figure 2-1. Regional Setting	5
Figure 2-2. Eielson AFB Airfield Diagram	9
Figure 3-1. Summary of Air Traffic for the Last Five Years.....	16
Figure 3-2. Departure Flight Tracks.....	20
Figure 3-3. Arrival Flight Tracks.....	21
Figure 3-4. Closed Pattern Flight Tracks	22
Figure 4-1. Typical A-weighted Sound Levels of Common Sounds	26
Figure 4-2. 2018 AICUZ Noise Contours with Gradient Shading.....	32
Figure 4-3. Comparison of 2018 and 1992 AICUZ Noise Contours	33
Figure 5-1. Runway Clear Zones and Accident Potential Zones.....	35
Figure 5-2. 2018 AICUZ Clear Zones and APZs	36
Figure 5-3. Imaginary Surfaces and Transition Planes for Fixed-wing Runways.....	37
Figure 5-4. Runway Airspace Imaginary Surfaces, Transition Planes, and Hazards to Aircraft Flight Zone	39
Figure 6-1. Comprehensive Plan Land Use and 2018 AICUZ Noise Planning Contours, Clear Zones, and APZs.....	46
Figure 6-2. Existing Zoning and 2018 AICUZ Noise Planning Contours, Clear Zones, and APZs	47
Figure 6-3. Incompatible Comprehensive Plan Land Use Surrounding Eielson AFB.....	54

Abbreviations and Acronyms

AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AFH	Air Force Handbook
AFI	Air Force Instruction
AGL	Above Ground Level
AICUZ	Air Installations Compatible Use Zones
Air Force	United States Air Force
APZ	Accident Potential Zone
ATC	Air Traffic Control
BASH	Bird/Wildlife Aircraft Strike Hazard
CFR	Code of Federal Regulations
CZ	Clear Zone
dB	Decibel
dBA	A-weighted Decibel
DNL	Day-night Average Sound Level
DoD	Department of Defense
DoDI	Department of Defense Instruction
EMI	Electromagnetic Interference
EPA	United States Environmental Protection Agency
FAA	Federal Aviation Administration
FNSB	Fairbanks North Star Borough
HAFZ	Hazards to Aircraft Flight Zone
HRMA	Housing Requirements and Market Analysis
Hz	Hertz
IFR	Instrument Flight Rules
JLUS	Joint Land Use Study
MSL	Mean Sea Level
NVG	Night Vision Goggles
PA	Public Affairs
SLUCM	Standard Land Use Coding Manual
T&G	Touch-and-Go
VFR	Visual Flight Rules
WWII	World War II

1.0 Introduction

This study is an update of the Eielson Air Force Base (AFB) Air Installations Compatible Use Zones (AICUZ) Study. The update presents and documents changes to the AICUZ since the release of the previous study in 1992. It reaffirms the United States Air Force's (Air Force's) policy of promoting public health, safety, and general welfare in areas surrounding an air installation while seeking development that is compatible with the defense flying mission. This study presents changes in flight operations since the previous study and provides planning noise contours and recommendations for achieving development that is compatible with the defense flying mission.

1.1 AICUZ Program

Military airfields attract development—people who work on the installation want to live nearby, while others want to provide services to installation employees and residents. When incompatible development occurs near an installation or training area, affected parties within the community may seek relief through political channels that could restrict, degrade, or eliminate capabilities necessary to perform the defense mission. In the early 1970s, the Department of Defense (DoD) established the AICUZ Program. The goal of the program is to protect the health, safety, and welfare of those living and working near air installations while sustaining the Air Force's operational mission. The Air Force accomplishes this goal by promoting proactive, collaborative planning for compatible development to sustain mission and community objectives.

The AICUZ Program recommends that noise zones, Clear Zones (CZs), Accident Potential Zones (APZs), and flight clearance requirements associated with military airfield operations be incorporated into local community planning programs in order to maintain the airfield's operational requirements while minimizing the impact to residents in the surrounding community. Cooperation between military airfield planners and community-based counterparts serves to increase public awareness of the importance of air installations and the need to address mission requirements and associated noise and risk factors in the public planning process. As the communities that surround airfields grow and develop, the Air Force has the responsibility to communicate and collaborate with local governments on land use planning, zoning, and similar matters that could affect the installation's operations or missions. Likewise, the Air Force has a responsibility to understand and communicate potential impacts that new and changing missions may have on the local community.

1.2 Scope and Authority

1.2.1 Scope

This AICUZ Study uses projected air operations. The Air Force provides Eielson AFB's CZs, APZs, and noise zones associated with the airfield's runways to the local communities, along with recommendations for compatible land use near the installation for

incorporation into comprehensive plans, zoning ordinances, subdivision regulations, building codes, and other related documents.

1.2.2 Authority

Authority for the Air Force AICUZ Program lies in two documents:

- Air Force Instruction (AFI) 32-7063, *Air Installations Compatible Use Zones Program*, implements Department of Defense Instruction (DoDI) 4165.57, *Air Installations Compatible Use Zones*, and applies to all Air Force installations with active runways located in the United States and its territories. This instruction provides guidance to installation AICUZ Program Managers.
- Air Force Handbook (AFH) 32-7084, *AICUZ Program Manager's Guide*, provides installation AICUZ Program Managers with specific guidance concerning the organizational tasks and procedures necessary to implement the AICUZ Program. It is written in a "how to" format and aligns with AFD 32-70, *Environmental Quality*.

1.3 Previous AICUZ Efforts and Related Studies

Previous studies relevant to this AICUZ Study include:

- Eielson AFB AICUZ (Air Force 1992);
- Fairbanks North Star Borough (FNSB) Joint Land Use Study (JLUS) (FNSB 2006);
- United States Air Force F-35A Operational Beddown – Pacific Final Environmental Impact Statement (Air Force 2016a, 2016b); and
- United States Air Force F-35A Operational Beddown – Pacific Final Supplemental Environmental Impact Statement (Air Force 2017).

1.4 Changes that Require an AICUZ Study Update

This 2018 Eielson AFB AICUZ Study updates the 1992 AICUZ Study. This update provides the installation's current flight tracks, CZs, APZs, and noise zone information and also presents the most accurate representation of the installation's future aircraft activities, as projected to 2021. As such, the AICUZ Program allows surrounding communities to consider both current and potential activities when making land use decisions.

As the DoD aircraft fleet mix and training requirements change over time, the resulting flight operations change as well. These changes can affect noise contours and necessitate an AICUZ Study update. Additionally, non-operational changes, such as noise modeling methods and a local community's land use, may also require the need for an

update. Per AFI 32-7063 and AFH 32-7084, the primary changes since the previous AICUZ Study that necessitate this update include:

- Changes to planning noise contours due to the beddown of two squadrons of F-35A aircraft at Eielson AFB beginning in late 2019;
- Introduction of new aircraft due to the aforementioned F-35A aircraft beddown;
- Increase in air operations due to the aforementioned F-35A aircraft beddown; and
- Changes in AICUZ AFI.

More information on these changes can be found in Section 3.4.1 of this report.

2.0 Eielson AFB, Alaska

2.1 Location

Eielson AFB is located approximately 13 miles southeast of the city of Fairbanks and 5 miles southeast of the city of North Pole in FNSB, Alaska (Figure 2-1). The installation occupies 19,789 acres. The Richardson Highway (Highway 2) runs along the airfield on the western side of the installation.

2.2 History

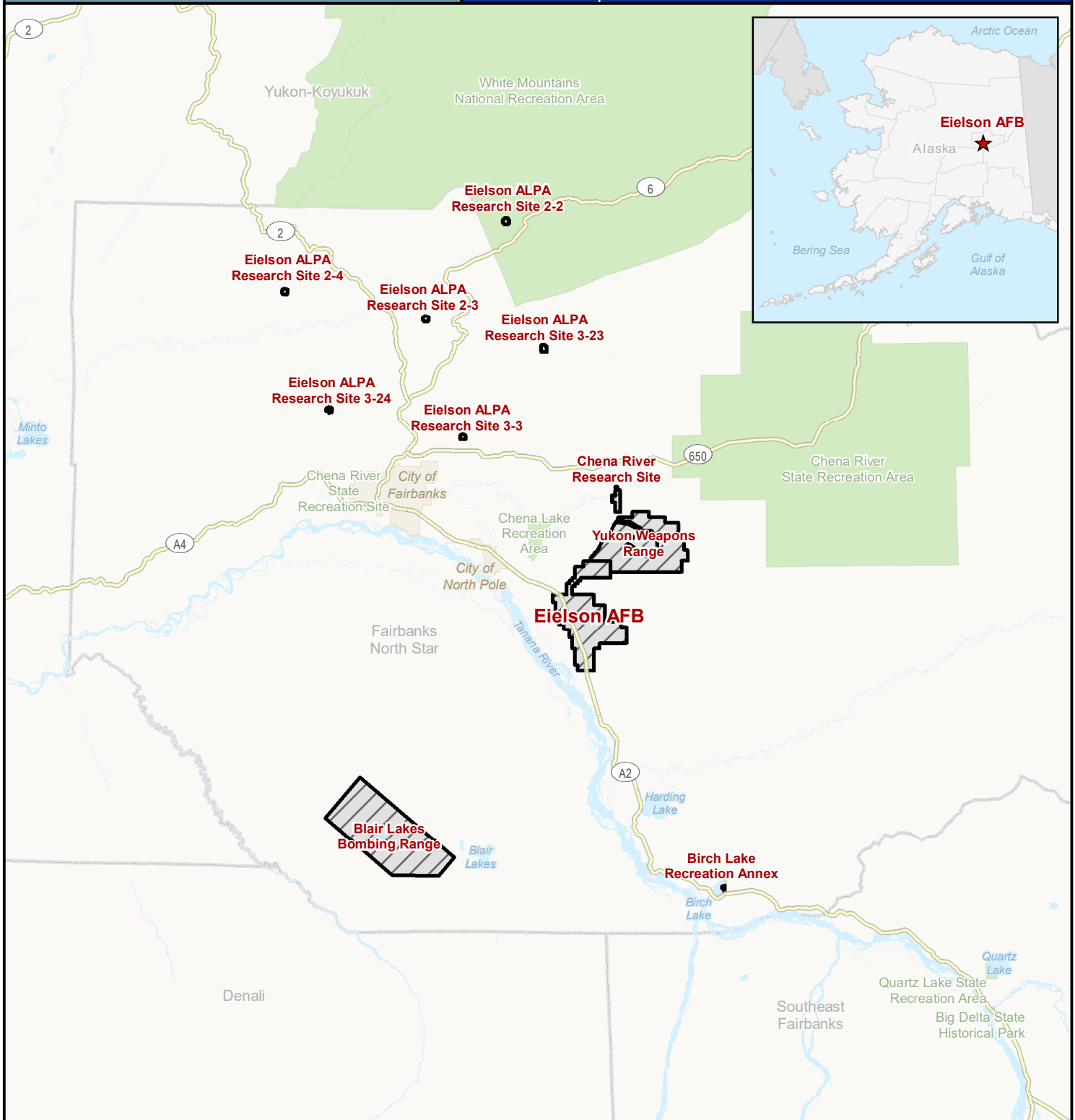
Eielson AFB was constructed in 1943 as the “26-Mile” satellite airfield of Ladd Field, now Fort Wainwright. After a brief, post-World War II (WWII) hiatus, the airfield became a full-fledged Air Force installation during the Cold War. The transfer of Ladd Field from the Air Force to the Army in 1961 established Eielson AFB as the only Air Force installation in the area.

The installation has hosted many missions and aircraft over the years. For example, from 1991 to 1995, Eielson AFB served as the main operating base for 16 Cope Thunder exercises, the Pacific Air Forces’ premier simulated combat airpower employment exercise. The installation continues to host Cope Thunder (re-designated as RED FLAG-Alaska in 2006) with Joint Base Elmendorf-Richardson located in Anchorage, Alaska. RED FLAG-Alaska is a Pacific Air Forces-directed field training exercise for U.S. and international forces flown under simulated air combat conditions. It is conducted on the Joint Pacific Alaska Range Complex with air operations flown primarily out of Eielson AFB and Joint Base Elmendorf-Richardson.

In 2005, the DoD recommended the transfer of Eielson AFB’s fighter squadrons, adding the installation to the Base Realignment and Closure Commission’s closure list (Alaska Journal of Commerce 2005). The cities of Fairbanks and North Pole lobbied against this recommendation, an effort that was ultimately successful. Per a 2016 Record of Decision, the beddown of up to 54 primary and backup F-35A aircraft at Eielson AFB will begin in 2019. The beddown and operation of the F-35A within the Pacific Air Forces Area of Responsibility meets directives to reduce vulnerabilities and provide rapid worldwide deployment. The F-35A aircraft will replace the F-16 aircraft currently located at Eielson AFB.

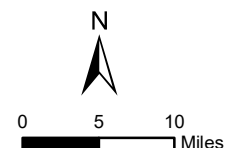
2.3 Mission

The mission of Eielson AFB is to prepare U.S. and partner nation joint forces for 21st century combat, deploy combat-ready Airmen in support of worldwide operations, and provide a strategic power projection platform.



Legend:

- County Boundary
- State Highway
- City
- Waterbody
- Park/Recreation Area
- Installation



Source: AFCEC 2017;
ESRI 2016; FHWA 2017.
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2.4 Host and Tenant Organizations

2.4.1 354th Fighter Wing

As the northernmost U.S. fighter wing, the 354th Fighter Wing has been the host unit at Eielson AFB since 1993. The wing conducts close air support, battlefield air interdiction, and wartime operations support, and hosts visiting aircrews from the four armed services and allied partners. The 354th Fighter Wing is comprised of the following groups:



- **354th Operations Group:** provides combat forces, exercise, and air-bridge support through a diverse array of specialties including intelligence, operations and scheduling, air traffic control (ATC), airfield management, and weather observation/forecasting;
- **354th Maintenance Group:** provides aircraft and munitions maintenance support to the 354th Fighter Wing's F-16 aggressor aircraft as well as RED FLAG-Alaska, tanker task force, and transient and special mission aircraft operating at Eielson AFB;
- **354th Mission Support Group:** supports the 354th Fighter Wing by providing combat-ready forces, equipment, and essential services while sustaining installation infrastructure and providing programs to improve quality of life for the Eielson community; and
- **354th Medical Group:** provides outpatient primary healthcare under the TRICARE program for all eligible beneficiaries living in the Eielson area.

The wing has participated in almost every major conflict in which the United States has been involved, including WWII and the Persian Gulf War.

2.4.2 1st Air Support Operations Group

The 1st Air Support Operations Group was administratively assigned to the 354th Fighter Wing in 2012. The group directs four squadrons and provides an Air Support Operations Center, Tactical Air Control Parties, and Battlefield Weather Teams to Army combat units.



2.4.3 Detachment 1, 66th Training Squadron, Arctic Survival Training

Detachment 1, 66th Training Squadron, conducts Arctic Survival Training at Eielson AFB for members of all branches of the military and other uniformed services. The course includes familiarization with the arctic environment, medical support, personal protection, sustenance, and signaling.



2.4.4 Detachment 460, Air Force Technical Applications Center

Detachment 460, Air Force Technical Applications Center, monitors and records natural and man-made seismic disturbances in the earth in conjunction with the Air Force Technical Application Center's nuclear treaty monitoring mission. The detachment operates and maintains the most comprehensive seismic network in the United States Atomic Energy Detection System and has an area of responsibility that stretches from the Arctic Circle to the Canadian border and out to the Aleutian Island Chain.



2.4.5 Detachment 632, Air Force Office of Special Investigations

Detachment 632, Air Force Office of Special Investigations, investigates offenses and illegal activities (e.g., espionage, terrorism, crimes against property, violence against people, larceny) that undermine the mission of the Air Force or the DoD. The detachment is responsible for Air Force concerns in interior and northern Alaska and reports to the 6th Field Investigations Region based at Headquarters Pacific Air Forces.



2.4.6 Detachment 1, 210th Rescue Squadron, Alaska Air National Guard

Detachment 1, 210th Rescue Squadron, Alaska Air National Guard, provides maintenance and operations support for HH-60G Pave Hawk rescue helicopters deployed to Eielson AFB from Kulis Air National Guard Base in Anchorage. The detachment also provides search-and-rescue for both military and civilian aviators north of the Alaska Range.



2.4.7 168th Wing, Alaska Air National Guard

The 168th Wing, Alaska Air National Guard, trains and equips KC-135R combat crews to provide air refueling in support of Pacific Air Forces Operations Plans and worldwide refueling tasks. The Wing is the only Arctic region refueling unit for all Pacific Air Forces.



2.5 Airfield Environment

The Eielson AFB airfield is situated slightly northeast of the center of the installation. The runway, Runway 14/32, is 14,540 feet long, 150 feet wide, and oriented in a southeast-northwest direction (Figure 2-2). It is the second longest runway in North America (Air Force 2016a). Day and night departures and arrivals primarily occur to the northwest on Runway 32. The runway currently supports an average of 18,963 takeoffs and landings per year by Eielson-based aircraft (i.e., F-16s and KC-135s), as well as transient aircraft. Within Eielson Class D airspace, Eielson ATC provides radar vectoring, sequencing, and separation for aircraft using instrument flight rules (IFR) and visual flight rules (VFR). The Fairbanks Terminal Radar Approach Control provides ATC approach and departure services for the Fairbanks International Airport as well as for military aircraft operating out of Eielson AFB and Fort Wainwright.

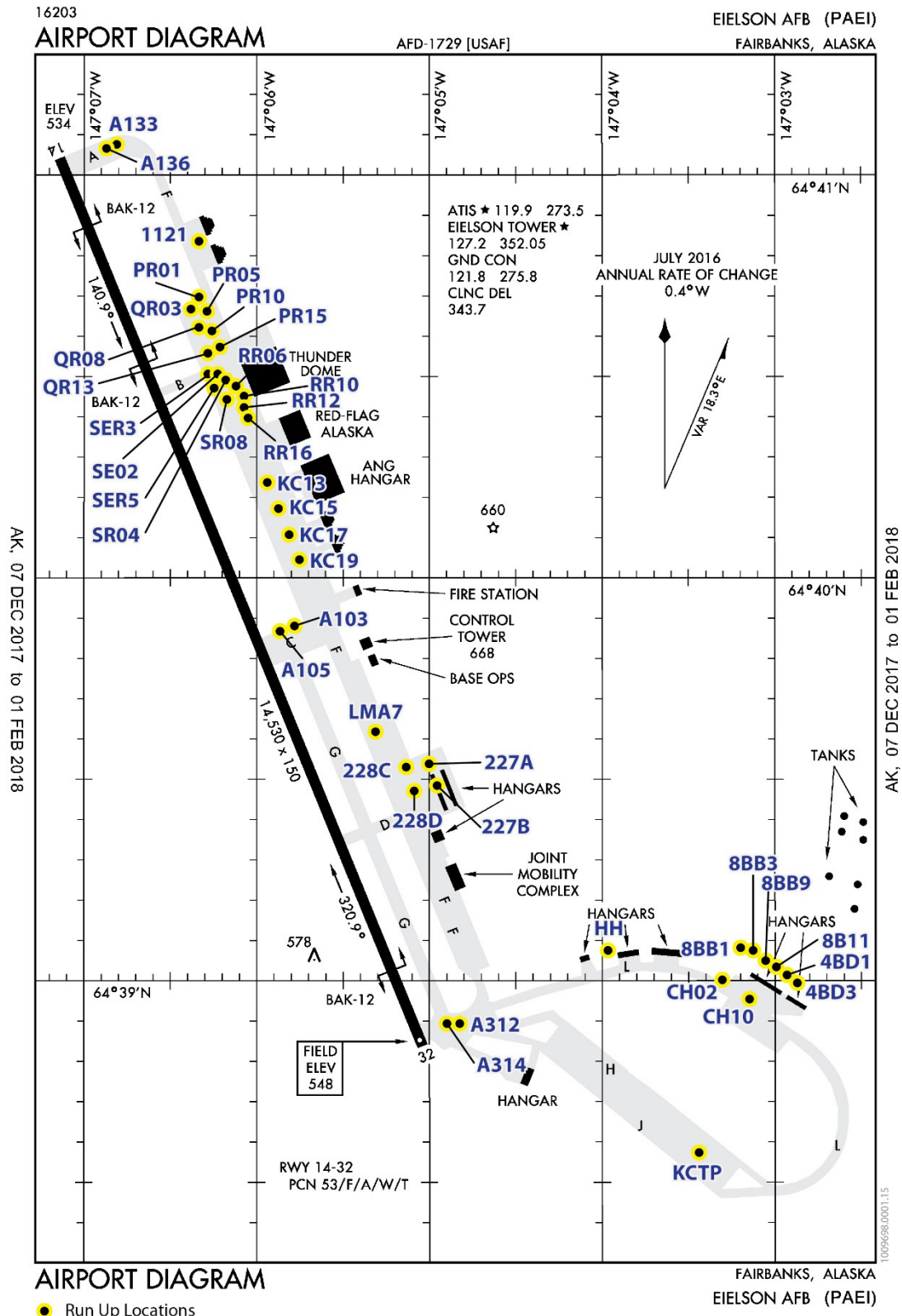
A runway is typically used in both directions and counted as two separate runways, depending on the direction of the departure. Each direction is labeled as a separate runway and numbered based on its magnetic heading, divided by 10 and rounded to a whole number. Parallel runways have the same heading and are distinguished by the suffix "L" for "left" and "R" for "right."

2.6 Local Economic Impacts

The military provides direct, indirect, and induced economic benefits to local communities through jobs and wages. Benefits include employment opportunities and increases in local business revenue, property sales, and tax revenue. The economic impact of a military installation is based on annual payroll (jobs and salaries), annual expenditures, and the estimated annual dollar value of the jobs created. The military further contributes to the economic development of communities through increased demand for local goods and services and increased household spending by military and civilian employees.

According to the Fairbanks Economic Development Corporation, DoD operations bring approximately \$1.2 billion into the local economy. The military industry is the largest single contributor for the local economy and generates 20 percent (11,552 jobs) of all jobs in FNSB. This percentage equals 38 percent of all wages, salary, and benefit payments in the region. Eielson AFB is responsible for 4,300 of the 16,000 jobs created by DoD operations in the local economy. Four induced or community jobs are created for every \$1 million dollars Eielson AFB or Fort Wainwright bring into the local economy (Fairbanks Economic Development Corporation, n.d.). Tables 2-1 to 2-5 provide summaries of personnel for Eielson AFB, the economic impact of the installation, military and civilian payroll, and construction, contracts, and expenditures for materials, equipment, and supplies.

Figure 2-2. Eielson AFB Airfield Diagram



Sources: Airnav.com 2018, Air Force 2016b.

Table 2-1. Total Military Personnel and Dependents by Classification and Housing (Total Persons) in FY15

Classification	On-installation Residents	Off-installation Residents	Total
Active Duty	1,315	641	1,956
Air Force Reserve/Air National Guard	25	315	340
Active Duty Military Dependents	1,550	713	2,263
Total	2,890	1,669	4,559

Source: Eielson AFB 2015

Table 2-2. Total Civilian Personnel by Appropriated and Non-appropriated Funds (Total Persons) in FY15

Appropriated Fund Civilians	Persons
General Schedule	288
Federal Wage Board	188
Other	54
Sub-total	530
Non-appropriated Fund Civilians	Persons
Civilian Non-appropriated Fund	194
Civilian Base Exchange	100
Contract Civilians	2,835
Sub-total	3,129
Total	3,659

Source: Eielson AFB 2015

Table 2-3. Annual Military Payroll by Category and Housing Location in FY15

Classification	On-installation Residents	Off-installation Residents	Total
Active Duty	\$74,535,486	\$40,352,742	\$114,888,228
Air National Guard /Reserve	\$2,766,300	\$34,804,800	\$37,571,100
Non-extended Active Duty Air National Guard/Reserve	\$0	\$18,871,200	\$18,871,200
Total	\$77,301,786	\$94,028,742	\$171,330,528

Source: Eielson AFB 2015

Table 2-4. Annual Civilian Payroll by Appropriated and Non-appropriated Funds in FY15

Appropriated Fund Civilians		Amount
General Schedule		\$15,586,246
Federal Wage Board		\$14,865,241
Other		\$1,799,409
Sub-total		\$32,250,896
Non-appropriated Fund Civilians		Amount
Civilian Non-appropriated Fund		\$4,246,766
Civilian Base Exchange		\$2,447,687
Sub-total		\$6,694,453
Total		\$38,945,349

Source: Eielson AFB 2015

Table 2-5. Summary of Construction, Contracts, and Expenditures for Materials, Equipment, and Supplies in FY15

Expense Category	Amount
Commissary (inventory)	\$504,137
Army and Air Force Exchange Service (inventory)	\$978,591
Health (TRICARE)	\$2,117,776
Education (tuition assistance)	\$1,223,465
Temporary Duty	\$19,389,200
Other Materials, Equipment, Supplies	\$33,957,660
Service Contracts	\$5,551,527
Construction	\$62,574,100
Sub-total	\$126,296,456
Total Annual Expenditure	\$126,296,456

Source: Eielson AFB 2015

3.0 Aircraft Operations

Aircraft operations are the primary source of noise associated with a military air installation. The level of noise exposure relates to a number of variables, including the aircraft type, engine power setting, altitude flown, direction of the aircraft, flight track, temperature, relative humidity, frequency, and time of operation (day/night). This chapter discusses the aircraft based at or transient to Eielson AFB, the types and number of operations conducted at the airfield, and the runways and flight tracks used to conduct the operations.

3.1 Aircraft Types

There are two primary types of aircraft operating at Eielson AFB: fixed-wing (airplanes and jets) and rotary-wing (helicopters). These aircraft are permanently based at Eielson AFB and are the most common aircraft conducting flight operations at the installation. Aircraft that are not permanently assigned to the installation, but conduct operations from the installation on an occasional basis, are referred to as “transient” aircraft. Brief descriptions of assigned aircraft and the most common transient aircraft at Eielson AFB are provided below.

3.1.1 Assigned Aircraft

- **F-16 Fighting Falcon:** a multi-role, highly maneuverable, fighter aircraft. F-16s are used in air-to-air combat and air-to-surface attack by the United States and allied nations.
- **KC-135 Stratotanker:** an aerial refueling and airlift aircraft. KC-135s provide aerial refueling support to Air Force, Navy, Marine Corps, and allied nation aircraft and transport litter and ambulatory patients during aeromedical evacuations.
- **F-35A Lightning II:** the Air Force’s fifth-generation fighter, which provides next-generation stealth, enhanced situational awareness, and reduced vulnerability for the United States and allied nations (Air Force 2014). Per a 2016 Record of Decision, the beddown of up to 54 primary and backup F-35A aircraft at Eielson AFB will begin in 2019.



3.1.2 *Transient Aircraft*

During the normal work week, helicopters from the 210th Rescue Squadron stationed at Joint Base Elmendorf-Richardson are present in the northern portion of the airfield to provide rescue for fighter aircraft north of the Alaska Range. Eielson AFB also supports several major flying exercises that introduce more than a dozen types of transient aircraft, including fighter/attack aircraft, bombers, large-body jets, turboprops, and helicopters from U.S. major units and allied nations (Air Force 2016a, 2016b). Operations at Eielson AFB temporarily increase during large-scale simulated combat exercises, such as RED FLAG-Alaska and Northern Edge. During RED FLAG-Alaska exercises, which typically occur four times a year for two weeks at a time, Eielson AFB hosts as many as 60 transient aircraft (Eielson AFB 2012). Northern Edge, a biennial Pacific Command contingency exercise, involves nearly 200 aircraft.



3.2 Maintenance Operations

Maintenance is an integral part of any flying operation and requires a dedicated team of professionals to ensure that units can meet their flying requirements. Two key tasks in maintaining aircraft are low- and high-powered engine maintenance runs.

Aircraft maintainers may conduct engine maintenance runs at power settings ranging from idle to maximum power. Maintainers typically conduct low- to mid-range-powered engine maintenance runs on aircraft parking ramps or just outside of maintenance hangars. High-powered engine maintenance runs are typically conducted in test cells (for out-of-frame engine testing) and in acoustical enclosures, commonly referred to as “hush houses” (i.e., buildings specifically designed to muffle engine noise during in-frame testing). At Eielson AFB, there are 42 run-up locations distributed across the airfield, as shown on Figure 2-2 (see Section 2.6) (Air Force 2016b). Quiet hours are in effect for all aircraft operations from 10:00 p.m. until 6:00 a.m. local time, including

restrictions on maintenance operations (Air Force 2016a). Mission necessity may require maintenance engine runs during nighttime hours. Noise associated with these operations is included in the noise analysis for the Eielson AFB noise contours.

3.3 Flight Operations

Flight activities, including where aircraft fly, how high they fly, how many times they fly over a specific area, and the time of day they operate, must be fully evaluated to understand the relationship of flight operations and land use. This section discusses typical flight operations for aircraft based or visiting at Eielson AFB.

Each time an aircraft crosses over a runway threshold (the beginning or ending of a runway's useable surface) to either takeoff, practice an approach, or land, it is counted as a single flight operation. For example, a departure counts as a single operation, as does an arrival. As another example, when an aircraft conducts a pattern (a departure followed by an immediate return), it counts as two operations because the aircraft crosses both the approach and departure ends of the runway during the pattern.

The following list highlights typical operations utilized during normal or increased flight operations. Each flight track utilized is designed to maximize flight operations and, when possible, minimize the effects of noise.

- **Takeoff:** When an aircraft is positioned on the runway, the engine power is set to facilitate movement and eventual flight.
- **Departure:** For the purpose of air traffic sequencing, separation, noise abatement, compliance with avoidance areas, and overall safety of flight, aircraft follow specific ground tracks and altitude restrictions as they depart the airfield's immediate airspace.
- **Straight-in Arrival:** An aircraft performing a straight-in arrival aligns with the runway extended centerline and begins a gradual descent for landing. This type of approach enables an aircraft to maintain a smooth, stable, and steady approach and requires no additional maneuvering.
- **Overhead Break Arrival:** An expeditious arrival using VFR. The aircraft arrives over the airfield on the runway centerline at a specified point and altitude and then performs a 180-degree "break turn" away from the runway to enter the landing pattern. Once established, the pilot lowers the landing gear and flaps and then performs a second 180-degree descending turn toward the runway centerline to land.
- **Pattern Work:** Pattern work refers to traffic pattern training where the pilot performs takeoffs and landings in quick succession by taking off, flying the pattern, and then landing. A closed pattern consists of two portions, a takeoff/departure and an approach/landing; a complete closed pattern is counted as two operations because the aircraft crosses over a runway

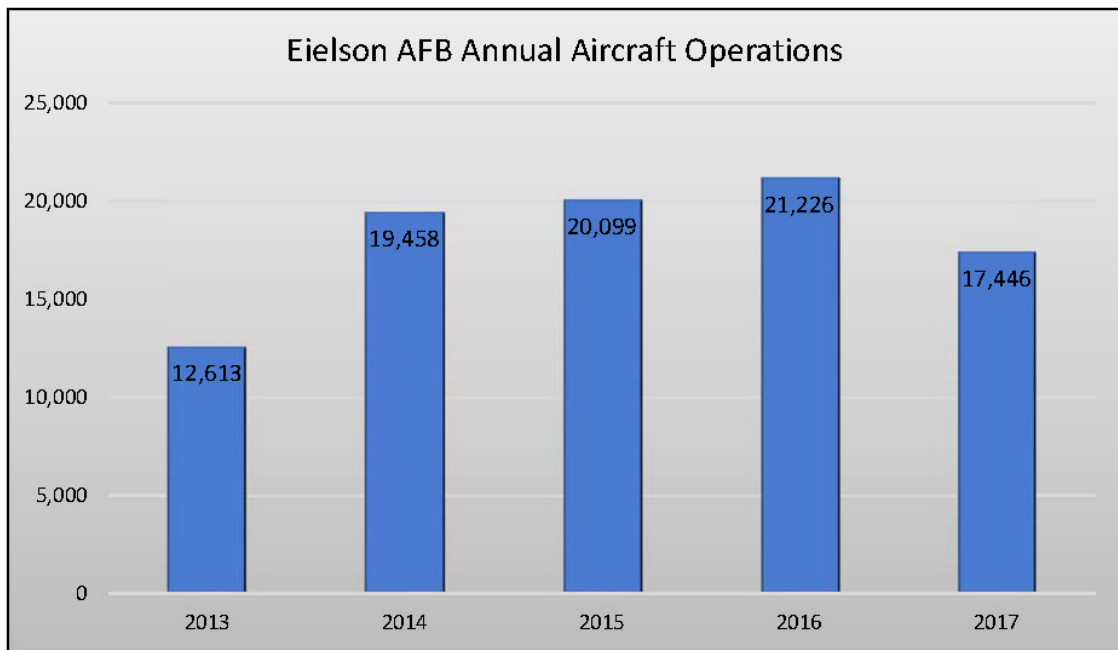
threshold twice, once on departure and once on arrival. Traffic pattern training is demanding and utilizes all of the basic flying maneuvers a pilot learns—takeoffs, climbs, turns, climbing turns, descents, descending turns, and straight and level landings.

- **Low Approach:** A low approach is an approach to a runway that does not result in a landing, but rather a descent towards the runway (usually below 500 feet above ground level [AGL]) followed by a climb-out away from the airfield. Pilots perform low approaches for a number of reasons, including practicing to avoid potential ground obstructions (e.g., vehicles, debris, stray animals).
- **Touch-and-Go (T&G):** A T&G landing pattern is a training maneuver that involves landing on a runway and taking off again without coming to a full stop. Usually, the pilot then circles the airfield in a defined pattern, known as a circuit, and repeats the maneuver.
- **Ground Control Approach (GCA):** GCA is a radar or “talk down” approach directed from the ground by ATC. ATC personnel provide pilots with verbal course and glide slope information, allowing them to make an instrument approach during inclement weather. The GCA generally utilizes a “box-shaped” flight pattern with four 90-degree turns performed at a set altitude and is used to practice a variety of approach procedures at an airfield.
- **Radar Approach:** Radar approaches are instrument approaches performed with active assistance from ATC during poor weather conditions. ATC personnel direct the aircraft toward the runway centerline. Once established on the centerline, pilots use aircraft instruments to maintain runway alignment and adherence to altitude restrictions until the pilot is able to acquire visual sight with the runway environment. Pilots often practice this type of approach to maintain proficiency.
- **Simulated Flame-out:** This is a visual flight maneuver used to simulate a landing recovery from a complete loss of engine thrust. To execute the maneuver, a pilot must establish the aircraft on a specified flight profile (altitude, airspeed, position over the airfield) that would allow the aircraft to glide safely across the runway threshold in a position to land. If properly executed, the maneuver should not require the use of additional engine power until after the maneuver is complete.

3.4 Annual Aircraft Operations

Figure 3-1 provides annual aircraft operations at Eielson AFB for the last five years. Table 3-1 details aircraft operations for 2014 and reflects the actual number of aircraft operations that occurred in 2014. Total annual operations account for each departure and arrival, including those conducted as part of a1 pattern operation.

Figure 3-1. Summary of Air Traffic for the Last Five Years



Source: Air Force 2016b

Table 3-1. CY14 [Current] Annual Flight Operations

Aircraft	Departures ¹			Arrivals ²			Closed Patterns ³			Totals		
	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total
Based Aircraft												
F-16C	3,465	35	3,500	3,473	27	3,500	3,810	-	3,810	10,748	62	10,810
F-35A	-	-	-	-	-	-	-	-	-	-	-	-
GASEPF	122	-	122	122	-	122	549	-	549	793	-	793
KC-135R	361	105	466	309	157	466	1,614	1,076	2,690	2,284	1,228	3,512
Transient Aircraft												
A-10A	33	-	33	33	-	33	-	-	-	66	-	66
AV-8B	8	-	8	8	-	8	-	-	-	16	-	16
B-52H	6	-	6	6	-	6	-	-	-	12	-	12
C-5	83	2	85	84	1	85	-	-	-	167	3	170
C-9A	1	-	1	1	-	1	-	-	-	2	-	2
C-12	58	-	58	58	-	58	-	-	-	116	-	116
C-21A	12	-	12	12	-	12	-	-	-	24	-	24
C-130H&N&P	81	-	81	79	2	81	-	-	-	160	2	162
EA-6B	4	-	4	4	-	4	-	-	-	8	-	8
F-15E	34	2	36	36	-	36	-	-	-	70	2	72
F-16C	115	2	117	94	23	117	-	-	-	209	25	234
F-22	7	-	7	6	-	6	-	-	-	13	-	13
FA-18C/D	12	-	12	13	-	13	-	-	-	25	-	25
FA-18E/F	12	-	12	11	-	11	-	-	-	23	-	23
H-60	1,030	-	1,030	1,030	-	1,030	188	-	188	2,248	-	2,248
KC-10A	54	4	58	55	3	58	-	-	-	109	7	116
KC-135R	141	11	152	144	8	152	-	-	-	285	19	304
TORNADO	3	-	3	4	-	4	-	-	-	7	-	7
737-700	20	2	22	21	1	22	-	-	-	41	3	44
747-400	12	1	13	12	1	13	-	-	-	24	2	26
767-CF6	23	2	25	24	1	25	-	-	-	47	3	50
Grand Total	5,697	166	5,863	5,639	224	5,863	6,161	1,076	7,237	17,497	1,356	18,853

Table 3-1. CY14 [Current] Annual Flight Operations

Aircraft	Departures ¹		Arrivals ²		Closed Patterns ³			Totals	
	Day 7AM-10PM	Night 10PM-7AM	Day 7AM-10PM	Night 10PM-7AM	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM
Total									

Source: Air Force 2016b

Notes:

- ¹ Sum of "Departure" and "Departure – Min Risk" columns from Table E-12, "Annual Airfield Flight Operations for Baseline (CY14)" of the Final EIS, Volume II, Appendix E (Air Force 2016b).
- ² Sum of "Arrival – Vectored", "Arrival – IFR", "Arrival – VFR Other", "Arrival – Pitchout", "Arrival – SFO", and "Arrival – Min Risk" columns from Table E-12, "Annual Airfield Flight Operations for Baseline (CY14)" of the Final EIS, Volume II, Appendix E (Air Force 2016b).
- ³ Sum of "Pattern – IFR", "Pattern – VFR", and "Pattern – SFO" columns from Table E-12, "Annual Airfield Flight Operations for Baseline (CY14)" of the Final EIS, Volume II, Appendix E (Air Force 2016b).

3.5 Runway Utilization and Flight Tracks

3.5.1 Runway Utilization

The frequency with which aircraft utilize a runway involves a variety of factors including, but not limited to:

- Airfield environment (layout, lights, runway length);
- Direction of prevailing winds;
- Location of natural terrain features (rivers, lakes, mountains, and other features);
- Wildlife activity;
- Number of aircraft in the pattern; and/or
- Preference of a runway for the purpose of safety and noise abatement.

Installation Operations, ATC personnel, and the Supervisor of Flying establish the runway in use. Aviation planners adjust the pattern procedures accordingly to maximize air traffic flow efficiency. Table 3-2 lists how frequently each runway at Eielson AFB is currently used.

Table 3-2. Current Runway Usage and Routing

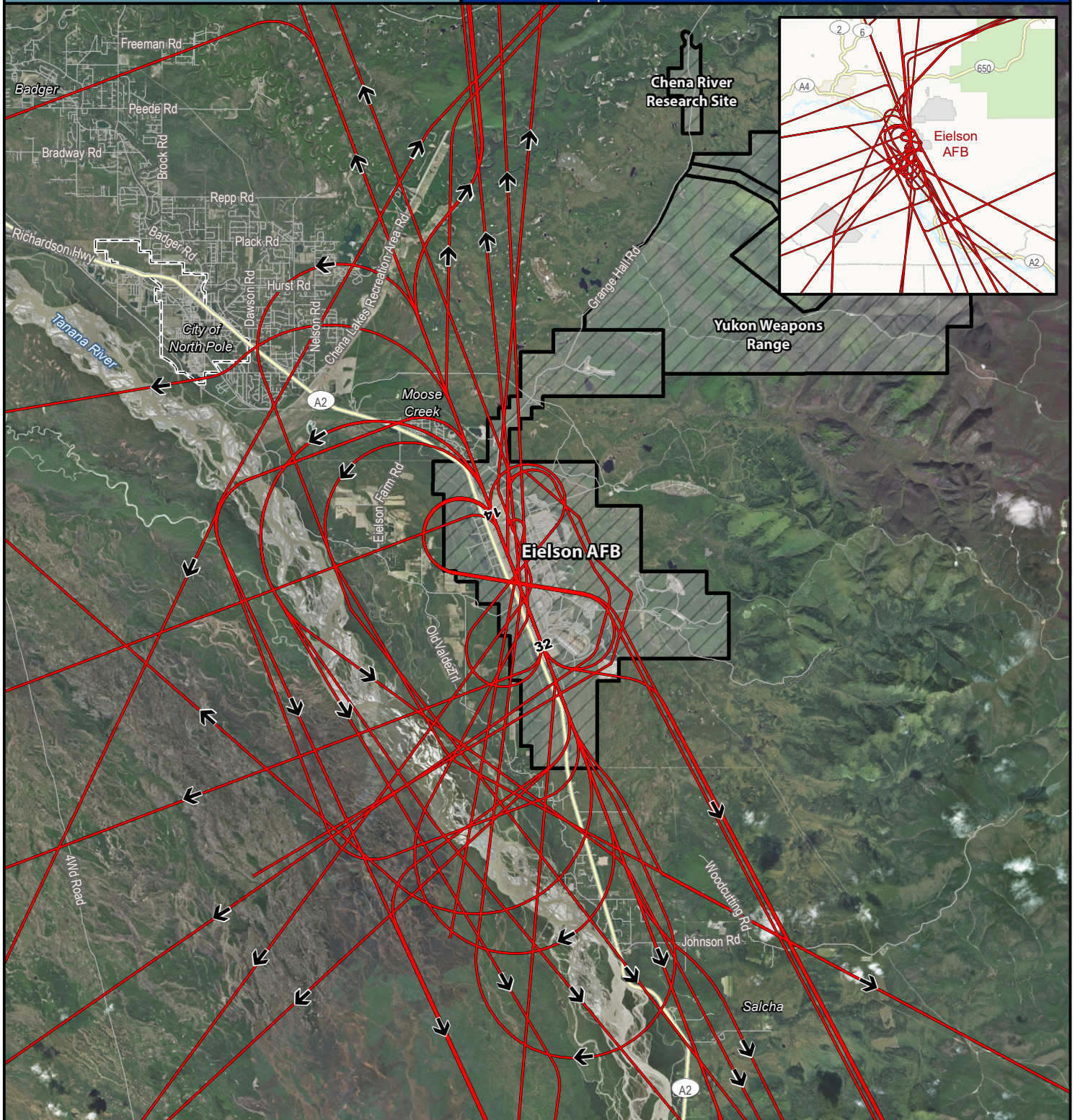
Runway Direction	Arrival (percent)	Departure (percent)
Runway 32 (arriving from the south and/or departing to the north)	90	90
Runway 14 (arriving from the north and/or departing to the south)	10	10

Source: Air Force 2016b

3.5.2 Flight Tracks

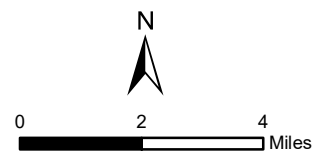
Each runway has designated flight tracks that provide for the safety, consistency, and control of an airfield. Flight tracks depict where aircraft fly in relation to an airfield. They are designed for departures, arrivals, and for pattern work procedures, and are designated for each runway to facilitate operational safety, noise abatement, air crew consistency, and the efficient flow of air traffic within the tower's controlled airspace. Aircraft flight tracks are not set "highways in the sky." While we show flight tracks as lines on the map, they are actually bands. Aircraft de-confliction, configuration, pilot technique, takeoff weight, and wind all affect the actual path taken on any given flight.

Figures 3-2, 3-3, and 3-4 present the flight tracks for Eielson AFB.

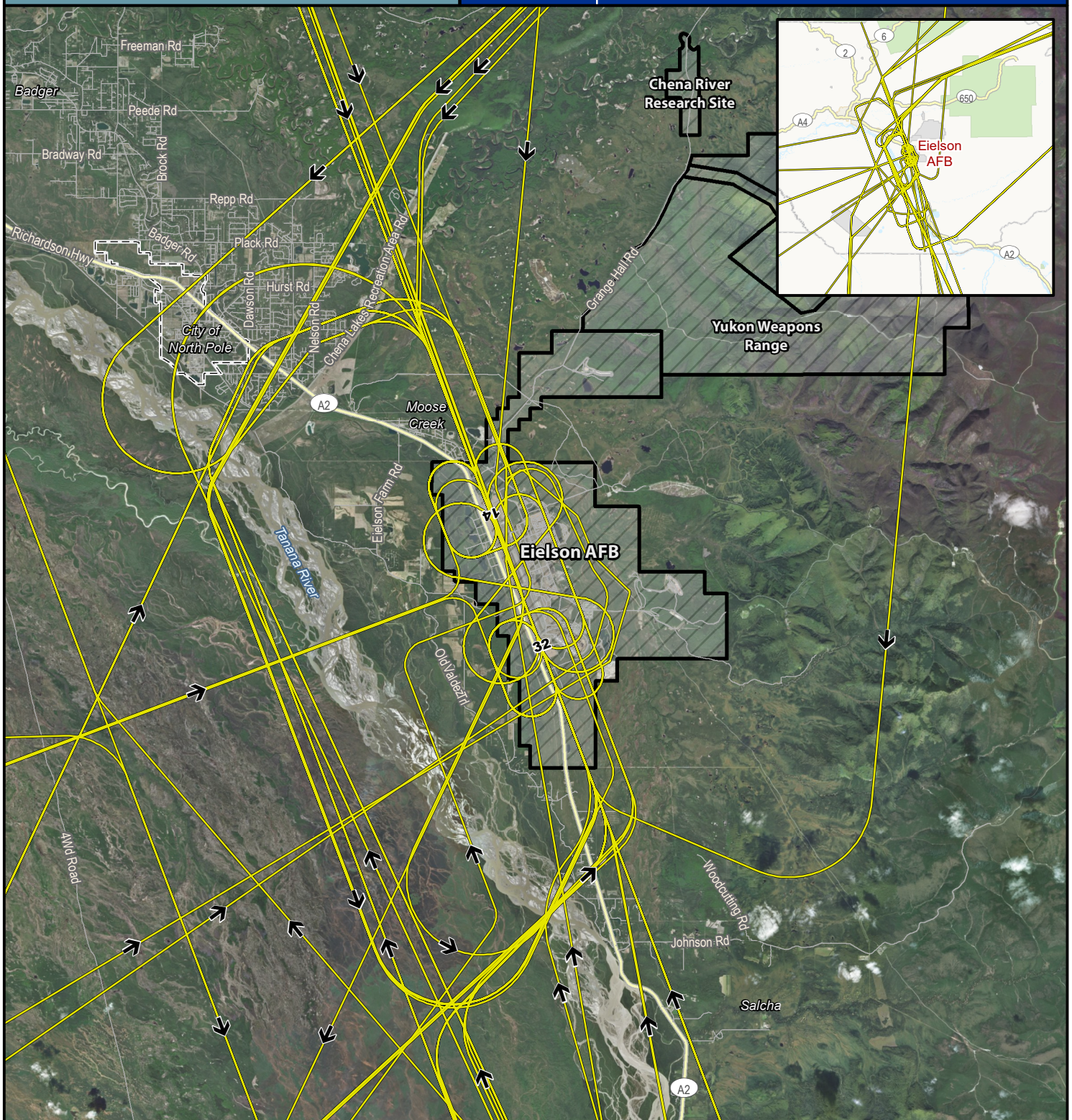


Legend:

- City Boundary
- State Highway
- Street
- Runway
- Departure Flight Track
- Installation

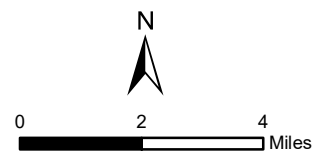


Source: AFCEC 2017, 2018; Digital Globe 2015;
ESRI 2016; FHWA 2017.
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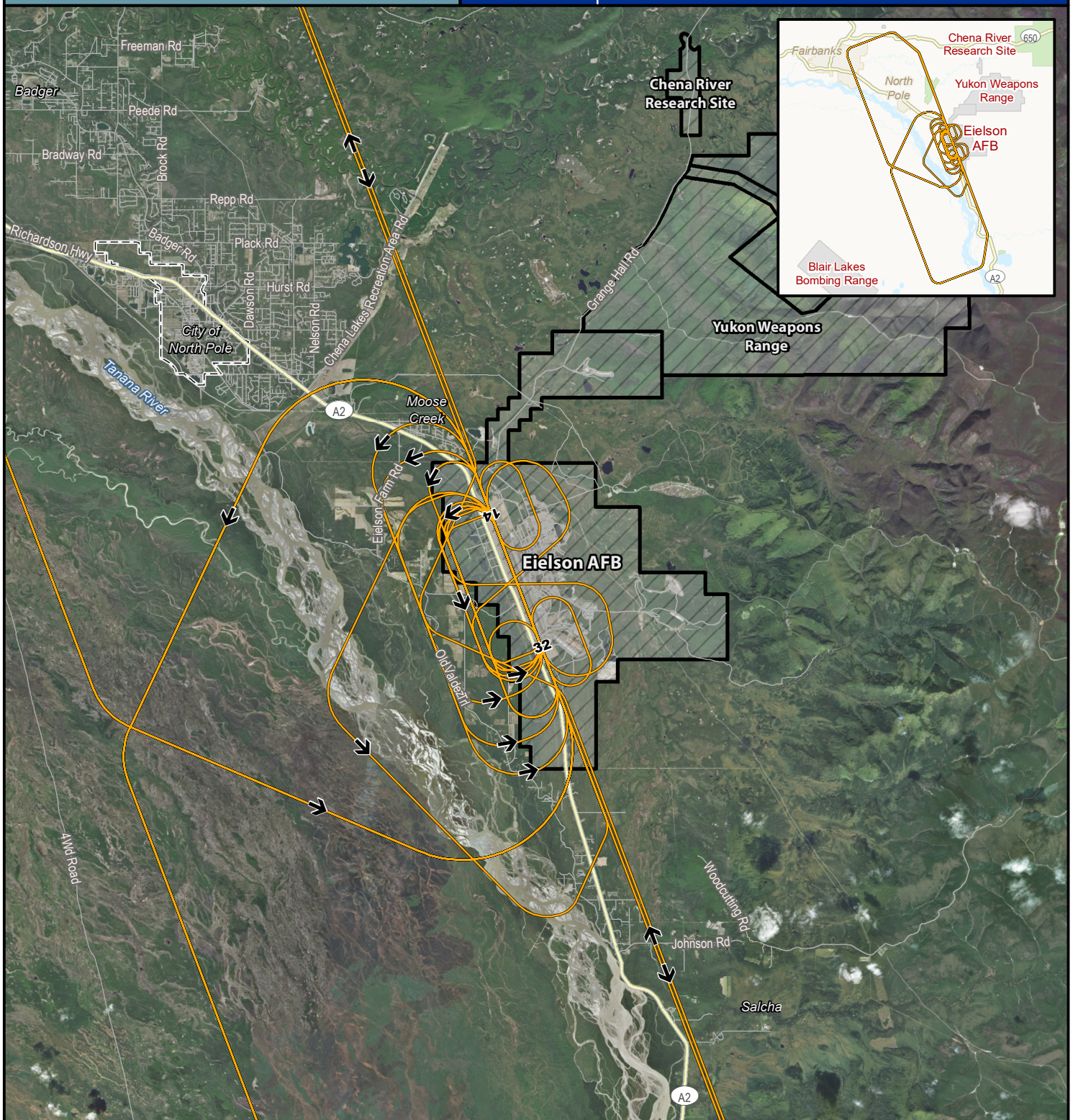


Legend:

- City Boundary
- State Highway
- Street
- Runway
- Arrival Flight Track
- Installation



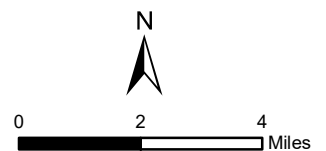
Source: AFCEC 2017, 2018; Digital Globe 2015;
ESRI 2016; FHWA 2017.
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Legend:

- City Boundary
- State Highway
- Street
- Runway
- Closed Pattern Flight Track*
- Installation

*Note - Flight track directional arrows assume left-hand turns.



Source: AFCEC 2017, 2018; Digital Globe 2015; ESRI 2016; FHWA 2017.
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3.6 Noise Abatement

The Air Force recognizes that noise from military operations may cause concern for people living near military installations.

For this reason, the Air Force has established a Noise Program aimed at reducing and controlling the emission of noise and vibrations associated with the use of military aircraft, weapon systems, and munitions, while maintaining operational requirements. The result is the implementation of various strategies, techniques, and procedures documented under the Eielson AFB Noise Abatement Program and that are aimed at protecting persons and structures from the harmful effects of noise and vibrations.

Eielson AFB noise abatement procedures include the following:

- All aircraft avoid flying below 3,500 feet mean sea level (MSL) over installation housing and populated areas in Moose Creek, Fort Wainwright, and Fairbanks;
- Quiet hours are in effect for all aircraft operations (including maintenance) from 10:00 p.m. until 6:00 a.m. local time. During quiet hours, the pattern is closed and all aircraft use a straight-in approach for landing; and
- Runway 32 is the predominant runway for arrivals based on local wind conditions. When using this runway, aircraft approach the installation from the south and land pointing northward on Runway 32 (Air Force 2016a). This has the added benefit of reducing noise over populated areas south of the base in and near Salcha.

The F-35A would use existing standard departure and arrival routes, as well as noise abatement procedures already in place at Eielson AFB (e.g., quiet hours, engine run-up times and locations). Once the beddown is complete, approximately 96 percent of the total airfield operations would occur during environmental daytime hours (i.e., 7:00 a.m. to 10:00 p.m.) and approximately 4 percent would occur during environmental nighttime hours (10:00 p.m. to 7:00 a.m.) (Air Force 2016a).

Installation leadership periodically reviews flight operations and their potential impact on surrounding communities. This requirement facilitates the planning, designation, and establishment of flight tracks over sparsely populated areas and/or waterways as often as practicable to balance operational safety and reduce noise exposure levels in surrounding communities.

3.7 Noise Complaints

At times, military operations may generate noise complaints. The Air Force evaluates all noise complaints to ensure future operations, when possible, do not generate unacceptable noise. Concerned citizens are encouraged to contact the Eielson AFB 354th Fighter Wing Public Affairs (PA) Office with any noise complaints. The Eielson AFB PA Office can be reached at 907-377-2116. During RED FLAG-Alaska, noise complaints can also be filed by calling:

- Alaska Command at 1-800-JET-NOIS;
- 11th Air Force PA Office (Joint Base Elmendorf-Richardson) at 1-800-538-6647; or
- 3rd Wing PA Office (Joint Base Elmendorf-Richardson) at 907-552-5756.

Eielson AFB also posts information on the installation website, including alerts about upcoming aircraft operations that are able to be shared publicly:

- Website (<http://www.eielson.af.mil/>); and
- Facebook (<https://www.facebook.com/EielsonAirForceBase/>).

4.0 Aircraft Noise

Terrain features, weather phenomena, man-made structures, and daily life activity contribute to noise exposure.

How an installation manages aircraft noise can play a key role in shaping its relationship with neighboring communities. Ideally, aircraft noise and its management should be key factors in local land use planning. Because noise from aircraft may affect areas around the installation, the Air Force has defined noise zones using the guidance provided in the AICUZ Instruction (AFI 32-7063).

While the level of noise produced by aircraft may have a direct effect on communities in proximity to military air installations, other factors also influence the noise impact. An airfield's layout (its buildings, parking ramps, and runways), type of aircraft, natural terrain features, weather phenomena, and daily activities all influence the levels of noise that the community experiences.

4.1 What is Sound/Noise?

Sound consists of vibrations in the air. A multitude of sources can generate these vibrations, including roadway traffic, barking dogs, radios—or aircraft operations. We call these vibrations compression waves. Just like a pebble dropped into a pond creates ripples, the compression waves—formed of air molecules pressed together—radiate out, decreasing with distance. If these vibrations reach your eardrum at a certain rate and intensity, you perceive it as sound. When the sound is unwanted, we refer to it as noise. Generally, sound becomes noise to a listener when it interferes with normal activities. Sound has three components: intensity, frequency and duration.

Sound becomes noise when it interferes with normal activities.

- **Intensity** or loudness relates to sound pressure change. As the vibrations oscillate back and forth, they create a change in pressure on the eardrum. The greater the sound pressure change, the louder it seems.
- **Frequency** determines how we perceive the pitch of the sound. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches. Sound frequency is measured in terms of cycles per second or hertz (Hz). While the range of human hearing goes from 20 to 20,000 Hz, we hear best in the range of 1,000 to 4,000 Hz. For environmental noise, we use A-weighting, which focuses on this range, to best represent human hearing. While we may refer to A-weighted decibels as “dBA”, if it is the only weighting being discussed, the “A” is generally dropped.
- **Duration** is the length of time one can detect the sound.

4.2 How Sound is Perceived

The loudest sounds that the human ear can comfortably hear are a trillion times higher in intensity than those of sounds we barely hear. Because such large numbers become awkward to use, we measure noise in decibels (dB), which uses a logarithmic scale.

Figure 4-1 is a chart of A-weighted sound levels from common sources. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above 120 dB can cause discomfort inside the ear, while sound levels between 130 and 140 dB are felt as pain.

Figure 4-1. Typical A-weighted Sound Levels of Common Sounds

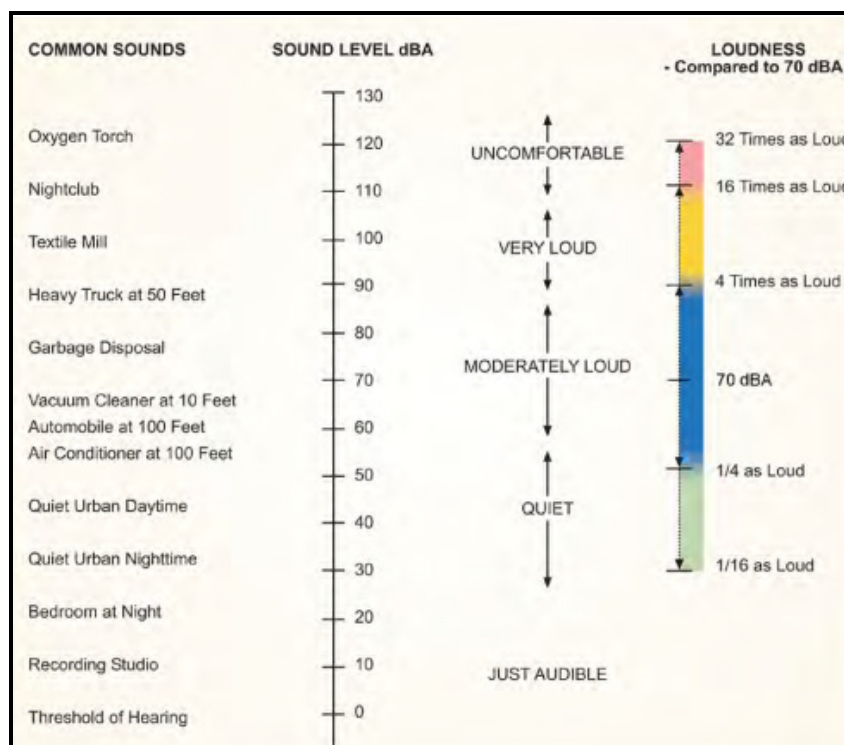


Table 4-1 shows the subjective responses with change in (single-event) sound level. While noise energy doubles or halves with every 3-db change, we do not perceive all this noise energy. It takes a 10 dB increase or decrease for our ears to perceive a doubling or halving of loudness.

Table 4-1. Subjective Response to Changes in Sound Level

Change in Sound Level	Change in Loudness
20 dB	Striking 4-fold Change
10 dB	Dramatic 2-fold or Half as Loud
5 dB	Quite Noticeable
3 dB	Barely Perceptible
1 dB	Requires Close Attention to Notice

4.3 The Day-night Average Sound Level

When people hear an aircraft fly overhead, the question may be asked, “How loud was that?” While we may often find ourselves concerned over the loudness of a sound, there are other dimensions to the sound event that draw our interest. For instance, does one overflight draw the same interest as two separate overflights—or 20? Also, does the 30-second run-up of engines prior to takeoff draw the same interest as a 30-minute maintenance run? Additionally, is an overflight more noticeable at 2:00 p.m. or at 2:00 a.m., when the ambient noise is low and most people are sleeping?

The length and number of events—the total noise energy—and the time of day that a noise event takes place play key roles in our perception of noise. To reflect these concerns, the Air Force uses a metric called the “Day-night Average Sound Level” (DNL). DNL was created by the United States Environmental Protection Agency (EPA) and is used throughout the United States.

DNL, when used as a metric for aircraft noise, represents the accumulation of noise energy from all aircraft noise events in a 24-hour period. Additionally, for all operations between 10:00 p.m. and 7:00 a.m., DNL adds a 10-dB penalty to each event to account for the intrusiveness of nighttime operations. As is implied in its name, the DNL represents the noise energy present in a daily period. However, because aircraft operations at military airfields fluctuate from day to day, the Air Force typically bases DNL on a year’s worth of operations and represents the annual average daily aircraft events.

DNL is not a level heard at any given time, but represents long-term exposure. Scientific studies have found good correlation between the percentages of groups of people highly annoyed by sounds and the level of average noise exposure measured in DNL.

4.4 Noise Contours

The Air Force develops noise contours, as needed, to assess the compatibility of aircraft operations with surrounding land uses. Noise contours connect points of equal value, just as contours on topographic maps connect points of equal elevation. This AICUZ Study presents the historical and future year planning noise contours. The Air Force utilizes NOISEMAP, the DoD standard model for assessing noise exposure from military aircraft operations at air installations. Noise contours, when overlaid on local land use

maps, can help to identify areas of incompatible land use and assist communities in planning for future development around an air installation.

4.4.1 *Planning Contours*

This AICUZ Study provides future year planning noise contours. Long-range planning by local land use authorities involves strategies that influence present and future uses of land. Due to the long-range nature of this planning, the Air Force provides planning contours—noise contours based on reasonable projections of future missions and operations. AICUZ studies using planning contours provide a description of the long-term (5- to 10-year) aircraft noise environment for projected aircraft operations that is more consistent with the planning horizon used by state, tribal, regional, and local planning bodies.

The Air Force develops planning contours on the best available, realistic, long-range projections of unclassified estimates of future mission requirements. This includes reasonable projections of future operations based on trends in operational tempo, retirement of legacy aircraft, new aircraft entering the inventory, and other factors.

These long-range projections are not commitments of future operations. Inclusion of planning contours in the AICUZ Study does not eliminate the need to conduct appropriate environmental analysis if an assumption used in the development of the planning contours becomes a proposed Air Force action.

Assumptions included in the Eielson AFB planning contours include:

- The beddown of two squadrons of F-35A aircraft at Eielson AFB beginning in late 2019; and
- No new airspace being established, per the Record of Decision.

Table 4-2 presents the projected operations for the Eielson AFB planning contours.

Table 4-2. Projected Annual Aircraft Flight Operations for 2018 AICUZ Noise Contours (Planning Contours for CY2021)

Aircraft	Departures ¹			Arrivals ²			Closed Patterns ³			Totals		
	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total
Based Aircraft												
F-16C	3,465	35	3,500	3,473	27	3,500	3,810	-	3,810	10,748	62	10,810
F-35A	8,468	172	8,640	8,468	172	8,640	8,826	-	8,826	25,762	344	26,106
GASEPF	122	-	122	122	-	122	549	-	549	793	-	793
KC-135R	361	105	466	309	157	466	1,614	1,076	2,690	2,284	1,338	3,622
Transient Aircraft												
A-10A	33	-	33	33	-	33	-	-	-	66	-	66
B-52H	6	-	6	6	-	6	-	-	-	12	-	12
C-5	83	2	85	84	1	85	-	-	-	167	3	170
C-9A	1	-	1	1	-	1	-	-	-	2	-	2
C-12	58	-	58	58	-	58	-	-	-	116	-	116
C-21A	12	-	12	12	0	12	-	-	-	24	-	24
C-130	81	-	81	79	2	81	-	-	-	160	2	162
EA-18G	4	-	4	4	-	4	-	-	-	8	-	8
F-15E	34	2	36	36	-	36	-	-	-	70	2	72
F-16C	115	2	117	94	23	117	-	-	-	209	25	234
F-22	7	-	7	6	-	6	-	-	-	13	-	13
F-35B	8	-	8	8	-	8	-	-	-	16	-	16
F-35B	12	-	12	13	-	13	-	-	-	25	-	25
FA-18E/F	12	-	12	11	-	11	-	-	-	23	-	23
H-60	1,030	-	1,030	1,030	-	1,030	188	-	188	2,248	-	2,248
KC-10A	54	4	58	55	3	58	-	-	-	109	7	116
KC-135R	141	11	152	144	8	152	-	-	-	285	19	304
TORNADO	3	-	3	4	-	4	-	-	-	7	-	7
737-700	20	2	22	21	1	22	-	-	-	41	3	44
747-400	12	1	13	12	1	13	-	-	-	24	2	26
767-CF6	23	2	25	24	1	25	-	-	-	47	3	50
Grand Total	14,165	338	14,503	14,107	396	14,503	14,987	1,076	16,063	43,259	1,810	45,069

Table 4-2. Projected Annual Aircraft Flight Operations for 2018 AICUZ Noise Contours (Planning Contours for CY2021)

Aircraft	Departures ¹			Arrivals ²			Closed Patterns ³			Totals		
	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total

Sources: Air Force 2016b

Notes:

- ¹ Sum of "Departure" and "Departure – Min Risk" columns from Table E-14, "Annual Airfield Flight Operations for the Proposed Action Alternative (CY21)" of the Final EIS, Volume II, Appendix E (Air Force 2016b).
- ² Sum of "Arrival – Vectored," "Arrival – IFR," "Arrival – VFR," "Arrival – Pitchout," "Arrival – PPO/SFO," and "Arrival – Min Risk" columns from Table E-14, "Annual Airfield Flight Operations for the Proposed Action Alternative (CY21)" of the Final EIS, Volume II, Appendix E (Air Force 2016b).
- ³ Sum of "Pattern – IFR," "Pattern – VFR," "Pattern – VFR Reentry w/o Break," "Pattern – VFR Reentry w/ Break," and "Pattern – PFO/SFO" columns from Table E-14, "Annual Airfield Flight Operations for the Proposed Action Alternative (CY21)" of the Final EIS, Volume II, Appendix E. (Air Force 2016b)

4.4.2 Eielson AFB Noise Contours

The 2018 Eielson AFB AICUZ noise contours represent planning contours for the year 2021 (Figure 4-2). The 65 dB DNL contour extends past the northern installation boundary into the community of Moose Creek by nearly 1 mile and to the west by approximately 1,900 feet. The 80 dB DNL contour would not extend beyond the installation boundary, except for the western boundary where it would extend past the boundary by approximately 800 feet (Air Force 2016a).

Figure 4-3 shows a comparison of the 2021 planning contours and the 1992 AICUZ noise contours. In general, the 2021 planning contours extend farther to the north, south, east, and west than the 1992 AICUZ noise contours. Arrivals of F-35A and transient heavy cargo aircraft to Runway 14 would contribute the most to the noise levels south of Eielson AFB (Air Force 2016a).

Table 4-3 presents the off-installation land acreage and estimated population within the planning contours. The Air Force generates population estimates from 2016 American Community Survey 5-year estimates with census block-level data, using a geometric proportion method to determine the estimated population within the contour bands. This method assigns population based on the portion of a census block that falls within the contour. The population across census blocks is assumed to be evenly distributed.

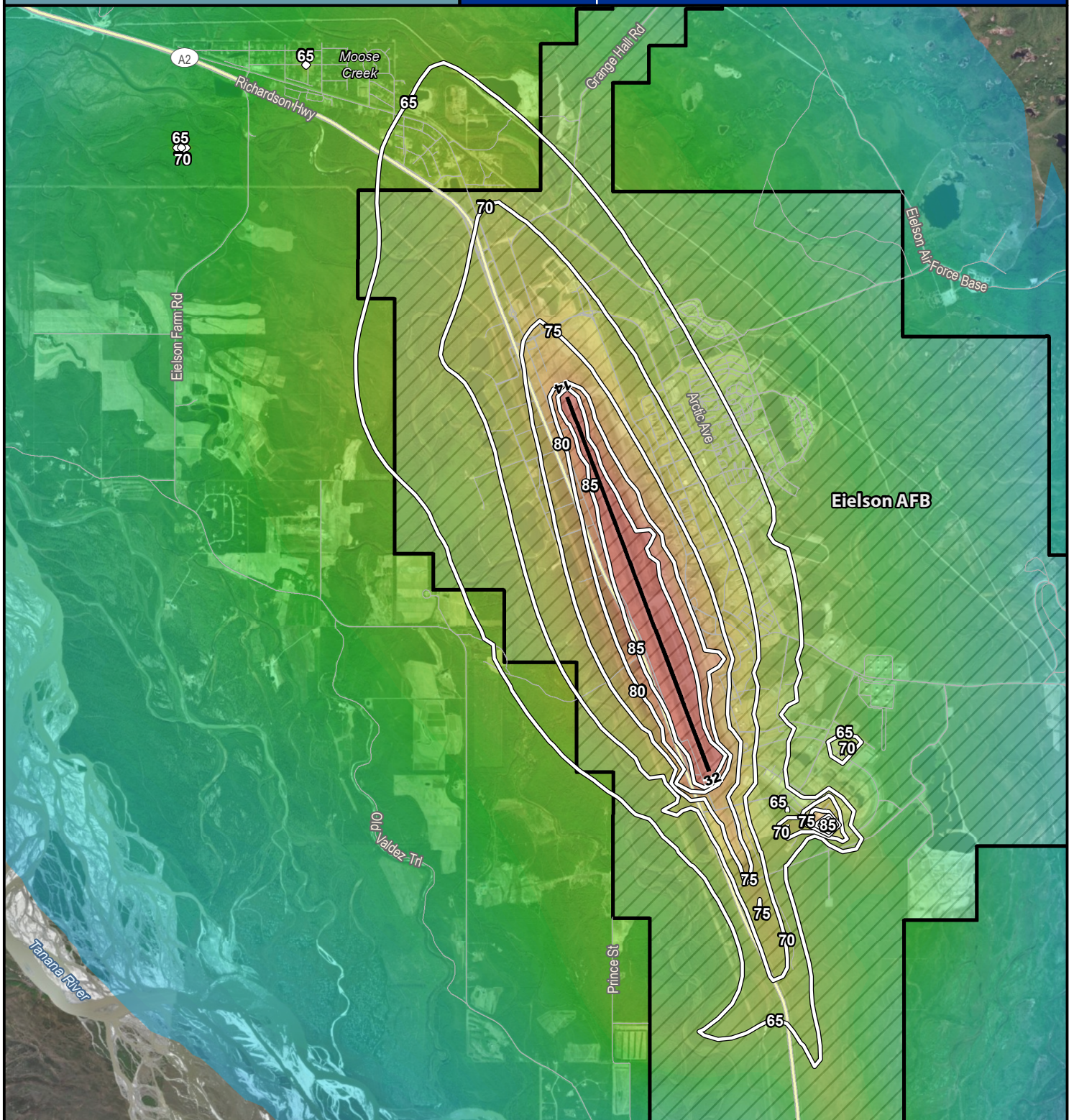
Table 4-3. Off-installation Land Area and Estimated Population within Noise Zones for the 2018 AICUZ Noise Contours at Eielson AFB

Noise Zone (dB DNL)	Acres	Estimated Population ¹
65-69	821.25	152
70-74	9.54	0
75-79	0	4
80-84	0	0
85+	0	0
Total (65+)	830.79	156

Source: United States Census Bureau 2016.

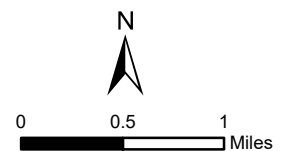
Note:

¹ Population is estimated using a geometric proportion method to determine the estimated population within the contour bands. This method assigns population based on the portion of a census block that falls within the contour. The population across census blocks is assumed to be evenly distributed.

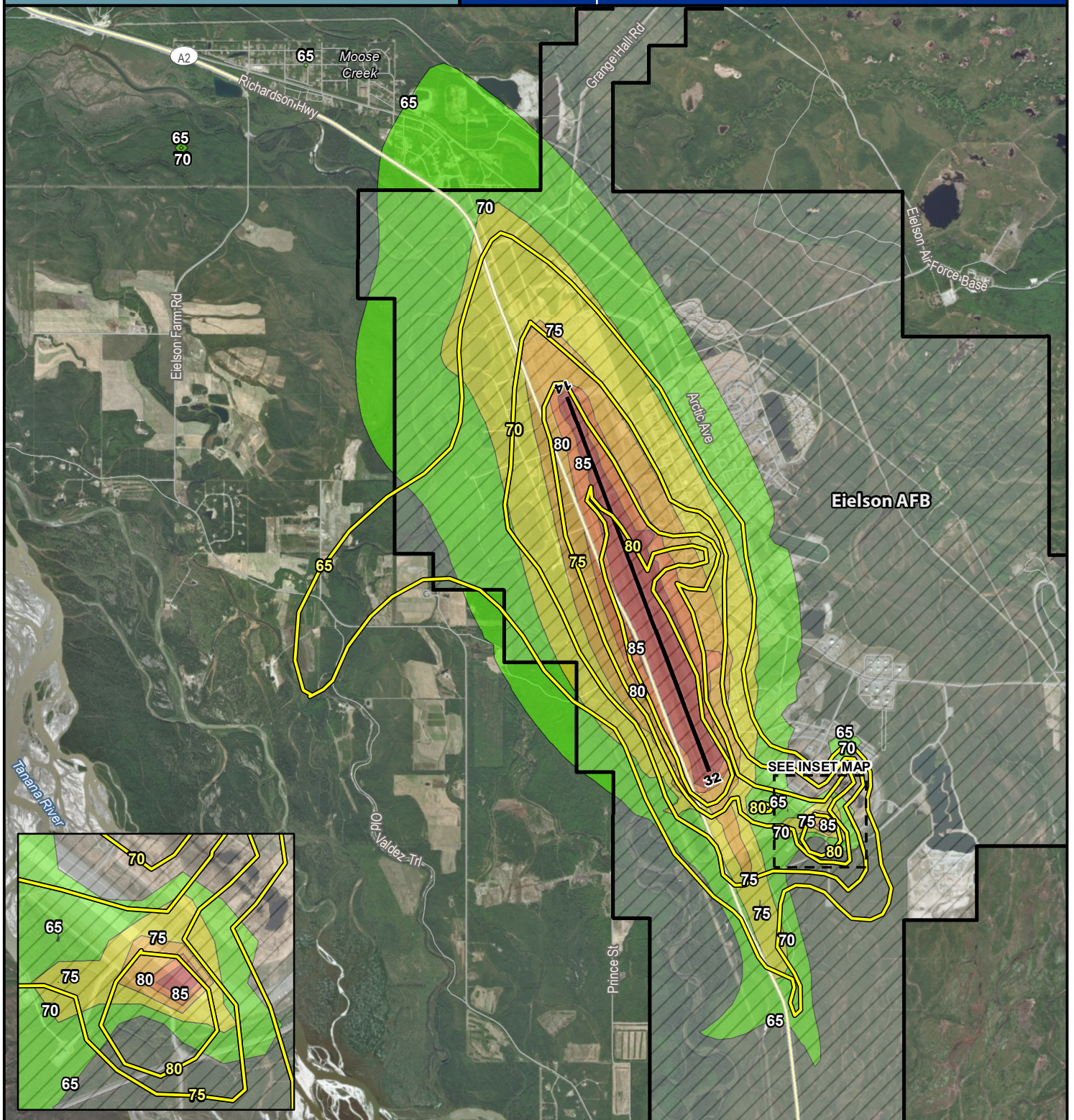


Legend:

- City Boundary
 - State Highway
 - Runway
 - Installation
 - 2018 AICUZ Noise Contour (dB DNL)
- Noise Gradients (dB DNL)
- High: 85+
- Low: 45

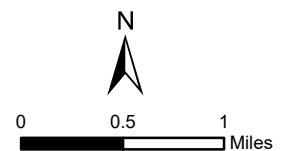


Source: AFCEC 2017; Digital Globe 2015;
ESRI 2016; FHWA 2017.
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Legend:

	State Highway	2018 AICUZ Noise Contour (dB DNL)	
	Street		65 dB
	Runway		70 dB
	Installation		75 dB
	1992 AICUZ Noise Contour (dB DNL)		80 dB
			85 dB



Source: AFCEC 2017; Digital Globe 2015;
ESRI 2016; FHWA 2017.
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5.0 Community and Aircraft Safety

Community and aircraft safety is paramount to the Air Force, and this safety is a shared responsibility between the Air Force and the surrounding communities, with each playing a vital role in its success. Cooperation between the Air Force and the community results in strategic and effective land use planning and development. As such, the Air Force has established a flight safety program and has designated areas of accident potential around its air installations to assist in preserving the health, safety, and welfare of residents living near its airfield. This AICUZ Study provides the information needed, in part, to reach this shared safety goal.

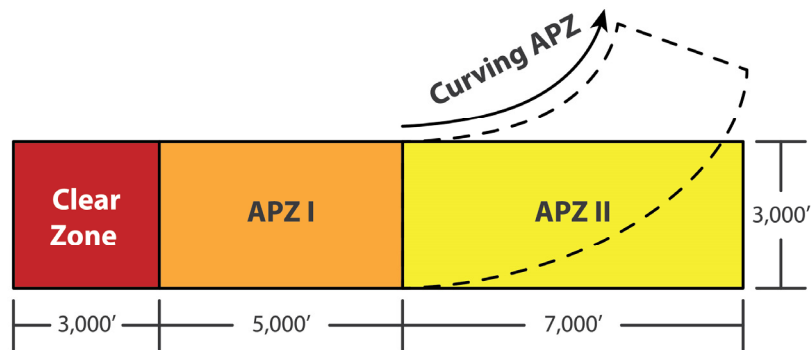
Identifying safety issues assists the community in developing land uses compatible with airfield operations. As part of the AICUZ Program, the Air Force defines areas of accident potential, imaginary surfaces, and hazards to aircraft flight.

5.1 Clear Zones and Accident Potential Zones

In the 1970s and 1980s, the military conducted studies of historical accident and operations data throughout the military. The studies showed that most aircraft mishaps occur on or near the runway, diminishing in likelihood with distance from the runway. Based on these studies, the DoD identified CZs and APZs as areas where an aircraft accident is most likely to occur if an accident were to take place; however, it should be noted that CZs and APZs are not predictors of accidents. The studies identified three areas that, because of accident potential, planners should consider for density and land use restrictions: the CZ, APZ I, and APZ II. The CZs and APZs are described in the bullets below and are shown on Figure 5-1.

- **Clear Zone:** At the end of all active Air Force runways is an area known as the “Clear Zone.” The CZ is an area 3,000 feet square centered on the end of the runway. A CZ is required for all active runways and should remain undeveloped.
- **APZ I:** Beyond the CZ is APZ I. APZ I is 3,000 feet in width and 5,000 feet in length along the extended runway centerline.
- **APZ II:** APZ II is the rectangular area beyond APZ I. APZ II is 3,000 feet in width by 7,000 feet in length along the extended runway centerline.

Figure 5-1. Runway Clear Zones and Accident Potential Zones



While the APZs extend outward from the ends of the runway along the extended runway centerline, the installation may add a curved APZ when over 80 percent of the operations follow a curved departure.

Within the CZ, most uses are incompatible with military aircraft operations. For this reason, it is the Air Force's policy, where possible, to acquire real property interests in land within the CZ to ensure incompatible development does not occur. Within APZ I and APZ II, a variety of land uses are compatible; however, higher density uses (e.g., schools, apartments, churches) should be restricted because of the greater safety risk in these areas. Table 5-1 tabulates the off-installation land acreage and estimated population within the CZs and APZs. Chapter 6 discusses land use and recommendations for addressing incompatibility issues within CZs and APZs for an airfield.

Table 5-1. Off-installation Land Area and Estimated Population within the Clear Zones and Accident Potential Zones

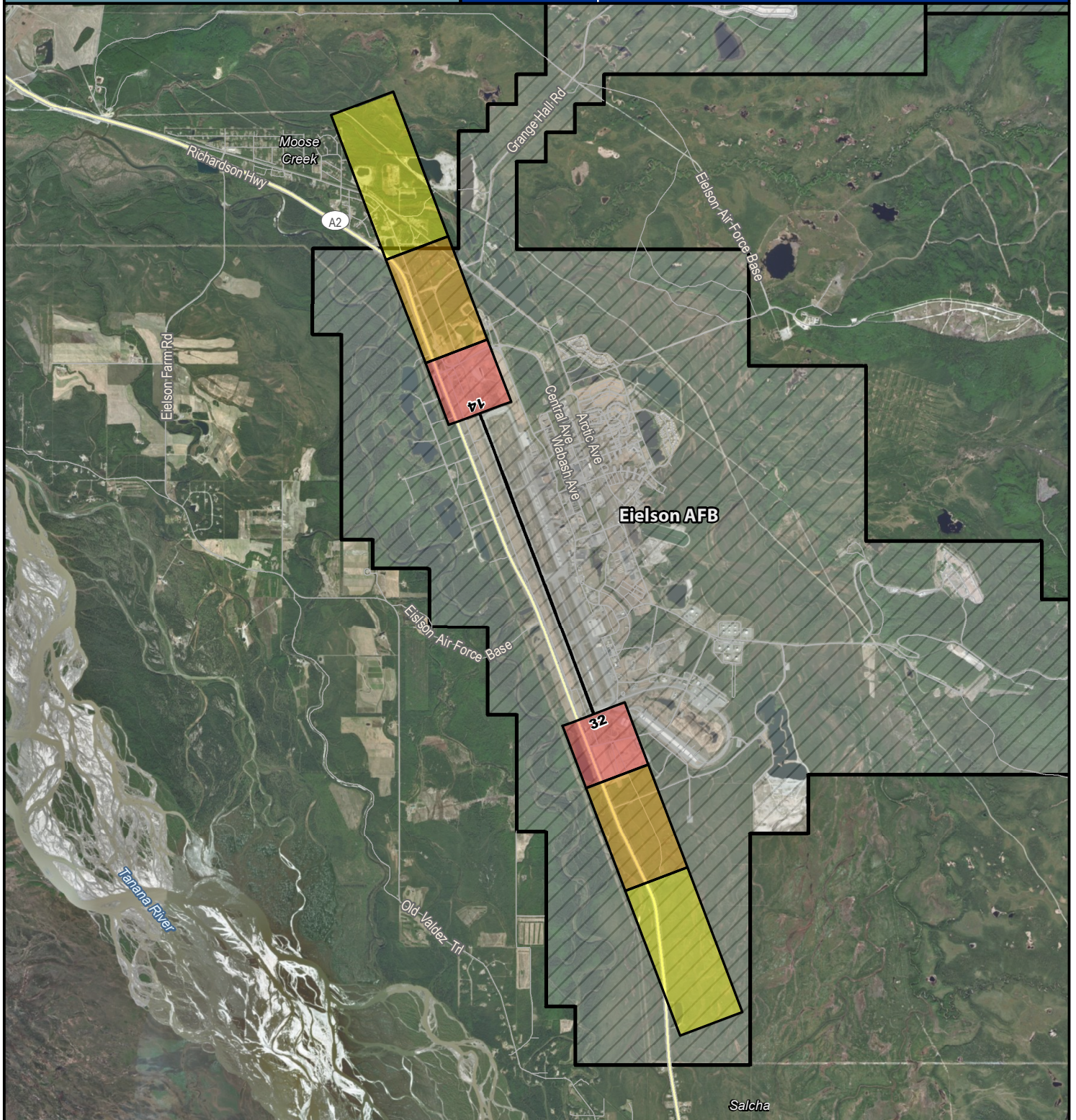
Zone	Acres	Estimated Population ¹
CZ	0	0
APZ I	10.21	4
APZ II	472.34	168
Total	482.55	172

Source: United States Census Bureau 2016.

Note:

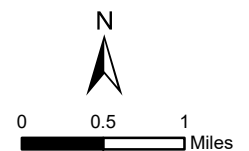
¹ Population is estimated using a geometric proportion method to determine the estimated population within the contour bands. This method assigns population based on the portion of a census block that falls within the contour. The population across census blocks is assumed to be evenly distributed.

Figure 5-2 depicts the CZs and APZs for Runway 14/32 for Eielson AFB. There are no changes in the CZs or APZs from the 1992 AICUZ. Eielson AFB's CZs and APZs do not curve. The CZ, APZ I, and APZ II south of the runway are within the installation boundary. A portion of APZ I and all of APZ II north of the runway extend off the installation.



Legend:

- | | |
|---------------|--|
| State Highway | 2018 AICUZ Clear Zones and APZs |
| Street | Clear Zone |
| Runway | Accident Potential Zone I |
| Installation | Accident Potential Zone II |



Source: AFCEC 2017; Digital Globe 2015;
ESRI 2016; FHWA 2017.
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5.2 Imaginary Surfaces

The DoD and Federal Aviation Administration (FAA) identify a complex series of imaginary planes and transition surfaces that define the airspace needed to remain free of obstructions around an airfield. Obstruction-free imaginary surfaces ensure safe flight approaches, departures, and pattern operations. Obstructions include natural terrain and man-made features such as buildings, towers, poles, wind turbines, cell towers, and other vertical obstructions to airspace navigation.

An illustration of the imaginary surfaces for fixed-wing runways is depicted on Figure 5-3, and Table 5-2 provides brief descriptions for each. Figure 5-4 depicts the runway airspace imaginary surfaces specific to Eielson AFB. In general, the Air Force does not permit above-ground structures in the primary surface, and height restrictions apply to transitional surfaces and approach and departure surfaces. Height restrictions are more stringent for areas closer to the runway and flight paths.

Figure 5-3. Imaginary Surfaces and Transition Planes for Fixed-wing Runways

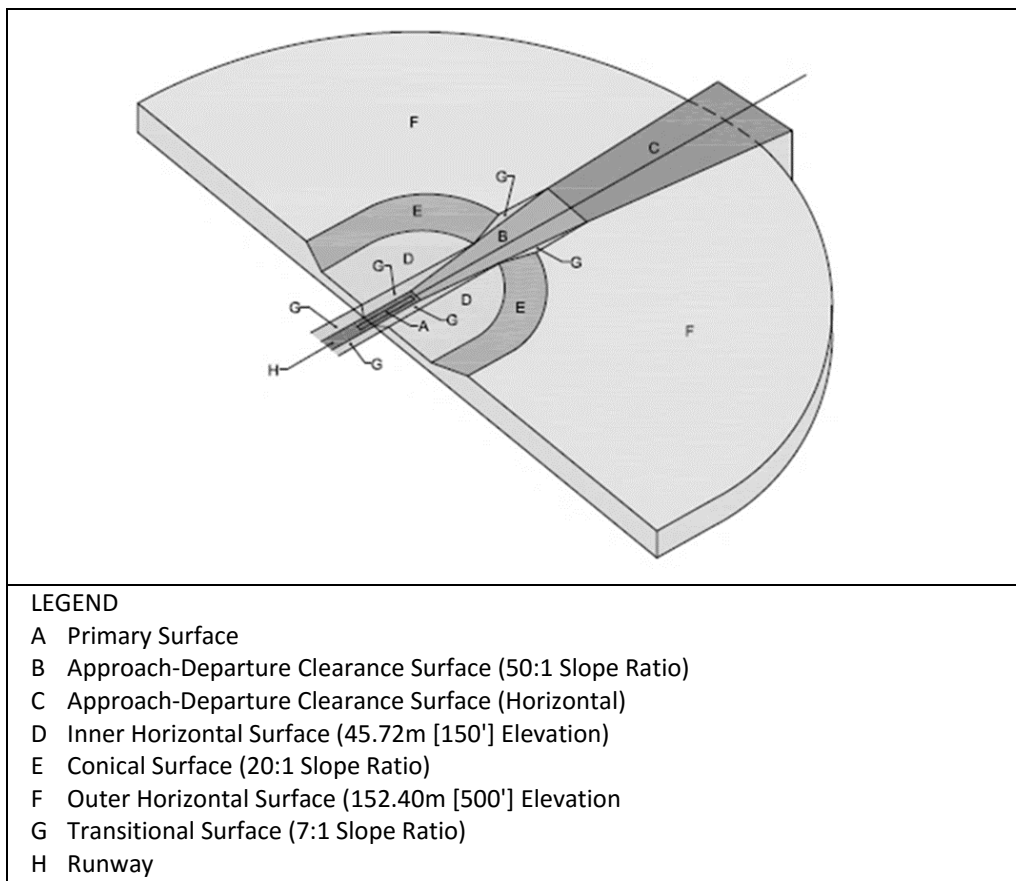
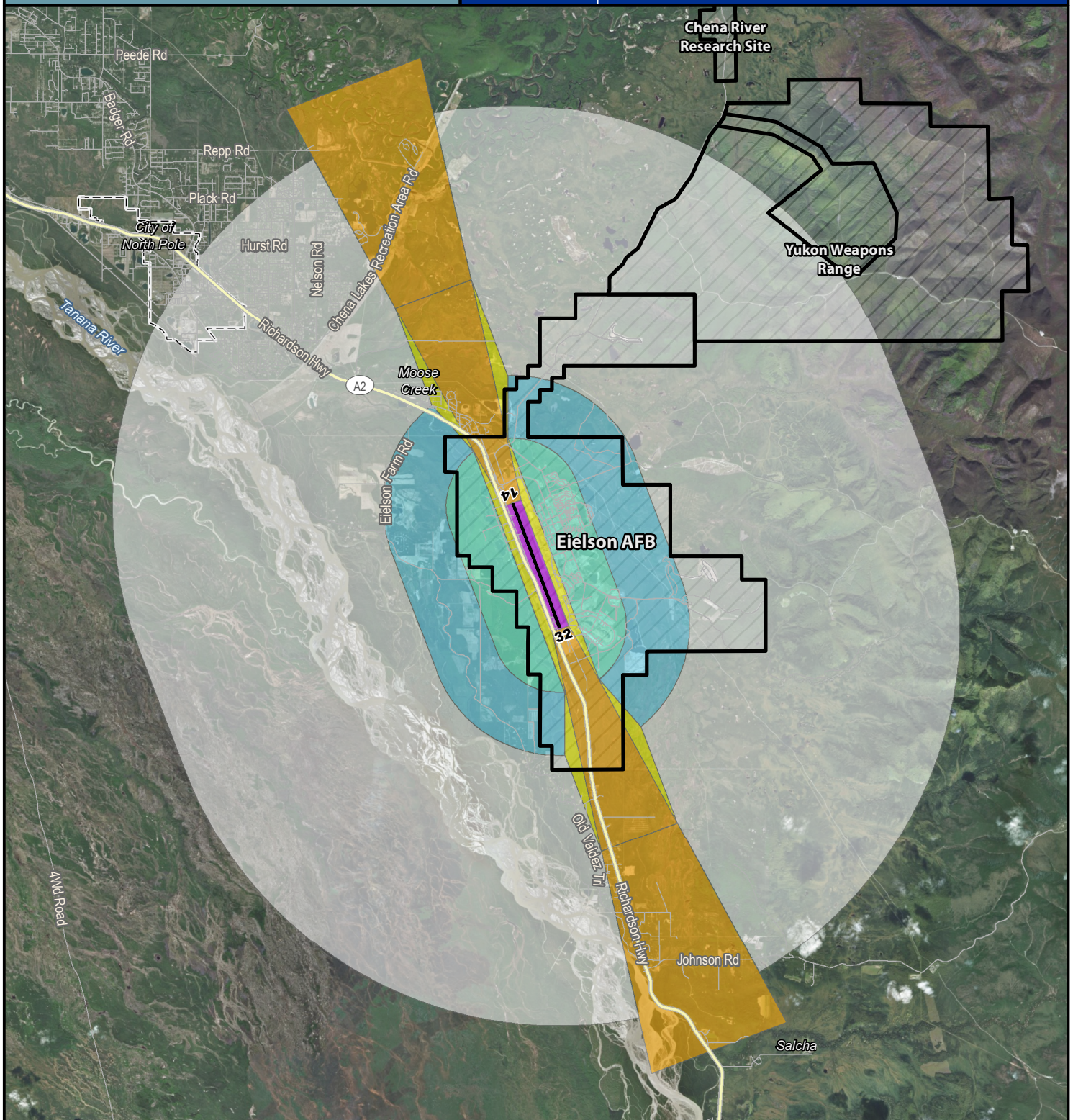


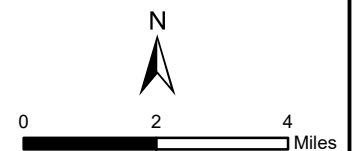
Table 5-2. Descriptions of Imaginary Surfaces for Military Airfields

Primary Surface	An imaginary surface symmetrically centered on the runway, extending 200 feet beyond each runway end that defines the limits of the obstruction clearance requirements in the vicinity of the landing area. The width of the primary surface is 2,000 feet, or 1,000 feet on each side of the runway centerline.
Approach-Departure Clearance Surface	This imaginary surface is symmetrically centered on the extended runway centerline, beginning as an inclined plane (glide angle) at the end of the primary surface (200 feet beyond each end of the runway), and extending for 50,000 feet. The slope of the approach-departure clearance surface is 50:1 until it reaches an elevation of 500 feet above the established airfield elevation. It then continues horizontally at this elevation to a point 50,000 feet from the starting point. The width of this surface at the runway end is 2,000 feet, flaring uniformly to a width of 16,000 feet at the end point.
Inner Horizontal Surface	This imaginary surface is an oval plane at a height of 150 feet above the established airfield elevation. The inner boundary intersects with the approach-departure clearance surface and the transitional surface. The outer boundary is formed by scribing arcs with a radius 7,500 feet from the centerline of each runway end and interconnecting these arcs with tangents.
Conical Surface	This is an inclined imaginary surface extending outward and upward from the outer periphery of the inner horizontal surface for a horizontal distance of 7,000 feet to a height of 500 feet above the established airfield elevation. The slope of the conical surface is 20:1. The conical surface connects the inner and outer horizontal surfaces.
Outer Horizontal Surface	This imaginary surface is located 500 feet above the established airfield elevation and extends outward from the outer periphery of the conical surface for a horizontal distance of 30,000 feet.
Transitional Surface	This surface extends outward and upward at right angles to the runway centerline and extended runway centerline at a slope of 7:1. The transitional surface connects the primary and the approach-departure clearance surfaces to the inner horizontal, the conical, and the outer horizontal surfaces.



Legend:

- | | | |
|-------------------|-----------------------------|----------------------|
| --- City Boundary | Airfield Imaginary Surfaces | Primary Surface |
| State Highway | Approach/Departure Surface | Transitional Surface |
| Street | Conical Surface | |
| Installation | Inner Horizontal Surface | |
| Runway | Outer Horizontal Surface | |



Source: AFCEC 2017; Digital Globe 2015;
ESRI 2016; FHWA 2017.
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5.3 Hazards to Aircraft Flight Zone

Certain land uses and activities pose potential hazards to flight. To ensure land uses and activities are examined for compatibility, the Air Force has identified a Hazards to Aircraft Flight Zone (HAFZ). The HAFZ is defined as the area within the imaginary surfaces that are shown on Figure 5-4. Unlike noise zones and safety zones, the HAFZ does not have recommended land use compatibility tables. Instead, it is a consultation zone recommending that project applicants and local planning bodies consult with the Air Force to ensure the project is compatible with Air Force operations. These land use and activity compatibility considerations include:

- **Height:** Tall objects can pose significant hazards to flight operations or interfere with navigational equipment (including radar). City/borough agencies involved with approvals of permits for construction should require developers to submit calculations showing that projects meet the height restriction criteria of 14 Code of Federal Regulations (CFR) 77.17 for the specific airfield described in the AICUZ Study. City and borough agencies may also consider requiring a “Determination of No Hazard” issued by the FAA for any tall objects within this zone.
- **Visual Interference:** Industrial or agricultural sources of smoke, dust, and steam in the airfield vicinity can obstruct a pilot’s vision during takeoff, landing, or other periods of low-altitude flight. Close coordination between the installation and landowners can often mitigate these concerns. For example, irrigating before plowing can greatly reduce dust concerns.
- **Light Emissions:** Bright lights, either direct or reflected, in the airfield vicinity can impair a pilot’s vision, especially at night. A sudden flash from a bright light causes a spot or “halo” to remain at the center of the visual field for a few seconds or more, rendering a person virtually blind to all other visual input. This is particularly dangerous for pilots at night when the flash can diminish the eye’s adaptation to darkness. The eyes partially recover from this adaptation in a matter of minutes, but full adaptation typically requires 40 to 45 minutes. Specific examples of light emissions that can interfere with the safety of nearby aviation operations include:
 - Lasers that emit in the visible spectrum, which can be potentially harmful to a pilot’s vision during both day and night.
 - The increasing use of energy-efficient LED lighting, which poses potential conflicts in areas where pilots use night vision goggles (NVGs). NVGs can exaggerate the brightness of these lights, interfering with pilot vision.
 - The use of red LED lights to mark obstructions, which can produce an unintended safety consequence because red LED lights are not visible

on most NVG models, rendering them invisible to NVG users in the area.

- **Bird/Wildlife Aircraft Strike Hazard (BASH):** Wildlife represents a significant hazard to flight operations. Birds, in particular, are drawn to different habitat types found in the airfield environment, including hedges, grass, brush, forest, water, and even the warm pavement of the runways. Due to the speed of the aircraft, collisions with wildlife can happen with considerable force. Although most bird and animal strikes do not result in crashes, they cause structural and mechanical damage to aircraft as well as loss of flight time.

Most collisions occur when the aircraft is at an elevation of less than 1,000 feet. To reduce the potential of a BASH, the Air Force recommends that land uses that attract birds not be located near installations with an active air operations mission. These land uses include:

- Waste disposal operations;
- Wastewater treatment facilities;
- Transfer stations;
- Landfills;
- Golf courses;
- Wetlands;
- Storm water ponds; and
- Dredge disposal sites.

Birds and raptors in search of food or rodents will flock to landfills, increasing the probability of BASH occurrences near these facilities. One can also use design modifications to reduce the attractiveness of these types of land uses to birds and other wildlife.

- **Radio Frequency/Electromagnetic Interference:** The American National Standards Institute defines electromagnetic interference (EMI) as any electromagnetic disturbance that interrupts, obstructs, or otherwise degrades or limits the effective performance of electronics/electrical equipment.

EMI can be induced intentionally, as in forms of electronic warfare, or unintentionally, as a result of spurious emissions and responses, such as high-tension line leakage and industrial machinery. In addition, EMI may be caused by atmospheric phenomena, such as lightning or precipitation static.

New generations of military aircraft are highly dependent on complex electronic systems for navigation and critical flight and mission-related functions. Consequently, communities should use care when siting any activities that create EMI. Many of these sources are low-level emitters of EMI. However, when combined, they have an additive quality.

EMI also affects consumer devices, such as cell phones, FM radios, television reception, and garage door openers. In some cases, the source of interference occurs when consumer electronics use frequencies set aside for military use.

6.0 Land Use Compatibility Analysis

CZs, APZs, noise zones, and the HAFZ make up the AICUZ footprint for an air installation. The AICUZ footprint defines the minimum recommended area within which land use controls are needed to enhance the health, safety, and welfare of those living or working near a military airfield and to preserve the flying mission. The AICUZ footprint, combined with the guidance and recommendations set forth in the AICUZ Study, are the fundamental tools necessary for the planning process. The Air Force recommends that local and regional governments adopt the AICUZ noise zones, CZs, APZs, and HAFZ into planning studies, regulations, and processes to best guide compatible development around installations. This AICUZ Study uses the AICUZ noise zones, CZs, and APZs (Figure 6-1) for Eielson AFB as the basis for the land use compatibility analysis.

6.1 Land Use Compatibility Guidelines and Classifications

In an effort to establish long-term compatibility for lands within the vicinity of military air installations, the DoD has created land use compatibility recommendations based on the Federal Highway Administration's Standard Land Use Coding Manual (SLUCM). These guidelines are used by DoD personnel for on-installation planning and for engaging with the local community to foster compatible land use development. Table A-1 of Appendix A shows the suggested land use compatibility guidelines within the CZs and APZs. Table A-2 of Appendix A provides land use compatibility recommendations within noise zones.

6.2 Planning Authorities

This section presents information for each governing body that has land use jurisdictions near Eielson AFB.

6.2.1 *Fairbanks North Star Borough*

Planning and zoning oversight for FNSB and the city of North Pole is provided by the Borough's Community Planning Department (FNSB 2015). The FNSB Regional Comprehensive Plan is the adopted master planning policy document for the borough. The plan is used to guide the zoning process, but is a policy document only (i.e., does not have enforceable regulations). Land use decisions are made during zoning decisions. The plan recognizes the military as a key economic driver and encourages the completion of joint land use plans, recreational use agreements for military land, and the rezoning of areas adjacent to Eielson AFB for airport noise sensitive areas and height restrictions (FNSB 2005).

With the exception of North Pole, neither of the other two surrounding communities have community plans; Moose Creek and Salcha rely on the borough for their planning needs. In 2016, the City of North Pole completed a community-driven Strategic Comprehensive Plan. The plan reflects the zoning in the borough's Regional Comprehensive Plan and emphasizes working with FNSB to encourage land use compatibility with the installation, particularly with respect to noise (City of North Pole 2016).

In 2006, a JLUS was completed, in the spirit of FNSB's commitment to compatible land use planning. The JLUS includes 57 recommended actions to promote compatibility. A number of the recommended actions have been implemented, including the creation of an advisory Military Noise Overlay that FNSB's Assembly adopted in 2015. The overlay identifies areas likely to experience noise related to military operations at Fort Wainwright and Eielson AFB. The overlay is intended to encourage land uses compatible with the military mission in the Eielson and Fort Wainwright area. Parcels located wholly or partially within the composite noise zones surrounding Fort Wainwright or within the 65 dB DNL noise contour surrounding Eielson AFB are included in this overlay. Currently, FNSB is holding community meetings, Planning Commission work sessions, and public hearings for a draft ordinance that would identify potential land use and density limitations within the APZs off base in a Safety/Density Overlay (FNSB 2015).

6.2.2 *Other Planning Authorities*

The Alaska Department of Natural Resources and Bureau of Land Management have planning and platting authority for some land in the vicinity of Eielson AFB, although none of this land is located within the noise contours. These parcels are areas preserved for recreational and environmental uses and can be re-zoned by the owning agency.

6.3 Land Use and Proposed Development

The land use compatibility analysis identifies existing and future land uses near Eielson AFB to determine compatibility conditions. Existing land use is assessed to determine current land use activity, while future land use plans are used to project development and potential growth areas. Existing land use and parcel data provided by local communities were evaluated to ensure an actual account of land use activity regardless of conformity to zoning classification or designated planning or permitted use. Additionally, local management plans, policies, ordinances, and zoning regulations were evaluated to determine the type and extent of land use allowed in specific areas. In FNSB, land use decisions are made during the zoning process. As a result, the Borough has not designated future land use areas, which is discussed in Section 6.3.4.

6.3.1 *Existing Land Uses*

Eielson AFB is located in southeast FNSB, approximately 13 miles southeast of the city of Fairbanks and 5 miles southeast of the city of North Pole. Per the Comprehensive Plan, land use northwest of the installation, toward the city of North Pole, west of the

installation, and south of the installation near Salcha is primarily zoned Open/Agriculture/Low Density.

Existing land uses within the Eielson AFB CZs, APZs, and noise zones are illustrated on Figure 6-1. The predominant land use in these zones is Open/Agriculture/Low Density. Table 6-2 summarizes the total acreage of land uses within the 2018 CZs, APZs, and noise zones. Areas of specific land use compatibility concerns within these zones are further evaluated in Section 6.4.1.

6.3.2 Current Zoning

Land surrounding Eielson AFB is primarily zoned GU-1 General Use District. GU-1 is a broad zoning category with very few restrictions. It is used in rural areas where community sewer and water systems are unavailable and allows any use except for correctional facilities. Existing zoning within the Eielson AFB 2018 CZs, APZs, and noise zones are illustrated on Figure 6-2.

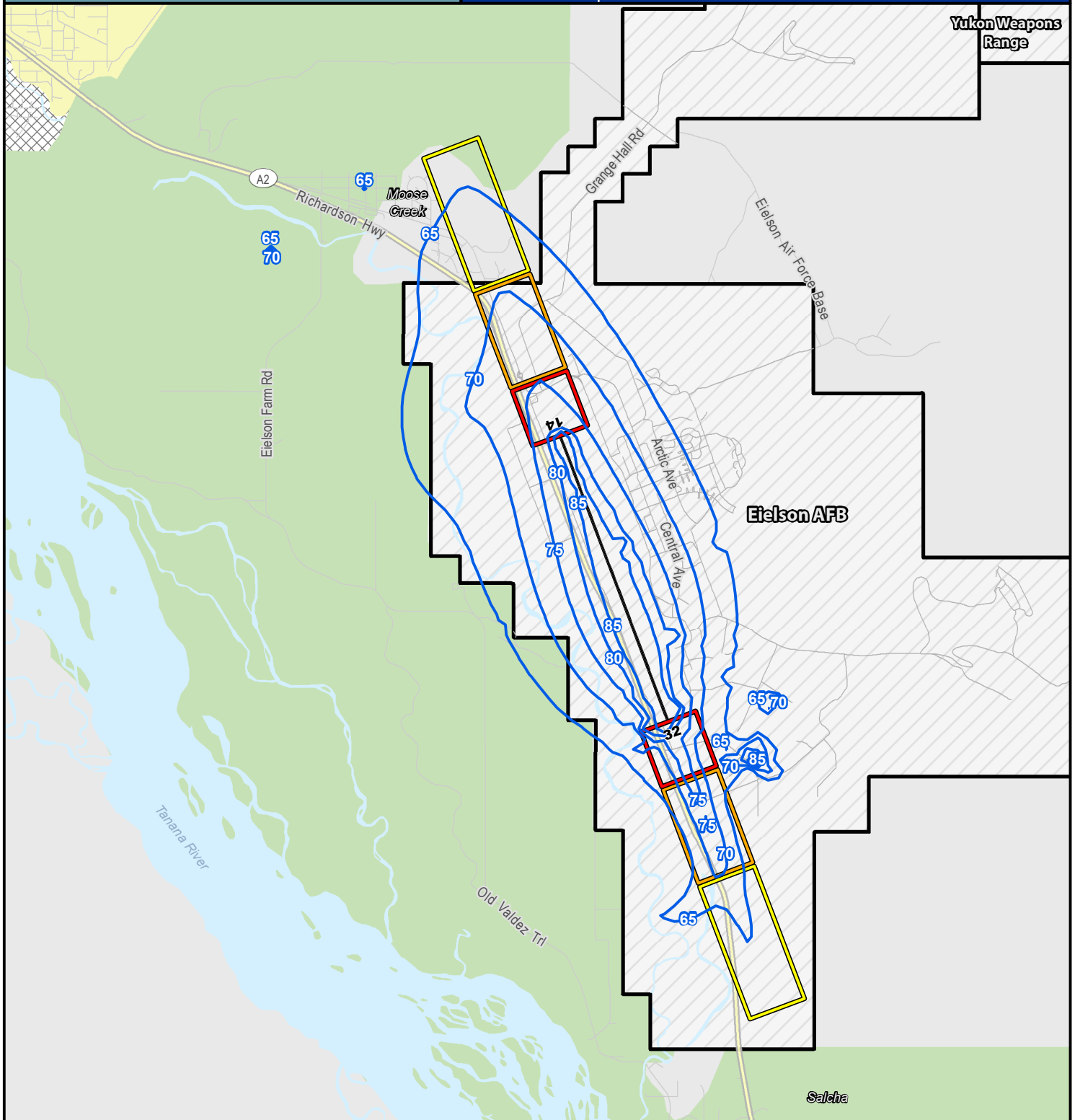
6.3.3 Future Land Use

FNSB has not designated future land use areas. As previously noted, the Regional Comprehensive Plan is used to guide land use decisions, but is a policy document only (i.e., does not have enforceable regulations) and land use decisions are made during zoning decisions. In 2017, FNSB and the City of North Pole began holding community discussions about a potential rezoning of the city's core commercial area (near the intersections of Badger Road with the Richardson Highway and Hurst Road) from General Use to Commercial to promote further commercial development (FNSB 2017).

DoD spending often instigates growth in FNSB. The arrival of two F-35A squadrons to Eielson AFB will result in an increase of 1,068 personnel. The housing market area for Eielson AFB includes the city of North Pole, Moose Creek, and Salcha, which, combined, comprise about 4 percent of the borough's total population and 4.23 percent of the total housing units in the borough (Leidos, Inc. 2015). Growth within FNSB is generally constrained by a lack of utility service in undeveloped areas. Consequently, the city of North Pole has more housing units than Moose Creek or Salcha and was the only area to experience an increase in housing units over the past few years.

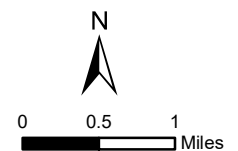
While the City of North Pole is expected to continue to grow, housing suitability in the area surrounding Eielson AFB is an ongoing issue. A 2015 Housing Requirements and Market Analysis (HRMA) projected a shortfall of 1,064 suitable private sector rental units for military families¹ (Leidos, Inc. 2015) with the arrival of the F-35A in the next few years. The suitable housing deficiency is also a concern for the community.

¹ The housing market evaluated in the HRMA is defined as the greater of either a one-hour commute or 20 miles distance originating from the base's headquarters building during peak traffic in privately owned vehicles assuming normal weather conditions (Leidos, Inc. 2015).

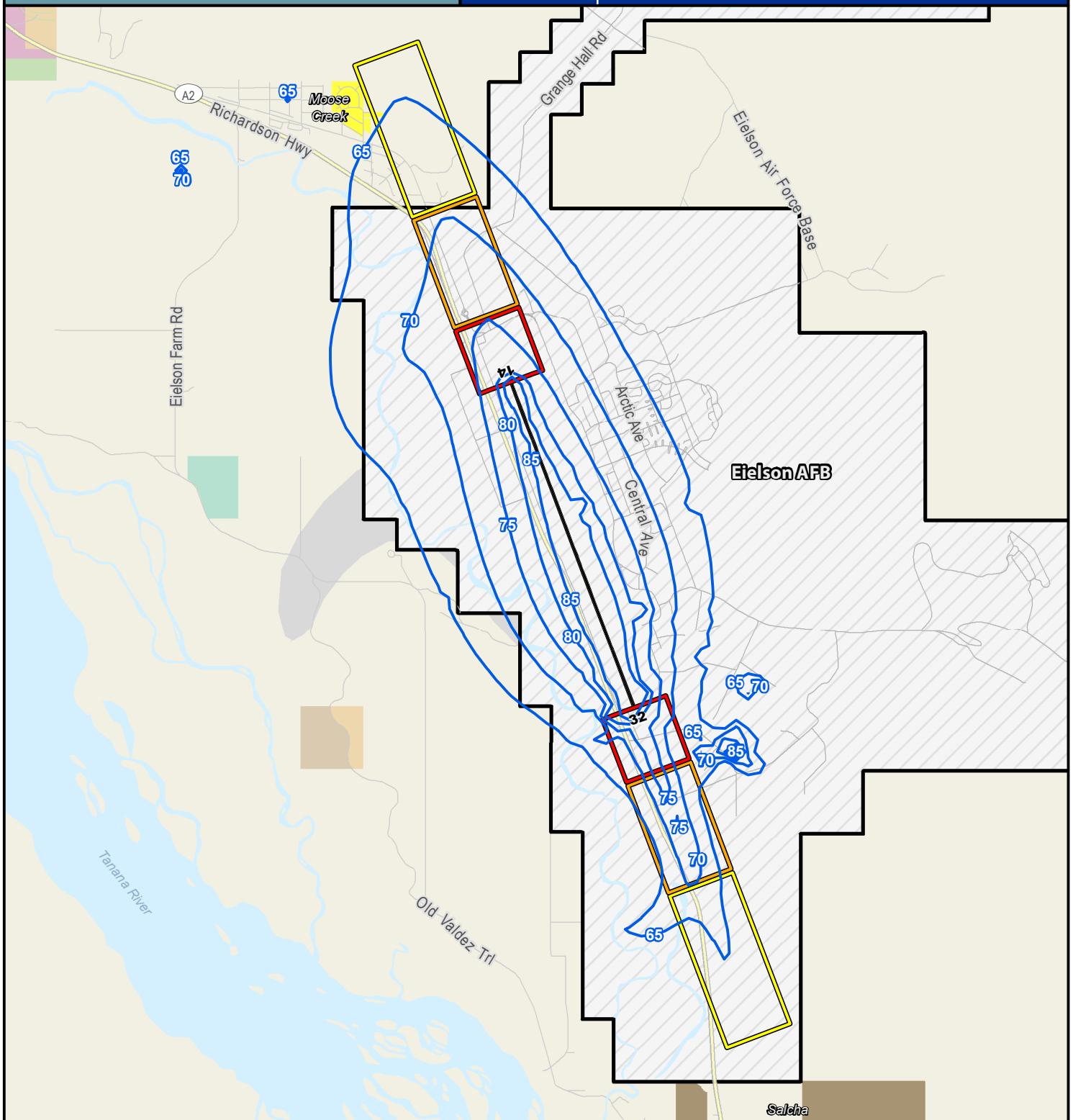


Legend:

- | | | |
|---------------|-----------------------------------|------------------------------|
| State Highway | 2018 AICUZ Noise Contour (dB DNL) | Comprehensive Plan Land Use |
| Street | 2018 AICUZ Clear Zones and APZs | Advisory Military Overlay |
| Runway | Clear Zone | Open/Agriculture/Low Density |
| Installation | Accident Potential Zone I | Residential |
| Waterbody | Accident Potential Zone II | Undesignated |



Source: AFCEC 2017; Digital Globe 2015; ESRI 2016; FNSB 2018; FHWA 2017. © Ecology and Environment, Inc. 2018



Legend:

- | | | | |
|--------------------------------------|---|--|---------------------------|
| State Highway | 2018 AICUZ Clear Zones and APZs | Outdoor Recreational/
Groundwater Damage Protection | Rural and Agricultural-20 |
| Street | Clear Zone | Rural Farmstead-4 | Rural and Agricultural-40 |
| Runway | Accident Potential Zone I | Rural Residential | |
| Installation | Accident Potential Zone II | Rural and Agricultural-5/
Groundwater Damage Protection | |
| Waterbody | Existing Zoning | Rural and Agricultural-5 | |
| 2018 AICUZ Noise
Contour (dB DNL) | General Use-1 | | |
| | General Use-1/Military Noise | | |



0 0.5 1
Miles

Source: AFCEC 2017; ESRI 2016;
FNSB 2018; FHWA 2017.
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An Office of Economic Adjustment-funded FNSB Growth Management Plan is currently in progress. The plan includes a gap analysis evaluating 12 topic areas, including housing, to assess existing conditions and expected needs related to the F-35's arrival at Eielson AFB. The community has been experiencing an economic contraction due to the loss of one squadron at Eielson AFB that generated vacancies on base and in town, as well as the general economic depression in Alaska from the oil field downturn. It is now expected that housing needs may be less than originally expected in the HRMA completed in 2015. Rather the influx of F-35A personnel is expected to help stabilize the community during this time of economic contraction.

6.4 Compatibility Concerns

6.4.1 *Land Use Analysis*

Land use describes how land is developed and managed, and is characterized by the dominant function occurring within an area. To compare land use consistently across jurisdictions, this analysis uses generalized land use classifications illustrating land use compatibility across common land use types. These generalized land use categories are not exact representations of the local community's land use designations, but combine similar land uses into one of seven categories:

- **Residential:** All types of residential activity, such as single- and multi-family residences and mobile homes, at a density greater than one dwelling unit per acre.
- **Commercial:** Offices, retail stores, restaurants, and other types of commercial establishments.
- **Industrial:** Manufacturing, warehouses, and other similar uses.
- **Public/Quasi-public:** Publicly owned lands and land to which the public has access, including military reservations and training grounds, public buildings, schools, churches, cemeteries, and hospitals.
- **Recreational:** Land areas designated for recreational activity, such as parks, wilderness areas and reservations, conservation areas, and areas designated for trails, hikes, camping, etc.
- **Open/Agriculture/Low Density:** Undeveloped land areas, agricultural areas, grazing lands and areas with residential activity at densities less than or equal to one dwelling unit per acre.
- **Undesignated:** Applies to parcels that had no indicated value or were listed as "undesigned" in the original datasets.

For the purpose of this analysis, the DoD AICUZ compatibility guidelines (Tables A-1 and A-2 of Appendix A) have been consolidated into the seven generalized land use classifications. Table 6-1 provides generalized compatibility guidelines. Land use compatibility falls into one of four categories: (1) Compatible; (2) Compatible with Restrictions; (3) Not Compatible; and (4) Not Compatible with Exceptions. The conditionally compatible land use (i.e., categories 2 and 4) may require incorporation of noise attenuation measures into the design and construction of structures and further evaluation to be considered “compatible,” and may require density limitations for land in APZs.

6.4.2 Existing Land Use Compatibility Concerns

As shown in Table 6-2, there are 357.30 acres of Open/Agriculture/Low Density land use in the 65-69 dB DNL noise zone and 9.54 acres of Open/Agriculture/Low Density land use in the 70-74 dB DNL noise zone. In both the 65-69 dB DNL noise zone and 70-74 dB DNL noise zone, this land use is compatible with restrictions. Figure 6-3 illustrates that there is not significant incompatible land use surrounding Eielson AFB when Comprehensive Plan land uses are analyzed.

As shown in Table 6-3, there are 65.32 acres of Open/Agriculture/Low Density land use in APZ II. In APZ II, Open/Agriculture/Low Density land use is compatible with restrictions. Specifically, activities that attract concentrations of birds creating a hazard to aircraft operations should be excluded. There is no incompatible land use in the CZ or APZ I.

The Richardson Highway is a public right-of-way that runs through installation property. It also crosses through the CZ, APZ I, APZ II, and all noise zones.

- In the CZ, the highway use is compatible with restrictions indicating that the highway should not exceed two lanes, should have no sidewalks, and should have no bike trails. Within the clear zone, the fencing should also be frangible (i.e. able to break clean if hit by an aircraft) and there should be no vertical clearance issues.
- In APZ I, the highway use is compatible with restrictions indicating that no passenger facilities or power lines should be present.
- In APZ II, the highway use is considered compatible.

In the 85+ dB DNL noise zone, the highway use is considered incompatible. It is considered compatible in all other noise zones.

Table 6-1. Generalized Land Use Categories and Noise/Safety Compatibility

Generalized Land Use Category ³	Noise Zone (dB DNL)						CZ	APZ I	APZ II
	<65	65-69	70-74	75-79	80-84	85+			
Residential	Yes	No ¹	No ¹	No	No	No	No	No	No
Commercial	Yes	Yes	Yes ²	Yes ²	No	No	No	Yes ²	Yes ²
Industrial	Yes	Yes	Yes	Yes	Yes ²	No	No	Yes ²	Yes ²
Public/Quasi-public	Yes	Yes ²	Yes ²	Yes ²	No	No	No	No	Yes ²
Recreation	Yes	Yes ²	Yes ²	No	No	No	No	Yes ²	Yes ²
Open/Agriculture/Low Density	Yes	Yes ²	Yes ²	Yes ²	Yes ²	Yes ²	No	Yes ²	Yes ²
Undesignated	Yes	No	No	No	No	No	No	No	No

Notes:

¹ Incompatible with exceptions.

² Compatible with restrictions.

³ This generalized table demonstrates the land compatibility guidelines. Refer to Appendix A for use in determining land use compatibility.

Table 6-2. Off-Installation Comprehensive Plan Land Use Acreage within AICUZ Noise Zones

Designation	Generalized Land Use Category ²	Noise Zone (dB DNL)								Note	Total
		65-69	Note	70-74	Note	75-79	Note	80-84	Note	85+	
Incompatible	Residential										
	Commercial										
	Industrial										
	Public/Quasi-public										
	Recreation										
	Open/Agriculture/Low Density										
Compatible	Undesignated										
	Residential										
	Commercial										
	Industrial										
	Public/Quasi-public										
	Recreation										
Subtotals	Open/Agriculture/Low Density	357.30	(1)	9.54	(1)						
	Undesignated										
	Incompatible										
	Compatible	357.30		9.54							
TOTAL		357.30		9.54							

Notes:

All contour areas on-installation are excluded from the counts.

¹ Compatible with restrictions.

² Refer to Appendix A for details.

Table 6-3. Off-Installation Comprehensive Plan Land Use Acreage within Clear Zones/Accident Potential Zones

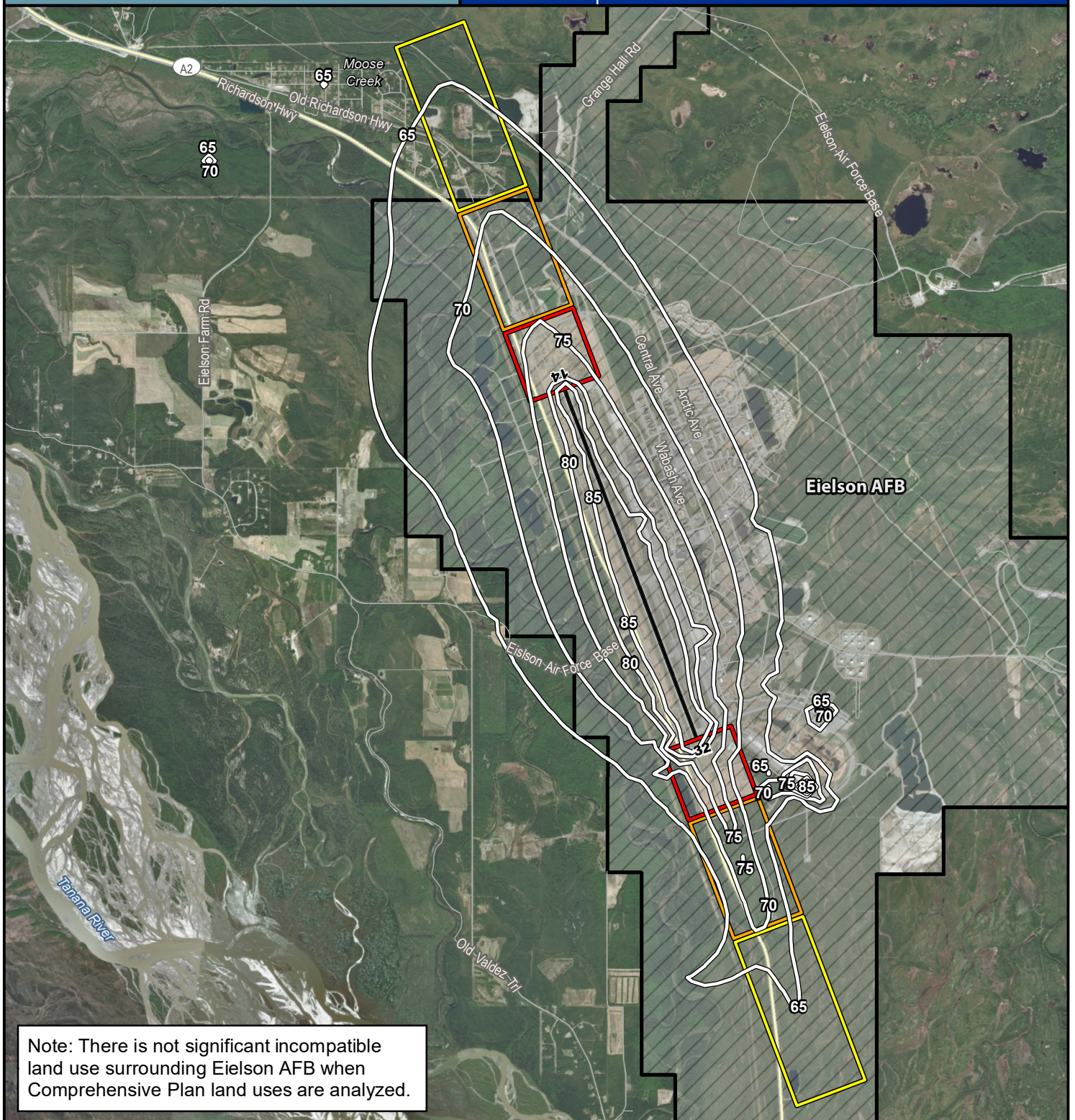
Designation	Generalized Land Use Category ²	CZ	Note	APZ I	Note	APZ II	Note	Total
Incompatible	Residential							
	Commercial							
	Industrial							
	Public/Quasi-public							
	Recreation							
	Open/Agriculture/Low Density					65.32	(1)	
	Undesignated							
Compatible	Residential							
	Commercial							
	Industrial							
	Public/Quasi-public							
	Recreation							
	Open/Agriculture/Low Density							
	Undesignated							
Subtotals	Incompatible					65.32	(1)	
	Compatible							
	TOTAL					65.32	(1)	

Notes:

All contour areas on-installation are excluded from the counts.

¹ Compatible with restrictions.

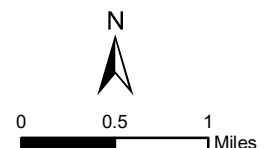
² Refer to Appendix A for details.



Note: There is not significant incompatible land use surrounding Eielson AFB when Comprehensive Plan land uses are analyzed.

Legend:

- | | |
|-----------------------------------|----------------------------------|
| State Highway | 2018 AICUZ Clear Zones and APZ's |
| Street | Clear Zone |
| Runway | Accident Potential Zone I |
| Installation | Accident Potential Zone II |
| 2018 AICUZ Noise Contour (dB DNL) | |



Source: AFCEC 2017; Digital Globe 2015; ESRI 2016; FHWA 2017; FNSB 2018. © Ecology and Environment, Inc. 2018

7.0 Implementation

Implementation of the AICUZ Study must be a joint effort between Eielson AFB and the surrounding communities. This AICUZ Study provides the best source of information to ensure land use planning decisions made by the local municipalities are compatible with a future installation presence. This chapter discusses the roles of all partners in the collaborative planning.

7.1 Air Force Role

The goal of the Air Force AICUZ Program is to minimize noise and safety concerns for the surrounding communities and to advise these communities about potential impacts from installation operations on the safety, welfare, and quality of life of their citizens.

Eielson AFB's AICUZ responsibilities encompass the areas of flight safety, noise abatement, and participation in the land use planning process.

Air Force policy and guidance requires that installation leadership periodically review existing practices for flight operations and evaluate these factors in relationship to populated areas and other local situations.

- Eielson AFB should ensure that, wherever possible, air operations planners route flights over sparsely populated areas to reduce the exposure of lives and property to a potential accident.
- Eielson AFB should periodically review existing traffic patterns, instrument approaches, weather conditions, and operating practices and evaluate these factors in relationship to populated areas and other local conditions. The purpose of this review is to limit, reduce, and control the impact of noise from flying operations on surrounding communities.
- Eielson AFB should establish a community forum between the installation and surrounding stakeholders to discuss land use and other issues of concern; the installation should hold these meetings on a quarterly basis.
- Eielson AFB should schedule land use planning meetings to provide a forum for agencies to meet and discuss future development and to address issues that may surface because of new proposals.
- Eielson AFB should provide copies of the AICUZ Study to local, borough, tribal, and regional planning departments and zoning administrators to aid in the planning process and provide copies of the AICUZ Study to appropriate state and federal agencies.

Preparation and presentation of this Eielson AFB AICUZ Study is one phase in continuing Air Force participation in the local planning process. The Air Force recognizes that, as

the local community updates its land use plans, Eielson AFB must be ready to provide additional input, as needed.

7.2 State/Regional Roles

There are no state planning districts in the state of Alaska, and state land use laws generally defer to local planning authorities. As noted in Section 6.2.2, the Alaska Department of Natural Resources and Bureau of Land Management have planning and platting authority for some land in the vicinity of Eielson AFB, although none of the land is located within the noise contours. FNSB is within the Tanana Basin Area Plan, which encompasses 14.5 million acres of state owned land and 1.7 million acres of federal land selected for conveyance to the state. The plan designates land uses that will occur on state lands within the Tanana Basin. According to the plan, within FNSB, most community expansion land in state ownership has already been sold or is otherwise encumbered, and approximately 29,000 acres of state land is available for agriculture (Alaska DNR 1991).

FNSB is also within the Bureau of Land Management's Central Yukon Planning Area. A new Resource Management Plan for the Central Yukon Planning Area is currently underway. When completed and approved, the Resource Management Plan will replace two existing Bureau of Land Management land use plans: the Utility Corridor Resource Management Plan (1991) and the Central Yukon Resource Management Plan (1986). It will also provide a Resource Management Plan for a portion of the lands currently covered by the Southwest Management Framework Plan (1986) and unplanned lands near Fairbanks (Bureau of Land Management, n.d.).

Alaska Statute 34.70.010 requires that before the buyer of an interest in residential real property makes a written offer, the seller must deliver a completed written disclosure form, the Residential Real Property Transfer Disclosure Statement. While the form requires a disclosure for noise in Section 33, it does not specifically reference noise associated with military installations. In addition, there is an Alaska Civil/Military Aviation Council that meets regularly to discuss airspace coordination.

7.3 Local Government Role

The role of the local government is to enact planning, zoning, and development principles and practices that are compatible with the installation and protect the installation's mission. The residents of the surrounding community have a long history of working with personnel from Eielson AFB. Adoption of the following recommendations during the revision of relevant land use planning or zoning regulations will strengthen this relationship, increase the health and safety of the public, and protect the integrity of the installation's flying mission:

- Recommend local government planners consider AICUZ policies and guidelines when developing or revising city comprehensive plans and use

AICUZ overlay maps and Air Force Land Use Compatibility Guidelines (see Appendix A) to evaluate existing and future land use proposals.

- Ensure that new development applications or “changed use of property” are submitted to Eielson AFB to afford the opportunity to assess those applications for potential impacts on defense missions. The Eielson AFB PA Office can provide a land use planning point of contact.
- Recommend zoning ordinances, such as the advisory Military Noise Overlay that FNSB’s Assembly adopted in 2015 and the in-progress Safety/Density Overlay, be adopted or modified to reflect the compatible land uses outlined in the AICUZ Study, including the creation of military airport overlay zones.
- Recommend local governments review their capital improvement plan, infrastructure investments, and development policies to ensure they do not encourage incompatible land use patterns near Eielson AFB, with particular emphasis on utility extension and transportation planning.
- Recommend local governments implement height and obstruction ordinances that reflect current Air Force and 14 CFR 77 requirements, presented in this study as HAFZs.
- Recommend fair disclosure ordinances be enacted to require disclosure to the public for those AICUZ items that directly relate to aircraft operations at Eielson AFB.
- Recommend local governments, where allowed, require real estate disclosure for individuals purchasing property within noise zones or CZs/APZs.
- Enact or modify building/residential codes to ensure that any new construction near Eielson AFB has the recommended noise level reduction measures incorporated into the design and construction of structures.
- Recommend government planning bodies monitor proposals for tall structures, such as wind turbines and communication towers, to ensure that new construction does not pose a hazard to navigable airspace around Eielson AFB. Where appropriate, coordinate with the FAA on the height of structures.
- Recommend that local government land use plans and ordinances reflect AICUZ recommendations for development in CZs/APZs and noise zones, such as the advisory Military Noise Overlay that FNSB’s Assembly adopted in 2015 and the in-progress Safety/Density Overlay.
- Recommend that local governments consult with Eielson AFB on planning and zoning actions that have the potential to affect installation operations.

- Invite the Air Force leadership to be ex officio members on boards, commissions, and regional councils addressing long-range development and other planning policies.
- Encourage the development of a working group of city, borough, and Eielson AFB representatives, as an extension of 2006 JLUS working group, to discuss land use concerns and major development proposals that could affect aircraft operations.

7.4 Community Roles

Neighboring residents and installation personnel have a long-established history of working together for the mutual benefit of the Eielson AFB mission and local community. Adoption of the following recommendations will strengthen this relationship, protect the health and ensure the safety of the public, and help protect the integrity of the installation's flying mission:

- **Real Estate Professionals and Brokers:**
 - Know where noise zones and CZs/APZs encumber land near the air installation and invite installation representatives to brokers' meetings to discuss the AICUZ Program with real estate professionals.
 - Expanding Section 33 of the State of Alaska Residential Real Property Transfer Disclosure Statement to address military noise. This could be done specifically by disclosing noise impacts to all prospective buyers of properties within areas greater than 65 dB DNL or within the CZs/APZs.
 - Require the Multiple Listing Service to disclose noise zones and CZs/APZs for all listings.
- **Developers:**
 - Know where the noise zones and CZs/APZs encumber land near the air installation. Consult with Eielson AFB on proposed developments within the AICUZ footprint.
 - Participate in local discussions regarding existing zoning ordinances and subdivision regulations to support the compatible land uses outlined in this AICUZ Study through implementation of a zoning overlay district based on noise contours and CZs/APZs.
- **Local Citizens:**
 - Participate in local forums with the installation to learn more about the installation's missions.

-
- Become informed about the AICUZ Program and learn about the program's goals, objectives, and value in protecting the public's health, safety, and welfare.
 - When considering property purchases, ask local real estate professionals, city planners, and installation representatives about noise and accident potential.

While the installation and community are separated by a fence, Air Force activities and operations affect the community and, conversely, community activities and decisions can affect the Air Force mission. Collaborative planning, forging partnerships, open communications, and close relationships help the Air Force and its neighbors achieve their mutual goals.

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Appendix A. Land Use Compatibility Tables

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation ¹	APZ-I Recommendation ¹	APZ-II Recommendation ¹	DENSITY Recommendation ¹
10	Residential				
11	Household Units				
11.11	Single units: detached	N	N	Y ²	Maximum density of 2 Du/Ac
11.12	Single units: semi-detached	N	N	N	
11.13	Single units: attached row	N	N	N	
11.21	Two units: side-by-side	N	N	N	
11.22	Two units: one above the other	N	N	N	
11.31	Apartments: walk-up	N	N	N	
11.32	Apartment: elevator	N	N	N	
12	Group quarters	N	N	N	
13	Residential hotels	N	N	N	
14	Mobile home parks or courts	N	N	N	
15	Transient lodgings	N	N	N	
16	Other residential	N	N	N	
20	Manufacturing ³				
21	Food and kindred products; manufacturing	N	N	Y	Maximum FAR 0.56 IN APZ II
22	Textile mill products; manufacturing	N	N	Y	Maximum FAR 0.56 IN APZ II
23	Apparel and other finished products; products made from fabrics, leather and similar materials; manufacturing	N	N	N	
24	Lumber and wood products (except furniture); manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
25	Furniture and fixtures; manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
26	Paper and allied products; manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
27	Printing, publishing, and allied industries	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
28	Chemicals and allied products; manufacturing	N	N	N	

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation ¹	APZ-I Recommendation ¹	APZ-II Recommendation ¹	DENSITY Recommendation ¹
29	Petroleum refining and related industries	N	N	N	
30	Manufacturing ³ (continued)				
31	Rubber and miscellaneous plastic products; manufacturing	N	N	N	
32	Stone, clay, and glass products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II
33	Primary metal products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II
34	Fabricated metal products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks	N	N	N	
39	Miscellaneous manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
40	Transportation, communication, and utilities ^{3, 4}				
41	Railroad, rapid rail transit, and street railway transportation	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
42	Motor vehicle transportation	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
43	Aircraft transportation	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
44	Marine craft transportation	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
45	Highway and street right-of-way	Y ⁵	Y ⁶	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
46	Automobile parking	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
47	Communication	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
48	Utilities ⁷	N	Y ⁶	Y ⁶	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation ¹	APZ-I Recommendation ¹	APZ-II Recommendation ¹	DENSITY Recommendation ¹
48.5	Solid waste disposal (landfills, incinerators, etc.)	N	N	N	
49	Other transportation, communication, and utilities	N	Y ⁶	Y	See Note 6 below
50	Trade				
51	Wholesale trade	N	Y	Y	Maximum FAR of 0.28 in APZ I & .56 in APZ II
52	Retail trade – building materials, hardware and farm equipment	N	Y	Y	See Note 8 below
53	Retail trade – including, discount clubs, home improvement stores, electronics superstores, etc.	N	N	Y	Maximum FAR of 0.16 in APZ II
53	Shopping centers- Neighborhood, Community, Regional, Super-regional ⁹	N	N	N	
54	Retail trade – food	N	N	Y	Maximum FAR of 0.24 in APZ II
55	Retail trade – automotive, marine craft, aircraft, and accessories	N	Y	Y	Maximum FAR of 0.14 in APZ I & 0.28 in APZ II
56	Retail trade – apparel and accessories	N	N	Y	Maximum FAR of 0.28 in APZ II
57	Retail trade – furniture, home, furnishings and equipment	N	N	Y	Maximum FAR of 0.28 in APZ II
58	Retail trade – eating and drinking establishments	N	N	N	
59	Other retail trade	N	N	Y	Maximum FAR of 0.16 in APZ II
60	Services¹⁰				
61	Finance, insurance and real estate services	N	N	Y	Maximum FAR of 0.22 in APZ II
62	Personal services	N	N	Y	Office uses only. Maximum FAR of 0.22 in APZ II.
62.4	Cemeteries	N	Y ¹¹	Y ¹¹	
63	Business services (credit reporting; mail, stenographic, reproduction; advertising)	N	N	Y	Maximum FAR of 0.22 in APZ II

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation ¹	APZ-I Recommendation ¹	APZ-II Recommendation ¹	DENSITY Recommendation ¹
63.7	Warehousing and storage services ¹²	N	Y	Y	Maximum FAR of 1.0 in APZ I; 2.0 in APZ II
64	Repair Services	N	Y	Y	Maximum FAR of 0.11 APZ I; 0.22 in APZ II
65	Professional services	N	N	Y	Maximum FAR of 0.22 in APZ II
65.1	Hospitals, nursing homes	N	N	N	
65.1	Other medical facilities	N	N	N	
66	Contract construction services	N	Y	Y	Maximum FAR of 0.11 APZ I; 0.22 in APZ II
67	Government Services	N	N	Y	Maximum FAR of 0.24 in APZ II
68	Educational services	N	N	N	
68.1	Child care services, child development centers, and nurseries	N	N	N	
69	Miscellaneous Services	N	N	Y	Maximum FAR of 0.22 in APZ II
69.1	Religious activities (including places of worship)	N	N	N	
70	Cultural, entertainment and recreational				
71	Cultural activities	N	N	N	
71.2	Nature exhibits	N	Y ¹³	Y ¹³	
72	Public assembly	N	N	N	
72.1	Auditoriums, concert halls	N	N	N	
72.11	Outdoor music shells, amphitheaters	N	N	N	
72.2	Outdoor sports arenas, spectator sports	N	N	N	
73	Amusements – fairgrounds, miniature golf, driving ranges; amusement parks, etc.	N	N	Y ²⁰	
74	Recreational activities (including golf courses, riding stables, water recreation)	N	Y ¹³	Y ¹³	Maximum FAR of 0.11 in APZ I; 0.22 in APZ II
75	Resorts and group camps	N	N	N	
76	Parks	N	Y ¹³	Y ¹³	Maximum FAR of 0.11 in APZ I; 0.22 in APZ II

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation ¹	APZ-I Recommendation ¹	APZ-II Recommendation ¹	DENSITY Recommendation ¹
79	Other cultural, entertainment and recreation	N	Y ¹¹	Y ¹¹	Maximum FAR of 0.11 in APZ I; 0.22 in APZ II
80	Resource production and extraction				
81	Agriculture (except live-stock)	Y ⁴	Y ¹⁴	Y ¹⁴	
81.5, 81.7	Agriculture-Livestock farming, including grazing and feedlots	N	Y ¹⁴	Y ¹⁴	
82	Agriculture related activities	N	Y ¹⁵	Y ¹⁵	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II, no activity which produces smoke, glare, or involves explosives
83	Forestry activities ¹⁶	N	Y	Y	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II, no activity which produces smoke, glare, or involves explosives
84	Fishing activities ¹⁷	N ¹⁷	Y	Y	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II, no activity which produces smoke, glare, or involves explosives
85	Mining activities ¹⁸	N	Y ¹⁸	Y ¹⁸	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II, no activity which produces smoke, glare, or involves explosives
89	Other resource production or extraction	N	Y	Y	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II, no activity which produces smoke, glare, or involves explosives
90	Other				
91	Undeveloped land	Y	Y	Y	
93	Water areas ¹⁹	N ¹⁹	N ¹⁹	N ¹⁹	

FOOTNOTES - Land Use Compatibility Recommendations in APZs and CZs

¹ A "Yes" or a "No" designation for compatible land use is to be used only for general comparison. Within each, uses exist where further evaluation may be needed in each category as to whether it is clearly compatible, normally compatible, or not compatible due to the variation of densities of people and structures. In order to assist air installations and local

governments, general suggestions as to FARs are provided as a guide to density in some categories. In general, land use restrictions that limit occupants, including employees, of commercial, service, or industrial buildings or structures to 25 an acre in APZ I and 50 an acre in APZ II are considered to be low density. Outside events should normally be limited to assemblies of not more than 25 people an acre in APZ I, and maximum assemblies of 50 people an acre in APZ II. Recommended FARs are calculated using standard parking generation rates for various land uses, vehicle occupancy rates, and desired density in APZ I and II. For APZ I, the formula is $FAR = 25 \text{ people an acre} / (\text{Average Vehicle Occupancy} \times \text{Average Parking Rate} \times (43560/1000))$. The formula for APZ II is $FAR = 50 / (\text{Average Vehicle Occupancy} \times \text{Average Parking Rate} \times (43560/1000))$.

- ² The suggested maximum density for detached single-family housing is two Du/Ac. In a planned unit development (PUD) of single family detached units, where clustered housing development results in large open areas, this density could possibly be increased slightly provided the amount of surface area covered by structures does not exceed 20 percent of the PUD total area. PUD encourages clustered development that leaves large open areas.
- ³ Other factors to be considered: Labor intensity, structural coverage, explosive characteristics, air-pollution, electronic interference with aircraft, height of structures, and potential glare to pilots.
- ⁴ No structures (except airfield lighting and navigational aids necessary for the safe operation of the airfield when there are no other siting options), buildings, or above-ground utility and communications lines should normally be located in Clear Zone areas on or off the air installation. The Clear Zone is subject to the most severe restrictions.
- ⁵ Roads within the graded portion of the Clear Zone are prohibited. All roads within the Clear Zone are discouraged, but if required, they should not be wider than two lanes and the rights-of-way should be fenced (frangible) and not include sidewalks or bicycle trails. Nothing associated with these roads should violate obstacle clearance criteria.
- ⁶ No above ground passenger terminals and no above ground power transmission or distribution lines. Prohibited power lines include high-voltage transmission lines and distribution lines that provide power to cities, towns, or regional power for unincorporated areas.
- ⁷ Development of renewable energy resources, including solar and geothermal facilities and wind turbines, may impact military operations through hazards to flight or electromagnetic interference. Each new development should to be analyzed for compatibility issues on a case-by-case basis that considers both the proposal and potentially affected mission.
- ⁸ Within SLUCM Code 52, maximum FARs for lumberyards (SLUCM Code 521) are 0.20 in APZ-I and 0.40 in APZ-II; the maximum FARs for hardware, paint, and farm equipment stores, (SLUCM Code 525), are 0.12 in APZ I and 0.24 in APZ II.
- ⁹ A shopping center is an integrated group of commercial establishments that is planned, developed, owned, or managed as a unit. Shopping center types include strip, neighborhood, community, regional, and super-regional facilities anchored by small businesses, a supermarket or drug store, discount retailer, department store, or several department stores, respectively.
- ¹⁰ Ancillary uses such as meeting places, auditoriums, etc. are not recommended.
- ¹¹ Chapels, houses of worship, and other land uses of public gatherings are incompatible within APZ I or APZ II.
- ¹² Big box home improvement stores are not included as part of this category.
- ¹³ Facilities must be low intensity, and provide no playgrounds, etc. Facilities such as club houses, meeting places, auditoriums, large classes, etc., are not recommended.
- ¹⁴ Activities that attract concentrations of birds creating a hazard to aircraft operations should be excluded.
- ¹⁵ Factors to be considered: labor intensity, structural coverage, explosive characteristics, and air pollution.
- ¹⁶ Lumber and timber products removed due to establishment, expansion, or maintenance of Clear Zone lands owned in fee will be disposed of in accordance with applicable DoD guidance.
- ¹⁷ Controlled hunting and fishing may be permitted for the purpose of wildlife management.
- ¹⁸ Surface mining operations that could create retention ponds that may attract waterfowl and present bird/wildlife aircraft strike hazards (BASH), or operations that produce dust or light emissions that could affect pilot vision are not compatible.
- ¹⁹ Naturally occurring water features (e.g., rivers, lakes, streams, wetlands) are pre-existing, nonconforming land uses. Naturally occurring water features that attract waterfowl present a potential BASH. Actions to expand naturally occurring water features or construction of new water features should not be encouraged. If construction of new features is necessary for storm water retention, such features should be designed so that they do not attract waterfowl.
- ²⁰ Amusement centers, family entertainment centers or amusement parks designed or operated at a scale that could attract or result in concentrations of people, including employees and visitors, greater than 50 people per acre at any given time are incompatible in APZ II.

Table A-2. Recommended Land Use Compatibility for Noise Zones

LAND USE			SUGGESTED LAND USE COMPATIBILITY			
SLUCM NO.	LAND USE NAME	DNL or CNEL 65-69	DNL or CNEL 70-74	DNL or CNEL 75-79	DNL or CNEL 80-84	DNL or CNEL 85+
10	Residential					
11	Household units	N ¹	N ¹	N	N	N
11.11	Single units: detached	N ¹	N ¹	N	N	N
11.12	Single units: semidetached	N ¹	N ¹	N	N	N
11.13	Single units: attached row	N ¹	N ¹	N	N	N
11.21	Two units: side-by-side	N ¹	N ¹	N	N	N
11.22	Two units: one above the other	N ¹	N ¹	N	N	N
11.31	Apartments: walk-up	N ¹	N ¹	N	N	N
11.32	Apartment: elevator	N ¹	N ¹	N	N	N
12	Group quarters	N ¹	N ¹	N	N	N
13	Residential hotels	N ¹	N ¹	N	N	N
14	Mobile home parks or courts	N	N	N	N	N
15	Transient lodgings	N ¹	N ¹	N ¹	N	N
16	Other residential	N ¹	N ¹	N	N	N
20	Manufacturing					
21	Food and kindred products; manufacturing	Y	Y ²	Y ³	Y ⁴	N
22	Textile mill products; manufacturing	Y	Y ²	Y ³	Y ⁴	N
23	Apparel and other finished products; products made from fabrics, leather, and similar materials; manufacturing	Y	Y ²	Y ³	Y ⁴	N
24	Lumber and wood products (except furniture); manufacturing	Y	Y ²	Y ³	Y ⁴	N
25	Furniture and fixtures; manufacturing	Y	Y ²	Y ³	Y ⁴	N
26	Paper and allied products; manufacturing	Y	Y ²	Y ³	Y ⁴	N
27	Printing, publishing, and allied industries	Y	Y ²	Y ³	Y ⁴	N
28	Chemicals and allied products; manufacturing	Y	Y ²	Y ³	Y ⁴	N
29	Petroleum refining and related industries	Y	Y ²	Y ³	Y ⁴	N
30	Manufacturing (continued)					
31	Rubber and misc. plastic products; manufacturing	Y	Y ²	Y ³	Y ⁴	N
32	Stone, clay and glass products; manufacturing	Y	Y ²	Y ³	Y ⁴	N
33	Primary metal products; manufacturing	Y	Y ²	Y ³	Y ⁴	N
34	Fabricated metal products; manufacturing	Y	Y ²	Y ³	Y ⁴	N
35	Professional scientific, and controlling instruments; photographic and optical goods; watches and clocks	Y	25	30	N	N
39	Miscellaneous manufacturing	Y	Y ²	Y ³	Y ⁴	N

LAND USE			SUGGESTED LAND USE COMPATIBILITY			
SLUCM NO.	LAND USE NAME	DNL or CNEL 65-69	DNL or CNEL 70-74	DNL or CNEL 75-79	DNL or CNEL 80-84	DNL or CNEL 85+
40	Transportation, communication and utilities					
41	Railroad, rapid rail transit, and street railway transportation	Y	Y ²	Y ³	Y ⁴	N
42	Motor vehicle transportation	Y	Y ²	Y ³	Y ⁴	N
43	Aircraft transportation	Y	Y ²	Y ³	Y ⁴	N
44	Marine craft transportation	Y	Y ²	Y ³	Y ⁴	N
45	Highway and street right-of-way	Y	Y	Y	Y	N
46	Automobile parking	Y	Y	Y	Y	N
47	Communication	Y	25 ⁵	30 ⁵	N	N
48	Utilities	Y	Y ²	Y ³	Y ⁴	N
49	Other transportation, communication and utilities	Y	25 ⁵	30 ⁵	N	N
50	Trade					
51	Wholesale trade	Y	Y ²	Y ³	Y ⁴	N
52	Retail trade – building materials, hardware and farm equipment	Y	25	30	Y ⁴	N
53	Retail trade – including shopping centers, discount clubs, home improvement stores, electronics superstores, etc.	Y	25	30	N	N
54	Retail trade – food	Y	25	30	N	N
55	Retail trade – automotive, marine craft, aircraft and accessories	Y	25	30	N	N
56	Retail trade – apparel and accessories	Y	25	30	N	N
57	Retail trade – furniture, home, furnishings and equipment	Y	25	30	N	N
58	Retail trade – eating and drinking establishments	Y	25	30	N	N
59	Other retail trade	Y	25	30	N	N
60	Services					
61	Finance, insurance and real estate services	Y	25	30	N	N
62	Personal services	Y	25	30	N	N
62.4	Cemeteries	Y	Y ²	Y ³	Y ^{4,11}	Y ^{6,11}
63	Business services	Y	25	30	N	N
63.7	Warehousing and storage	Y	Y ²	Y ³	Y ⁴	N
64	Repair services	Y	Y ²	Y ³	Y ⁴	N
65	Professional services	Y	25	30	N	N
65.1	Hospitals, other medical facilities	25	30	N	N	N
65.16	Nursing homes	N ¹	N ¹	N	N	N
66	Contract construction services	Y	25	30	N	N
67	Government services	Y ¹	25	30	N	N
68	Educational services	25	30	N	N	N
68.1	Child care services, child development centers, and nurseries	25	30	N	N	N
69	Miscellaneous Services	Y	25	30	N	N
69.1	Religious activities (including places of worship)	Y	25	30	N	N

LAND USE			SUGGESTED LAND USE COMPATIBILITY			
SLUCM NO.	LAND USE NAME	DNL or CNEL 65-69	DNL or CNEL 70-74	DNL or CNEL 75-79	DNL or CNEL 80-84	DNL or CNEL 85+
70	Cultural, entertainment and recreational					
71	Cultural activities	25	30	N	N	N
71.2	Nature exhibits	Y ¹	N	N	N	N
72	Public assembly	Y	N	N	N	N
72.1	Auditoriums, concert halls	25	30	N	N	N
72.11	Outdoor music shells, amphitheaters	N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	Y ⁷	Y ⁷	N	N	N
73	Amusements	Y	Y	N	N	N
74	Recreational activities (including golf courses, riding stables, water recreation)	Y	25	30	N	N
75	Resorts and group camps	Y	25	N	N	N
76	Parks	Y	25	N	N	N
79	Other cultural, entertainment and recreation	Y	25	N	N	N
80	Resource production and extraction					
81	Agriculture (except live- stock)	Y ⁸	Y ⁹	Y ¹⁰	Y ^{10,11}	Y ^{10,11}
81.5, 81.7	Agriculture-Livestock farming including grazing and feedlots	Y ⁸	Y ⁹	N	N	N
82	Agriculture related activities	Y ⁸	Y ⁹	Y ¹⁰	Y ^{10,11}	Y ^{10,11}
83	Forestry activities	Y ⁸	Y ⁹	Y ¹⁰	Y ^{10,11}	Y ^{10,11}
84	Fishing activities	Y	Y	Y	Y	Y
85	Mining activities	Y	Y	Y	Y	Y
89	Other resource production or extraction	Y	Y	Y	Y	Y

FOOTNOTES - Recommended Land Use Compatibility for Noise Zones

1. General

- a. Although local conditions regarding the need for housing may require residential use in these zones, residential use is discouraged in DNL 65-69 and strongly discouraged in DNL 70-74. The absence of viable alternative development options should be determined and an evaluation should be conducted locally prior to local approvals indicating that a demonstrated community need for the residential use would not be met if development were prohibited in these zones. Existing residential development is considered as pre-existing, non-conforming land uses.
- b. Where the community determines that these uses must be allowed, measures to achieve outdoor to indoor NLR of at least 25 decibels (dB) in DNL 65-69 and 30 dB in DNL 70-74 should be incorporated into building codes and be considered in individual approvals; for transient housing, an NLR of at least 35 dB should be incorporated in DNL 75-79.
- c. Normal permanent construction can be expected to provide an NLR of 20 dB, thus the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation, upgraded sound transmission class ratings in windows and doors, and closed windows year round. Additional consideration should be given to modifying NLR levels based on peak noise levels or vibrations.
- d. NLR criteria will not eliminate outdoor noise problems. However, building location, site planning, design, and use of berms and barriers can help mitigate outdoor noise exposure particularly from ground level sources.

Measures that reduce noise at a site should be used wherever practical in preference to measures that only protect interior spaces.

2. Measures to achieve NLR of 25 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
3. Measures to achieve NLR of 30 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
4. Measures to achieve NLR of 35 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
5. If project or proposed development is noise sensitive, use indicated NLR; if not, land use is compatible without NLR.
6. Buildings are not permitted.
7. Land use is compatible provided special sound reinforcement systems are installed.
8. Residential buildings require an NLR of 25.
9. Residential buildings require an NLR of 30.
10. Residential buildings are not permitted.
11. Land use that involves outdoor activities is not recommended, but if the community allows such activities, hearing protection devices should be worn when noise sources are present. Long-term exposure (multiple hours per day over many years) to high noise levels can cause hearing loss in some unprotected individuals.

Appendix B. Key Terms

Day-Night Average Sound Level (DNL) – DNL is a composite noise metric accounting for the sound energy of all noise events in a 24-hour period. In order to account for increased human sensitivity to noise at night, DNL includes a 10 dB penalty to events occurring during the acoustical nighttime period (10 p.m. through 7 a.m.). See section 4.3 for additional information.

Decibel (dB) – Decibel is the unit used to measure the intensity of a sound.

Flight Profiles – Flight profiles consist of aircraft conditions (i.e. altitude, speed, power setting, etc.) defined at various locations along each assigned flight track.

Flight Track – The flight track locations represent the various types of arrivals, departures, and closed patterns accomplished at air installations. The location for each track is representative for the specific track and may vary due to air traffic control, weather, and other reasons (e.g. one pilot may fly the on one side of the depicted track, while another pilot may fly slightly to the other side of the track).

Operation – An aircraft operation is defined as one takeoff or one landing. A complete closed pattern or circuit is counted as two operations because it has a takeoff component and a landing component. A sortie is a single military aircraft flight from the initial takeoff through the termination landing. The minimum number of aircraft operations for one sortie is two operations, one takeoff (departure) and one landing (approach).