

2013
AIR INSTALLATIONS COMPATIBLE
USE ZONES STUDY FOR
ANDERSEN AIR FORCE BASE, GUAM

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Prepared for:



AND
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EXECUTIVE SUMMARY

Incompatible land use adjacent to military installations is a growing concern for the United States Air Force. The increase in incompatible land use and development around airfields, generally referred to as encroachment, has the potential to seriously constrain an installation's mission capability.

At Andersen Air Force Base (Andersen AFB), land development in areas adjacent to the installation has increased in recent years. Fortunately, this growth has not yet resulted in serious constraints to the Andersen AFB mission. The opportunity still exists to proactively manage surrounding land use development to meet the growth needs of local communities and protect the sustainability of the Andersen AFB mission through the implementation and maintenance of compatible land use policies and practices.

This Air Installations Compatible Use Zones (AICUZ) Study highlights this opportunity and offers recommended strategies and planning tools that can be applied by local agencies to promote compatible land use development before encroachment becomes a serious problem at Andersen AFB. The study examines various planning parameters related to aircraft operations, noise, and safety, and provides an analysis of land use compatibility in both on- and off-base properties.

An AICUZ study was last prepared and approved for Andersen AFB in 1998. AICUZ studies should be updated when an air installation mission is modified, has a significant change in aircraft operations (i.e., the number of take-offs and landings), a change in the type of aircraft stationed and operating at the installation, or changes in flight paths or procedures. Since the 1998 AICUZ study was completed, the aircraft mix at Andersen AFB, noise modeling assumptions, and operations modeled for their contribution to noise at Andersen AFB have changed. Since the 1998 noise contours were produced, the runways thresholds have shifted approximately 1,000 feet southeast; operations (i.e.,

takeoffs and landings) and the noise generated from operations have therefore also shifted southeast due to this change in airfield configuration. Aircraft types have been replaced with newer airframes and operational tempo has also increased. Finally, increases in noise are due to changes in noise modeling technology (such as the ability to model terrain and ground impedance) that have allowed Andersen AFB to more accurately capture the noise environment.

ES.1 Safety

This 2013 AICUZ study defines standard Accident Potential Zones (APZs) and evaluates other key issues associated with flight safety in and around the Andersen AFB airfield.

ES.2 Noise

The 2013 AICUZ study update reports the results of the October 2013 Wyle Noise Report, *Aircraft Noise Study, Andersen Air Force Base, Guam* Revised Advanced Final WR 12-10 (Wyle Laboratories, Inc. 2013). The 2013 noise study was initiated to investigate the noise contributions of new and different types of aircraft operating at Andersen AFB since the 1998 AICUZ study, and to update the technical modeling assumptions of the noise analysis conducted in the 1998 AICUZ study. The increase in noise exposure from the 1998 AICUZ study to the 2013 AICUZ study is primarily attributed to changes in airfield configuration, aircraft type and operations, as well as noise modeling software.

ES.3 Land Use Compatibility

This study defines the AICUZ planning areas surrounding Andersen AFB. This includes the AICUZ footprint which more thoroughly addresses regional safety issues. Using accepted DOD guidelines, current zoning designations in the 2013 AICUZ footprint are evaluated for land use compatibility. The results of the analysis show that several areas of potential concern are currently zoned to allow development of potentially incompatible land uses (see Section 5).

ES.4 Recommendations

The following recommendations promote continued compatible development and seek to limit or prevent future incompatible development and potential encroachment resulting from changes in land use controls/zoning regulations.

Recommendations for Andersen AFB Action

1. Continue to incorporate AICUZ operational profiles and noise and safety conditions into the existing land management practices, including the site approval process, environmental review process, and Capital Improvements Program of the Andersen AFB General Plan.
2. Maintain and enhance Andersen AFB community information programs and AICUZ outreach efforts to address agency and public information needs.
3. Continue the implementation of the Andersen AFB noise complaint response program to address and respond to public inquiries regarding Andersen AFB air operations.
4. Continue implementation of the Andersen AFB air operations noise abatement and aircrew education programs to minimize noise and flight safety impacts on- and off-base.

Recommendations for Government of Guam and Municipalities Action

1. Update and incorporate AICUZ policies and guidelines into the comprehensive plans of northern Guam as well as the municipalities of Yigo and Dededo.
2. Modify zoning ordinances and subdivision regulations to support the compatible land uses outlined in this study through the implementation of a zoning overlay district based on the AICUZ map. Within this district use the Air Force Land Use Compatibility Guidelines to evaluate existing and future land use proposals.
3. Fair disclosure ordinances should be enacted to disclose to the public those AICUZ items directly related to operations at Andersen AFB such

as disclosure of noise zones during the purchase of property within the AICUZ footprint.

4. Implement height and obstruction ordinances that reflect current Air Force and Federal Aviation Administration (FAA) Part 77 requirements.
5. Ensure that the recommended noise level reductions are incorporated, when in accordance with local building practices, into the design and construction of new construction within the AICUZ area.
6. Continue to inform Andersen AFB of planning and zoning actions that have the potential to affect base operations.
7. Develop a working group representing GovGuam, municipality planners, and base planners to meet at least quarterly to discuss AICUZ concerns and major development proposals that could affect airfield operations.
8. Support and implement recommendations of the Joint Land Use Study Program efforts.

TABLE OF CONTENTS

Section	Page
Executive Summary	iii
List of Figures	ix
List of Tables	x
Acronyms and Abbreviations	xi
1 Purpose and Need	1-1
1.1 Introduction.....	1-1
1.2 Purpose and Need	1-2
1.3 Process, Procedure, and Noise Metrics.....	1-3
1.4 Computerized Noise Exposure Models	1-5
2 Installation Description	2-1
2.1 Description of Air Force Base	2-1
2.2 Mission.....	2-5
2.3 Economic Impact	2-8
2.4 Local Economic Characteristics	2-9
2.5 Base Impact.....	2-11
3 Aircraft Operations	3-1
3.1 Aircraft Operations by Aircraft Type	3-1
3.1.1 Aircraft Types	3-2
3.1.2 Flight Operations	3-9
3.2 Runway and Flight Track Utilization	3-17
3.3 Pre-Flight and Maintenance Run-Up Operations.....	3-18
3.4 Aircraft Flight Profiles and Noise Data	3-19
4 Effects of Flight Operations	4-1
4.1 Introduction.....	4-1
4.2 Airspace Control Surface Plan.....	4-1
4.3 Existing Noise Exposure.....	4-4
4.4 Comparison with Previous Aircraft Survey.....	4-7
4.5 Clear Zones and Accident Potential Zones	4-10
4.6 Land Use Compatibility Guidelines.....	4-14
4.7 Participation in the Planning Process.....	4-25

Table of Contents, continued

Section	Page
5 Land Use Analysis.....	5-1
5.1 Introduction.....	5-1
5.2 Existing Land Use.....	5-2
5.3 Current Zoning.....	5-3
5.3.1 Guam Planning Program and Implementation.....	5-3
5.3.2 SLUCM Classifications	5-4
5.3.3 Existing Zoning.....	5-6
5.4 Future Land Use.....	5-8
5.5 Incompatible Zoning.....	5-9
5.5.1 Noise Zones	5-9
5.5.2 Runway End 06L and 06R Clear Zones and Accident Potential Zones	5-13
5.5.3 Runway End 24R and 24L Clear Zones and Accident Potential Zones	5-14
5.5.4 Planning Considerations	5-14
6 Implementation.....	6-1
6.1 Air Force Responsibilities.....	6-1
6.2 Local Community Responsibilities.....	6-4
7 References	7-1

LIST OF FIGURES

Figure	Page
2.1	General Location Map, Andersen AFB, Guam 2-2
2.2	Andersen AFB Installation Map, Guam 2-4
3.1	Non Break Arrival Flight Tracks 3-21
3.2	Overhead Break Arrival Flight Tracks, Andersen AFB, Guam..... 3-22
3.3	Departure Flight Tracks, Andersen AFB, Guam 3-23
3.4	Pattern Flight Tracks, Andersen AFB, Guam 3-24
3.5	Rotary Wing Flight Tracks, Andersen AFB, Guam..... 3-25
3.6	Airspace Complex..... 3-26
4.1	Imaginary Surfaces, Andersen AFB, Guam..... 4-3
4.2	2013 AICUZ Noise Zones, Andersen AFB, Guam 4-5
4.3	1998 Noise Zones, Andersen AFB, Guam..... 4-8
4.4	Comparison of 1998 Noise Contours and 2013 AICUZ Noise Zones, Andersen AFB, Guam 4-9
4.5	Accident Potential Zones, Andersen AFB, Guam 4-11
4.6	Comparison of 1998 and 2013 Accident Potential Zones, Andersen AFB, Guam..... 4-13
4.7	2013 Andersen AFB AICUZ Map, Andersen AFB, Guam 4-26
5.1	Existing Zoning on the 2013 Andersen AFB AICUZ Map 5-7
5.2	Zoning Compatibility and the 2013 AICUZ Noise Contours, Andersen AFB, Guam 5-11
5.3	Zoning Compatibility and the 2013 AICUZ Accident Potential Zones, Andersen AFB, Guam..... 5-17

LIST OF TABLES

<u>Table</u>	<u>Page</u>
2.1 Decennial Population of Guam: 1990, 2000, and 2010	2-9
2.2 Personnel by Classification.....	2-12
2.3 Annual Economic Impact	2-12
3.1 Historical Flight Annual Operation, Andersen AFB	3-10
3.2 Annual Flight Operations, Andersen AFB.....	3-12
4.1 Imaginary Surfaces	4-2
4.2 Off-Base Areas, Population and Housing Units within the DNL 65-dB and Greater Noise Exposure Area.....	4-6
4.3 Land-Use Compatibility Guidelines	4-15
5.1 Zoning Districts on Guam.....	5-5
5.2 Zoning within the DNL 65-dB and Greater Noise Exposure Area.....	5-8
5.3 Zoning within Clear Zones and Accident Potential Zones	5-8
5.4 Zoning - Compatibility with Noise Exposure	5-10
5.5 Zoning - Compatibility with Runway End 06L and 06R Clear Zones and Accident Potential Zones.....	5-13

ACRONYMS AND ABBREVIATIONS

– A –

AAD	Average Annual Day
AEA	Airborne Electronic Attack
AFI	Air Force Instruction
AICUZ	Air Installations Compatible Use Zones
Air Force	United States Air Force; also USAF
AMC	Air Mobility Command
AMS	Air Mobility Squadron
Andersen AFB	Andersen Air Force Base
APZ	Accident Potential Zone
ARM	Anti-Radiation Missile
ATC	Air Traffic Control

– B –

BASH	Bird/Animal Aircraft Strike Hazard
BRAC	Base Realignment and Closure

– C –

CBP	Continuous Bomber Presence
CDP	Census Designated Place
CEDS	Comprehensive Economic Development Strategy
CPI	Consumer Price Index
CVW-5	Transient Carrier Air Wing Five
CY	Calendar Year
CZ	Clear Zone

– D –

dB	decibel(s)
dBA	A-weighted decibel(s)
DET 2, 21 SOPS	Detachment 2, 21st Space Operations Squadron
DLM	(Guam) Department of Land Management
DNL	Day-Night Average Sound Level
DOD	(United States) Department of Defense
Du/Ac	Dwelling Units per Acre

– E –

E & E	Ecology and Environment, Inc.
e.g.	for example

– F –

FAA	Federal Aviation Administration
FAR	Floor Area Ratio
FICAN	Federal Interagency Committee on Aviation Noise
FY	fiscal year

– G –

GCA	Guam Code Annotated
GDP	Gross Domestic Product
GEDA, BSP, UOG PCEI	Guam Economic Development Authority, Bureau of Statistics and Plans, University of Guam-Pacific Center for Economic Initiatives
GH	Global Hawk
GIS	geographic information system
GUANG	Guam Air National Guard

– H –

ha	hectare(s)
HSC-25	Helicopter Sea Combat Squadron Twenty Five
HSCWINGPAC	Helicopter Sea Combat Wing Pacific
HUD	(United States Department of) Housing and Urban Development
Hz	Hertz

– K –

km	kilometer(s)
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– L –

Lmax	maximum sound level
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– M –

MAGTF	Marine Air-Ground Task Force
Marine Corps	United States Marine Corps
MMA	Multi-mission Maritime Aircraft
MSL	mean sea level

– N –

NAVAIR	Naval Air Systems Command
Navy	United States Department of the Navy
NLR	noise level reduction
NMAP	NOISEMAP

– P –

PACOM	(United States) Pacific Command
RNM	Rotorcraft Noise Model

– S –

SEL	sound exposure level
SFARP	Strike Fighter Advanced Readiness Program
SLUCM	Standard Land Use Coding Manual
SOCAPAC	Special Operations Command Pacific

– T –

T&G	touch and go
TSP	Theater Security Package
TTF	Tanker Task Force

– U –

USAF	United States Air Force; also Air Force
USDA	United States Department of Agriculture

– V –

V/STOL	Vertical/Short Take-Off and Landing
VFR	visual flight rules

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1

PURPOSE AND NEED

- 1.1 Introduction
- 1.2 Purpose and Need
- 1.3 Process, Procedure, and Noise Metrics
- 1.4 Computerized Noise Exposure Models

1.1 Introduction

This study updates the 1998 Andersen Air Force Base (Andersen AFB) Air Installations Compatible Use Zones (AICUZ) Study. The update presents and documents the changes to the AICUZ for the period of 1998 to 2013. This AICUZ Study reaffirms United States Air Force (Air Force, *also* USAF) policy of promoting public health, safety, and general welfare in areas surrounding Andersen AFB by encouraging land-use patterns and activities in the vicinity of Andersen AFB that are compatible with Air Force aircraft operations. The AICUZ Study presents changes in flight operations since the last study and provides noise contours and compatible use guidelines for land areas surrounding the installation. This information is provided to assist the local communities and to serve as a tool for future planning and zoning activities. Therefore, the AICUZ Study provides base and community planners with a current and credible planning guide for managing land use and potential development issues surrounding the installation. The requirement to update the AICUZ Study is attributed to the following changes that occurred since the 1998 Andersen AFB AICUZ Study:

- Changes in the types of aircraft assigned at Andersen AFB;
- Addition, elimination, and/or modification of the number of operations associated with the various aircraft types;
- Addition, elimination, and/or modification of aircraft flight tracks that correspond to operational changes since the release of the 1998 Andersen AFB AICUZ Study; and

- Technical improvements to the NOISEMAP computer modeling program.

1.2 Purpose and Need

Andersen AFB is located at the northern end of the island of Guam and is part of the United States Department of Defense's (DOD) Joint Region Marianas where the United States Department of the Navy (Navy) is the supporting component. The purpose of the AICUZ program is to promote compatible land development in areas subject to aircraft noise and accident potential. As the Territory of Guam prepares and modifies their land use and development plans, recommendations from this AICUZ Study update should be included in their planning process to prevent incompatible usage that may compromise Andersen AFB's ability to fulfill its mission requirements. Accident potential and aircraft noise should be major considerations in their planning processes.

The goal of the AICUZ Program is to protect military operational capabilities and the health, safety, and welfare of the public by achieving compatible land use patterns and activities in the vicinity of a military installation.

Air Force AICUZ guidelines reflect land use recommendations for Clear Zones (CZs), Accident Potential Zones (APZs) I and II, and five noise zones at or above 65 decibels (dB) Day-Night Average Sound Level (DNL). These guidelines have been established on the basis of studies prepared and sponsored by several federal agencies, including the United States Department of Housing and Urban Development (HUD), the United States Environmental Protection Agency (USEPA), the Air Force, and territory and local agencies. The guidelines recommend land uses that are compatible with airfield operations while allowing maximum beneficial use of adjacent properties. The Air Force has no desire to recommend land use regulations that render property economically useless. It does, however, have an obligation to the inhabitants of the Andersen AFB environs and the citizens of the United States to point out ways to protect the public investment in the installation and the people living in areas adjacent to the installation.

The AICUZ program uses the latest technology to define noise levels in areas near Air Force installations. An analysis of Andersen AFB's flying operations was performed, including types of aircraft,

flight patterns utilized, variations in altitude, power settings, number of operations, and hours of operations. Aircraft modeled include bombers, tankers, fighters, military/civilian cargo/transport aircraft, electronic surveillance/attack aircraft, helicopters, tilt-rotors, and unmanned aerial systems. Modeled types of flight operations include departures, non-break arrivals, overhead break arrivals, touch and go (T&G) patterns and radar traffic patterns, as applicable (Wyle 2013). This information was used to develop the noise contours contained in this study. The DOD NOISEMAP methodology and the DNL metric were used to define the noise zones for Andersen AFB.

1.3 Process, Procedure, and Noise Metrics

Preparation and presentation of this update to Andersen AFB's AICUZ Study is part of the continuing Air Force participation in the local planning process. The authority for the establishment and implementation of the Air Force AICUZ program is derived from Air Force Instruction (AFI) 32-7063, *Air Installation Compatible Use Zone Program*, which implements DOD Instruction 4165.57, *Air Installations Compatible Use Zones*. Further guidance concerning organizational tasks and procedures needed to implement the Air Force AICUZ program is contained in Air Force Handbook 32-7084, *AICUZ Program Manager's Guide*. A citizen's brochure, a separate document that summarizes the Andersen AFB AICUZ Study, accompanies this document under separate cover.

AICUZ guidance consulted during the course of this Andersen AFB AICUZ Study includes:

- Air Force Instruction (AFI) 32-7063, *Air Installation Compatible Use Zone Program*
- DoD Instruction 4165.57, *Air Installations Compatible Use Zones*
- Air Force Handbook 32-7084, *AICUZ Program Manager's Guide*

It is recognized that, as local communities prepare land use plans and zoning ordinances, the Air Force has the responsibility to provide input on its activities relating to the community. This study is presented in the spirit of mutual cooperation and assistance by Andersen AFB to aid in the local land use planning process on the Territory of Guam.

This study updates information on base flying activities since 1998. Noise contours portrayed on the AICUZ maps in this study are based on recent historical mission plans.

The DOD and the Federal Interagency Committee on Aviation Noise (FICAN) use three types of metrics to describe noise exposure (Wyle 2013):

- 1) A measure of the highest sound level occurring during an individual aircraft overflight (single event);
- 2) A combination of the maximum level of that single event with its duration; and
- 3) A description of the noise environment based on the cumulative flight and engine maintenance activity.

The DOD and the FICAN use Maximum Sound Level (L_{max}), Sound Exposure Level (SEL) and DNL, respectively, for the three aforementioned types. The L_{max} is important in judging the interference caused by a noise event with conversation, television or radio listening, sleep, or other common activities. Although it provides some measure of the intrusiveness of the event, it does not completely describe the total event, because it does not include the period of time that the sound is heard. The SEL is a composite metric that represents all the sound energy of the event and includes both the intensity of a sound and its duration. The SEL metric is the best metric to compare noise levels from overflights of different aircraft types. For sound from military aircraft overflights in the vicinity of airbases, the SEL is usually 5 to 10 dB greater than the L_{max}. The DNL is a composite noise metric accounting for the sound energy of all noise events in a 24-hour period. To account for increased human sensitivity to noise at night, a 10-dB penalty is applied to nighttime (10:00 p.m. to 7:00 a.m.) events (Wyle 2013).

The metrics used to describe aircraft noise in this study are presented in terms of A-weighted dB (dBA), which de-emphasizes low-frequency noise, i.e., noise containing components less than 200 Hertz (Hz), to approximate the response and sensitivity of the human ear. Noise-sensitive land uses, such as housing, schools, and medical facilities are considered compatible in areas where the DNL is less than 65 dB. Noise-sensitive land uses are discouraged in areas where the DNL

Major Elements of an AICUZ Study:

- Data inventory (e.g. operations, local / regional land use and development information)
- Analysis of Existing and Projected Conditions
- Prepare AICUZ Study
 - Operations:
 - Safety Issues
 - Noise Exposure
 - Land Use Compatibility Analysis

is between 65 and 69 dB, and strongly discouraged where the DNL is between 70 and 74 dB. At higher levels, i.e. greater than 75 dB, noise-sensitive land use and related structures are not compatible and should be prohibited (Wyle 2013).

Generalized Land Use	DNL Noise Zones (decibels)				
	65-69	70-74	75-79	80-84	85+
Residential					
Manufacturing					
Transportation, Communications, and Utilities					
Wholesale and Retail Trade including Shipping Districts					
Offices, Public and Quasi-Public Services					
Recreation including Public Assembly					
Agriculture and Mining					

Generalized Noise Compatibility Matrix
See Table 4.3 for more detailed noise compatibility information

1.4 Computerized Noise Exposure Models

This section describes the analysis tools used to calculate the noise levels in this AICUZ Study: the NOISEMAP suite of computer programs. The programs allow noise exposure prediction of aircraft flight operations without actual implementation and/or noise monitoring of those actions. Analyses of aircraft noise exposure and compatible land uses around DOD airfield-like facilities are normally accomplished using a group of computer-based programs, collectively called NOISEMAP. The core computational programs of the NOISEMAP suite are NMAP and the Rotorcraft Noise Model (RNM). For this AICUZ Study NOISEMAP Version 7.2 and RNM Version 7.2.4 were used to analyze fixed- and rotary-wing aircraft/operations, respectively (Wyle 2013).

In addition to NMAP and RNM, the NOISEMAP suite of computer programs includes BaseOps, OMEGA10, OMEGA11, and NMPlot. The suite also includes noise databases known as NOISEFILE (used with fixed-wing aircraft) and NCFiles (used with rotary-wing

NOISEMAP (NMAP) and Rotorcraft Noise Model (RNM) were used to analyze fixed- and rotary-wing aircraft/operations, respectively, in this Andersen AFB AICUZ Study.

aircraft) databases. The BaseOps program allows entry of runway coordinates, airfield information, flight tracks, flight profiles along each flight track for each aircraft, numbers of daily flight operations, run-up coordinates, run-up profiles, and run-up operations. At this stage, closed-pattern operations, which are counted by Air Traffic Control (ATC) as two operations (one departure and one arrival), are entered in the program as one noise event (one departure followed by one arrival with the aircraft remaining in the vicinity of the airfield). The OMEGA10 program then calculates the SEL for each model of aircraft from the NOISEFILE database taking into consideration the specified speeds, engine thrust settings, and environmental conditions appropriate to each type of flight operation. The OMEGA11 program calculates maximum A-weighted sound levels from the NOISEFILE database for each model of aircraft taking into consideration the engine-thrust settings and environmental conditions appropriate to run-up operations. RNM simulates rotary-wing aircraft flight in a time-based manner along a particular flight track and the sound spreads through the atmosphere to specified receiver locations (Wyle 2013).

2

INSTALLATION DESCRIPTION

- 2.1 Description of Air Force Base
- 2.2 Mission
- 2.3 Economic Impact
- 2.4 Local Economic Characteristics
- 2.5 Base Impact

2.1 Description of Air Force Base

Andersen AFB comprises approximately 19,000 acres (6,880 hectares [ha]) of land in northern Guam (Ecology and Environment, Inc. [E & E] 2010).

Guam is the largest island in the Mariana Islands and is approximately 3,800 statute miles southwest of Hawaii and 1,500 miles east of the Philippines (Wyle 2013). Guam comprises an area of approximately 208 square miles (539 square kilometers). The island is 31 miles (50 kilometers [km]) long by 4 to 8 miles (6.5 to 13 km) wide from east to west and contains approximately 78 miles (126 km) of coastline (see Figure 2.1) (E & E 2010).

The largest metropolitan area on Guam, Hagatna, is approximately 20 miles southwest of Andersen AFB. The only other major aviation use on the island is A.B. Won Pat International Airport (Guam International Airport) (Wyle 2013). Guam Route 1 (Marine Corps Drive) serves the Main Gate and provides the primary highway access to base. Guam Route 15 serves the Santa Rosa Gate which is located southeast of the Main Gate (Parsons 2010).



Island of Guam

Nearby Air Traffic Control Assigned Airspaces provide numerous Air Force, United States Marine Corps (Marine Corps), Navy, and allied nations training opportunities. Additionally, Andersen AFB is approximately 150 miles south of the Farallon de Medinilla Island. Farallon de Medinilla is used by surface and subsurface ships (submarines), as well as by DOD aircraft and aircraft from other allied nations as a naval bombing range.

The airfield at Andersen on the base's eastern side is approximately 1,750 acres (708 ha) (E & E 2010, Parsons 2010). The historical World War II Northwest Field, an approximately 2,000 acres (809 ha) unlit auxiliary airfield, is approximately 5 miles northwest of the center of the Andersen airfield (Wyle 2013; Parsons 2010).

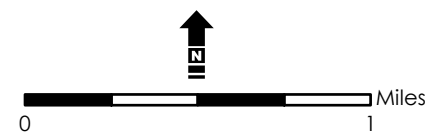


Figure 2.2
Andersen AFB Installation Map,
Guam

Legend

-  Runway
-  Andersen AFB
-  Airfield Surface Area
-  Helipad
- Base Buildings**
 -  Water or Pump Facility
 -  Auditorium or Amphitheatre
 -  Educational Facility or Clubhouse
 -  Cargo or Storage Facility
 -  Office
 -  Explosive Storage
 -  Motor Pool (vehicles)
 -  Other
 -  Religious/Church
 -  Repair & Maintenance Shops
 -  Residential
 -  Sanitary
 -  Social*
 -  Training
-  Major Road
-  Road
-  School

*Note: Social base buildings include the Base Theater used as an auditorium for Wing events.



Source: ESRI 2012; Navy, 2012;
USDA Imagery, 2006;
Google Maps, 2012

The Andersen airfield has two parallel runways. Runway 06L/24R is 10,535 feet long and 200 feet wide. Runway 06R/24L is 11,204 feet long and 200 feet wide (USAF 2011e; see Figure 2.2). The elevation of runway centerline endpoints 06L and 06R are 539 and 557 feet above mean sea level (MSL), respectively, and the centerline endpoints of runways 24L and 24R are 607 and 618 feet above MSL, respectively. The published airfield elevation is 618 feet above MSL; however, the modeled airfield reference point was set to 560 feet above MSL because of the approximate 70-foot disparity between the centerline endpoints of the runways (Wyle 2013). Based helicopters generally depart and arrive on Pads N17, N19, and N25 on the north side of the airfield, but perform closed patterns on the runways.

2.2 Mission

The mission of the Pacific Air Force is to provide ready air and space power to promote United States interests in the Asia-Pacific region during peacetime through crisis and in war. In support of this mission Andersen AFB and the 36th Wing provide the President of the United States sovereign options to decisively employ airpower across the entire spectrum of engagement (Andersen AFB 2012). Andersen AFB is an important main operating base and warfighting forward operating location for forces in the Pacific and Indian Oceans (Wyle 2013).



The 36th Wing is a “Fight Tonight” operational base tasked to project global power and reach from its strategic locations in the Pacific (Parsons 2010; Wyle 2013). Responsibilities of the 36th Wing include employment of assigned and deployed forces in support of United States Pacific Command (PACOM) objectives, maintenance of the base, and provision of services and support to the base’s military personnel, civilian staff, family members, and surrounding community

(Parsons 2010). The 36th Wing is divided into five Groups:

- 36th Maintenance Group (inspection, maintenance, and repair of aircraft and munitions);
- 36th Mission Support Group (support daily operations);
- 36th Medical Group (operates medical treatment facility and issues medical care);
- 36th Contingency Response Group (organizes, equips, and leads cross functional forces to respond to AF missions including Humanitarian and Disaster Relief); and
- 36th Operations Group (operational functions to maintain combat readiness and airlift capabilities) (Parsons 2010).

Andersen is also home to the Air Mobility Command's (AMC's) 734th Air Mobility Squadron (AMS), Naval unit Helicopter Sea Combat Squadron TWO FIVE (HSC-25), Detachment 2, 21st Space Operations Squadron (DET 2, 21 SOPS), and the Guam Air National Guard (GUANG) (Parsons 2010; Wyle 2013). As part of the USAF Global Mobility capability, the 734th AMS provides airfreight processing, forward-deployed command and control, passenger services and maintenance services support for military aircraft supporting humanitarian relief, contingency, and joint/combined exercise missions.

HSC-25 is the Navy's only forward-deployed MH-60S expeditionary squadron. As a part of Helicopter Sea Combat Wing Pacific (HSCWINGPAC), it provides an armed helicopter capability for US SEVENTH and FIFTH FLEETS as well as detachments to various commands covering a diverse mission set. Flying the MH-60S, HSC-25 supports permanently assigned detachments to the USS ESSEX homeported in Sasebo, Japan, and Commander Task Force 73. These detachments perform logistics, search and rescue, and humanitarian assistance for US SEVENTH FLEET. HSC-25 is also the Navy's only squadron that maintains a 24-hour search and rescue and medical

evacuation alert posture, directly supporting the U.S. Coast Guard, Sector Guam and Joint Region Marianas (DoN 2012).

As an Air Force Satellite Command unit the DET 2, 21 SOPS operates one of the eight remote tracking stations that are part of the Air Force Satellite Control Network. Through the operation of the remote tracking station, DET 2, 21 SOPS provides real-time command and control of military, national, allied, and civil satellites during launch and orbit for intelligence, early warning, communications, weather, and navigation programs purposes along with delivering time-sensitive tactical data to warfighters. GUANG's mission is to provide operationally ready combat support to supplement the active USAF (Parsons 2010).

Andersen's clear flying conditions, relatively unlimited airspace, nearby air-to-ground range, and unlit auxiliary fields make this an ideal and active training area for the U.S. military and militaries of nearby countries (Wyle 2013). Based aircraft include the MH-60S helicopter of the Navy HSC-25 squadron, RQ-4 Global Hawk (GH) remote-piloted aircraft of the 9 Operations Group (OG), Detachment (DET) 3, Continuous Bomber Presence (CBP) and Theater Security Package (TSP) aircraft. Although some aircraft are not stationed at the base, they typically operate at the base year round due to the rotation of units that utilize similar aircraft. Refer to Chapter 3 for further information aircraft that operate at Andersen AFB.

The CBP normally consists of 6 B-52s, though the rotations have included both B-1s and B-2s since this PACOM mission began in 2004, and may include them again in the future. The TSP, which includes four KC-135 aircraft, normally manned by the Air National Guard or USAF Reserves, has also been present on Andersen AFB since 2004. TSP also includes rotations of fighter aircraft that are sometimes located at Andersen AFB, normally made up of either 12 F-22s or 18 F-15Es or F-16s. These TSP missions are also part of the PACOM efforts to maintain stability in the region.

Andersen AFB is forward-based logistics support center for contingency forces deploying in the Pacific and Indian oceans. Primary tenants include:

- 36th Wing
- Air Mobility Command's 734th Air Mobility Squadron (AMS)
- Helicopter Sea Combat Squadron TWO FIVE (HSC-25)
- Detachment 2, 21st Space Operations Squadron (DET 2, 21 SOPS)
- Guam Air National Guard (GUANG)

2.3 Economic Impact

Guam's economy experienced a slowdown in the 1990s and early 2000s but by 2009 showed signs it was beginning to strengthen. Growth of all military service branches on Guam, including the Air Force, is expected. The DOD expansion includes both facilities and personnel (ICF International 2009). In 2009, approximately 14,000 active-duty personnel and dependents were located on Guam. However, implementation of the defense realignment roadmap with the Japanese government may increase the on-island military population to approximately 20,000 active-duty personnel and dependents or greater subject to further plans in development. Since Guam's economy is largely supported by tourism and the U.S. military, any military sector growth would have an impact on the private sector and residential growth and development (ICF International 2009).

The municipalities, of Yigo, Barrigada, Dededo, and Tamuning are located closest to Andersen AFB in north-central Guam.

According to the 2010 Census of Population and Housing, Guam's total population has increased 2.9% since 2000 and is home to 159,358 people (Bureau of Statistics and Plans 2012). In general, north-central Guam has a high population density compared to the southern half of the island, with the villages, also known as municipalities, of Yigo, Barrigada, Dededo, and Tamuning located closest to Andersen AFB (E & E 2010). Yigo, Barrigada, Dededo, Tamuning, along with Mangilao accounted for 67% of the Guam's housing stock in 2000 (ICF International 2009). The municipalities of Yigo, Barrigada, Dededo, and Tamuning continued to experience an increase in population during the period from 2000 to 2010. Tamuning experienced the largest growth, followed by Yigo, Dededo, and Barrigada (see Table 2.1 for additional municipality population information). Machanao, Mataguac, Dededo, and Liguan, Census Designated Places (CDP), located in the northern Guam near Andersen AFB, each had populations over 5,000 people in 2010 and represented the largest CDP populations near Andersen AFB in 2010 (Bureau of Statistics and Plans 2012). Andersen AFB's 2010 population, a combination of military, civilian, contractors, and

dependents of active duty personnel, exceeded 6,200 people (Parsons 2010).

Table 2.1: Decennial Population of Guam: 1990, 2000, and 2010

Municipality	Population			Change			
	1990	2000	2010	Number		Percent	
				1990 to 2000	2000 to 2010	1990 to 2000	2000 to 2010
Guam (total)	133,152	154,805	159,358	21,653	4,553	16.3 %	2.9 %
Barrigada	8,846	8,652	8,875	-194	223	-2.2 %	2.6 %
Dededo	31,728	42,980	44,943	11,252	1,963	35.5 %	4.6 %
Tamuning	16,673	18,012	19,685	1,339	1,673	8.0 %	9.3 %
Yigo	14,213	19,474	20,539	5,261	1,065	37.0 %	5.5 %

Source: Bureau of Statistics and Plans 2012.

2.4 Local Economic Characteristics

Employment figures from the March 2011 Guam Department of Labor's Current Employment Statistics Report (Hiles 2011) show a total of 61,930 jobs on Guam and an unemployment rate of 13.3%. This figure indicates a slight decline from 2010 when 62,200 jobs were recorded.

Although there was a slight decline in jobs between 2010 and 2011, the 2009 Annual Census of Business Establishments showed an increase in the growth rate of jobs during the period of 2005 through 2009 (Guam Economic Development Authority, Bureau of Statistics and Plans, University of Guam-Pacific Center for Economic Initiatives [GEDA, BSP, UOG PCEI] 2011).

In March 2011, Guam's workforce was represented by the following sectors:

- 27.76% in Services such as Hotels and other Lodging/Accommodations;
- 18.44% in Retail Trade;
- 10.27% in Construction;
- 7.14% in Transport and Public Utilities;

Local Economic Characteristics

- There are 61,930 jobs on Guam with an unemployment rate of 13.3%
- Guam's workforce is represented by the following top three sectors: service, retail trade, and construction
- Average household income is \$49,263
- The real GDP increased to \$3.9 billion in 2009
- Annual defense spending is approximately \$700-800 million on Guam

- 4.28% in Financial Insurance and Real Estate;
- 3.39% in Wholesale Trade;
- 2.71% Manufacturing; and
- 0.44% in Agriculture.

The private sector provided 74.42% of the jobs while the federal government and the Government of Guam provided 6.36% and 19.22% of the jobs, respectively (GEDA, BSP, UOG PCEI 2011).

As of July 2011, the Guam Bureau of Labor Statistics reported Guam's average household income was \$49,263 which represented a 7.1% increase from \$45,786 in 2008. However, the Per Capita Income decreased 1.7% from 2008 to \$12,864 in 2010. The Consumer Price Index (CPI) is used as a measure of inflation and is one of the most commonly used economic indicators of economic trends. The CPI for the First Quarter of 2011 was 1.9% compared to the same period in 2010. Estimates for Guam's Gross Domestic Product (GDP) for 2008 and 2009 were released by the U.S. Bureau of Economic Analysis in 2011. The real GDP, which is adjusted to remove price changes, showed an increase of 0.5% in 2008 and 1.7% in 2009 for a total of \$3.9 billion in 2009. The federal government, primarily the DOD, was the largest contributor to the increase in the real GDP during this time period. The increase in federal spending in 2008 and 2009 reflected increases in construction spending and compensation. However, Guam has experienced a significant drop in revenues from the three primary sectors of the economy – tourism, military/federal, and other – over a period of approximately 15 years. This is partially due to the significant decrease in military activity on the island beginning with the Base Realignment and Closure (BRAC) Commission's recommendations in 1995. As a result, total government revenues dropped 49% from the mid-1990s to an estimated total of \$340 million in 2010. This has led to deficiencies in the delivery of public services and raises concerns about various health, safety, employment, and education issues island-wide. (GEDA, BSP, UOG PCEI 2011)

The aftermath of the devastating earthquake and tsunami in northeastern Japan in March 2011 has been felt on Guam through a significant decline in tourist arrivals. This decline has affected hotel occupancy rates, occupancy taxes collected, and employment and income of island residents employed in the tourism sector. Partially due to the devastation in Japan and developments in the U.S. Congress, and dependent on the fiscal health of both countries, the terms, magnitude, and timing of the military buildup on Guam could differ from the 2006 U.S.-Japan Agreement. If there are delays in the military buildup, increases in earlier cost estimates are likely and could worsen the fiscal situation (GEDA, BSP, UOG PCEI 2011).

Overall, the proposed military buildup is expected to have a major economic impact on the local Guam economy especially in terms of construction and an increase in civilian employees. Although exact details of the military buildup and its impact are uncertain, it is recognized that a continued military presence is a significant component of the Guam's economy. The 2011 Comprehensive Economic Development Strategy (CEDS) is intended to guide all future economic development policies and efforts on Guam. The DOD, the United States Department of Agriculture (USDA), and the Government of Japan are providing a substantial portion of the funding for the military buildup effort. Annual defense spending is \$700 to 800 million on Guam. Approximately 6,500 active-duty personnel and 7,000 dependents are on the island and, in 2009, 1,601 civilians were employed by the DOD. The Air Force employed approximately 8% of the DOD civilian employees on Guam for total of 125 civilian employees (GEDA, BSP, UOG PCEI 2011).

2.5 Base Impact

Andersen AFB is an important part of the larger DOD presence on Guam and contributes to the local economy through direct employment and purchases of goods and services from island businesses. The fiscal year (FY) 2013 economic impact statement prepared by the 36th Comptroller Squadron for Andersen AFB shows that the Air Force

directly employs 1,350 civilians and contractors. The FY2013 economic impact statement also indicates the installation population including military dependents equals 7,252 people (Table 1). The annual gross payroll is \$319 million and the annual value of construction, contracts, along with expenditures for materials, equipment, and supplies is \$206 million. Andersen AFB contributes to the creation of an estimated 1,471 indirect jobs in the local area such as retail, service, or construction jobs for a total estimated value of \$47 million (Table 5). Based on payroll expenditures; annual expenditures related to contracts, construction, and other materials; and the estimated value of indirect jobs created in the local area, Andersen AFB has a direct economic impact of approximately \$572 million on the local economy (Table 6). The total value of resources is documented as \$4.8 billion (Parsons 2010).

Table 1: Personnel by Classification

Classification	Total
Appropriated Fund Military	2,782
Active Duty	2431
Guam Air National Guard/Reserve	351
Deployed Personnel	596
Active Duty Military Dependents	2,530
Appropriated Fund Civilians (NAVFAC, AF, NCTS, JRM)	443
Non-Appropriated Fund/Contractors	901
Grand Total	7,252

Source: EIA 2013.

Table 6: Total EIA Estimate

Expense Category	Total
Annual Gross Payroll (Table 2)	\$243.6 Million
Retiree Payroll (Table 4)	\$75.5 Million
Annual Expenditures (Table 3)	\$205.9 Million
Annual Dollar Value of Jobs Created (Table 5)	\$46.8 Million
Total Annual Economic Impact	\$571.8 Million

Source: EIA 2013.

3

AIRCRAFT OPERATIONS

- 3.1 Aircraft Operations by Aircraft Type
- 3.2 Runway and Flight Track Utilization
- 3.3 Pre-Flight and Maintenance Run-Up Operations
- 3.4 Aircraft Flight Profiles and Noise Data

3.1 Aircraft Operations by Aircraft Type

To describe the relationship between aircraft operations and land use, it is necessary to fully evaluate the exact nature of flying activities. The aircraft operations reported in this study represent an average of Andersen AFB airfield operations from CY2007 to CY2010 that is roughly equivalent to the aircraft operations conducted during CY2010. Operations tempo may vary from year to year based on ramp-ups and airfield maintenance schedules, therefore, average airfield operations from CY2007 to CY2010 are provided to accurately reflect the overall operations tempo at Andersen AFB. The operations inventory includes based and transient aircraft at Andersen AFB, where those aircraft fly, how high they fly, how many times they fly over a given area, and at what time of day they operate. Northwest Field is considered a separate airfield, and Northwest Field operations (other than based aircraft inter-facility flights from Andersen AFB) are not included in the 2010 flight operations scenario (Wyle 2013).

2013 AICUZ airfield operations fall into seven categories, or mission groups, at Andersen AFB. The mission and exercises are evolving. For the purposes of this report, groups include:

- HSC-25 based MH-60S helicopters;
- Based aircraft including CBP, Tanker Task Force (TTF), and GHs stationed at Andersen AFB;

- Miscellaneous transient aircraft, including the 36th Wing, Air Mobility Command's 734th Air Mobility Support Squadron, military and civilian transport, Multi-mission Maritime Aircraft (MMA), and other aircraft categorized according to handling reports;
- Transient Carrier Air Wing Five (CVW-5) and the Strike Fighter Advanced Readiness Program (SFARP);
- Valiant Shield Exercise;
- Marines Expeditionary Unit (MEU);
- Cope North exercise; and
- Aviation Training Relocation deployments.

Subsection 3.1.1 summarizes based and transient aircraft types at Andersen AFB. Subsection 3.1.2 summarizes the flight operations.

3.1.1 Aircraft Types

The following aircraft are either currently stationed or typically on station temporarily conducting exercises, conducting mobility operations, and simply transiting through the region. Aircraft observed at Andersen AFB include those described in Sections 3.1.1.1 and 3.1.1.2.

3.1.1.1 Rotary-Wing Aircraft

AH-1 Cobra, UH-1 Iroquois "Huey"



Source: NAVAIR n.d.(c).

AH-1 Cobra

The AH-1 *Cobra* serves as the Marine Corps' primary attack helicopter. The AH-1 provides the Marine Corps with close air support, armed escort, and armed reconnaissance.

The UH-1 *Iroquois*, more commonly known as "Huey," originated in 1956 and has become the most successful military helicopter ever produced. The Marine Corps uses the UH-1 for battlefield command and control, maritime special

operations and search-and-rescue missions for the Navy's HH-1N helicopter (Naval Air Systems Command [NAVAIR] n.d.[a]). Both the AH-1 and the UH-1 are used by the Marines Expeditionary Unit mission group at Andersen AFB (Wyle 2013).

CH-53E Super Stallion, CH-46E Sea Knight



Source: NAVAIR n.d.(d).

CH-53E Super Stallion

The CH-53E *Super Stallion* helicopter primarily moves cargo and equipment. The CH-53E can also transfer troops ashore during in an amphibious assault (Naval History and Heritage Command 2012). The Marine Corps CH-46E *Sea Knight* helicopter's primary mission is to provide assault support by transporting combat troops. The CH-46E's secondary mission is the transport of supplies and equipment (NAVAIR n.d.[a]). The CH-53E and CH-46E are used by the Marines Expeditionary Unit mission group at Andersen AFB (Wyle 2013).

MH-60S Seahawk

The primary functions of the MH-60S *Seahawk* helicopter are Anti-Surface Warfare, combat support, and humanitarian disaster relief. The MH-60S replaced the aging fleet of H-46D helicopters and provided several new benefits such as reducing unscheduled maintenance and component removals (NAVAIR n.d.[a]). The MH-60S *Seahawk* is used by the HSC-25 mission group at Andersen AFB (Wyle 2013).



Source: NAVAIR n.d.(e).

MH-60S Seahawk

3.1.1.2 Fixed-Wing Aircraft

AV-8B Harrier II



Source: U.S. Department of the Navy 2008.

AV-8B Harrier II

The AV-8B is a single-seat, light attack aircraft that has a Vertical/Short Take-Off and Landing (V/STOL) capability which allows it to operate in a variety of situations such as amphibious ships, expeditionary airfields, damaged conventional airfields, and forward sites such as roads. The AV-8B provides offensive air support to the Marine Air-Ground Task Force (MAGTF) (U.S. Department of the Navy 2008). The Marines Expeditionary Unit mission group at Andersen AFB utilizes the AV-8B (Wyle 2013).

B-1 Lancer, B-2 Spirit, B-52 Stratofortress

The bombers that are at Andersen AFB include the B-1 *Lancer*, B-2 *Spirit*, and B-52 *Stratofortress*. The B-1 *Lancer* is a supersonic bomber that transports the largest payload of guided and unguided weapons in the Air Force inventory. It is considered the backbone of the long-range bomber force and is a versatile and multi-mission weapon system. The B-2 Spirit bomber also has a large payload and has low-observable characteristics, commonly known as “stealth.” It is capable of

delivering both conventional and nuclear munitions. The B-52 *Stratofortress* is also a long-range, heavy bomber, can carry nuclear or precision-guided conventional ordnance, and serves a variety of missions (USAF 2011a). All three bombers are used by the Based Aircraft mission group at Andersen AFB. The B-52 is also used by the Valiant Shield Exercise and Cope North mission group (Wyle 2013).



B-52 Stratofortress

C-12 Huron, C-17 Globemaster III, C-40 Clipper, C-130 Hercules,

The C-12 *Huron* has a range of capabilities including range clearance, courier flights, medical evacuation, humanitarian rescue and assistance, training and testing, and quick, time-sensitive, or high-priority personnel and cargo transport (NAVAIR n.d.[b]).

The C-17 *Globemaster III* is a flexible cargo aircraft used in the airlift force. The C-17 can provide strategic delivery of troops and various cargos to main operating bases or bases in a deployment area. It not only has tactical airlift and airdrop mission capabilities, but can also transport ambulatory patients during evacuations (USAF 2011b).

The C-40 *Clipper* is a logistics aircraft operated and maintained by the United States Naval Reserve. The C-40, part of the Boeing Next-Generation 737 series, provides the fleet forces with critical logistics support (NAVAIR n.d.[b]).

The C-130 *Hercules* provides the tactical portion of the airlift mission and is considered the primary transport for airdropping troops and equipment into hostile areas among other various uses. The C-130 can operate from dirt airstrips and is used throughout the Air Force (USAF 2011c).

The C-12, C-40, C-17, and C-130 are used by the transient aircraft mission group. The C-130 is also used within the Cope North mission group at Andersen AFB (Wyle 2013).



Source: NAVAIR n.d.(f).

C-12 Huron

EA-6B Prowler, E-3



Source: U.S. Department of the Navy 2008.

EA-6B Prowler

The primary capabilities of the EA-6B *Prowler* include Airborne Electronic Attack (AEA) and Anti-Radiation Missile (ARM) against enemy radar and communications. The EA-6B *Prowler* has enhanced the strike capabilities of carrier wings, Marine expeditionary forces, and an expeditionary *Prowler* force has supported ground forces in numerous joint and allied operations since 1995 (U.S. Department of the Navy 2008). The *Prowler* is used by the CVW-5 and SFARP mission group at Andersen AFB (Wyle 2013).

E-2C Hawkeye

The Navy's E-2C *Hawkeye* is a carrier-based, tactical battle management, airborne early-warning and command and control aircraft that can operate in all weather conditions. The E-2C is an important component of the Carrier Strike Group air wing by providing threat analysis against potentially hostile air and surface targets (NAVAIR n.d.[b]). The E-2C *Hawkeye* is used by the CVW-5 and SFARP mission group and the Cope North mission group at Andersen AFB (Wyle 2013).



Source: NAVAIR n.d.(g).

E-2C Hawkeye

F-2, F-15 Eagle, F-16 Fighting Falcon, F-22 Raptor

The F-15 *Eagle* allows the Air Force to achieve air supremacy over the battlefield. As a tactical fighter, the F-15 is highly maneuverable, can operate in all weather conditions, and achieves air superiority through a combination of acceleration, range, weapons, and avionics. The F-15C is a single-seat aircraft. The F-16 *Fighting Falcon*, a multi-role aircraft, is a compact and maneuverable aircraft that provides air-to-air combat and air-to-surface attack capabilities. Based on the design of the F-16 *Fighting Falcon*, the F-2 is a multi-role, single-engine fighter that provides both air-to-air and air-to-surface capabilities (Lockheed Martin 2012). The F-22 *Raptor* is a new Air Force fighter aircraft and is an important part of the Global Strike Task Force. Its air-to-air and air-to ground mission capabilities are unmatched due to a mixture of stealth, supercruise, maneuverability, avionics, and improved supportability (USAF 2012).

The F-15, F-16, and F-22 are used by the Based Aircraft mission group at Andersen AFB. The F-15 and F16 is also used by the Cope North mission group. The F-2 is also used by Cope North (Wyle 2013).



F/A-18C/D *Hornet*, F/A-18E/F *Super Hornet*



Source: NAVAIR 2012(h).

F/A-18E/F *Super Hornet*

The F/A-18C/D *Hornet* is a twin-engine, multi-mission fighter/attack aircraft that can operate either from aircraft carriers or from land bases. The *Hornet* fulfills a variety of roles: air superiority, fighter escort, suppression of enemy air defenses, reconnaissance, forward air control, close and deep air support, and day and night strike missions. The F/A-18E/F *Super Hornet* is a single-seat (E) or two-seat (F), twin-engine, multi-mission fighter/attack aircraft that fulfills the same types of roles as the C/D

models. The F/A-18 *Super Hornet*, however, is 4.2 feet longer than earlier *Hornets*, has a 25% larger wing area, and carries 33% more internal fuel, which effectively increases mission range by 41% and endurance by 50% (U.S. Department of the Navy 2008). The F/A-18C/D *Hornet* is used by the CVW-5 and SFARP mission group and the Marines Expeditionary Unit mission group at Andersen AFB. The F/A-18E/F *Super Hornet* is used by the CVW-5 and SFARP, Valiant Shield Exercise, and Cope North Exercise mission groups at Andersen AFB (Wyle 2013).

KC-10 *Extender*, KC-135 *Stratotanker*



Source: USAF 2011d.

KC-135 *Stratotanker*

The primary mission of the KC-10 *Extender*, an AMC advanced tanker and cargo aircraft, is aerial refueling. It can simultaneously refuel fighters and transport fighter support personnel and equipment on overseas deployments. The USAF's core aerial refueling capability is provided by the KC-135 *Stratotanker*. The KC-135 is also capable of carrying ambulatory patients during aeromedical evacuations (USAF 2011d). Both the KC-10 and KC-135 are used by the Based Aircraft, transient aircraft, and the Valiant Shield Exercise mission groups at Andersen

AFB. The KC-135 is also used by the Cope North mission group (Wyle 2013).

P-3A Orion

The P-3A *Orion* is the Navy's land-based, long-range patrol aircraft that provides surveillance of battlespace at sea for anti-submarine warfare or battlespace on land (NAVAIR n.d.[b]). The P-3A *Orion* is used by the transient aircraft and Valiant Shield Exercise mission groups at Andersen AFB (Wyle 2013).



Source: NAVAIR n.d(i).

P-3 Orion

3.1.2 Flight Operations

The first step in the noise analysis process is to determine the number of annual flight operations for the year studied. The NOISEMAP suite of computer programs requires input of the annual operations by aircraft type, operation type, and time period (acoustical daytime hours of 0700 to 2200 and nighttime hours of 2200 to 0700).

ATC considers a flight operation as a takeoff or landing of one aircraft. Closed patterns count as two operations: one departure and one arrival.

Historical aircraft operations at Andersen AFB for CY2003 through CY2013 are represented in Table 3.1. Total annual flight operations remained relatively constant at around 30,000 aircraft operations from CY2003 through CY2006. From CY2007 to CY2013 a 33% decrease in total annual flight operations occurred relative to the period from CY2003 to CY2006 when the annual flight operations totaled approximately 20,000 aircraft operations. Approximately 95% of all flight operations at Andersen AFB during the time period from CY2007 to CY2013 were military aircraft.

Table 3.1: Historical Flight Annual Operation, Andersen AFB

Calendar Year	Military	Civil		Total
		Air Carrier	General Aviation	
2003	28,705	635	1,000	30,340
2004	27,998	620	1,005	29,623
2005	29,102	605	935	30,642
2006	28,903	623	929	30,455
2007	19,666	357	880	20,903
2008	21,326	582	895	22,803
2009	16,863	447	538	17,848
2010	19,583	330	547	20,460
2011	10,878	265	474	11,617
2012	24,173	572	982	25,727
2013	14,828	919	475	16,222

Source: Wyle 2013.

The aircraft operations reported in this study reflect a four-year average of tower counts for the period of CY2007 to CY2010 and are roughly equivalent to aircraft operations conducted during CY2010. The aircraft operations include approximately 23,691 total annual based and transient military/civilian flight operations. Table 3.2 depicts the aircraft operations by mission group, aircraft type, operation type, total day operations, total night operations, and total annual flight operations. The vast majority of operations occur during the day as only 9% of the AICUZ Study flight operations happened within the acoustical nighttime period (2200 to 0700 [10 p.m. to 7 a.m.]). The operation types are defined as follows:

- **Departure:** An aircraft takes off and proceeds to a separate destination, a local training area, a nonlocal training area, or as part of a training maneuver (e.g., touch and go).
- **Non-Break Arrival:** An aircraft lines up on the runway centerline, descends gradually, lands, comes to a full stop, and then taxis off the runway.
- **Overhead Break Arrival:** An expeditious arrival using visual flight rules (VFR). An aircraft approaches the runway 500 feet above the altitude of the landing pattern. Approximately halfway down the runway, the aircraft performs a 180-degree turn to enter the landing pattern. Once established in the pattern, the aircraft lowers landing gear and flaps and performs a 180-degree descending turn to land on the runway.
- **Touch and Go:** An aircraft lands and takes off on a runway without coming to a full stop. After touching down, the pilot immediately goes to full power and takes off again. The touch and go is counted as two operations—the landing is counted as one operation, and the takeoff is counted as another.
- **Radar Traffic Pattern:** A radar pattern is primarily used for instrument proficiency for aircraft originating from Andersen AFB. Additionally, aircraft arriving either stationed or transient may utilize instrument or visual approaches to the field. Air Traffic Control provides “radar vectors” to join the ILS or TACAN approaches, which is the preferred method of arrival during instrument conditions. Note: The radar traffic pattern is counted as two operations—the landing is counted as one operation, and the takeoff is counted as another.

Table 3.2: Annual Flight Operations, Andersen AFB

Aircraft Type	Operation Type	Total		
		Day (0700-2200)	Night (2200-0700)	Total
Mission Group: HSC-25				
MH-60S	Departure	1,150	36	1,186
	Non-break Arrival	1,150	36	1,186
	Touch and Go	5,429	168	5,597
	Radar Traffic Pattern	391	12	403
	Total	8,120	252	8,372
Mission Group: Based Aircraft (CBP, TTF, GH)				
B-1	Departure	24	2	26
	Non-break Arrival	24	2	26
	Touch and Go	27	2	29
	Radar Traffic Pattern	27	2	29
	Total	102	8	110
B-52	Departure	380	44	424
	Non-break Arrival	380	44	424
	Touch and Go	199	22	221
	Radar Traffic Pattern	199	22	221
	Total	1,158	132	1,290
B-2	Departure	94	12	106
	Non-break Arrival	94	12	106
	Touch and Go	106	12	118
	Radar Traffic Pattern	106	12	118
	Total	400	48	448
KC-135	Departure	498	55	553
	Non-break Arrival	498	55	553
	Touch and Go	498	55	553
	Radar Traffic Pattern	346	38	384
	Total	1,840	203	2,043
KC-10	Departure	173	19	192
	Non-break Arrival	173	19	192
	Total	346	38	384
F-15	Departure	96	-	96
	Non-break Arrival	36	-	36
	Overhead Break Arrival	60	-	60
	Touch and Go	48	-	48
	Total	240	-	240
F-16	Departure	144	-	144
	Non-break Arrival	44	-	44
	Overhead Break Arrival	100	-	100
	Touch and Go	72	-	72
	Total	360	-	360
F-22	Departure	720	-	720
	Non-break Arrival	204	-	204
	Overhead Break Arrival	516	-	516
	Touch and Go	72	-	72
	Total	1,512	-	1,512

Table 3.2: Annual Flight Operations, Andersen AFB

Aircraft Type	Operation Type	Total		
		Day (0700-2200)	Night (2200-0700)	Total
Global Hawk	Departure	30	30	60
	Non-break Arrival	30	30	60
	Total	60	60	120
Mission Group: Transient Aircraft (AMC, Military and Civilian Transport, MMA)				
C-40	Departure	205	50	255
	Non-break Arrival	205	50	255
	Total	410	100	510
C-12	Departure	24	6	30
	Non-break Arrival	24	6	30
	Total	48	12	60
B767	Departure	8	2	10
	Non-break Arrival	8	2	10
	Total	16	4	20
KC-10	Departure	20	78	98
	Non-break Arrival	88	10	98
	Total	108	88	196
C-17	Departure	65	259	324
	Non-break Arrival	292	32	324
	Total	357	291	648
KC-135	Departure	56	223	279
	Non-break Arrival	251	28	279
	Total	307	251	558
C-130	Departure	285	70	355
	Non-break Arrival	285	70	355
	Total	570	140	710
P-3A	Departure	79	11	90
	Non-break Arrival	79	11	90
	Total	158	22	180
B747	Departure	73	109	182
	Non-break Arrival	73	109	182
	Total	146	218	364
Mission Group: CVW-5 and SFARP				
EA-6B	Departure	17	-	17
	Non-break Arrival	1	-	1
	Overhead Break Arrival	16	-	16
	Total	34	-	34
F/A-18C/D	Departure	190	-	190
	Non-break Arrival	19	-	19
	Overhead Break Arrival	171	-	171
	Total	380	-	380
F/A-18E/F ²	Departure	569	-	569
	Non-break Arrival	57	-	57
	Overhead Break Arrival	512	-	512
	Total	1,138	-	1,138
C-21A	Departure	17	-	17

Table 3.2: Annual Flight Operations, Andersen AFB

Aircraft Type	Operation Type	Total		
		Day (0700-2200)	Night (2200-0700)	Total
	Non-break Arrival	17	-	17
	Total	34	-	34
E-2C	Departure	26	-	26
	Non-break Arrival	26	-	26
	Total	52	-	52
SK70	Departure	37	-	37
	Non-break Arrival	37	-	37
	Total	74	-	74
Mission Group: Valiant Shield Exercise				
B-52	Departure	9	1	10
	Non-break Arrival	9	1	10
	Total	18	2	20
KC-135	Departure	27	3	30
	Non-break Arrival	27	3	30
	Total	54	6	60
KC-10	Departure	18	2	20
	Non-break Arrival	18	2	20
	Total	36	4	40
P-3A	Departure	28	2	30
	Non-break Arrival	28	2	30
	Total	56	4	60
F/A-18E/F	Departure	75	-	75
	Non-break Arrival	7	-	7
	Overhead Break Arrival	68	-	68
	Total	150	-	150
Mission Group: Marines Expeditionary Unit				
CH-53E	Departure	36	7	43
	Non-break Arrival	36	7	43
	Touch and Go	52	11	63
	Radar Traffic Pattern	7	1	8
	Total	131	26	157
AH-1	Departure	37	7	44
	Non-break Arrival	37	7	44
	Touch and Go	59	13	72
	Radar Traffic Pattern	7	1	8
	Total	140	28	168
UH-1	Departure	26	5	31
	Non-break Arrival	26	5	31
	Touch and Go	39	8	47
	Radar Traffic Pattern	5	1	6
	Total	96	19	115
CH-46E	Departure	92	19	111
	Non-break Arrival	92	19	111
	Touch and Go	149	27	176
	Radar Traffic Pattern	17	4	21

Table 3.2: Annual Flight Operations, Andersen AFB

Aircraft Type	Operation Type	Total		
		Day (0700-2200)	Night (2200-0700)	Total
	Total	350	69	419
AV-8B	Departure	42	8	50
	Non-break Arrival	7	-	7
	Overhead Break Arrival	35	8	43
	Touch and Go	57	12	69
	Radar Traffic Pattern	16	3	19
	Total	157	31	188
F/A-18C/D	Departure	31	7	38
	Non-break Arrival	5	-	5
	Overhead Break Arrival	26	7	33
	Touch and Go	45	8	53
	Radar Traffic Pattern	12	2	14
	Total	119	24	143
Mission Group: Cope North Exercise				
F-15C	Departure	415	-	415
	Non-break Arrival	20	-	20
	Overhead Break Arrival	395	-	395
	Touch and Go	10	-	10
	Radar Traffic Pattern	6	-	6
	Total	846	-	846
F-16	Departure	341	2	343
	Non-break Arrival	28	1	29
	Overhead Break Arrival	313	1	314
	Touch and Go	10	-	10
	Radar Traffic Pattern	4	-	4
	Total	696	4	700
F-2	Departure	129	-	129
	Non-break Arrival	10	-	10
	Overhead Break Arrival	119	-	119
	Touch and Go	4	-	4
	Radar Traffic Pattern	2	-	2
	Total	264	-	264
F-18F	Departure	80		80
	Non-break Arrival	10		10
	Overhead Break Arrival	70		70
	Touch and Go	12		12
	Radar Traffic Pattern	8		8
	Total	180		180

Table 3.2: Annual Flight Operations, Andersen AFB

Aircraft Type	Operation Type	Total		
		Day (0700-2200)	Night (2200-0700)	Total
KC-135	Departure	20	-	20
	Non-break Arrival	20	-	20
	Touch and Go	6	-	6
	Radar Traffic Pattern	6	-	6
	Total	52	-	52
E-2C	Departure	35	-	35
	Non-break Arrival	5	-	5
	Overhead Break Arrival	30	-	30
	Touch and Go	3	-	3
	Radar Traffic Pattern	2	-	2
	Total	75	-	75
E-3	Departure	22	1	23
	Non-break Arrival	22	1	23
	Touch and Go	1	-	1
	Radar Traffic Pattern	3	-	3
	Total	48	2	50
C-130	Departure	35	-	35
	Non-break Arrival	35	-	35
	Touch and Go	1	-	1
	Radar Traffic Pattern	1	-	1
	Total	72	-	72
B-52	Departure	25	-	25
	Non-break Arrival	25	-	25
	Touch and Go	10	5	15
	Radar Traffic Pattern	20	10	30
	Total	80	15	95
GRAND TOTAL		21,590	2,101	23,691

Source: Wyle 2013.

Notes:

1) Each Closed Pattern event (Touch and Go, Radar Traffic) is counted here as 2 operations (1 landing + 1 departure)

3.2 Runway and Flight Track Utilization

Once annual flight operations are determined, the next step in the noise modeling process is to assign the flight operations to runways through runway utilization percentages for each aircraft type, operation type, and DNL time period (day and night). The utilization percentages for this AICUZ were primarily based on utilization and operational data presented in Wyle Report WR 08-01 (Czech and Kester 2008). Minor updates were made to helicopter pad and runway/track utilization percentages according to interviews with flight personnel during the 2011 site visit and the most recent data package (Wyle 2013).

Flight patterns at Andersen AFB result from several considerations, including:

- Takeoff patterns routed to avoid heavily populated areas as much as possible;
- Air Force criteria governing the speed, rate of climb, and turning radius for each type of aircraft;
- Efforts to control and schedule missions to keep noise levels low, especially at night; and
- Coordination with the Federal Aviation Administration (FAA) to minimize conflict with civilian aircraft operations.

Planning for the areas in the vicinity of the airfield considers three primary aircraft operational/land use determinants: (1) accident potential to land users, (2) aircraft noise, and (3) hazards to operations from land uses (height obstructions, etc.). Each of these concerns is addressed in conjunction with mission requirements and safe aircraft operation to determine the optimum flight track for each aircraft type. The fixed wing and rotary flight tracks depicted on Figures 3.1 through 3.5 (provided at the end of this chapter) are the result of such planning and are used for noise modeling.

As mentioned in Section 2.1, Description of Air Force Base, the Andersen airfield has two parallel runways: runway 06L/24R which is 10,535 feet long and runway 06R/24L which is 11,204 feet long (USAF 2011e). Both runways are 200 feet wide. Based helicopters generally depart and arrive on Pads N17, N19 and N25, but perform pattern work on the main runways. Detailed information on runway utilization categorized for the modeled aircraft types can be found in the Wyle 2013 noise study in Appendix A.

The flight tracks depicted on Figures 3.1 through 3.5 (provided at the end of this chapter) represent the various operation types performed at Andersen AFB: departures, non-break arrivals, overhead break arrival, touch and go, and radar traffic pattern. Flight tracks were verified by the FAA and were reviewed by ATC and Andersen AFB tower personnel during a 2011 site visit (Wyle 2013). The flight tracks, represented as single lines on the figures, are idealized representations. Flights can vary depending on aircraft performance, pilot technique, weather conditions, and other reasons; therefore, the flight track is actually a flight corridor. Refer to Figure 3.6 (provided at the end of this chapter) for a depiction of the Airspace Complex surrounding Andersen AFB and supported by airfield operations. Airspaces depicted in Figure 3.6 reflect the record of decision for the Mariana Island Range Complex Airspace Environmental Assessment and are pending coordination with the FAA and the International Civil Aviation Organization.

3.3 Pre-Flight and Maintenance Run-Up Operations

To the maximum extent possible, engine run-up locations have been established in areas that minimize noise for people on base, as well as for those in the surrounding communities.

Pre-flight run-up, which is conducted at the runway threshold prior to break release, can be automatically modeled in fixed-wing departure profiles. Rotary-wing or tilt rotor aircraft did not include pre-flight run-up models (Wyle 2013).

Aircraft noise consists of two major sources – *flight operations* and *ground engine maintenance “run-ups.”*

Run-up operations are modeled on an average operating day for DNL purposes. Annual run-up operations are divided by the number of operating days to compute average daily run-up events. Detailed information on modeled run-up operations can be found in the Wyle 2013 noise study in Appendix A.

3.4 Aircraft Flight Profiles and Noise Data

Flight profiles for fixed-wing aircraft consist of power settings, airspeeds and altitudes at a series of points along each modeled flight track. Like fixed-wing aircraft, rotary-wing aircraft flight profiles also consist of a combination of airspeeds and altitudes along with attitude, which consists of roll, pitch, and yaw angles (and nacelle angle for tilt rotor aircraft). These data define the vertical profile (altitude), performance profile (power setting and/or airspeed), and orientation of each modeled aircraft. The flight profiles for this AICUZ Study were primarily based on Wyle Report 08-01 profiles, but also include minor updates according to interviews with flight personnel (Wyle 2013). Detailed information on flight profiles for all aircraft can be found in the Wyle 2013 noise study in Appendix A.

Once runway and flight track utilization, run-up operations, and flight profiles are defined, the next step in the noise modeling process is the calculation of the daytime and nighttime events in an Average Annual Day (AAD) for each aircraft's flight profile on each modeled track. The annual operations are divided by 365 days for the given aircraft and dividing closed pattern operations (e.g., touch and go, radar traffic pattern) by 2. Once the AAD event numbers are calculated, the daily events are spread across runway and track utilization percentages.

Calculating the noise exposure is the final step in the noise modeling process. All of the data described in Section 3 of this AICUZ study are input into NOISEMAP Version 7.2 or RNM Version 7.2.4 in order to calculate and plot noise contours for the AAD operations at

Andersen AFB. The existing noise exposure and Andersen AFB flight operations affects are detailed in Section 4, Effects of Flight Operations.

Noise levels from the loudest aircraft tend to significantly influence the DNL noise contours. Due to the logarithmic nature of the decibel unit the combined sound level produced by two aircraft of different intensity will only be slightly higher than the louder of the two aircraft. For this reason a few operations conducted by loud aircraft will have a large influence on the DNL noise contours even though operations from quieter aircraft could account for the majority of flight activity.

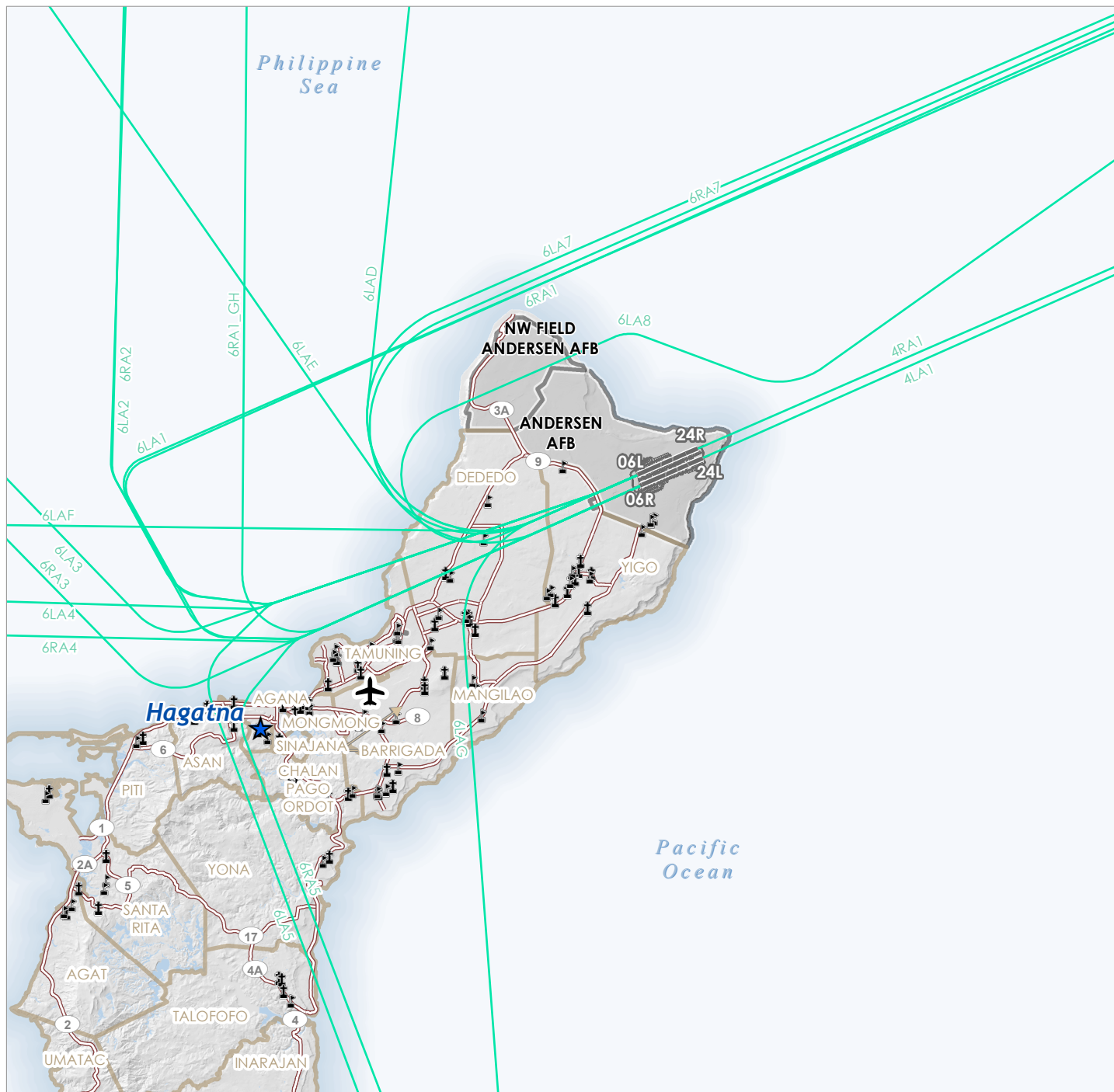
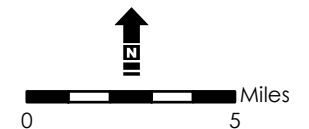


Figure 3.1
Non Break Arrival Flight Tracks,
Andersen AFB,
Guam

Legend

- Non Break Arrival Flight Track
- Runway
- Major Road
- Airfield Surface Area
- Village/Municipal Boundaries
- Capital City
- School
- Church
- A.B. Won Pat International Airport
(Guam International Airport)



Source: ESRI 2012; Navy, 2012; Wyle, 2013;
Google Maps, 2012

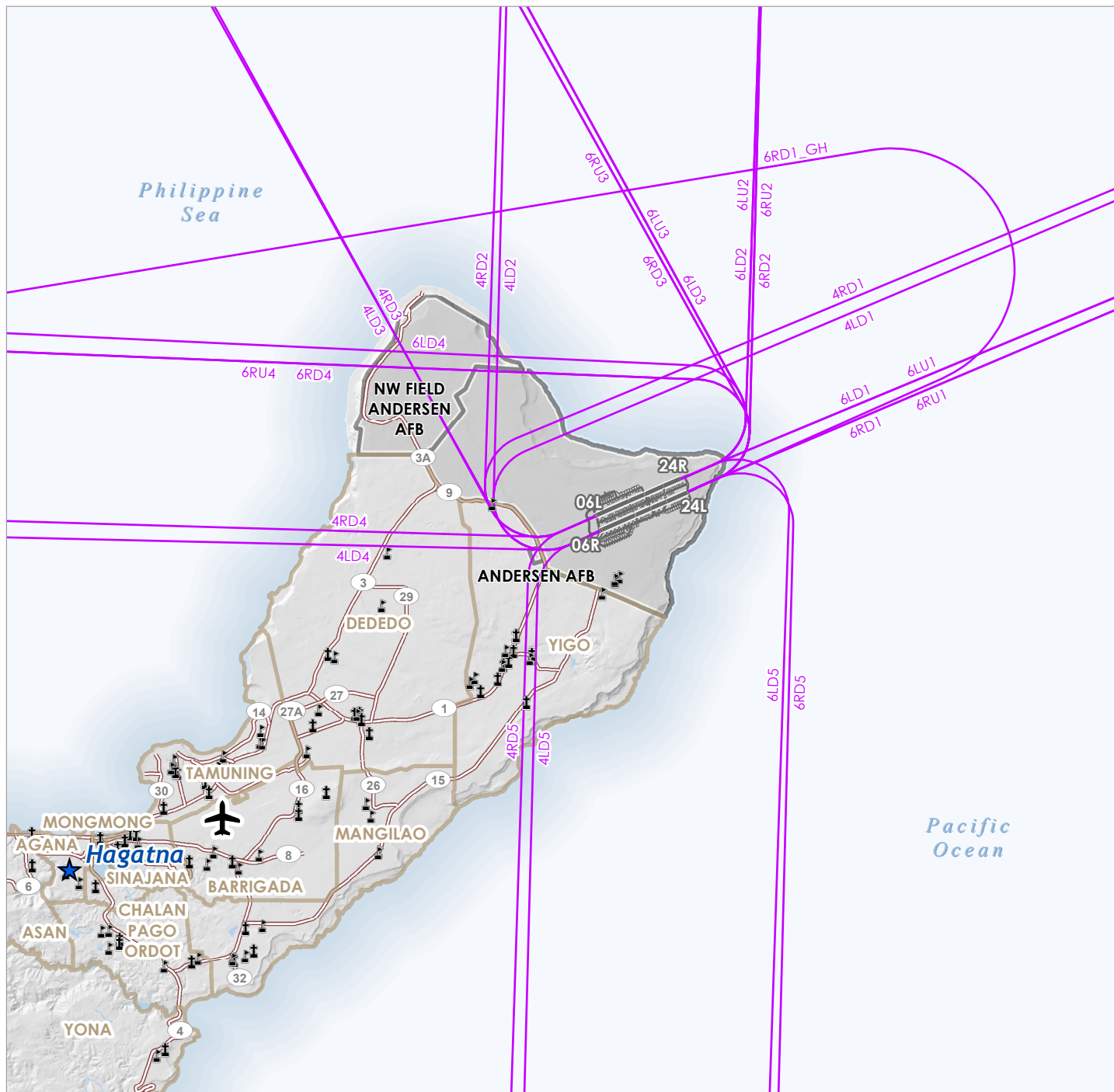
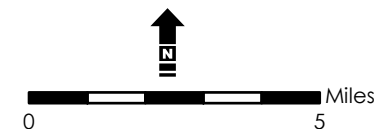


Figure 3.3
Departure Flight Tracks,
Andersen AFB,
Guam

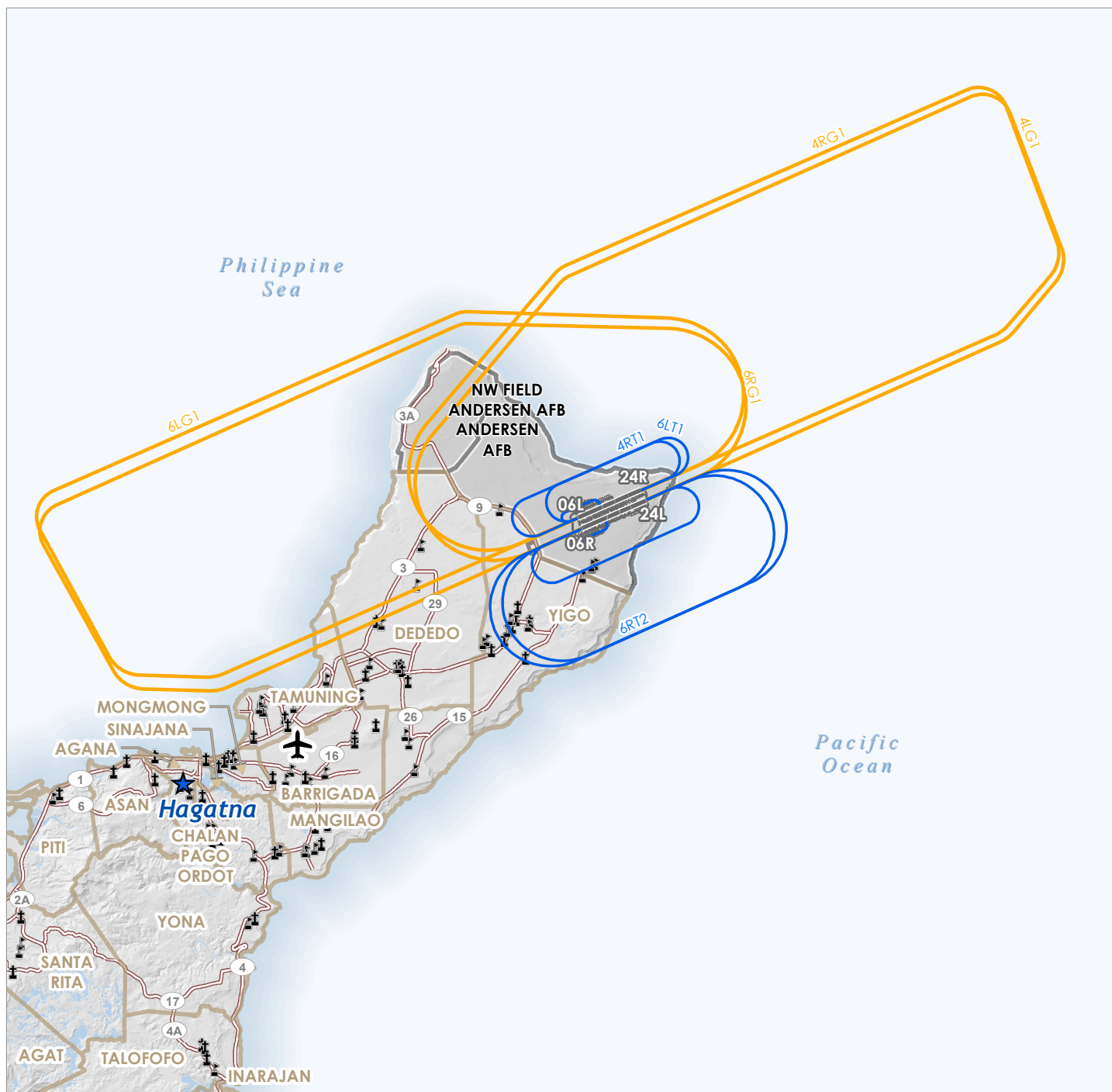
Legend

-  Departure Flight Track
-  Runway
-  Major Road
-  Airfield Surface Area
-  Village/Municipal Boundaries
-  Capital City
-  School
-  Church
-  A.B. Won Pat International Airport
(Guam International Airport)



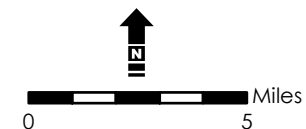
Source: ESRI 2012; Navy, 2012; Wyle, 2013;
Google Maps, 2012

Figure 3.4
Pattern Flight Tracks,
Andersen AFB,
Guam



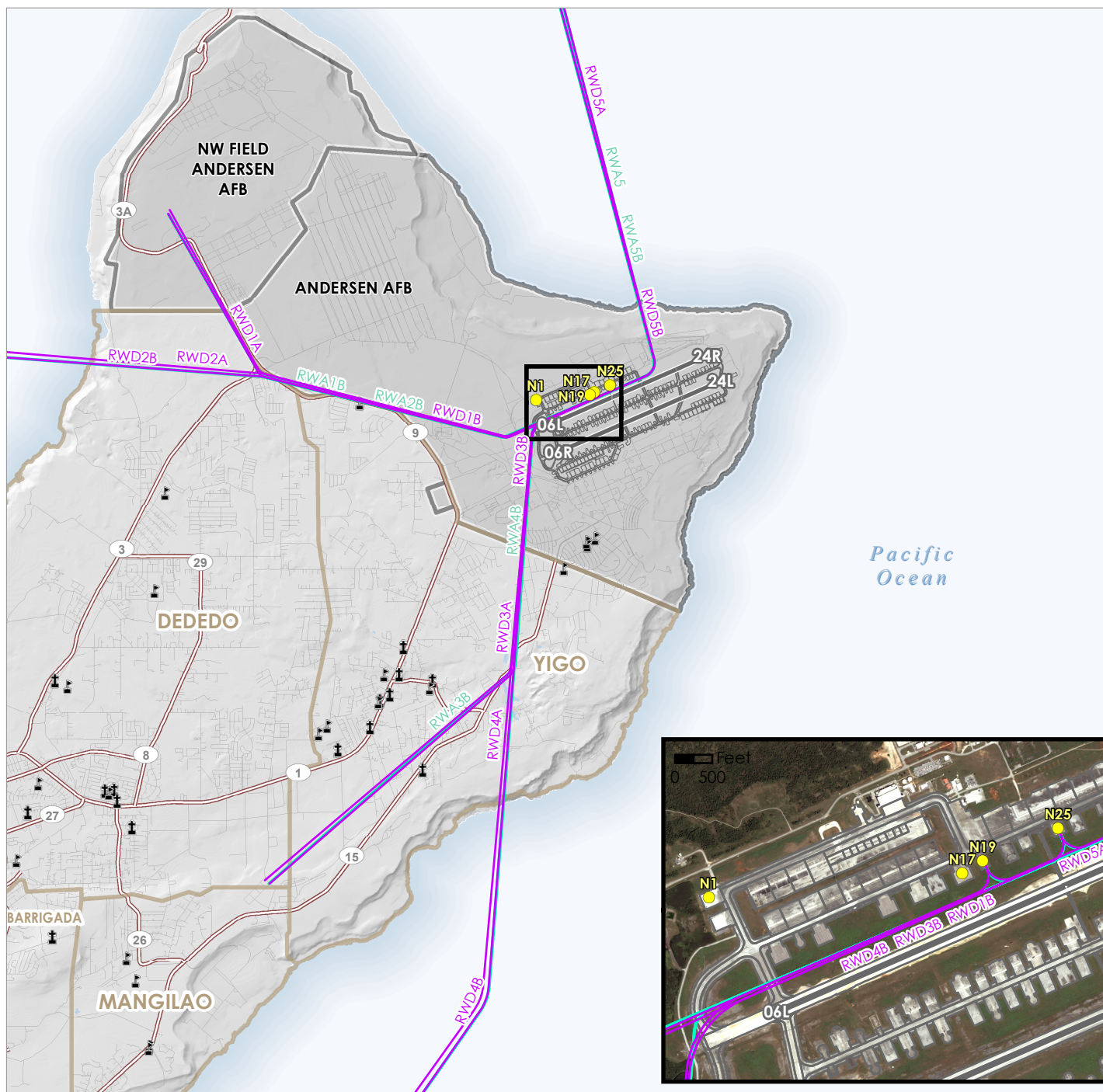
Legend

- Runway
- Airfield Surface Area
- Pattern Flight Track
 - Radar Traffic Patterns
 - Touch and Go
- Village/Municipal Boundaries
- Capital City
- School
- Church
- Major Road
- A.B. Won Pat International Airport
(Guam International Airport)



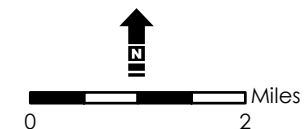
Source: ESRI 2012; Navy, 2012; Wyle, 2013;
Google Maps, 2012

Figure 3.5
Rotary Wing Flight Tracks,
Andersen AFB,
Guam



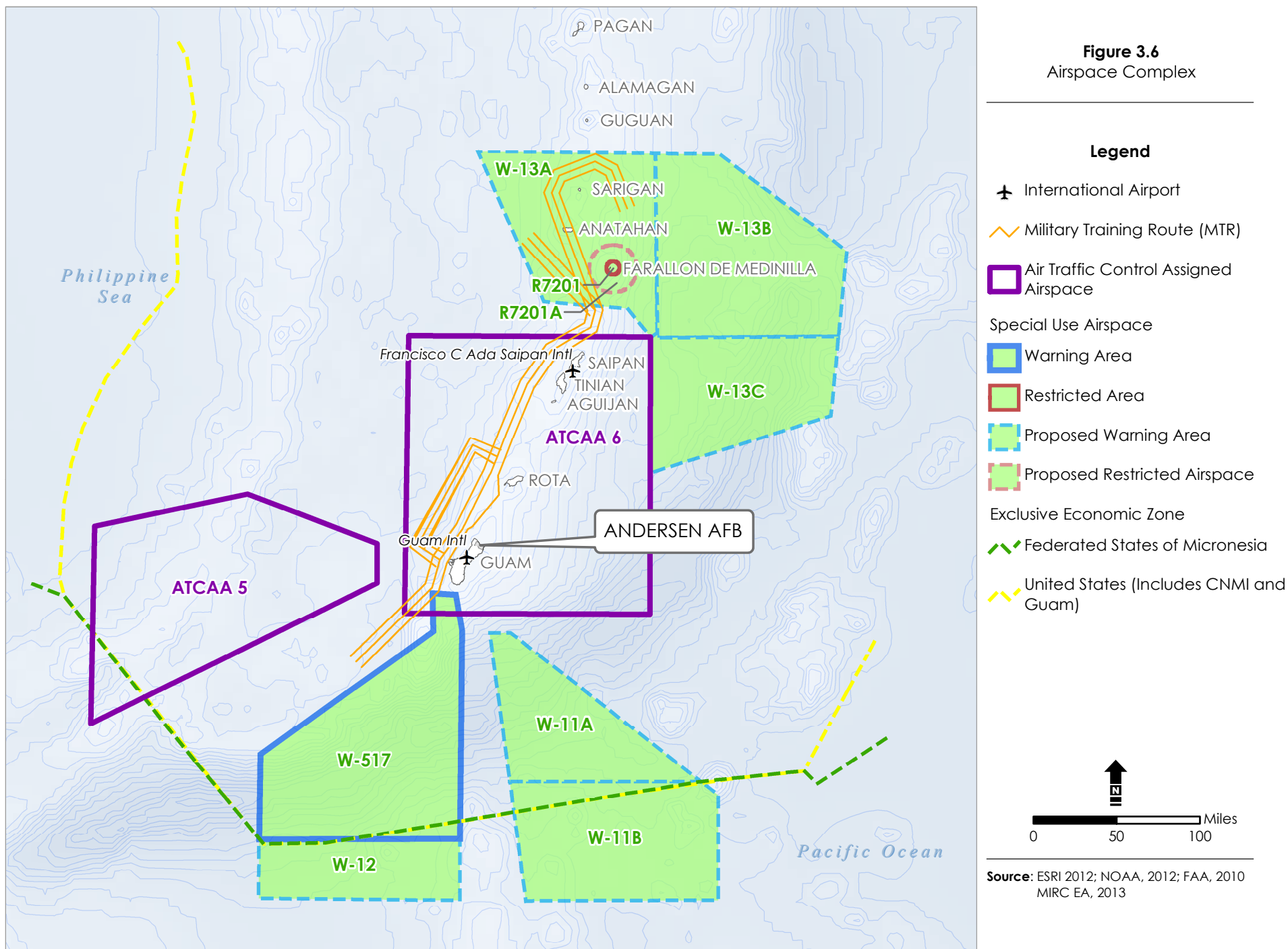
Legend

- Helipad
- ↗ Non Break Arrival Flight Track
- ↘ Departure Flight Track
- Runway
- Major Road
- Road
- Airfield Surface Area
- Village/Municipal Boundaries
- School
- Church



Source: ESRI 2012; Navy, 2012;
Wyle, 2013; USDA Imagery,
2006; Google Maps, 2012

Figure 3.6
Airspace Complex



Source: ESRI 2012; NOAA, 2012; FAA, 2010
MIRC EA, 2013

4

EFFECTS OF FLIGHT OPERATIONS

- 4.1 Introduction
- 4.2 Airspace Control Surface Plan
- 4.3 Existing Noise Exposure
- 4.4 Comparison with Previous Aircraft Survey
- 4.5 Clear Zones and Accident Potential Zones
- 4.6 Land Use Compatibility Guidelines
- 4.7 Participation in the Planning Process

4.1 Introduction

This section identifies the imaginary surfaces, noise exposure, and APZs resulting from aircraft operations at Andersen AFB. This section also identifies applicable DOD recommendations for areas encumbered by noise exposure and areas of accident potential.

4.2 Airspace Control Surface Plan

The Airspace Control Surface Plan identifies imaginary planes and transition surfaces that define the required airspace that must remain free from obstructions to ensure safe Andersen AFB flight approaches, departures, and pattern operations. Obstructions are considered to be natural objects or manmade structures that protrude above the planes or surfaces defined in the Airspace Control Surface Plan (see Table 4.1 and Figure 4.1). For a more complete description of airspace and control surfaces refer to Unified Facilities Criteria 3-260-01, AFI 32-1026 or Federal Aviation Regulation Part 77.

There are several airspace obstructions within the airfield for which Andersen AFB has waived, exempted, or accepted as permanent deviations to DOD criteria. Outside the installation boundary, no known obstructions penetrate the Andersen AFB imaginary surfaces.

Table 4.1: Imaginary Surfaces

Planes and Surfaces	Geographical Dimensions
Primary Surface	This surface defines the limits of the obstruction clearance requirements in the immediate vicinity of the landing area. The primary surface comprises surfaces of the runway, runway shoulders, and lateral safety zones and extends 200 feet beyond the runway end. The width of the primary surface for a single class "B" runway is 2,000 feet, or 1,000 feet on each side of the runway centerline.
Clear Zone (CZ) Surface	This surface defines the limits of the obstruction clearance requirements in the vicinity contiguous to the end of the primary surface. The length and width (for a single runway) of a CZ surface at Andersen AFB is 3,000 feet by 3,000 feet.
Approach-Departure Clearance Surface	This surface is symmetrical about the extended runway centerline, begins as an inclined plane (glide angle) 200 feet beyond each end of the primary surface of the centerline elevation of the runway end, and extends for 50,000 feet. The slope of the approach-departure clearance surface is 50:1 along the extended runway (glide angle) centerline 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 start of the glide angle. The width of this surface at the runway end is 2,000 feet; it flares uniformly, and the width at 50,000 feet is 16,000 feet.
Inner Horizontal Surface	This surface is a plane, oval in shape at a height of 150 feet above the established airfield elevation. It is constructed by scribing an arc with a radius of 7,500 feet above the centerline at the end of the runway and interconnecting these arcs with tangents.
Conical Surface	This is an inclined 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.
Outer Horizontal Surface	This surface is a plane located 500 feet above the established airfield elevation. It extends for a horizontal distance of 30,000 feet from the outer periphery of the conical surface.
Transitional Surfaces	These surfaces connect the primary surfaces, clear zone surfaces, and approach-departure clearance surfaces to the outer horizontal surface, conical surface, other horizontal surface, or other transitional surfaces. The slope of the transitional surface is 7:1 outward and upward at right angles to the runway centerline. To determine the elevation for the beginning the transitional surface slope at any point along the lateral boundary of the primary surface including the clear zone, draw a line from this point to the runway centerline. This line will be at right angles to the runway axis. The elevation at the runway centerline is the elevation for the beginning of the 7:1 slope.

Source: AFI 32-7084.

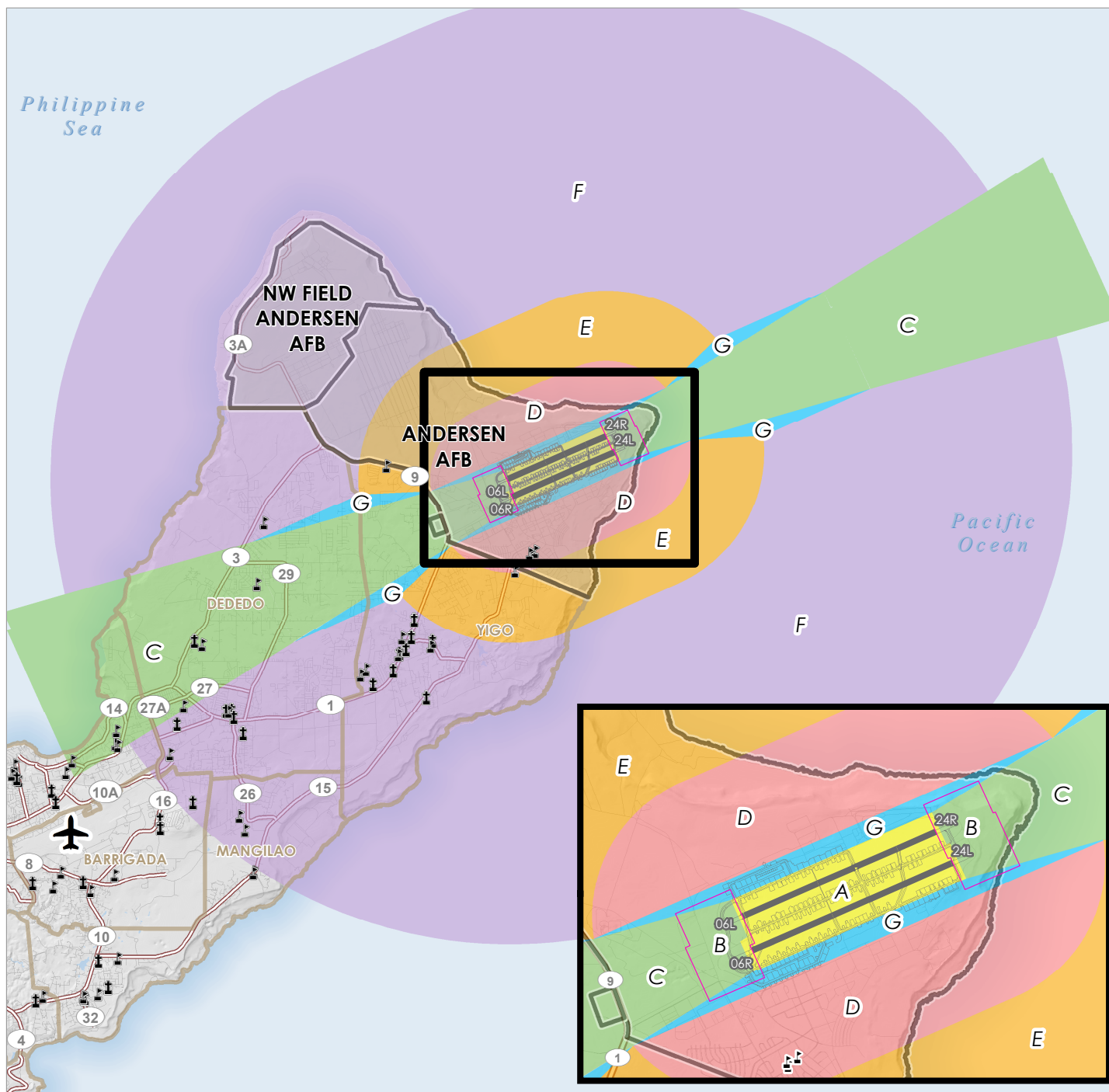


Figure 4.1
Imaginary Surfaces for
Fixed-wing Runways,
Andersen AFB,
Guam

Legend

- Runway
- Airfield Surface Area
- Andersen AFB
- Village/Municipal Boundaries

Imaginary Surfaces for
Fixed-wing Runways

- A: PRIMARY SURFACE
- B: CLEAR ZONE
- C: APPROACH-DEPARTURE
- D: INNER HORIZONTAL SURFACE
- E: CONICAL SURFACE
- F: OUTER HORIZONTAL SURFACE
- G: TRANSITIONAL SURFACE

A.B. Won Pat International Airport
(Guam International Airport)

- School
- Church
- Major Road
- Road

0 2 Miles

Source: ESRI 2012; Navy, 2012; Wyle, 2013;
Google Maps, 2012

4.3 Existing Noise Exposure

The Air Force periodically conducts noise studies to assess the noise impacts of aircraft operations. Noise studies evaluate flight and run-up operations and are defined for Andersen AFB based on the aircraft; type of operation (arrival, departure, pattern); number of operations; time of operation; flight track; aircraft power settings, speeds and altitudes; number and duration of maintenance run-ups; and environmental factors such as terrain, surface type, temperature and humidity. Refer to Section 3 for further information on existing aircraft operations.

The Air Force uses the DNL descriptor in assessing the amount of aircraft noise exposure. The DNL noise matrix, developed by the U.S. Environmental Protection Agency, is a national uniform standard for noise assessments and is a reliable measure of community sensitivity to aircraft noise. The matrix measures the average sound/noise level at a location over a 24-hour period, with a 10-dB “penalty” to events occurring between 10:00 p.m. and 7:00 a.m. The “penalty” represents the added intrusiveness of sounds occurring during normal sleeping hours. A-weighted decibels (dBA) are units of sound pressure adjusted to the range of human hearing.

DNL is depicted visually as a noise contour that connects points of equal value. The noise contours in this document are depicted in 5 dBA increments. The 2013 AICUZ noise contours for Andersen AFB extend off-base northeast over the Pacific Ocean and southwest from the base boundary over the municipalities of Dededo and Yigo (see Figure 4.2). The formation of noise contours is largely due to fighter jet and bomber flight activities. The extent of the over-land noise contours in line with the straight-in approach departure corridor are primarily due to the final approach portion of radar traffic patterns of the B-2 and B-52 aircraft on Runway 06R; the large hook patterns south of this corridor are primarily due to touch and go arrivals and overhead break arrivals on runway 06R.

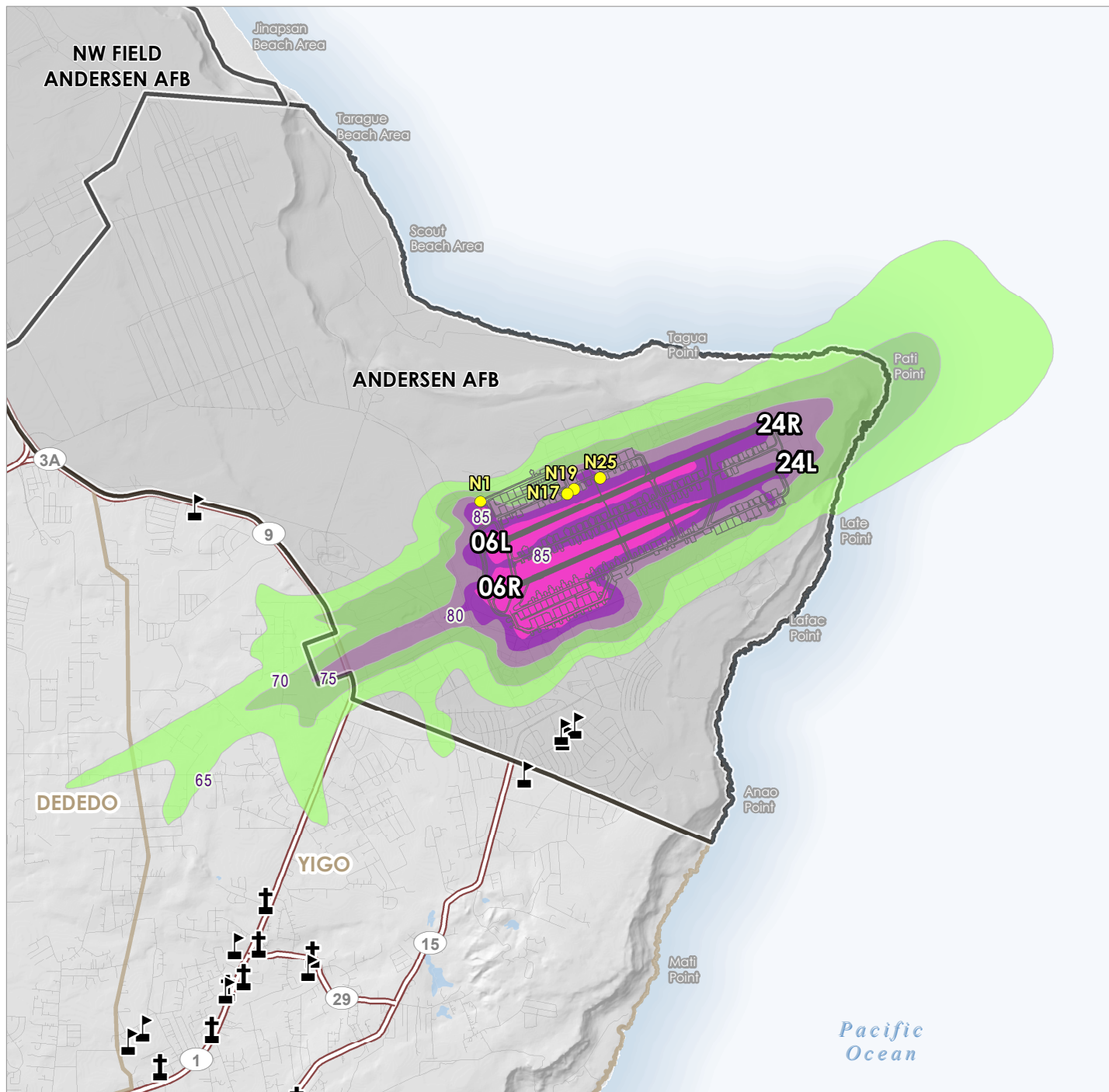
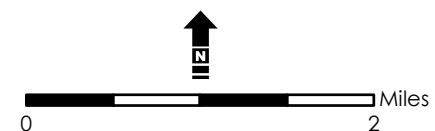


Figure 4.2
2013 AICUZ Noise Zones,
Andersen AFB,
Guam

Legend

- Runway
- Andersen AFB
- Airfield Surface Area
- Helipad
- 2013 AICUZ Noise Zones (DNL)
 - 65 - 69 (dB)
 - 70 - 74 (dB)
 - 75 - 79 (dB)
 - 80 - 84 (dB)
 - 85+ (dB)
- Village/Municipal Boundaries
- Major Road
- Road
- School
- Church



Source: ESRI 2012; Navy, 2012; Wyle, 2013;
Google Maps, 2012

The DNL values used for planning purposes are 65, 70, 75, 80, and greater than 85 dB. Land use guidelines are based on the compatibility of various land uses with these noise exposure levels. Refer to Section 4.6 for further information on land use guidelines.

Table 4.2 illustrates the off-base noise exposure in acres, estimated affected population, and estimated housing units within the DNL 65-dB and greater noise zone. The area under each contour was overlaid with population by CDP of the 2010 Census of Population and Housing (Bureau of Statistics and Plans 2012) to provide an estimate of population and housing units within each noise contour. Since higher resolution census block-specific population data are not available this currently represents the best available population data. However, this methodology tends to overestimate actual population within the modeled noise contours. Based on this methodology, outside the Andersen AFB boundary a total of approximately 822 acres, 1,552 persons, and 378 housing units are estimated to be located within the DNL 65-dB and greater noise contour. The largest concentration of persons and housing units occurs in the 65- to 69-dB noise contour which covers 689 acres outside the installation boundary.

Table 4.2: Off-Base Areas, Population and Housing Units within the DNL 65-dB and Greater Noise Exposure Area

DNL	Acreage	Population	Housing Units
65 to 69	689	1,331	325
70 to 74	117	195	47
75 to 79	16	26	6
80 to 85	0	0	0
85+	0	0	0
Total	822	1552	378
Note: Figures may not sum exactly due to rounding.			

4.4 Comparison with Previous Aircraft Survey

Noise contours presented in the 1998 Andersen AFB AICUZ Study generally extend northeast and southwest of the runways in line with straight-in approach departure corridors (see Figure 4.3). The 65-dB noise contour extends for about 1 mile on land off-base; subsequent to the 1998 AICUZ report a large block of land was incorporated into the base boundary in this area.

The 2013 AICUZ noise zones have changed in configuration and have greatly expanded from the 1998 noise contours (see Figure 4.4). The 2013 AICUZ on-land off-base 65-69 dB noise zone extends farther in all directions than the corresponding 1998 noise contour. The 2013 AICUZ 65-64 dB noise zone extends approximately 1.5 miles southwest of the base boundary; 70-74 and 75-79 dB noise zones also extend on-land off-base within the immediate vicinity of the primary approach departure/corridors for runway 06L and 06R. In comparison the 1998 70- and 75-dB noise contours do not extend on-land off-base and the 65-dB noise contour does not extend as far from the base boundary (approximately 0.5 mile) as the 2013 AICUZ 65-69 dB noise zone (see Figure 4.4).

Changes in the 2013 AICUZ noise contours from the 1998 noise contours are due to changes in airfield configuration, aircraft type and operations, as well as noise modeling software. Since the 1998 noise contours were produced, the runways have shifted approximately 1,000 feet southeast; operations (i.e., takeoffs and landings) and the noise generated from operations have therefore also shifted southeast due to this change in airfield configuration. Aircraft types have been replaced with newer airframes and operational tempo has also increased. Finally, increases in noise are due to changes in noise modeling technology (such as the ability to model terrain and ground impedance) that have allowed Andersen AFB to more accurately capture the noise environment.

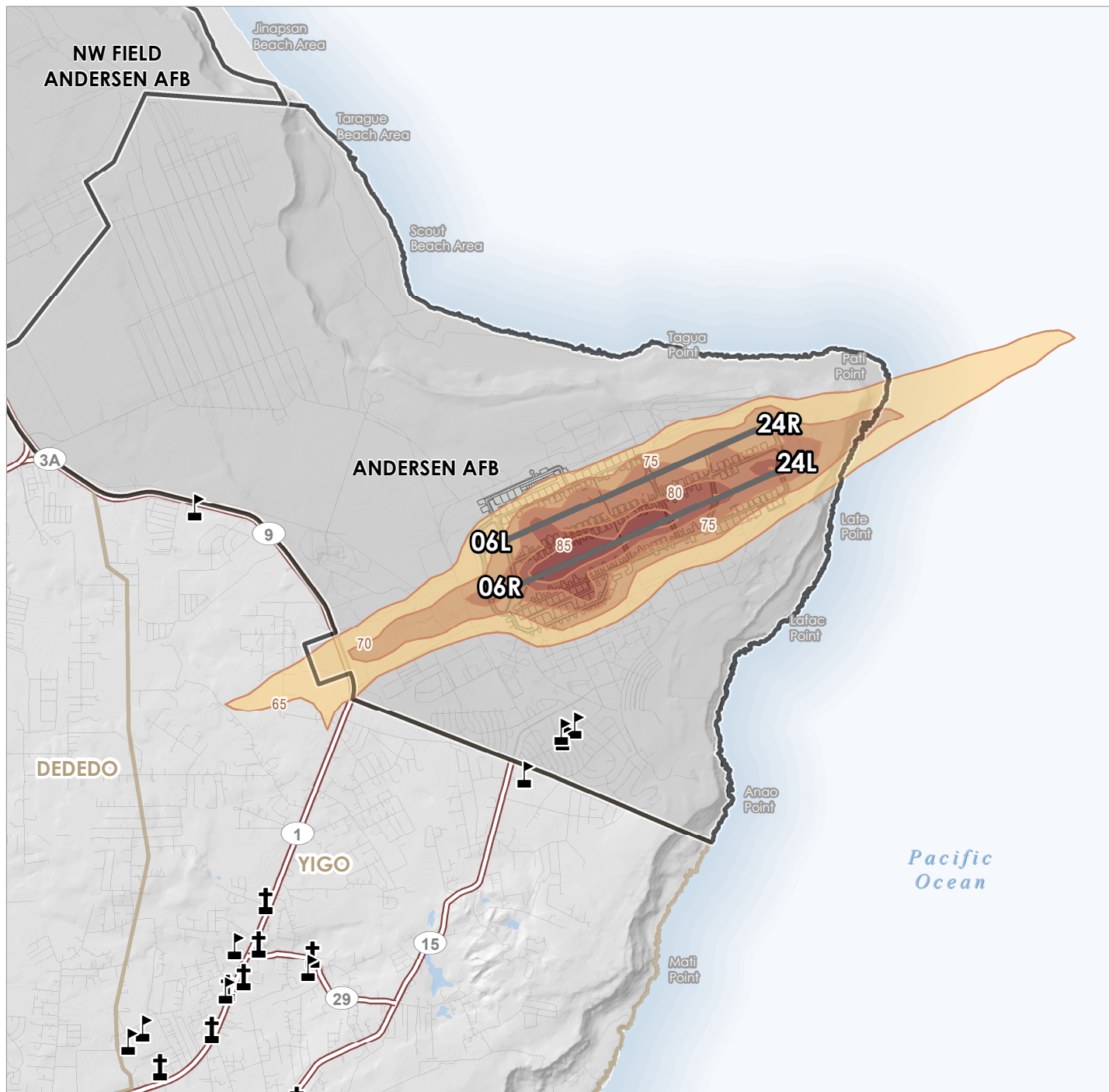
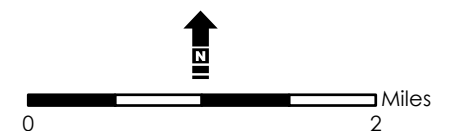


Figure 4.3
1998 Noise Zones,
Andersen AFB,
Guam

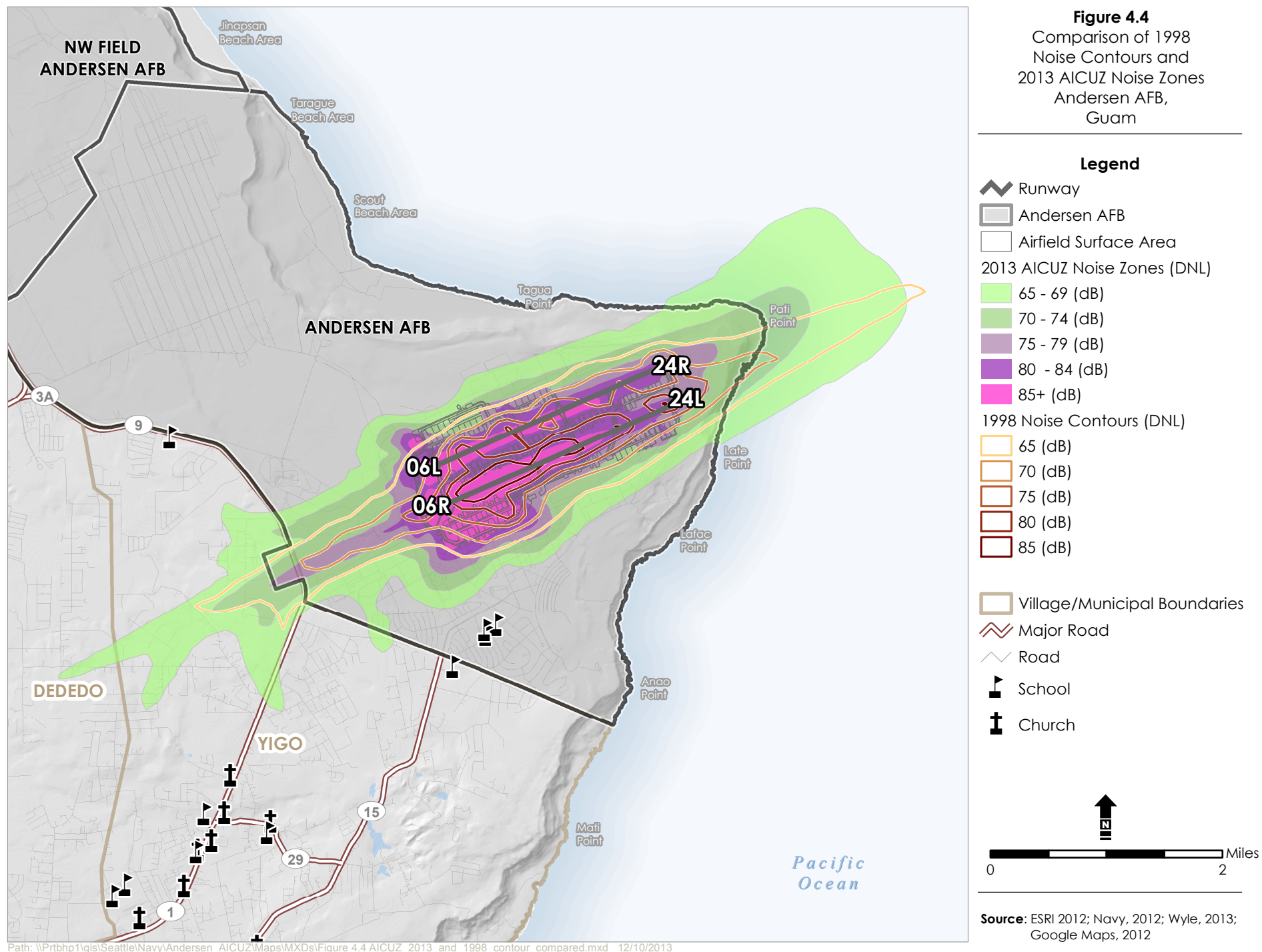
Legend

-  Runway
-  Andersen AFB
-  Airfield Surface Area
- 1998 Noise Zones (DNL)
 -  65 - 69 (dB)
 -  70 - 74 (dB)
 -  75 - 79 (dB)
 -  80 - 84 (dB)
 -  85+ (dB)
-  Village/Municipal Boundaries
-  Major Road
-  Road
-  School
-  Church



Source: ESRI 2012; Navy, 2012; Wyle, 2013;
Google Maps, 2012

Figure 4.4
Comparison of 1998
Noise Contours and
2013 AICUZ Noise Zones
Andersen AFB,
Guam



Path: \\Prtrbhp1\gis\Seattle\Navy\Andersen_AICUZ\Maps\MXDs\Figure 4.4 AICUZ_2013_and_1998_contour_compared.mxd 12/10/2013

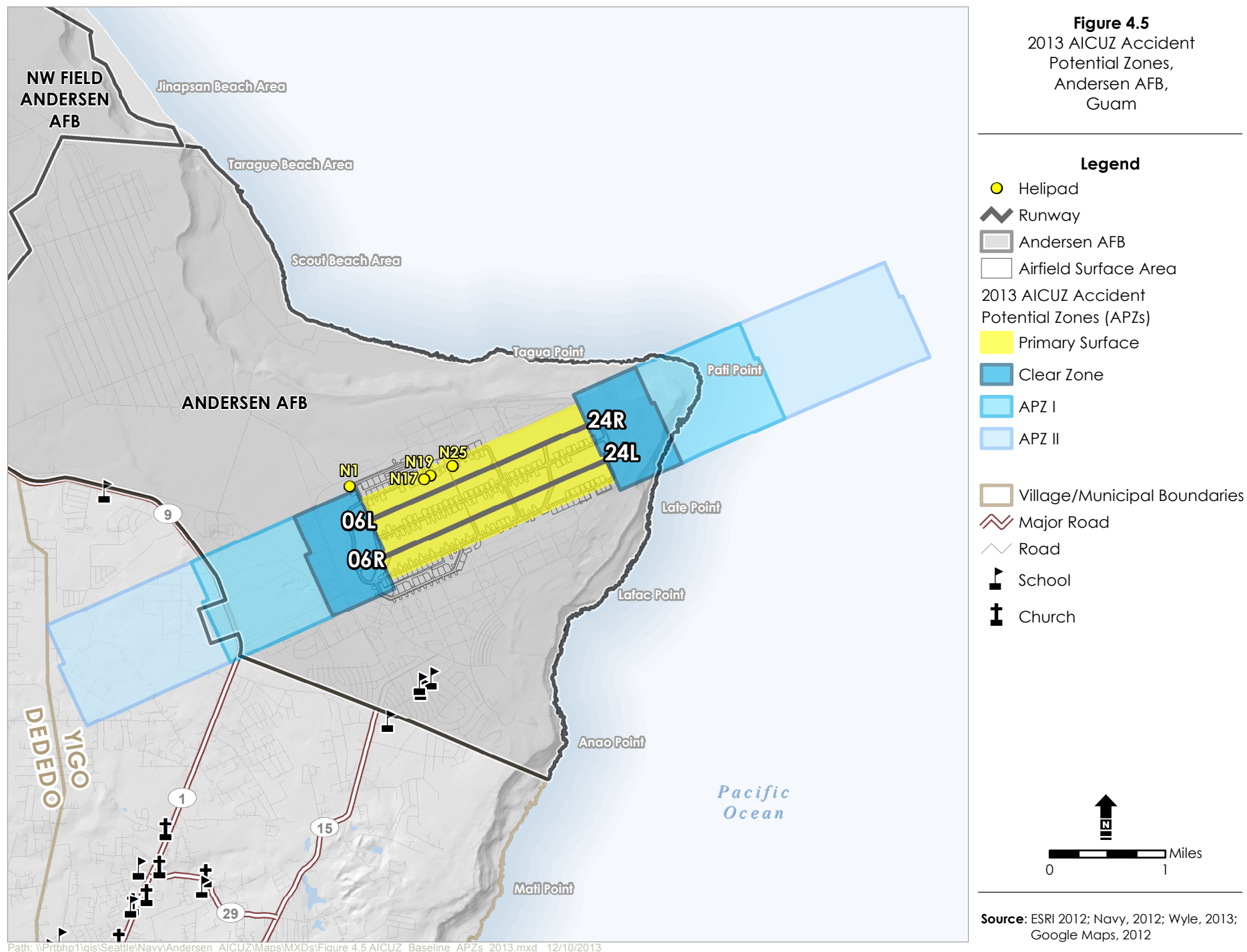
4.5 Clear Zones and Accident Potential Zones

While the likelihood of an aircraft mishap occurring is remote, the DOD identifies areas of accident potential to assist in land-use planning. The Air Force has identified APZs around its runways and helipads based on the analysis of more than 800 aircraft mishaps occurring within 10 nautical miles of airfields. The study showed that most aircraft mishaps occur on or near the runway or along the centerline of the runway, diminishing likelihood with distance.

Three zones were established based on crash patterns: The CZ, APZ I, and APZ II. The CZ starts at the end of the runway and extends outward 3,000 feet. It has the highest accident potential of the three zones. APZ I extends an additional 5,000 feet from the CZ. It includes an area of reduced accident potential. APZ II extends from APZ I an additional 7,000 feet in an area of further reduced accident potential. Figure 4.5 illustrates the 2013 AICUZ APZs for Andersen AFB. CZs are required for all fixed-wing active runways and extend from both ends of runway 06L/24R and 06R/24L. APZs I and II extend from the CZ along straight-in approach departure corridors. These zones overlap at Andersen AFB as a result of the two parallel runways.

Land use guidelines for the APZs are based on a hazard index system which compares the relationship of accident occurrence on or adjacent to the runway, within the CZ, in APZ I, in APZ II, and in all other areas within 10 nautical miles radius of the runway. Accident potential on or adjacent to the runway or within the CZ is so high that few uses are acceptable.

Figure 4.5
2013 AICUZ Accident
Potential Zones,
Andersen AFB,
Guam



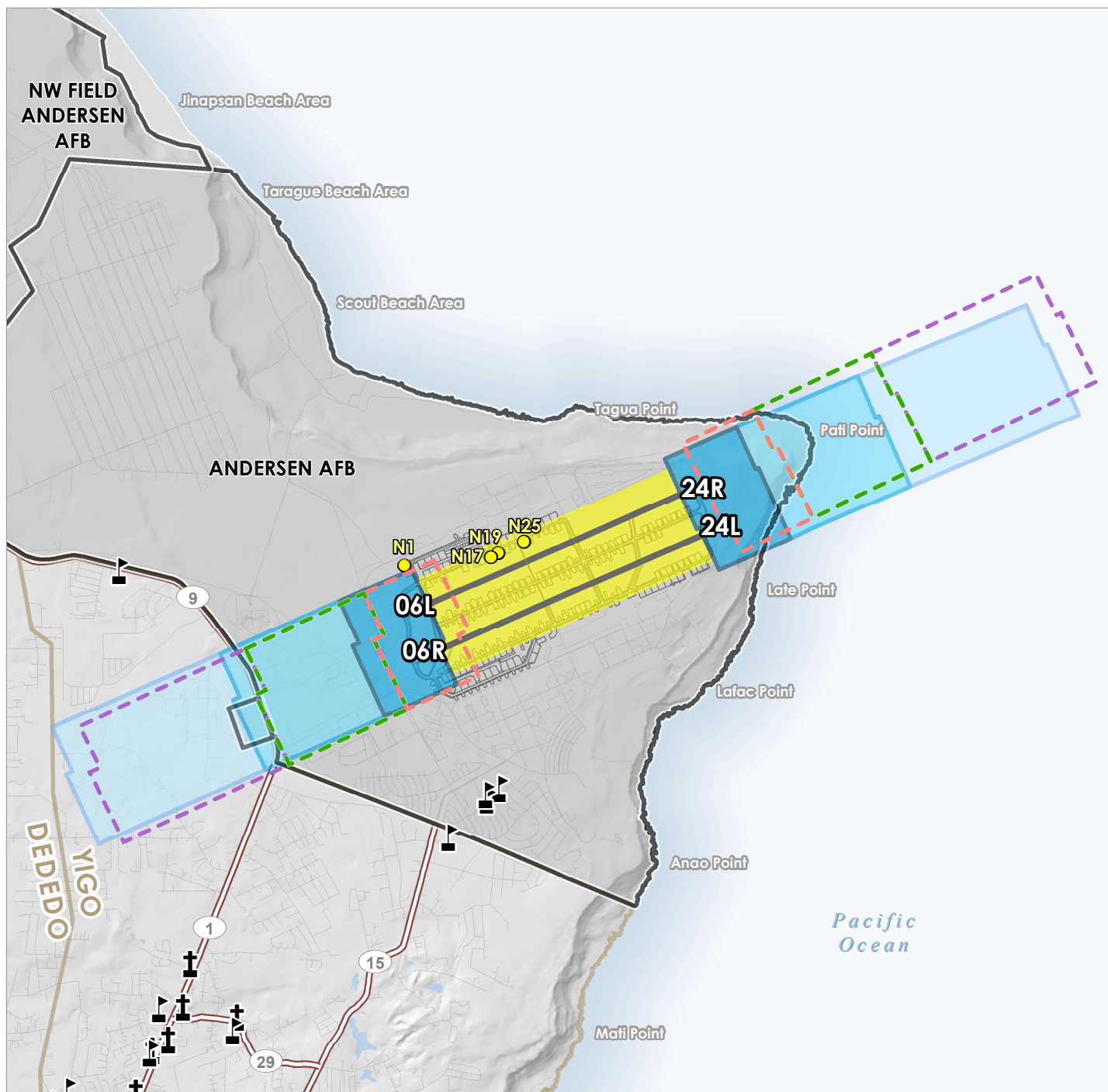
Path: \\Prtrbhp1gis\Seattle\Navy\Andersen_AICUZ\Maps\MXDs\Figure 4.5 AICUZ_Baseline_APZs_2013.mxd 12/10/2013

The Air Force has adopted a policy of acquiring property rights to areas designated as CZs because of the high accident potential. Guidelines have been established in order to restrict people-intensive uses in APZs I and II (refer to Section 4.6). In general guidelines aim to prevent uses that:

- have high residential density characteristics;
- have high labor intensity; involve above-ground explosive, fire, toxic, corrosive, or other hazardous characteristics;
- promote population concentrations (especially populations that are unable to respond to emergency situations such as children);
- involve utilities and services required for area-wide population; or
- pose a hazard to aircraft operations.

The risk outside APZ I and APZ II, but within the 10 nautical mile radius area, is significant, but is acceptable if sound engineering and planning practices are followed.

Figure 4.6 compares the 1998 and 2013 AICUZ APZs at Andersen AFB. Both the 1998 and the 2013 AICUZ APZs include straight-in APZs on all runway ends. Slight shifts in the APZ configuration from 1998 and 2013 reflect changes in configuration of the runways and current geographic information systems (GIS) mapping in this study. The shift in runway configuration results in the 2013 AICUZ APZs extending approximately 1,000 feet further outside of base boundaries southwest of the runways.



Source: ESRI 2012; Navy, 2012; Wyle, 2013; Google Maps, 2012

4.6 Land Use Compatibility Guidelines

The DOD developed the AICUZ program for military airfields. Using this program, the DOD works to protect aircraft operational capabilities at its installations and to assist local government officials in protecting and promoting the public health, safety, and quality of life. The goal is to promote compatible land use development around military airfields by providing information on aircraft noise exposure and accident potential.

AICUZ reports describe three basic types of constraints that affect, or result, from flight operations. The first constraint involves areas that the FAA and the DOD have identified for height limitations. The second constraint involves noise zones produced by the computerized dBA DNL metric and the DOD NOISEMAP methodology. Figure 4.2 shows the 2013 AICUZ noise contours based on aircraft operations. The third constraint involves APZs based on statistical analysis of past DOD aircraft accidents. Refer to Figure 4.5 for the configurations of CZs, APZ I, and APZ II at Andersen AFB.

To aid in determining land-use compatibility, the DOD has developed recommendations for APZs and noise zones. These recommendations, found in DOD Instruction 4165.57, “Air Installations Compatibility Use Zones (AICUZ)” are identified in Table 4.3 and are intended to serve as guidelines for development of land uses around military air installations. Table 4.3 identifies land uses versus all possible combinations of noise exposure and accident potential at Andersen AFB, showing land uses that are compatible or incompatible. Noise guidelines are essentially the same as those published by the Federal Interagency Committee on Urban Noise in the June 1980 publication “Guidelines for Considering Noise in Land Use Planning and Control.” The U.S. Department of Transportation publication “Standard Land Use Coding Manual (SLUCM)” has been used for identifying and coding land use activities.

Table 4.3: Land-Use Compatibility Guidelines

Land Use		Accident Potential Zones				Noise Levels				
SLUCM No.	Name	Clear Zone ¹	APZ I ¹	APZ II ¹	Density Recommendation ¹	DNL 65-69	DNL 70-74	DNL 75-79	DNL 80-84	DNL 85+
10	Residential					N ²⁰	N ²⁰	N	N	N
11	Household units					N ²⁰	N ²⁰	N	N	N
11.11	Single units; detached	N	N	Y ²	Maximum density of 2 Du/Ac	N ²⁰	N ²⁰	N	N	N
11.12	Single units; semidetached	N	N	N		N ²⁰	N ²⁰	N	N	N
11.13	Single units; attached row	N	N	N		N ²⁰	N ²⁰	N	N	N
11.21	Two units; side-by-side	N	N	N		N ²⁰	N ²⁰	N	N	N
11.22	Two units; one above the other	N	N	N		N ²⁰	N ²⁰	N	N	N
11.31	Apartments; walk up	N	N	N		N ²⁰	N ²⁰	N	N	N
11.32	Apartments; elevator	N	N	N		N ²⁰	N ²⁰	N	N	N
12	Group quarters	N	N	N		N ²⁰	N ²⁰	N	N	N
13	Residential hotels	N	N	N		N ²⁰	N ²⁰	N	N	N
14	Mobile home parks or courts	N	N	N		N	N	N	N	N
15	Transient lodgings	N	N	N		N ²⁰	N ²⁰	N ²⁰	N	N
16	Other residential	N	N	N		N ²⁰	N ²⁰	N	N	N
20	Manufacturing ³									
21	Food and kindred products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N
22	Textile mill products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N
23	Apparel and other finished products; products made from fabrics, leather and similar materials; manufacturing	N	N	N		Y	Y ²¹	Y ²²	Y ²³	N
24	Lumber and wood products (except furniture); manufacturing	N	N	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N

Table 4.3: Land-Use Compatibility Guidelines

Land Use		Accident Potential Zones				Noise Levels				
SLUCM No.	Name	Clear Zone ¹	APZ I ¹	APZ II ¹	Density Recommendation ¹	DNL 65-69	DNL 70-74	DNL 75-79	DNL 80-84	DNL 85+
25	Furniture and fixtures; manufacturing	N	N	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N
26	Paper and allied products; manufacturing	N	N	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N
27	Printing, publishing, and allied industries	N	N	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N
28	Chemicals and allied products; manufacturing	N	N	N		Y	Y ²¹	Y ²²	Y ²³	N
29	Petroleum refining and related industries	N	N	N		Y	Y ²¹	Y ²²	Y ²³	N
30	Manufacturing ³ (continued)									
31	Rubber and misc. plastic products; manufacturing	N	N	N		Y	Y ²¹	Y ²²	Y ²³	N
32	Stone, clay, and glass products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N
33	Primary metal products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N
34	Fabricated metal products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks	N	N	N		Y	25	30	N	N
39	Miscellaneous manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N
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 and 0.56 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N

Table 4.3: Land-Use Compatibility Guidelines

Land Use		Accident Potential Zones				Noise Levels				
SLUCM No.	Name	Clear Zone ¹	APZ I ¹	APZ II ¹	Density Recommendation ¹	DNL 65-69	DNL 70-74	DNL 75-79	DNL 80-84	DNL 85+
42	Motor vehicle transportation	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N
43	Aircraft transportation	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N
44	Marine craft transportation	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N
45	Highway and street right-of-way	Y ⁵	Y ⁶	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II	Y	Y	Y	Y	N
46	Automobile parking	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II	Y	Y	Y	Y	N
47	Communication	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II	Y	25 ²⁴	30 ²⁴	N	N
48	Utilities ⁷	N	Y ⁶	Y ⁶	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N
48.5	Solid waste disposal (Landfills, incineration, etc.)	N	N	N						
49	Other transportation, communication, and utilities	N	Y ⁶	Y	See Note 6 below	Y	25 ²⁴	30 ²⁴	N	N
50	Trade									
51	Wholesale trade	N	Y	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N
52	Retail trade – building materials, hardware, and farm equipment	N	Y	Y	See Note 8 below	Y	25	30	Y ²³	N

Table 4.3: Land-Use Compatibility Guidelines

Land Use		Accident Potential Zones				Noise Levels				
SLUCM No.	Name	Clear Zone ¹	APZ I ¹	APZ II ¹	Density Recommendation ¹	DNL 65-69	DNL 70-74	DNL 75-79	DNL 80-84	DNL 85+
53	Retail trade ⁹ – including shopping centers, discount clubs, home improvement stores, electronics superstores, etc.	N	N	Y	Maximum FAR of 0.16 in APZ II	Y	25	30	N	N
54	Retail trade – food	N	N	Y	Maximum FAR of 0.24 in APZ II	Y	25	30	N	N
55	Retail trade – automotive, marine craft, aircraft, and accessories	N	Y	Y	Maximum FAR of 0.14 in APZ I and 0.28 in APZ II	Y	25	30	N	N
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		Y	25	30	N	N
59	Other retail trade	N	N	Y	Maximum FAR of 0.16 in APZ II	Y	25	30	N	N
60	Services ¹⁰									
61	Finance, insurance, and real estate services	N	N	Y	Maximum FAR of 0.22 in APZ II	Y	25	30	N	N
62	Personal services	N	N	Y	Office uses only; Maximum FAR of 0.22 in APZ II	Y	25	30	N	N
62.4	Cemeteries	N	Y ¹¹	Y ¹¹		Y	Y ²¹	Y ²²	Y ^{23,30}	Y ^{25,30}
63	Business services (credit reporting; mail, stenographic, reproduction; advertising)	N	N	Y	Maximum FAR of 0.22 in APZ II	Y	25	30	N	N
63.7	Warehousing and storage services ¹²	N	Y	Y	Maximum FAR of 1.0 in APZ I and 2.0 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N

Table 4.3: Land-Use Compatibility Guidelines

Land Use		Accident Potential Zones				Noise Levels				
SLUCM No.	Name	Clear Zone ¹	APZ I ¹	APZ II ¹	Density Recommendation ¹	DNL 65-69	DNL 70-74	DNL 75-79	DNL 80-84	DNL 85+
64	Repair services	N	Y	Y	Maximum FAR of 0.11 APZ I and 0.22 in APZ II	Y	Y ²¹	Y ²²	Y ²³	N
65	Professional services	N	N	Y	Maximum FAR of 0.22 in APZ II	Y	25	30	N	N
65.1	Hospitals; Other medical facilities	N	N	N		25	30	N	N	N
65.16	Nursing homes	N	N	N		N ²⁰	N ²⁰	N	N	N
66	Contract construction services	N	Y	Y	Maximum FAR of 0.11 in APZ I and 0.22 in APZ II	Y	25	30	N	N
67	Governmental services	N	N	Y	Maximum FAR of 0.24 in APZ II	Y ²⁰	25	30	N	N
68	Educational services	N	N	N		25	30	N	N	N
68.1	Child care services, child development centers, and nurseries	N	N	N		25	30	N	N	N
69	Miscellaneous	N	N	Y	Maximum FAR of 0.22 in APZ II	Y	25	30	N	N
69.1	Religious activities	N	N	N		Y	25	30	N	N
70	Cultural, entertainment and recreational									
71	Cultural activities	N	N	N		25	30	N	N	N
71.2	Nature exhibits	N	Y ¹³	Y ¹³		Y ²⁰	N	N	N	N
72	Public assembly	N	N	N		Y	N	N	N	N
72.1	Auditoriums, concert halls	N	N	N		25	30	N	N	N
72.11	Outdoor music shells, amphitheaters	N	N	N		N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	N	N	N		Y ²⁶	Y ²⁶	N	N	N
73	Amusements- fairgrounds, miniature golf, driving ranges; amusement parks, etc.	N	N	Y		Y	Y	N	N	N

Table 4.3: Land-Use Compatibility Guidelines

Land Use		Accident Potential Zones				Noise Levels				
SLUCM No.	Name	Clear Zone ¹	APZ I ¹	APZ II ¹	Density Recommendation ¹	DNL 65-69	DNL 70-74	DNL 75-79	DNL 80-84	DNL 85+
74	Recreational activities (including golf courses, riding stables, water recreation)	N	Y ¹³	Y ¹³	Maximum FAR of 0.11 in APZ I and 0.22 in APZ II	Y	25	30	N	N
75	Resorts and group camps	N	N	N		Y	25	N	N	N
76	Parks	N	Y ¹³	Y ¹³	Maximum FAR of 0.11 in APZ I and 0.22 in APZ II	Y	25	N	N	N
79	Other cultural, entertainment and recreation	N	Y ¹¹	Y ¹¹	Maximum FAR of 0.11 in APZ I and 0.22 in APZ II	Y	25	N	N	N
80	Resource production and extraction									
81	Agriculture (except livestock)	Y ⁴	Y ¹⁴	Y ¹⁴		Y ²⁷	Y ²⁸	Y ²⁹	Y ^{29,30}	Y ^{29,30}
81.5, 81.7	Livestock farming and breeding	N	Y ^{14,15}	Y ^{14,15}		Y ²⁷	Y ²⁸	N	N	N
82	Agricultural related activities	N	Y ¹⁴	Y ¹⁴	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II, no activity that produces smoke, glare, or involves explosives	Y ²⁷	Y ²⁸	Y ²⁹	Y ^{29,30}	Y ^{29,30}
83	Forestry activities ¹⁶	N	Y	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II, no activity that produces smoke, glare, or involves explosives	Y ²⁷	Y ²⁸	Y ²⁹	Y ^{29,30}	Y ^{29,30}

Table 4.3: Land-Use Compatibility Guidelines

Land Use		Accident Potential Zones				Noise Levels				
SLUCM No.	Name	Clear Zone ¹	APZ I ¹	APZ II ¹	Density Recommendation ¹	DNL 65-69	DNL 70-74	DNL 75-79	DNL 80-84	DNL 85+
84	Fishing activities ¹⁷	N ¹⁷	Y	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II; no activity that produces smoke, glare, or involves explosives	Y	Y	Y	Y	Y
85	Mining activities ¹⁸	N	Y ¹⁸	Y ¹⁸	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II; no activity that produces smoke, glare, or involves explosives	Y	Y	Y	Y	Y
89	Other resource production and extraction	N	Y	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II; no activity that produces smoke, glare, or involves explosives	Y	Y	Y	Y	Y
90	Other									
91	Undeveloped Land	Y	Y	Y						
93	Water Areas	N ¹⁹	N ¹⁹	N ¹⁹						

Adapted from DOD Instruction 4165.57 (U.S. Department of Defense, 2 May 2011).

See **Key** and **Notes** on next page.

Table 4.3: Land-Use Compatibility Guidelines

Land Use		Accident Potential Zones				Noise Levels				
SLUCM No.	Name	Clear Zone ¹	APZ I ¹	APZ II ¹	Density Recommendation ¹	DNL 65-69	DNL 70-74	DNL 75-79	DNL 80-84	DNL 85+
Key: Y (Yes) = Land use and related structures are normally compatible without restriction. N (No) = Land use and related structures are not normally compatible and should be prohibited. Y^x = Yes with restrictions. The land use and related structures are generally compatible. However, see notes indicated by superscript. N^x = No with exceptions. The land use and related structures are generally incompatible. However, see notes indicated by superscript. SLUCM = Standard Land Use Coding Manual, U.S. Department of Transportation FAR = Floor Area Ratio. A floor area ratio is the ratio between the square feet of floor area of the building and the gross site area. It is customarily used to measure non-residential intensities. Du/Ac = Dwelling Units per Acre. This is customarily used to measure residential densities. DNL = Day-night average sound level. Ldn = Mathematical symbol for DNL. (blank) = Not Applicable (no data available for that category). 25, 30, or 35 = The numbers refer to noise level reduction (NLR) levels. NLR (outdoor to indoor) is achieved through incorporation of noise attenuation into the design and construction of a structure. Land use and related structures generally compatible; however, measures to achieve NLR of 25, 30, or 35 must be incorporated into design and construction of structure. However, measures to achieve an overall noise reduction do not necessarily solve noise difficulties outside the structure and additional evaluation is warranted. Also, see notes indicated by superscripts where they appear with one of these numbers. Notes: 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 densities in some categories. In general, land-use restrictions which limit occupants, including employees, of commercial, service, or industrial buildings or structures to 25 per acre in APZ I and 50 per acre in APZ II are considered to be low density. Outside events should normally be limited to assemblies of not more than 25 people per acre in APZ I and maximum assemblies of 50 people per 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 people an acre/ (average occupancy x Average Parking rate x (43560/1000)). The formula for APZ II’s FAR = 50/ (Average Vehicle Occupancy x Average Parking Rate x (43560/1000)). 2. The suggested maximum density for detached single-family housing is two dwelling units per acre (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% 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 aboveground utility and communications lines should normally be located in Clear Zone areas on or off the air installation. The Clear Zone is subject to severe restrictions. 5. Rights-of-way for fenced highways, without sidewalks or bicycle trails, are allowed. 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. For hardware, paint, and farm equipment stores, SLUCM Code 525, the maximum FARs are 0.12 in APZ I and 0.24 in APZ II.										

Table 4.3: Land-Use Compatibility Guidelines

Land Use		Accident Potential Zones				Noise Levels				
SLUCM No.	Name	Clear Zone ¹	APZ I ¹	APZ II ¹	Density Recommendation ¹	DNL 65-69	DNL 70-74	DNL 75-79	DNL 80-84	DNL 85+
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. Included in this category are such uses as big box discount clubs, home improvement superstores, office supply superstores, and electronics superstores. The maximum recommended FAR for SLUCM 53 should be applied to the gross leasable area of the shopping center rather than attempting to use other recommended FARs listed in Table 4-3 under Retail or Trade.									
10.	Ancillary uses such as meeting places, auditoriums, etc., are not recommended.									
11.	No chapels or houses of worship are allowed 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.	Livestock grazing is a compatible land use, but feedlots and intensive animal husbandry are excluded. Activities that attract concentrations of birds creating a hazard to aircraft operations should be excluded.									
15.	Feedlots and intensive animal husbandry are included as compatible land uses.									
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/animal 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 water fowl.									
20.	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.									
21.	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.									
22.	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.									
23.	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.									
24.	If project or proposed development is noise sensitive, use indicated NLR; if not, land use is compatible without NLR.									
25.	Buildings are not permitted.									

Table 4.3: Land-Use Compatibility Guidelines

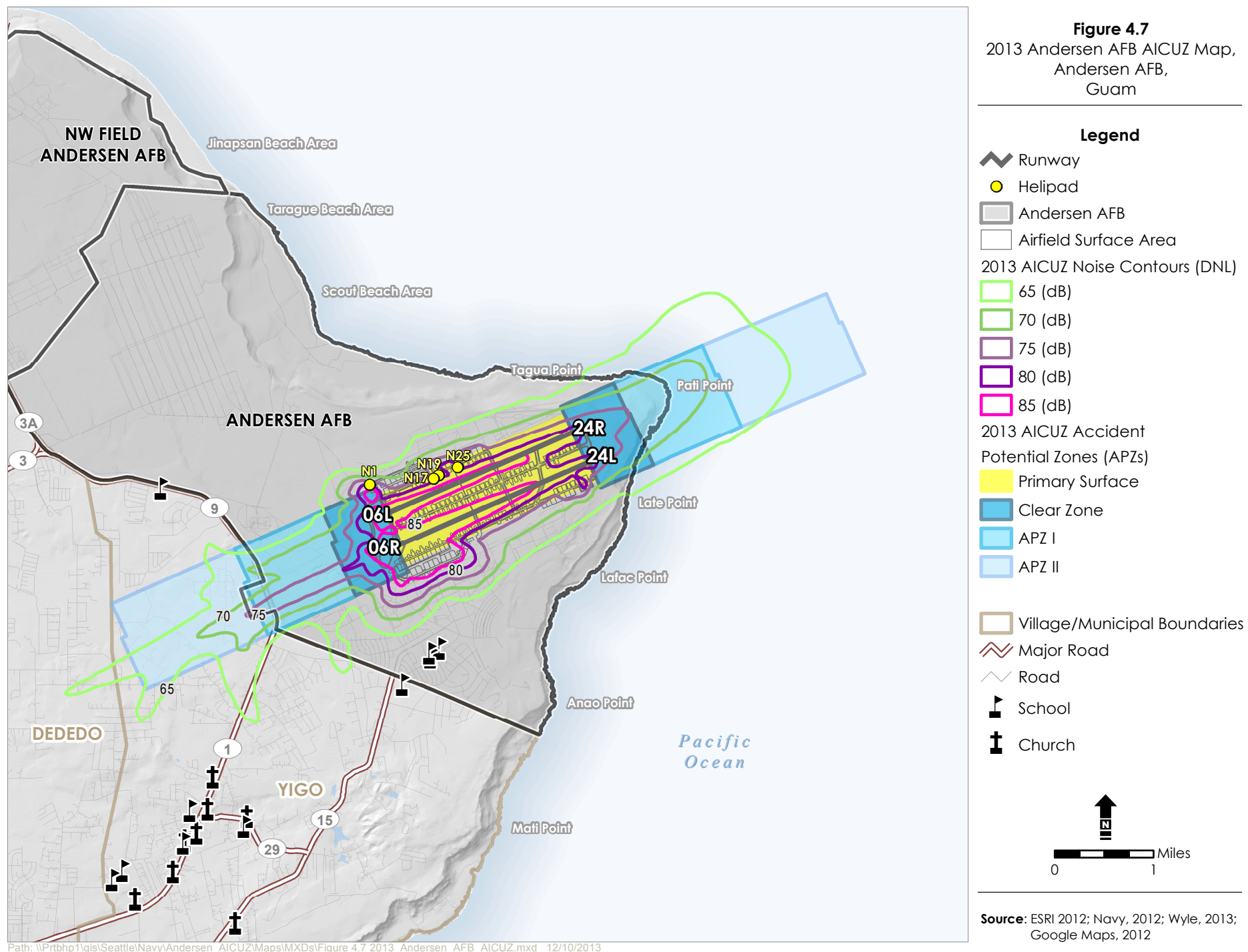
Land Use		Accident Potential Zones				Noise Levels				
SLUCM No.	Name	Clear Zone ¹	APZ I ¹	APZ II ¹	Density Recommendation ¹	DNL 65-69	DNL 70-74	DNL 75-79	DNL 80-84	DNL 85+
26. Land use is compatible provided special sound reinforcement systems are installed. 27. Residential buildings require an NLR of 25 28. Residential buildings require an NLR of 30. 29. Residential buildings are not permitted. 30. 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.										

4.7 Participation in the Planning Process

Andersen AFB regularly updates the AICUZ Study in order to assist local communities prepare their land use plans. The AICUZ defines certain areas as receiving high noise exposure or accident potential because aircraft operations may significantly impact land use in those areas. For example, the DOD recommends that certain land uses, such as apartments, churches, and schools, that concentrate large numbers of people are constructed outside the APZs (refer to Section 5 for further information on compatible land uses surrounding Andersen AFB). The 2013 AICUZ map comprises the 2013 AICUZ noise contours and APZs for Andersen AFB (see Figure 4.7). The AICUZ map defines the minimum recommend, acceptable area within which land use controls are suggested in order to protect the health, safety, and welfare of those living near a military airfield and to preserve the defense flying mission.

The AICUZ map (and information derived from the map) provides a tool for local communities to consider Andersen AFB aircraft operations in their land use plans. Refer to Section 6 for further information on the role of local communities in implementing the AICUZ Study. During the local land use planning process, the Air Force must be ready to provide additional inputs. The Andersen AFB Community Planner has been designated as the official liaison with the local community on all planning matters. This office is prepared to participate in the continuing discussion of zoning and other land use matters as they may affect, or may be affected by, Andersen AFB.

Figure 4.7
2013 Andersen AFB AICUZ Map,
Andersen AFB,
Guam



Source: ESRI 2012; Navy, 2012; Wyle, 2013;
Google Maps, 2012

5

LAND USE ANALYSIS

5.1 Introduction

5.2 Existing Land Use

5.3 Current Zoning

5.4 Future Land Use

5.5 Incompatible Zoning

5.1 Introduction

Land use planning and control is a dynamic, rather than a “static” process. The specific characteristics of land use will always reflect, to some degree, the changing conditions of the economic, social, and physical environment of a community, as well as changing public concern. The planning process accommodates this fluidity in that decisions are normally not based on boundary lines, but rather on more generalized area designations.

Andersen AFB was established during World War II in generally undeveloped portions of northern Guam. Today the majority of the island of Guam remains relatively rural. The southern portion of the island contains the largest portion of the island’s agricultural land while the north and central plains contain smaller agricultural spaces dispersed throughout the area. Commercial, such as tourist-focused development, and industrial uses are primarily located in the areas surrounding the districts of Tamuning and Agana, including the capital city of Hagatna (refer to Figure 2.1; ICF International 2009). Although northern portions of the island remain relatively rural, Guam has experienced substantial growth since Andersen AFB was established, and growth is anticipated to continue due to tourist industry and military relocations.

Computer technology has enabled Andersen AFB to more precisely display its flight tracks and noise contours for land use planning purposes. This same technology has revealed the extent of Andersen AFB’s region of impact into the municipalities of Yigo and Dededo. To determine the compatibility of land use surrounding

Andersen AFB with aircraft operations, the Air Force examined existing and zoned land use near the installation. Unfortunately, detailed existing and future land use information for areas surrounding Andersen AFB is unavailable at the time of writing this report. Existing land use is generally characterized in Section 5.2, Existing Land Use, and future land use is generally characterized in Section 5.4, Future Land Use. A detailed discussion of current zoning designations, as well as an analysis of their compatibility with DOD recommendations, is provided in Section 5.3, Current Zoning, and Section 5.5, Incompatible Zoning. Refer to Section 4.6, Land Use Compatibility Guidelines, for further information on DOD compatibility recommendations.

5.2 Existing Land Use

Andersen AFB is located on the northern end of the island of Guam which is characterized by large federal holdings including Andersen AFB, Naval Computer and Telecommunications Station (NCTS) Finegayan, South Finegayan, and Andersen South. This area of Guam also contains a large portion of the island's residents (approximately 52% of the population resides on 34% of the land). Despite this population, there are relatively few villages (DoN 2010). The closest northern villages/municipalities are Yigo and Dededo which serve as bedroom communities for residents who work in the urban areas of Hagatna or Tamuning (see Figure 2.1; ICF International 2009).

In general, Andersen AFB is bordered by rural residential, low-density residential and agriculture land uses. In northern Guam, park/open space uses are typical along coastlines as well as along Route 3, Route 9, and Route 1. Similarly, tourist/resort land uses are typical along coastlines; however, there is a large tourist/resort area (Starts Guam Golf Resort) located south of Potts Junction. Village centers are located along Route 29 between Route 15 and Route 1 (associated with Yigo village), along Route 9 adjacent to the Andersen AFB boundary, and along Route 3 near the intersection with Route 28 (associated with Dededo village). Larger commercial centers, shopping malls, hotels and

office buildings are located along Route 9 and Route 3 south of the intersection with Route 28 (DoN 2010).

The Yigo municipality (including the village center located along Route 9 adjacent to the Andersen AFB boundary) contains several churches, public and private schools (see Figure 5.1), as well as several housing subdivisions. Schools in this area include Simon A. Sanchez High School; F.B. Leon Guerrero Middle School; and Daniel L. Perez, Upi, and Machanaonao elementary schools; as well as Trinity Christian School and Dominican Catholic (Clement 2012). Our Lady of Lourdes and Way of Salvation churches as well as Spring Hill, Marianas Terrace, and Villa Pacita Estates housing subdivisions are all located in the Route 29 corridor between Route 15 and Route 1.

5.3 Current Zoning

The purpose of this section is to provide the context of comprehensive planning efforts and zoning as it exists for the island of Guam. This section also identifies zoning districts near Andersen AFB and within the AICUZ footprint (see Figure 4.7). Zoning districts are the basis by which similar SLUCM land-use classifications are assigned and compatibility with DOD recommendations is evaluated.

5.3.1 Guam Planning Program and Implementation

In accordance with the Guam Organic Act of 1950, the 1967 Territory of Guam Master Plan was prepared and approved by the Territorial Planning Commission. Since the adoption of the master plan, the 1978 Guam Comprehensive Development Plan and the 1997 I Tano'-Ta Land Use Plan have sought to update the master plan. However, the 1978 Guam Comprehensive Development Plan was never codified into law and the 1997 I Tano'-Ta Land Use Plan, adopted and approved by the Governor and the Senate, was repealed after its adoption (E & E 2010). Therefore, the 1967 Territory of Guam Master Plan remains the only approved comprehensive plan enacted into law. This plan provides the only approved zoning map for the island and is adopted into Guam's zoning law (E & E 2010; ICF International 2009).

Despite the last adoption of a master plan in 1967, Guam's program for comprehensive planning is in a constant state of evolution. Guam's zoning law provides the basis for land use decisions; however, changes in zoning from the 1967 plan may be adopted in separate areas and approved on a case-by-case basis through legislative adoption of interim regulations (E & E 2010). From 1952 through the 1980s, various Zoning Code sections have been adopted. The Guam Department of Land Management (DLM) is the designated zoning authority responsible for the oversight, implementation, and enforcement of island-wide zoning laws (5 Guam Code Annotated [GCA] § 1207). However, application of the zoning code rather than consistent implementation of a growth management plan is demonstrative of the evolving nature of Guam's comprehensive planning process. For example, the majority of the island is zoned for agriculture, but many such zones are developed as residential areas.

5.3.2 SLUCM Classifications

As discussed in Section 4.6, Land Use Compatibility Guidelines, the DOD uses the SLUCM classifications to assess land use compatibility with noise zones, CZs, and APZs. In order to complete the GIS zoning compatibility analysis, zoning districts were assigned applicable codes from SLUCM. The most current available information from the Guam DLM was used to conduct the zoning compatibility analysis. Zone classifications include: zone districts as identified in the Guam Zoning Code, zone districts as identified in the adopted and subsequently repealed I Tano'-Ta Land Use Plan, as well as other zoning classifications.

For the purposes of this study, zoned districts are described as they are adopted within 21 GCA Real Property, Ch. 61 Zoning Law, or described within the Guidebook to Development Requirements on Guam (Bureau of Statistics and Plans 2005). In instances where zoning districts are not sufficiently described within the Guam zoning code, best available information was used to equate SLUCM classifications. Table

5.1 provides a summary description of zoned districts and equated SLUCM classifications within the Andersen AFB AICUZ footprint.

Table 5.1: Zoning Districts on Guam

Zoning District	General Description	Equated SLUCM Categories
Rural Zone (A)	Agricultural uses, single-family dwellings, duplexes, places of rural public assembly, and uses considered accessory to these.	10 – Residential 60 – Services 70 – Cultural, Entertainment, and Recreation 80 – Resource Production and Extraction
One-Family Dwelling Zone (R-1)	Primarily single-family dwellings, gardening and keeping of non-commercial animals, and accessory uses and structures	10 – Residential 40 – Transportation, Communication, and Utilities 80 – Resource Production and Extraction
Multiple Dwelling Zone (R-2)	Duplexes and multi-family residential uses, as well as single-family dwellings, hotels, and accessory uses and structures.	10 – Residential
Commercial (C)	Typical commercial uses, single and multiple family dwelling units, and accessory uses and structures.	10 – Residential 40 – Transportation, Communication, and Utilities 50 – Trade 60 – Services 70 – Cultural, Entertainment, and Recreation
Low Intensity (2)	Mixture of low-density residential and agricultural uses.	10 – Residential 80 – Resource Production and Extraction
Moderate Intensity / Moderate Intensity Special (3/3s)	Residential, urban services such as sewer, roads, and water and power beyond essential needs and other trade and professional services.	10 – Residential 40 – Transportation, Communication, and Utilities 60 – Services
Military Lands (M)	Military uses.	<i>For the purposes of this analysis military uses are considered compatible with DOD recommendations. No SLUCM classification is assigned.</i>

Key:

SLUCM = Standard Land Use Coding Manual.

DOD = United States Department of Defense.

5.3.3 Existing Zoning

Figure 5.1 depicts the current zoning within the Andersen AFB AICUZ footprint. The majority of land located outside the Andersen AFB boundary and within the DNL 65-dB and greater noise exposure area is within the Yigo municipality. A relatively small area zoned **A – Rural**, **2 – Low Intensity** and **1 – Parks** zone is located within the DNL 65-dB noise contour in Dededo municipality.

Table 5.2 summarizes the acreage of each zoning district located within noise exposure areas of DNL 65 dB and greater (excluding **M – Military Lands**). Within the Yigo municipality, 1 acre of **A – Rural** zone are within the DNL 75-79 dB noise zone and 100 acres of **A – Rural** zone are within the DNL 70-74 dB noise zone. A total of 683 acres are within the DNL 65-69 dB noise zone, the majority of which (652 acres) are zoned **A – Rural**. Most of the remaining land in the DNL 65-69 dB noise zone is **2 – Low Intensity** zone, located south of Chin Mataguac road, and **C – Commercial** zone located adjacent to the base boundary and along Route 1. A small area (less than 1 acre) of **1 – Parks** zone is within the 65-69 dB noise zone, within the municipality of Dededo and south of Chin Mataguac road.

On-land CZs at Andersen AFB do not exceed the base boundaries; all on-land off-base APZs are located within the Yigo municipality (see Figure 5.1). Table 5.3 summarizes the acreage of each zoning district located within CZs and APZs (excluding **M – Military Lands**). Within APZ I, the primary zoning district is **A – Rural Zone** (51 acres). One (1) acre of **C – Commercial Zone** property in APZ I is located adjacent to the base boundary along Route 1. Likewise, the main zoning district located within APZ II is **A – Rural Zone** (767 acres).

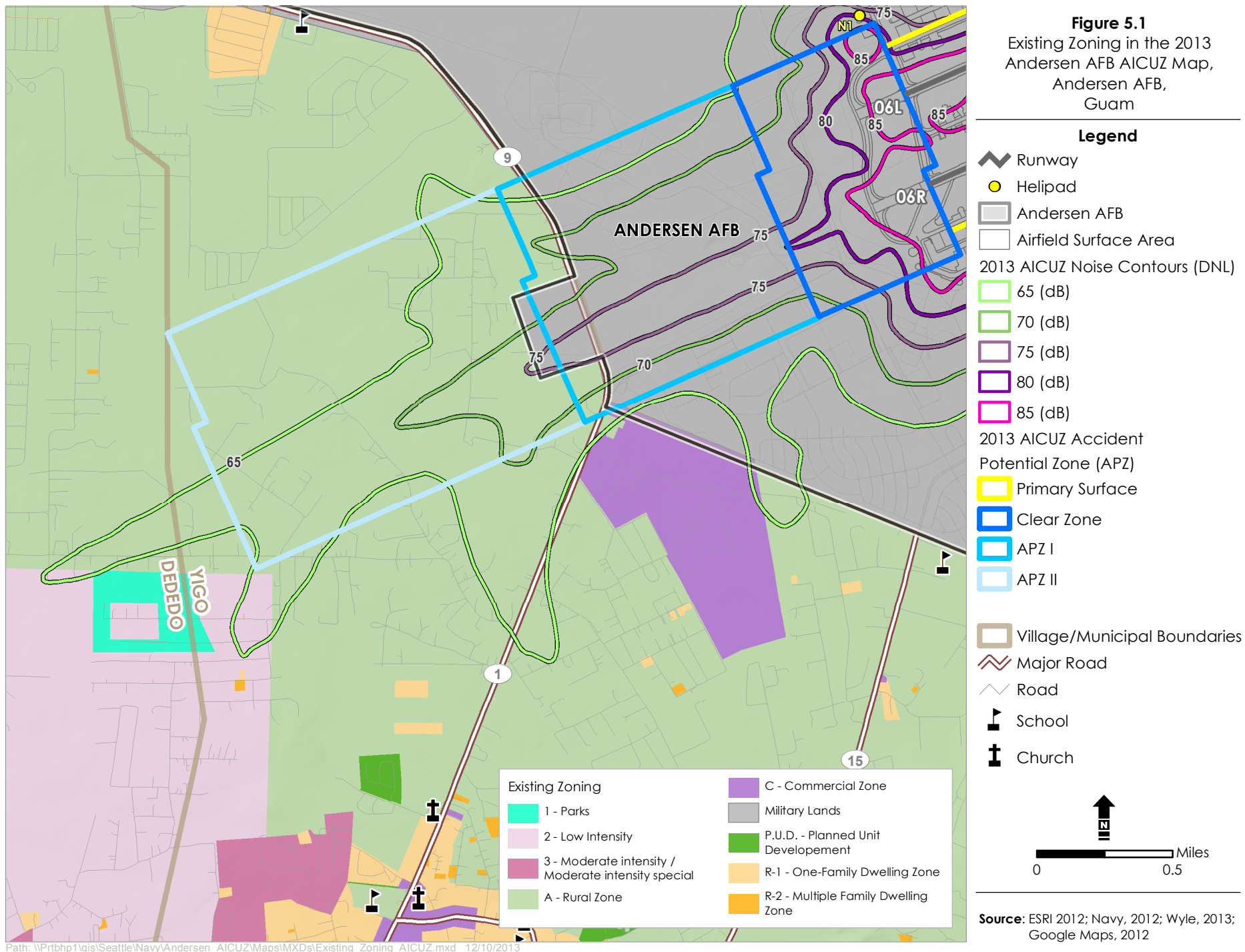


Table 5.2: Zoning within the DNL 65-dB and Greater Noise Exposure Area

Zoning District ¹	Acreage within Noise Zones DNL 65 dB+ ²			Total ³
	65-69 dB	70-74 dB	75-79 dB	
1	>1	0	0	>1
2	25	0	0	25
A	652	100	1	753
C	6	0	0	6
Total ³	683	100	1	783

Notes:

1 Excludes Military Lands (M).

2 Excludes offshore areas within the greater than 65dB noise contour.

3 Figures may not sum exactly due to rounding.

Table 5.3: Zoning within Clear Zones and Accident Potential Zones

Zoning District ¹	Acreage within CZs and APZs ²		Total ³
	APZ I	APZ II	
A	51	767	818
C	1	0	1
Total ³	52	767	819

Notes:

1 Excludes Military Lands (M).

2 Excludes offshore areas within the Clear Zone, APZ I or APZ II.

3 Figures may not sum exactly due to rounding.

5.4 Future Land Use

In preparation for the DOD expansion of facilities and personnel on Guam, the Bureau of Statistics and Plans of the Government of Guam prepared the 2009 Draft North and Central Guam Land Use Plan (ICF International 2009). The plan identifies a 20-year vision along with goals and policies to achieve the vision for the areas surrounding Andersen AFB including the municipalities of Yigo and Dededo (ICF International 2009). At the time of writing this report, the Draft North and Central Guam Land Use Plan has not been officially adopted, however, the plan provides the most current and accurate portrayal of future land use plans in the north and central areas of the island. If approved, land use

categories identified in the draft plan would be implemented via the official zoning law (E & E 2010; ICF International 2009). Refer to the 2009 Draft North and Central Guam Land Use Plan for further information on land use categories established by the plan and a future land use map.

5.5 Incompatible Zoning

This section addresses the compatibility of current zoning within 2013 AICUZ noise contours and APZs. According to the AICUZ map (Figure 4.7) areas within the 2013 AICUZ noise zones and APZs are classified as:

- generally compatible;
- compatible with restrictions; and
- incompatible with DOD recommendations.

Compatibility recommendations identified in this report generalize land use guidance provided by DOD Instruction 4165.57 and reflect all permitted land-uses identified by each zoning district. Within each zoning district uses may exist that are individually compatible with DOD recommendations.

5.5.1 Noise Zones

Based on assigned SLUCM classification, 1 acre of land outside the base boundary is incompatible, 125 acres are compatible with restrictions and 658 acres are compatible with DOD noise recommendations (see to Table 5.4). All areas incompatible with DOD recommendations occur within the 75-79 dB DNL noise zone. Areas compatible with restrictions with DOD recommendations are within the 65-69 dB and 70-74 dB DNL noise zones. All areas compatible with DOD recommendations are within the 65- 69 dB DNL noise zone (the lowest noise zone for which the DOD has compatibility recommendations). In addition to these areas, 1,206 offshore acres evaluated do not have DOD noise compatibility recommendations.

Table 5.4: Zoning - Compatibility with Noise Exposure

DNL (dB)	Compatibility Recommendation ¹			Total*
	Compatible	Compatible with Restrictions	Incompatible	
65-69	658	25	0	683
70-74	0	100	0	100
75-79	0	0	1	1
Total²	658	125	1	783

Notes:

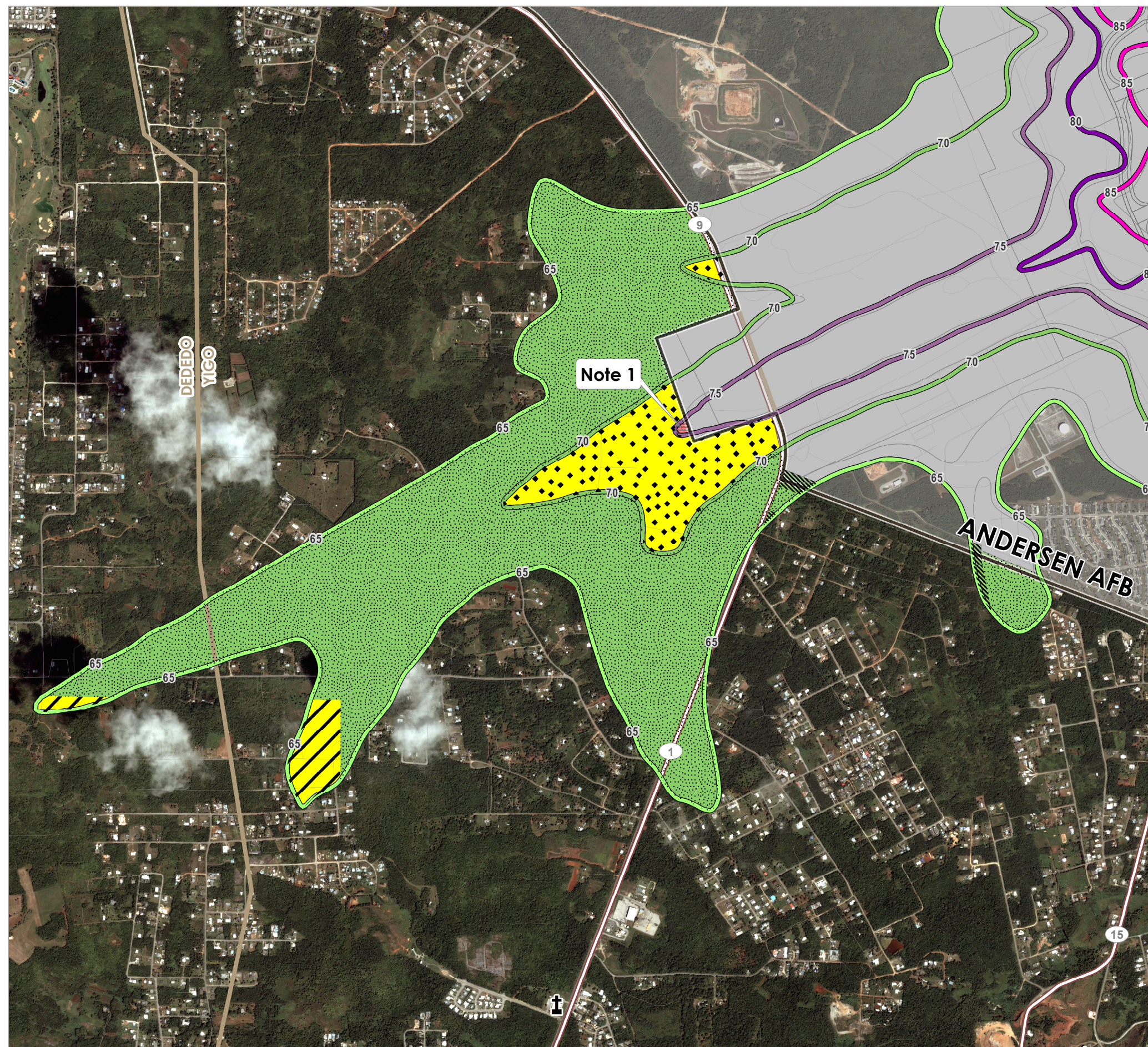
1 Compatibility Recommendations identified in this table are general and reflect all permitted uses identified by zoning districts. Within each zoning district uses may exist that are compatible with DOD recommendations.

2 Figures may not sum exactly due to rounding.

One (1) acre is generally incompatible with DOD recommendations for noise exposure ranging from 75 to 79 dB DNL (identified as pink on Figure 5.2). This area is zoned **A – Rural**; within this area, parcels with one-family dwellings and duplexes, farming, and uses that result in public assembly are incompatible with DOD recommendations; however, parcels with accessory uses such as warehouses may be compatible with restrictions with DOD recommendations.

One hundred (100) acres within the DNL 70-74 dB noise zone are **A – Rural** zone and 25 acres within the DNL 65-69 dB noise zone are **2 – Low Intensity** zone and **1 – Parks** zone; these zoning districts are generally compatible with restrictions with DOD recommendations (identified as yellow on Figure 5.2). Within this area, parcels that are developed primarily for residential use such as one-family dwellings and duplexes are incompatible with exceptions with DOD recommendations.

Six hundred fifty-two (652) acres within the DNL 65- 69 dB noise zone are **A – Rural** zone and 6 acres are **C – Commercial** zone; these zoning districts are generally compatible with DOD recommendations (identified as green on Figure 5.2). Refer to Figure 5.2 Notes for further information on parcel-level recommended restrictions.



Notes

One family dwellings and duplexes are incompatible with exceptions with DoD recommendations. If the community decides to allow these uses, noise level reduction and site planning restrictions should be applied.

One family dwellings and duplexes are incompatible with exceptions with DoD recommendations. If the community decides to allow residential uses, noise level reduction and site planning restrictions should be applied. Development in this zoning block that results in public assembly or uses customarily accessory to residential dwellings or farming, such as warehouses, are compatible with DoD recommendations.

◆◆◆ One family dwellings and
◆◆◆ duplexes are incompatible
◆◆◆ with exceptions with DoD
◆◆◆ recommendations. If the
community decides to allow
residential uses, noise level
reduction and site planning
restrictions should be applied.
Uses customarily accessory to
residential dwellings or
farming, such as warehouses,
may be allowed with
restrictions. Development in
this zoning block that results in
public assembly are
incompatible with DoD
recommendations.

(Note 1) Uses customarily accessory to residential dwellings or farming, such as warehouses, may be allowed with restrictions.

Residential use is incompatible with exceptions with DoD recommendations; noise level reduction and site planning restrictions should be applied.

Figure 5.2
Zoning Compatibility and the
2013 ALCUZ Noise Contours,
Andersen AFB,
Guam

Legend

 Andersen AFB

 Runway☐ Airfield Surface Area

2013 AICUZ Noise Contours (DNL)

65 (dB)

70 (dB)

75 (dB)

80 (dB)

85 (dB)

DoD Compatibility Recommendations

- Development in this zoning block is generally incompatible with DoD recommendations.

Development in this zoning block is generally compatible with DoD recommendations

Development in this zoning block is generally compatible with restrictions with DoD recommendations

 Compatible with DoD recommendations

☐ No DoD compatibility recommendations

 Village/Municipal Boundaries

 Major Road Road

† Church



A horizontal scale bar with a black segment on the left and a white segment on the right. The word "Miles" is at the right end. Below the bar, "0" is at the left end and "0.5" is at the right end.

Source: ESRI 2012; Navy, 2012; Wyle, 2013; USDA Imagery, 2006; Google Maps, 2012

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5.5.2 Runway End 06L and 06R Clear Zones and Accident Potential Zones

Based on assigned SLUCM classification, 818 acres outside of the installation boundary are compatible with restrictions and 1 acre is incompatible with DOD recommendations for runway end 06L and 06R APZs. Refer to Figure 5.3 and Table 5.5 for identification of recommended compatibility for all areas within the runway end 06L and 06R APZs.

Table 5.5: Zoning - Compatibility with Runway End 06L and 06R Clear Zones and Accident Potential Zones

	Compatibility Recommendation ¹			Total*
	Compatible	Compatible with Restrictions	Incompatible	
Clear Zone	0	0	0	0
APZ I	0	51	1	51
APZ II	0	767	0	767
Total²	0	818	1	819

Notes:

1 Compatibility Recommendations identified in this table are general and reflect all permitted uses identified by zoning districts. Within each zoning district uses may exist that are compatible with DOD recommendations.

2 Figures may not sum exactly due to rounding.

5.5.2.1 Clear Zone

CZs on runway end 06L and 06R are located within the Andersen AFB boundary.

5.5.2.2 APZ I

One (1) acre is generally incompatible with DOD recommendations for APZ I. This area is zoned **C – Commercial**; within this area, parcels with primary uses—one-family dwellings, duplexes, amusement enterprises, bakeries, offices, professional service shops, repair shops, restaurants and cafes, and other similar permitted uses—are incompatible with DOD recommendations. Other permitted uses within the **C – Commercial** zone such as wholesale stores and studios may be compatible or compatible with restrictions with DOD recommendations. Fifty-one (51) acres zoned **A – Rural** within APZ I are generally

compatible with restrictions with DOD recommendations. Within this area, one-family dwellings and duplexes, as well as uses that may result in public assembly, are incompatible with DOD recommendations. Agriculture uses that do not attract concentrations of birds and accessory uses such as warehouses are generally compatible with DOD recommendations in this area. Refer to Figure 5.3 Notes for further information on parcel-level recommended restrictions and uses that may be compatible with DOD recommendations.

5.5.2.3 APZ II

Seven hundred sixty-seven (767) acres zoned **A – Rural Zone** within APZ II are generally compatible with restrictions with DOD recommendations. Within APZ II, similar restrictions to those identified for APZ I are applied to **A – Rural Zone**. Refer to Figure 5.2 Notes for further information on parcel-level recommended restrictions.

5.5.3 Runway End 24R and 24L Clear Zones and Accident Potential Zones

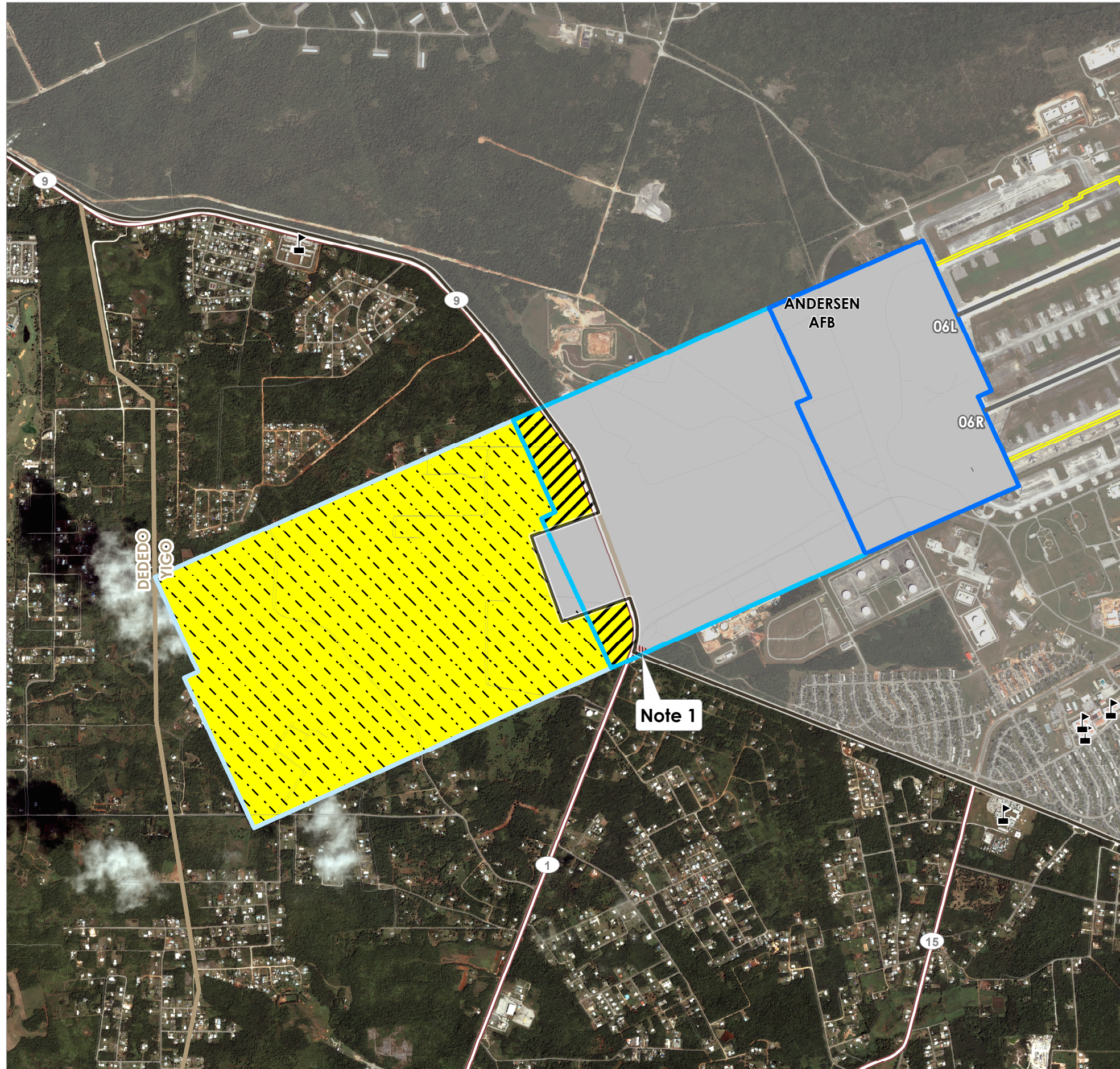
CZs and APZs on runway end 24R and 24L extend northeast from the airfield over the Pacific Ocean (see Figure 4.5). Within the CZ, 21 acres extend offshore; 430 acres within APZ I extend offshore and 1,230 acres within APZ II extend offshore. Technically, these areas are incompatible with exceptions with DOD recommendations and the Pacific Ocean is considered a preexisting, non-conforming land use. Natural water features, such as the ocean attract waterfowl and present a potential Bird/Animal Aircraft Strike Hazard (BASH); however runway ends 24R and 24L, respectively, are 618 and 607 feet above mean sea level.

5.5.4 Planning Considerations

AICUZ noise contours describe the noise characteristics of a specific operational environment, and as such, will change if a significant operational change is made. If a new mission is established at Andersen AFB, adding a larger number of airplanes or additional model types, the AICUZ could be amended. With these thoughts in mind, Andersen AFB

has revised the 1998 AICUZ Study and has provided flight track, APZ, and noise contour information in this report that reflect the most current and accurate picture of aircraft activities.

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Notes

Residential development and development that may result in public assembly is incompatible with DoD recommendations. Activities that attract concentrations of birds should be excluded. Uses customarily accessory to any of the above uses, such as warehouses, may be compatible with Floor Area Ratio (FAR) restrictions.

(Note 1) Permitted uses such as wholesale and retail stores, shops and businesses and repair services such as automobile service stations require Floor Area Ratio (FAR) restrictions but are generally compatible with DoD recommendations. Communications uses such as studios may be compatible with restrictions with DoD recommendations.

Residential development and development that may result in public assembly is incompatible with DoD recommendations. Agriculture related are generally compatible with DoD recommendations, however activities that attract concentrations of birds should be excluded. Uses customarily accessory to any of the above uses, such as warehouses, may be compatible with Floor Area Ratio (FAR) restrictions.

* Within Accident Potential Zones the Pacific Ocean (not shown) is a pre-existing, nonconforming land use with DoD recommendations for military airfields. Natural water features such as the ocean attract waterfowl and present a potential Bird/Animal Aircraft Strike Hazard (BASH).

Figure 5.3
Zoning Compatibility and the
2013 AICUZ Accident Potential Zones,
Andersen AFB,
Guam

Legend

Andersen AFB

Runway

2013 AICUZ Accident
Potential Zones (APZs)

Primary Surface

Clear Zone

APZ I

APZ II

DoD Compatibility Recommendations

Development in this zoning block
is generally compatible with
restrictions with DoD
recommendations

Development in this zoning block
is generally incompatible with
DoD recommendations

Compatible with DoD
recommendations

No DoD compatibility
recommendations

Village/Municipal Boundaries

Major Road

Road

Church

School



0 0.5 Miles

Source: ESRI 2012; Navy, 2012; Google Maps,
2012 ; Wyle, 2013; USDA Imagery, 2006;

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6

6.1 Air Force Responsibilities

6.2 Local Community Responsibilities

IMPLEMENTATION

The implementation of the AICUZ Study must be a joint effort between the Air Force and the adjacent communities. The Air Force's role is to minimize the impact on the local communities by Andersen AFB operations. The role of the communities is to ensure that development in the environs is compatible with accepted planning and development principles and practices.

6.1 Air Force Responsibilities

In general, the Air Force perceives its AICUZ responsibilities as encompassing the areas of flying safety, noise abatement, and participation in the land use planning process.

Well maintained aircraft and well trained aircrews do much to assure that aircraft accidents are avoided. Despite the best training of aircrews and maintenance of aircraft, however, history makes it clear that accidents do occur. It is imperative that flights be routed over sparsely populated areas as much as possible to reduce the exposure of lives and property to a potential accident.

By Air Force regulation, commanders are required to periodically review existing traffic patterns, instrument approaches, weather minima, and operating practices, and evaluate these factors in relationship to populated areas and other local situations. This requirement is a direct result and expression of Air Force policy that all AICUZ plans must include an analysis of flying and flying related activities designed to reduce and control the effects of such operations on surrounding land areas. Noise is generated from aircraft both in the air and on the ground. In an effort to reduce the noise effects of Andersen

AFB operations on surrounding communities, the base restricts nighttime flying activities and has routed flight tracks to avoid populated areas. Practice takeoffs/landings and instrument approaches are typically conducted at times when individuals are normally awake. These activities are generally not scheduled between 10:00 P.M. and 7:00 A.M. Whenever possible, traffic patterns are all located away from the population centers, both on and off-base. Base maintenance run-up activities are not performed between 10:00 P.M. and 7:00 A.M., except for high priority mission requirements.

The preparation and presentation of this Andersen AFB AICUZ Study is one phase of the continuing Air Force participation in the local planning process. As the local community updates its land use plans, the Air Force must be ready to provide additional inputs. Base personnel should also be prepared to participate in the continuing discussion of zoning and other land use matters as they may affect, or may be affected by Andersen AFB. Base personnel should also be available to provide information, criteria and guidelines to state, regional and local planning bodies, civic associations, and similar groups.

Recommended actions in order to address areas of current or future areas incompatible with DOD recommendations include:

- Develop guidelines to assist local communities in planning and land use decisions. Guidelines should include:
 - Limit concentrations of people and facilities in areas exposed to a higher risk from aircraft accidents.
 - Promote compatibility with the noise exposure from air installation operations.
 - Promote restrictions on land uses and heights of natural objects and man-made objects in the vicinity of air installations that may obstruct the airspace, attract birds, cause electromagnetic or thermal interference, or produce dust, steam, smoke, or light emissions to provide for safety of flight and the public welfare.

- Review proposed planned unit developments and subdivision requests within the AICUZ footprint for compatibility with DOD AICUZ guidelines.
 - Within APZ II recommend that proposed planned unit developments cluster housing units leaving large open areas. In order to conform to DOD AICUZ guidelines total amount of surface area covered by structures should not exceed 20 percent of the planned unit developments total area. Currently 21 GCA Real Property, CH. 61 zoning law allows all structures to cover not more than 30 percent of planned development districts.
- Other strategies to achieve compatibility including use of building codes, transfer development rights, real property acquisition, buffer lands and restrictive easement acquisition, and disclosure ordinances should only be considered when:
 - Aircraft operations may affect the public health, safety, or welfare; or
 - Certain uses or structures may obstruct the airspace, attract birds, create electromagnetic or thermal interference, or produce dust, smoke, steam, or light emissions that may impact a pilot's vision, or otherwise be hazardous to or incompatible with aircraft operations.
- Maintain a log of noise complaints received and conduct follow-up actions as required. Complaints should be collected in a standard format for plotting locations in a spatial database for future planning use. Recording these complaints can help:
 - Document whether newly developing sites may be noise-sensitive in the future;
 - Provide land-use planning information for the local government;

- Determine which operational flight tracks are responsible for the noise complaint and at what time most complaints occur; and
- Provide valuable information for real estate transactions.
- Continue to implement community outreach programs. Future initiatives for community outreach should focus in communities where aircraft operations are likely to cause the greatest impact such as the villages of Yigo and Dededo as well as village centers located along Route 9 adjacent to the Andersen AFB boundary.
- Develop a sourcebook of programs that may assist in providing noise attenuation to existing development incompatible with DOD noise recommendations. Distribute sourcebook to planning bodies and civic association in Yigo and Dededo municipalities.

6.2 Local Community Responsibilities

Area residents and the personnel at Andersen AFB have a long history of working together for mutual benefit. We feel that adoption of the following recommendations will strengthen this relationship, increase the health and safety of the public, and help protect the integrity of the base's flying mission:

- Update and incorporate AICUZ policies and guidelines into the comprehensive plans of northern Guam as well as the municipalities of Yigo and Dededo. Update existing GIS planning and land use layers for northern Guam.
- Modify zoning ordinances and subdivision regulations to support the compatible land uses outlined in this study through the implementation of a zoning overlay district based on the AICUZ map. Within this district use the Air Force Land Use Compatibility Guidelines to evaluate existing and future land use proposals.

- Enact fair disclosure ordinances to disclose to the public those AICUZ items directly related to operations at Andersen AFB, such as disclosure of noise zones during the purchase of property within the AICUZ footprint.
- Implement height and obstruction ordinances which reflect current Air Force and Federal Aviation Administration (FAA) Part 77 requirements.
- Ensure that new construction within the AICUZ area has the recommended noise level reductions incorporated into its design and construction.
- Continue to inform Andersen AFB of planning and zoning actions that have the potential of affecting base operations.
- Develop a working group representing GovGuam, municipality planners, and base planners to meet at least quarterly to discuss AICUZ concerns and major development proposals that could affect airfield operations.
- Support and implement recommendations of the Joint Land Use Study Program efforts.

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7

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