





The Redstone Arsenal JLUS was prepared under contract with the City of Huntsville, Alabama, with financial support from the Office of Economic Adjustment, Department of Defense. The content was developed through a collaborative stakeholder process and does not necessarily reflect the views of the Office of Economic Adjustment.



JLUS Report

Prepared for:

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Prepared by:



January 2019

How to Read the JLUS Documents

The Redstone Arsenal Joint Land Use Study (JLUS) consists of three separate documents that provide different levels of information. These three documents are:

JLUS Background Report

The JLUS Background Report provides a detailed technical background of existing conditions within the Redstone Arsenal JLUS Study Area. It is separated out into five chapters. Chapter 1 provides an introduction and overview of the Redstone Arsenal JLUS and why it was conducted. Chapter 2 introduces the communities that are within the JLUS Study Area and gives an overview of their history and current statistics, including population, housing characteristics, economic outlook, and past, present, and future trends of growth and development. Chapter 3 provides an overview of Redstone Arsenal and its operational facilities, discusses the installation's mission and tenants, its strategic and local importance, and facility and training capabilities and operations. It concludes with a discussion of the military footprints that go outside the installation boundaries. Chapter 4 provides an overview of relevant plans, programs, and studies that are tools to address compatibility issues in the JLUS Study Area. Chapter 5 presents the compatibility issues identified and a detailed assessment of each and how it impacts Redstone Arsenal or the surrounding community.

JLUS Report

The JLUS Report is a condensed portfolio of the key issues and strategies identified through the Redstone Arsenal JLUS process. The report includes a user-friendly reference of the JLUS that is accessible and easy-to-use for all stakeholders. This report provides a brief discussion on the purpose and objectives of the JLUS, describes the benefit of the JLUS, and provides an overview of the various JLUS partners that assisted in its development. Finally, this document outlines the relevant compatibility issues accompanied by applicable strategies identified in the Implementation Plan and provides summaries of the strategies separated by stakeholder.

Executive Summary Brochure

The Executive Summary brochure provides a brief overview of the JLUS project and process and highlights the key recommended strategies to address the compatibility issues identified. It also includes Redstone Arsenal Military Compatibility Area maps and descriptions of each.

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The Redstone Arsenal Joint Land Use Study (JLUS) was developed through a collaborative partnership of representatives from varied stakeholders including local communities, Redstone Arsenal, and other regional entities. Two JLUS committees – the Policy Committee and the Technical Review Group – provided direction and technical oversight on the document and were composed of representatives from the stakeholder groups. Together, the groups worked toward a consensus on the issues and recommendations, and participants provided comments at every stage of the drafting process. Individual working group participants do not necessarily agree with or endorse any part or the whole of the final document. The following pages identify the individuals that formally participated in the development of the Redstone Arsenal JLUS.

Policy Committee

The Policy Committee (PC) served an active and important role in providing policy direction during the development of the Redstone Arsenal JLUS. The PC was composed of the following individuals:

Local Representatives

Dale Strong, Commission Chairman
Madison County

James Hutcheson, Commission Chairman
Marshall County

Col. Kelsey Smith, Garrison Commander
Redstone Arsenal

Mayor Mary Caudle
Town of Triana

Mayor Paul Finley
City of Madison

Ray Long, Commission Chairman
Morgan County

Col. Tom Holliday
Redstone Arsenal

Mayor Tommy Battle
City of Huntsville

State Representatives

Doug Jones, U.S. Senator
U.S. Senate

Mo Brooks, U.S. Congressman
U.S. Congress

Richard Shelby, U.S. Senator
U.S. Senate

Robert Aderholt, U.S. Congressman
U.S. Congress



Technical Review Group – Community Representatives

The Technical Review Group (TRG) served a key role in the development of the Redstone Arsenal JLUS. They provided the overall technical support, review, and guidance of the study. The TRG was composed of the following individuals who represented local communities and regional stakeholders:

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Planning / Economic Development
Madison County

Bruce Freeman, Chief Decatur Office
*Alabama Department of Environmental
Management*

Carson Clark, Communications Director
Congressman Robert Aderholt

Chip Cherry, President and CEO
Huntsville Madison County Chamber of Commerce

Chris McNeese, Director Public Works
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Curtis Vincent, Region Engineer
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Rick Tucker, Executive Director
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Scott Cardno, Director Natural Resources
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Tiffany Noel, District Director
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Trevor Daniels, Chief of Staff / Government Relations
U.S. Space and Rocket Center

Trey Riley, City Attorney
City of Huntsville



Technical Review Group – Redstone Arsenal Representatives

The Technical Review Group (TRG) served a key role in the development of the Redstone Arsenal JLUS. They provided the overall technical support, review, and guidance of the study. The TRG was composed of the following individuals who represented Redstone Arsenal or its tenants:

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City of Huntsville

The City of Huntsville served as the overall JLUS project management agency and the administrator of the Office of Economic Adjustment grant that helped to fund the study.



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Scott Erwin, *Planner II*

Ashley Nichols, *Planner III*

JLUS Consultant / Technical Advisors

Matrix Design Group, Inc. was the project consultant hired to conduct the JLUS project through coordination with and assistance from the City of Huntsville, the PC, the TRG, the public, and other stakeholders.



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Celeste Werner, AICP, *Technical Manager*

Special Appreciation

The City of Huntsville wishes to recognize and thank all the residents, property owners, community leaders, and other stakeholders for their participation in the workshops and public open houses.

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A

ACUB	Army Compatible Use Buffer
ADCNR	Alabama Department of Conservation and Natural Resources
ADIDAP	Alabama Defense Industry Diversification Analysis Project Overview 2017
ADNL	A-weighted day-night average sound level
AMC	Army Materiel Command
APZ I	accident potential zone I
APZ II	accident potential zone II
APZ	accident potential zone
AR	Army Regulation
ATF	Bureau of Alcohol, Tobacco, and Firearms

B

BASH	Bird / Wildlife Aircraft Strike Hazard
BIO	Biological Resources

C

CDNL	C-weighted day-night average sound level
CFR	Code of Federal Regulation
COM	Communication / Coordination
CWA	Clean Water Act
CZ	clear zone

D

dB Peak	Peak decibels
dB	decibel
DNL	day-night average sound level
DOD	Department of Defense

E

EA	Environmental Assessment
EIS	Environmental Impact Statement
EMS	Environmental Management System
ESA	Endangered Species Act
EUL	Enhanced Use Lease



F

FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigations
FCC	Federal Communications Commission
FONSI	No Significant Impact
FSC	Frequency Spectrum Capacity

G

GIS	geographic information system
-----	-------------------------------

H

HUD	United States Department of Housing and Urban Development
-----	---

I

ICUZ	Installation Compatible Use Zone
INRMP	Integrated Natural Resource Management Plan

J

JLUS	Joint Land Use Study
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K

No acronyms were identified for "K."

L

LAS	Land / Air Space Competition
LG	Light and Glare
LU	Land Use
LUPZ	Land Use Planning Zone

M

MCA	Military Compatibility Area
MOA	Memorandum of Agreement
MPO	Metropolitan Planning Organization
MSL	mean sea level



N

NARCOG	North-central Alabama Regional Council of Governments
NARPO	North-central Alabama Rural Planning Organization
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NGOs	non-governmental organizations
NMFS	NOAA Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Noise
NPDES	National Pollutant Discharge Elimination System

O

OMMCS	Ordnance Missile and Munitions Center and School
ONMP	Operational Noise Management Program

P

PC	Policy Committee
PEOs	Program Executive Offices
PT	Public Trespassing

Q

No acronyms were identified for “Q.”

R

RAAF	Redstone Army Airfield
RC	Roadway Capacity
RCRA	Resource Conservation and Recovery Act
RDT&E	Research, Development, Test, and Evaluation
REPI	Readiness and Environmental Protection Integration
ROD	Record of Decision
RPO	Rural Planning Organization

S

SA	Safety
SDWA	Safe Drinking Water Act
SUA	Special Use Airspace



T

TARCOG	Top of Alabama Regional Council of Governments
TRG	Technical Review Group
TVA	Tennessee Valley Authority
TVRGCP	Tennessee Valley Regional Growth Coordination Plan

U

UAS	unmanned aerial system
UAV	unmanned aerial vehicle
U.S.	United States
USAG	U.S. Army Garrison
USFWS	U.S. Fish and Wildlife Service

V

V	Vibration
VFR	Visual Flight Rules
VO	Vertical Obstructions

W

WASH	Wildlife Aircraft Strike Hazard
WHWG	Wildlife Hazard Working Group
WQQ	Water Quality / Quantity

X

No acronyms were identified for "X."

Y

No acronyms were identified for "Y."

Z

No acronyms were identified for "Z."

Military installations are critical to local economies, generating thousands of jobs and billions of dollars in economic activity annually. The growth of incompatible development around military installations, often referred to as encroachment, has been a leading factor in the loss of training operations at military installations across the country and has resulted in realignment of mission-critical components between military installations. Existing levels and types of encroachment are key factors that are evaluated by the Department of Defense and federal government when considering future missions and realignment of assets from one installation to another. To protect the missions of military facilities and the health of economies and industries that rely on them, encroachment must be addressed through collaboration and joint planning between installations and local communities. This Joint Land Use Study (JLUS) attempts to mitigate existing issues and prevent future issues while strengthening coordination between Redstone Arsenal and the surrounding communities.

Redstone Arsenal is located in north central Alabama within the Tennessee Valley region. While organizations and missions have changed over time, Redstone Arsenal has been an integral part of the fabric of life in the Huntsville Metropolitan Area and the Tennessee Valley region. The relationship between Redstone Arsenal and the communities surrounding it has been extraordinarily positive, with Redstone Arsenal contributing to the social and economic well-being and the communities providing needed services including public safety, fire protection, waste collection, housing, and health care to those working at Redstone Arsenal. The local communities have also assisted Redstone Arsenal in developing into one of the nation's top technology centers through the development of institutions such as the University of Alabama-Huntsville and Cummings Research Park to supplement employment and related industries. Preserving and enhancing this relationship through this JLUS is critical to the combined futures of Redstone Arsenal, the communities, and institutions that create community synergy in the Tennessee Valley region.

Among other things, the Redstone Arsenal JLUS advocates a proactive approach to increasing communication about decisions relating to growth and development, land use regulation, conservation, and natural resource management affecting communities and the military. This study promotes activities to avoid conflicts previously experienced between the U.S. military and local communities in other areas of the country and throughout the world by engaging the military and local decision-makers in a collaborative process.

What Is a Joint Land Use Study?

A JLUS is a planning process accomplished through the collaborative efforts of a comprehensive set of stakeholders in a defined study area to identify compatibility issues within, and adjacent to, an active military installation. These stakeholders may include local jurisdictions, state and federal officials, agencies and organizations, business and non-governmental organizations, property owners, and the military. In addition, the public



also plays a vital role in the development and review of a JLUS. The intent of the JLUS process is to establish and encourage a working relationship among a military installation and stakeholders in the area to work as a team to prevent and / or reduce encroachment issues associated with current and future missions and local growth.

JLUS Goal

The goal of the Redstone Arsenal JLUS is to protect the viability of current and future military operations, while simultaneously guiding community growth, sustaining the environmental and economic health of the region, and protecting public health, safety, and welfare of the communities around Redstone Arsenal.

JLUS Objectives

To achieve this goal, three JLUS objectives were identified.

- **Understanding.** Convene community and military representatives to identify, confirm, and understand compatibility issues in an open forum, taking into consideration both community and military perspectives and needs. This includes public awareness, education, and input organized in a cohesive outreach program.
- **Collaboration.** Encourage cooperative land use and resource planning among the military and surrounding communities so that future community growth and development are compatible with the training and operational missions at Redstone Arsenal, while seeking ways to reduce operational impacts on adjacent land within the Study Area.
- **Actions.** Provide a set of mutually supported tools, activities, and procedures from which local jurisdictions, agencies, Redstone Arsenal, and other stakeholders can select, prepare, approve / adopt, and use to implement the recommendations developed during the JLUS process. The actions include both operational measures to mitigate installation impacts on surrounding communities and local government and agency approaches to reduce community impacts on military operations. These actions will help decision makers resolve compatibility issues and prioritize projects within annual budgeting processes.

Why Prepare a Joint Land Use Study?

Collaboration and joint planning between military installations, local jurisdictions, and agencies protects the long-term viability of existing and future military missions while enhancing the health of local economies and industries and helps to protect public health, safety, and welfare. Recognizing the close relationship that should exist between installations and adjacent communities, the OEA implemented the JLUS program to help mitigate existing and future conflicts and enhance communication and coordination among all affected stakeholders including the public. This program aims to help preserve the sustainability of local communities within the JLUS Study Area while protecting current and future operational missions at Redstone Arsenal.

This JLUS serves as an important tool to assist in protecting an Redstone Arsenal's missions, both current and future. Redstone Arsenal is an important asset not only for the Department of Defense, but also for the Tennessee Valley region. It provides jobs, economic benefit, and serves invaluable research and testing functions. By protecting Redstone Arsenal's mission capabilities through actions such as communication with regional neighbors and developing compatible land uses and limiting incompatible uses around the installation, Redstone Arsenal has a better standing when decisions are made at the national level to consider installations for closure or reallocation of resources. This includes not only loss of mission components or personnel, but also gaining new missions, and in turn, new personnel. It is unlikely that Redstone Arsenal would be closed in the near future, but such decisions take into account many different factors. By having a community that is not only supportive through words, but also through actions, Redstone

Arsenal is more likely to continue its success with its current missions and may be determined to be an appropriate location for new missions in the future.

Economic Benefit to the Region

Redstone Arsenal is the largest single site employer in the State of Alabama and has a workforce of more than 40,500 people. This is broken down to approximately 800 military personnel, 17,500 civilian employees, and 22,200 contractors. The majority of these personnel are associated with the Army and Department of Defense, while approximately 15 percent work for NASA and a small amount work for the Department of Justice. Redstone Arsenal also generates an estimated 66,500 indirect jobs in the Huntsville Metropolitan Area and the surrounding Tennessee Valley region. Redstone Arsenal has a highly educated workforce, with 68 percent of its employees having a Bachelor's Degree or higher. The major career fields supported at Redstone Arsenal include science and engineering, logistics management, and acquisition and contracting.

In 2017, Redstone Arsenal had a total annual economic impact to the region of \$18 billion, which is equivalent to 8.5 percent of Alabama's gross domestic product. This includes total annual salaries of approximately \$3.3 billion and total contracts to Alabama of approximately \$5.9 billion, as well as the generation of \$467 million total state and local tax revenues through personal and corporate taxes. Madison County is the sixth highest Department of Defense (DOD) spending location in the United States as a result of Redstone Arsenal.

Why Is It Important to Partner with Redstone Arsenal?

Strategically located in the Tennessee Valley region, Redstone Arsenal is a key component of DOD's national security capabilities due to its large area and access to rail, highway, and water transportation. Redstone Arsenal is a nationally significant installation, serving as the Army's center for missile and rocket programs. Key programs that occur at Redstone Arsenal include research, development, test / evaluation, purchase, repair, and maintenance of the advanced technology weapons that American soldiers rely on to perform their duties around the world. Redstone Arsenal's mission surrounds five key operations.

- **Logistics Services:** Including material management, acquisition, contracting, and full life-cycle sustainment.
- **Space Operations and Missile Defense:** Supporting the nation's exploration and defense capabilities.
- **Intelligence and Homeland Defense:** Conducting threat analysis and explosives training and research.
- **Research, Development, Test, and Evaluation:** Continuing the innovative application of sciences and technologies into systems and equipment.
- **Sustainment of Redstone Arsenal:** Conducting activities to ensure the installation and its workforce are properly cared for and resourced.

Redstone Arsenal is home to numerous command groups. These are U.S. Army Aviation and Missile Command, Space and Missile Defense Command, Army Materiel Command headquarters, Army Security Assistance Command, Army Contracting Command, Expeditionary Contracting Command, and Aviation & Missile Research Development & Engineering Command. Redstone Arsenal is a center of testing, development, and doctrine formation for the Army missile program. Along with the command groups identified, other tenants located at Redstone Arsenal include the National Aeronautics and Space Administration (NASA) Marshall Space Flight Center, Missile Defense Agency, Missile and Space Intelligence Center, Federal Bureau of Investigations (FBI), and many others. The three largest tenants –



Aviation & Missile Research Development & Engineering Command, Marshall Space Flight Center, and Missile Defense Agency – account for almost half of the 40,500+ employees that work at Redstone Arsenal.

JLUS Study Area

The Redstone Arsenal JLUS Study Area is designed to address the land, water and air resource areas around Redstone Arsenal that can impact current or future military operations (due to the resource use) or be impacted by military operations that utilize or affect the resource. Detailed information about population, economics, and activities that occur in the Study Area is included in Chapter 2 (Community Profile) and Chapter 3 (Redstone Arsenal Profile) of the Redstone Arsenal JLUS Background Report. As illustrated on Figure 1, the Redstone Arsenal JLUS Study Area is made up of the counties of Madison, Marshall, and Morgan, and includes the cities of Huntsville and Madison and the Town of Triana, as well as a portion of the Wheeler National Wildlife Reserve.

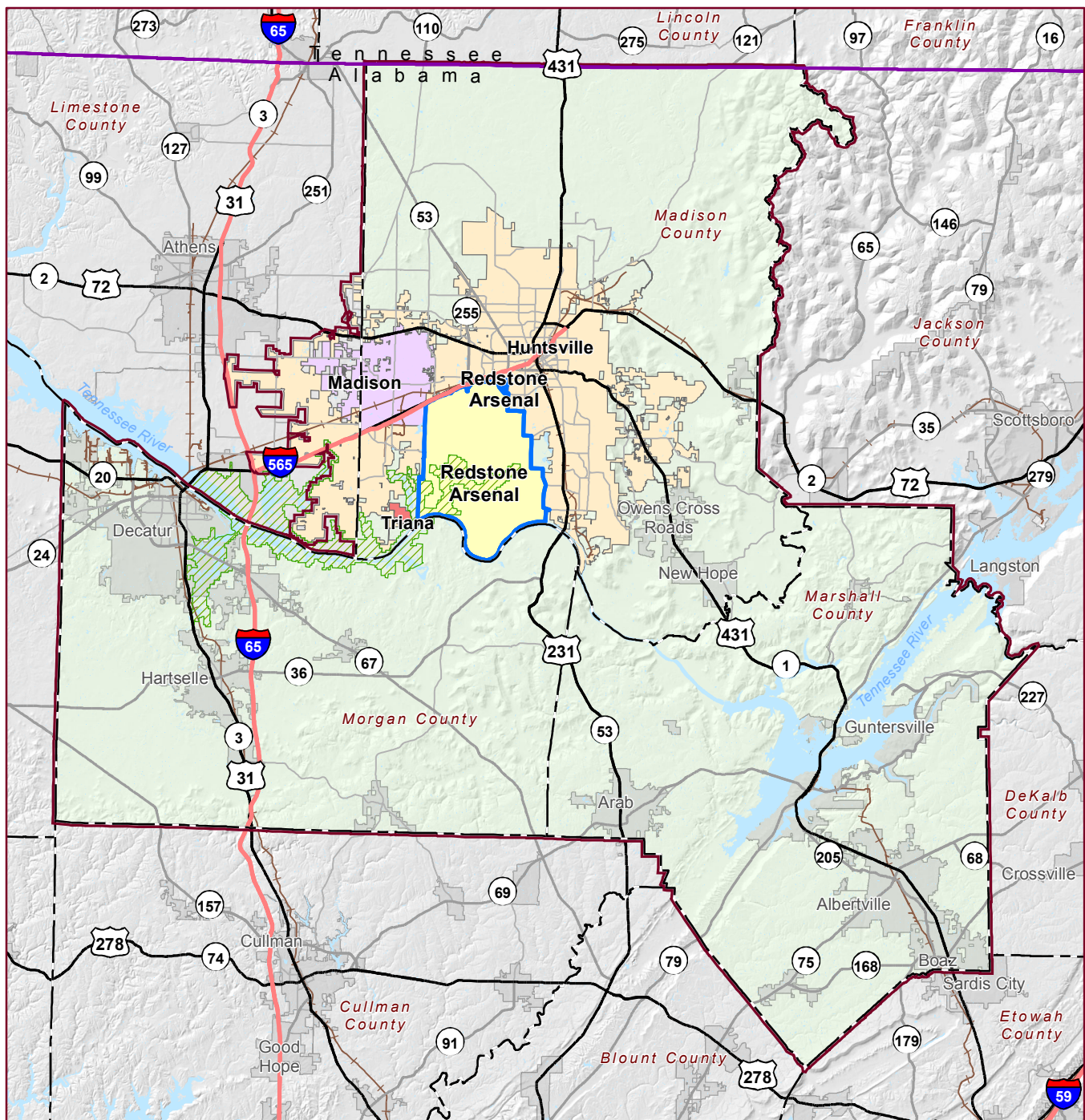
Stakeholder Participation and Public Outreach

The JLUS process is designed to create a locally relevant plan of action that builds consensus and obtains support from the various stakeholders involved. To achieve the JLUS goal and objectives, the Redstone Arsenal JLUS process included stakeholder participation at every step in the JLUS development and included a public outreach program that provided a variety of participation opportunities throughout the process. The stakeholder participation and public outreach programs were designed to ensure that all stakeholders and the public had an opportunity to participate and provide feedback to the development and review of the JLUS.

















Stakeholders

An early step in any collaborative planning process is the identification of stakeholders. Informing and involving stakeholders early in the project is essential to identifying, understanding, and resolving their critically important compatibility issues through the development of integrated recommended strategies and measures. Stakeholders include individuals, groups, organizations, and governmental entities interested in, affected by, or affecting the outcome of the JLUS project. Stakeholders identified for the Redstone Arsenal JLUS included, but were not limited to, the following:

- Local jurisdictions (the cities of Huntsville, and Madison; the Town of Triana; and the counties of Madison, Marshall, and Morgan);
- DOD officials (including OEA representatives) and Redstone Arsenal installation personnel;
- Other tenants and users of Redstone Arsenal (including federal agencies such as the FBI and NASA);
- Local, county, regional, and state planning, regulatory, and land management agencies;
- Landholding and regulatory federal agencies;
- Advocacy organizations;
- Non-governmental organizations (NGOs);
- The public (including property owners, residents, and business owners); and
- Other special interest groups (including local educational institutions and school districts).



Legend

- | | | | | | |
|---|---------------------|---|----------------------------------|---|-------------|
|  | Redstone Arsenal |  | Wheeler National Wildlife Refuge |  | Interstate |
|  | City of Huntsville |  | Other City / Town |  | US Route |
|  | City of Madison |  | County Boundary |  | State Route |
|  | Town of Triana |  | State Border |  | Major Road |
|  | JLUS Partner County | | |  | Railroad |
|  | JLUS Study Area | | |  | Water Body |

Source: United States Geological Survey, 2017; US Census, 2015.



A horizontal scale bar with a black outline. It is divided into five equal segments by four vertical tick marks. The number '0' is at the left end, and the number '5' is at the right end. Below the bar, the word 'Miles' is written in a bold, black, sans-serif font.

Figure 1
Redstone Arsenal JLUS Study Area



Policy Committee and Technical Review Group

The development of the Redstone Arsenal JLUS was guided by two committees, comprising staff from local governments, state and federal agencies, resource organizations, Redstone Arsenal and its tenants, and other stakeholders. The two committees were the Policy Committee (PC) and the Technical Review Group (TRG). The PC and TRG members served as liaisons to their respective stakeholder groups and were responsible for conveying committee activities and information to their organizations and constituencies, and relaying their organization's comments and suggestions for consideration. The responsibilities and list of participants for the PC and TRG are identified in Table 1.

JLUS Policy Committee. The PC consisted of elected officials from participating jurisdictions, Redstone Arsenal military installation leadership, and representatives from other interested and affected agencies. The PC was responsible for the overall direction of the JLUS, preparation and approval of the study design, policy recommendations, and approval of draft and final JLUS documents.

JLUS Technical Review Group. The TRG was responsible for identifying and studying technical issues. Membership included community land planners, military base planners, business and development community representatives, natural resource protection organizations, and other subject matter experts as needed. The TRG assisted in the development of the JLUS, analysis of the compatibility issues, and evaluation of recommended strategies and tools. Items discussed by the TRG were reviewed by the PC for consideration and action.

Table 1. JLUS Committee Responsibilities and Membership

Responsibilities	Participants	
Policy Committee		
<ul style="list-style-type: none">▶ Policy direction▶ Study oversight▶ Monitoring▶ Report adoption	<ul style="list-style-type: none">▶ City of Huntsville▶ City of Madison▶ Madison County▶ Marshall County▶ Morgan County	<ul style="list-style-type: none">▶ Redstone Arsenal▶ Town of Triana▶ US Congress▶ US Senate
Technical Review Group		
<ul style="list-style-type: none">▶ Identify issues▶ Provide expertise to address technical issues▶ Evaluate and recommend implementation options to the PC▶ Provide draft and final report recommendations to the PC	<ul style="list-style-type: none">▶ Alabama Department of Environmental Management▶ Alabama Department of Transportation▶ Association of the United States Army▶ City of Madison▶ City of Huntsville▶ Federal Highway Administration▶ Huntsville City Schools▶ Huntsville-Madison County Airport Authority▶ Huntsville / Madison County Chamber of Commerce▶ Madison City Schools▶ Madison County	<ul style="list-style-type: none">▶ Madison County Schools▶ Redstone Arsenal▶ Solid Waste Disposal Authority▶ State of Alabama Legislation▶ State of Alabama Senate▶ Top of Alabama Regional Council of Governments▶ US Army Corps of Engineers▶ US Congress▶ US Senate▶ US Space and Rocket Center▶ Wheeler Wildlife Refuge

Public Workshops

In addition to the PC and TRG meetings, a series of public workshops were held throughout the development of the JLUS. These workshops provided an opportunity for the exchange of information with the greater community, assisted in identifying the issues to be addressed in the JLUS, and received input on the proposed strategies. Each workshop included a traditional presentation and a facilitated exercise providing a “hands on,” interactive opportunity for the public to participate in the development of the study.

Public Review Period

The Public Draft Background Report and JLUS Report were released for a 30-day public review and comment period, which lasted from September 24 through October 24, 2018. During this time, the Public Draft documents were posted on the project website for download. Members of the public were invited to review the documents and submit any questions or comments they had on the information contained within. A public workshop was also held during this period to provide information on the documents and allow in-person discussions on the information.

Public Outreach Materials

Project Branding / Logo. To help make products related to the JLUS easy to identify, a logo was developed for use on all materials and publications developed. The logo was used to promote public awareness and maintain an active public participation role in this study.

Fact Sheet #1, JLUS Overview / Compatibility Factors. At the beginning of the JLUS process, a fact sheet was developed describing the JLUS program, objectives, methods for the public to be involved, and the Redstone Arsenal JLUS Study Area. This fact sheet also provides an overview of the 25 compatibility factors to be evaluated during the JLUS process. While not every factor may apply to the Redstone Arsenal JLUS, this list provided an effective tool to ensure a comprehensive evaluation of compatibility factors was conducted.

Fact Sheet #2, Strategy Toolkit. The second fact sheet provided an overview of the types of strategy tools available and commonly used to reduce or mitigate compatibility issues. The strategy types comprise a variety of actions that local governments, the military, agencies, and other stakeholders can take to promote compatibility. This fact sheet provided an overview of the strategy types that were available to develop the recommendations in the JLUS Implementation Plan.

Project Website. A project website was developed to provide stakeholders, the public, and media representatives with access to project information. This website was maintained for the entire duration of the project to ensure information was easily accessible. Information contained on the website included program points of contact, schedules, documents, maps, and public meeting information. The project website is located at www.redstonearsenaljlus.com.



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This chapter provides information about the surrounding communities that participated in the Redstone Arsenal Joint Land Use Study (JLUS). Capturing and describing certain demographic characteristics of these communities provides a baseline context from which informed decisions can be made when assessing compatibility strategies. The goal is to provide information that enables stakeholders to understand population and development trends that have the potential to affect Redstone Arsenal's future. This information is intended to be considered with other factors to help decision-makers generate coherent, informed planning policies and decisions about future development and economic growth of the communities they represent before compatibility issues arise.

Information presented in this chapter includes population trends and economic development within the region to better understand the impacts on and from Redstone Arsenal. This chapter is also intended to inform Redstone Arsenal about the types of activities occurring "outside the fence" when considering future missions and operations.

JLUS Study Area Population Growth Trends

The following section provides a profile of the JLUS Study Area's recent population growth trends and future projections. This information assists in understanding the regional context and growth potential for the JLUS Study Area.

Population data is based on the 2010 and 2016 data developed by the U.S. Census. Population numbers show the growth or decline in people in a geographical area. Population is a major factor for the economy of the JLUS Study Area and ultimately supports employment and housing opportunities. Table 2 shows the 2010 and 2016 census totals and percent change in populations of the state and of the jurisdictions within the JLUS Study Area.

Table 2. Study Area Population, 2010-2016 / 2019

Jurisdiction	2010	2016 / 2019	Number Change	Percent Change
State of Alabama	4,780,127	4,863,300	83,173	1.7%
Madison County	334,811	356,967	22,156	6.6%
City of Huntsville	180,270	193,079	12,809	7.1%
City of Madison	42,939	47,959	5,020	11.7%
Morgan County	119,486	119,012	-474	-0.4%
Marshall County	93,019	95,157	2,138	2.3%
Town of Triana	496	*1,812	1,316	265.3%

Source: 2010 and 2016 U.S. Census Bureau data

**Source: 2019 City of Huntsville Planning Department estimates*



The population figures represent the permanent population in the JLUS Study Area, but do not consider the temporary population surges associated with the tourism industry and migration from seasonal employment or transient workers in the Tennessee River region.

The populations in Morgan County and Marshall County increased slightly from 2010 to 2016; however, population growth in Morgan County was lower than the state's overall population growth. There has been substantial population growth in the Madison County (6.6 percent), City of Huntsville (7.1 percent), and City of Madison (11.7 percent) during this timeframe. Most notably, the Town of Triana's population grew by 265.3 percent from 2010 to 2019, due primarily to new housing subdivision growth. According to stakeholder interviews, many military families from Redstone Arsenal reside within the City of Huntsville and commute to and from the base. The quality of life attractants, such as, quality education and coveted school sports programs, are likely contributors to the large population increase in City of Madison, which is located northwest of Redstone Arsenal.

Table 3 indicates the forecasted population between 2010 and 2040 for counties within the JLUS Study Area. There is no information regarding the Town of Triana's future population predictions. Madison County's overall growth rate from 2010 to 2040 (34.7 percent) is projected to be far greater than the statewide rate (11.3 percent). Projections for population growth in Marshall County (13 percent) are expected to continue to stay par with the population growth in Alabama. The projected population growth for Morgan County shows small increases in population over the next three decades.

Table 3. JLUS Study Area Population Projections from 2010 to 2040

Jurisdiction	2010	2020	2030	2040	Percent Change
Alabama	4,779,736	4,941,485	5,124,710	5,319,305	11.3%
Madison County	334,811	372,447	412,126	451,043	34.7%
Huntsville Metropolitan Area	417,593	472,222	529,158	584,385	39.9%
Morgan County	119,490	119,865	121,344	124,028	3.8%
Marshall County	93,019	96,219	100,136	105,088	13.0%

Source: Census Bureau's State Data Center, http://cber.cba.ua.edu/edata/est_prj.html

Future population growth is predicated on continued employment of the major job centers within the City of Huntsville, which includes Redstone Arsenal and its various tenants such as NASA Marshall Space Flight Center. Redstone Arsenal supports a large concentration of jobs, employing more than 40,500 personnel. Cummings Research Park, one of the world's leading science and technology business parks, is also located in the Huntsville Metropolitan Area and will help stimulate additional population growth.

While the projected populations provided in Table 3 are not exact, they are projections to help cities and counties develop land use priorities to reduce impacts of future growth challenges.

Current Development Overview within the Study Area

Land uses throughout the JLUS Study Area range from open space and agriculture in Morgan County, to the residential and urban population center in the City of Huntsville. This section discusses the setting in the immediate vicinity of Redstone Arsenal.

North of Redstone Arsenal. The area north of Redstone Arsenal is mostly commercial use. This area contains the University of Alabama in Huntsville, Cummings Research Park, and the U.S. Space and Rocket Center. The remaining land in this area is comprised of residential areas. Northeast of Redstone Arsenal is the City of Huntsville. Interstate 565 is a main thoroughfare that runs north of Redstone Arsenal.

South of Redstone Arsenal. Redstone Arsenal is bordered to the south by the Tennessee River. Across the river, most of the land south of Redstone Arsenal is low density development consisting mainly of large agricultural land. Wheeler National Wildlife Refuge runs along the southern area of Redstone Arsenal.

East of Redstone Arsenal. To the east of Redstone Arsenal are several Huntsville neighborhoods and districts, including: Ashtynn Manor, Bell Grove Manor, Renaissance, Sockwell, and Whitesburg Estates. These areas include a mostly single-family residential. Some neighborhood commercial and institutional facilities are also located within the area east of Redstone Arsenal, including government buildings, churches, and schools. The southern part of the City of Huntsville abuts the eastern area of Redstone Arsenal.

West of Redstone Arsenal. West of Redstone Arsenal, residential development has been established along Zierdt Road. The area past the residential is mostly industrial / commercial. Huntsville International Airport is located west of Redstone Arsenal. Parts of the Wheeler Reserve are west of Redstone Arsenal. The City of Madison is located west of Redstone Arsenal.



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This chapter provides an overview of the current operations and activities at Redstone Arsenal and the associated military footprints that go outside the installation boundaries. Identifying and describing the various activities performed on Redstone Arsenal provides valuable insight into the importance of the installation as a strong community partner and national strategic asset. This information helps stakeholders to make informed decisions regarding the future development and economic growth of their communities, which may be influenced by installation activities due to their relative proximity to Redstone Arsenal and the areas that are influenced by activities that occur there. These decisions could potentially impact the future role of the installation.

Current Redstone Arsenal Vision and Missions

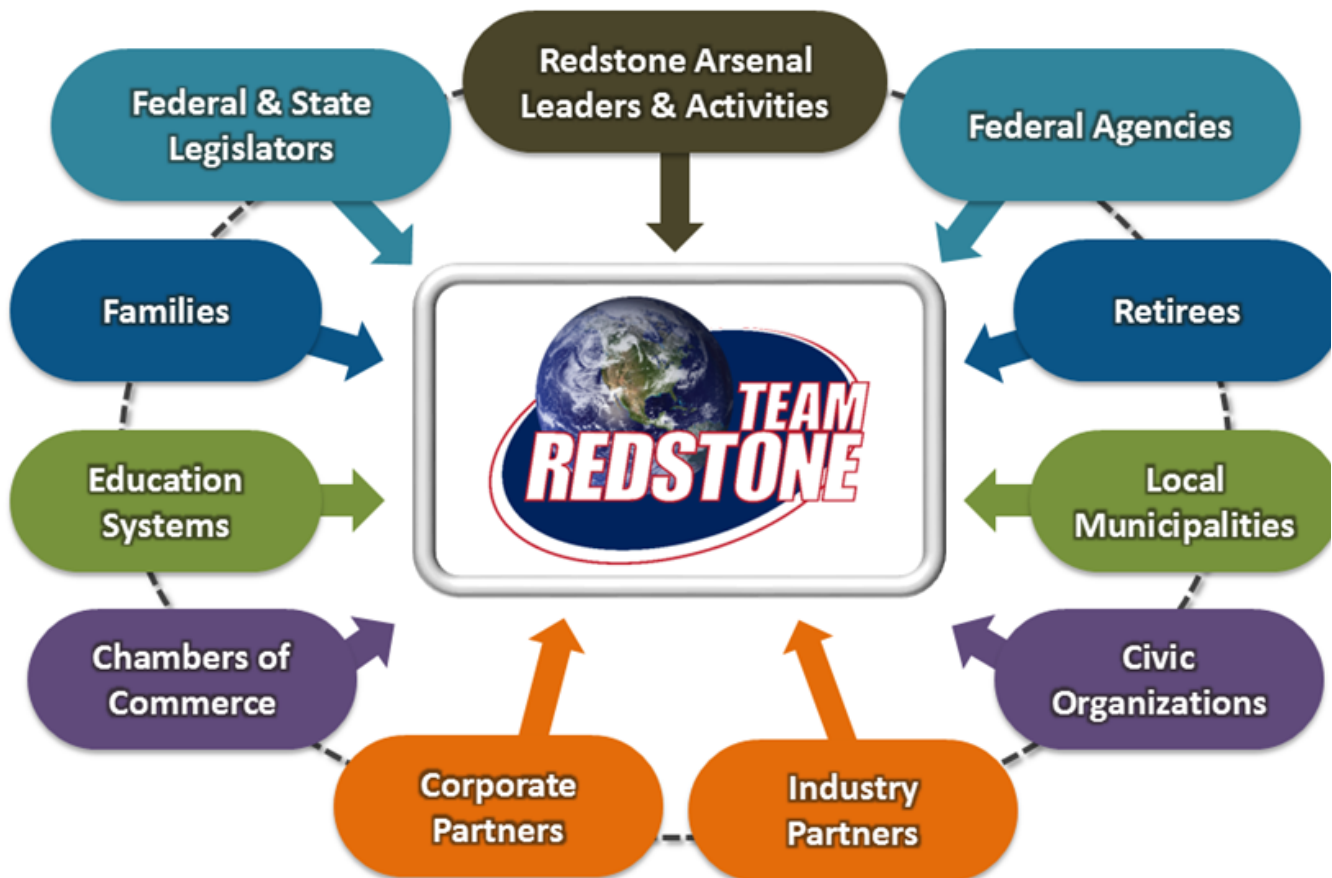
Redstone Arsenal's strategic vision is to be a "Federal Center of Excellence focused on the Joint Warfighter, growing its strategic impacts, and ready to seize opportunities of the future." This is accomplished through employing educated professionals who advance technologies for tomorrow, developing leading edge capabilities to provide decisive execution, and implementing strategic impacts through global reach. Through its role as a Federal Center of Excellence, Redstone Arsenal supports a multitude of tenants, each with their own unique and varied mission statements. As such, the installation does not have one specific mission. Missions are identified based on the synergies with which various organizations that operate at Redstone Arsenal work together to achieve the goals of the nation. The organizations located at Redstone Arsenal support five key objectives, as follows:

1. Logistics services including materiel management, acquisition, contracting and full life-cycle sustainment;
2. Space operations and missile defense to support the nation's exploration and defense capabilities;
3. Intelligence and homeland defense conducting threat analysis and explosives training and research;
4. Research, development, test and evaluation to continue the innovative application of sciences and technologies into systems and equipment; and
5. Sustainment of Redstone Arsenal's activities to ensure the installation and its workforce are properly cared for and resourced.



Team Redstone

The thirteen counties and their associated communities surrounding Redstone, including the Cities of Huntsville, Madison, Decatur and Guntersville, the Town of Triana, and Limestone, Madison, Marshall and Morgan Counties, with Redstone Arsenal serving as the central nexus, are known as “Team Redstone”. While Team Redstone centers around the Arsenal, it is a boundaryless concept that spans beyond the installation and the critical missions located there and is as vibrant and diverse as the missions, agencies, communities, and partners that constitute its foundation. Team Redstone can be defined as influence that spans across state borders and includes every affected community in between, comprised of people, organizations buildings, land and philosophy that intertwine Redstone Arsenal and all the surrounding communities. It builds upon the synergies built throughout the history of Redstone Arsenal and its missions that have been influential in shaping the history of American rockets and space exploration, as well as the missions that exist today and the wide range of tenants that call Redstone Arsenal home. Several technological and educational institutions have grown and developed in the region that are directly tied to the missions and relationships with Redstone Arsenal to support a cohesive environment for technological growth and warfare advancement. The mission successes that occur daily at Redstone Arsenal would not be possible without the support and dedication of the surrounding communities and organizations that are a part of Team Redstone.



Installation Setting

Redstone Arsenal is located in Madison County in northwest Alabama's 13-county region referred to as the Tennessee Valley. Madison County is the state's third most-populated county and enjoys its second-highest per capita income. Huntsville, the county seat and fastest-growing city, borders Redstone Arsenal on the north and east, with the Tennessee River forming Redstone Arsenal's southern boundary. Redstone Arsenal is 110 miles south of Nashville, Tennessee on Interstate 65; about 107 miles west of Chattanooga, Tennessee on US Highway 72; about 97 miles north of Birmingham, Alabama on Interstate 65; and 185 miles northwest of Atlanta, Georgia on US Highway 72 and I-75.

Redstone Arsenal sits between the southernmost ridges of the Appalachian Mountains and the Tennessee River. It covers 38,125 acres, including 25,860 Test Area acres and 3,000 buildable acres. Additionally, Redstone Arsenal has over 10 miles of Tennessee Riverfront with barge docks for transporting large equipment and components. Infrastructure assets at Redstone Arsenal include a 7,297-foot runway, more than 200 miles of roads with an interstate connection, a railhead with two spurs, 19 million square feet of building space and 352 privatized housing units.

Cantonment Areas

The cantonment areas are the locations where most of the buildings are and where functions such as administration, operations, maintenance, education, housing, industrial, storage, and recreation occur. This land also includes agricultural areas, forest land, and water bodies. There are approximately 10,700 acres on Redstone Arsenal that are classified as cantonment area. Due to the number of individualized tenants at Redstone Arsenal, there are ten cantonment areas around the installation.

Redstone Army Airfield

Redstone Army Airfield (RAAF) is in the northwestern portion of Redstone Arsenal and has a Class A runway, designated as Runway 17 / 35, that measures 7,297 feet long by 150 feet wide. On average, RAAF operates five days a week, with two shifts of crews staffing the facility between 6:15 am to 9:00 pm. The capabilities of RAAF include base flight operations, airspace management, air safety, rapid refuel, control tower, ground approach control, and crash / fire / rescue services, and night operation missions. The airfield personnel perform daily airfield inspection and assist with physical security of the airfield. Rotary wing aircraft are the main aircraft that fly at RAAF, but it supports extensive fixed wing aircraft operations. In 2016, there were a total of 18,199 Redstone Arsenal tenant military aircraft movements. Of these, 1,013 were military instrument flight rule, 16,630 were military visual flight rule, and 556 were military precision approach radar operations. There were also 1,630 transient military movements, broken out by 551 instrument flight rule, 801 visual flight rule, and 278 precision radar approach. RAAF also supports non-mission aircraft when military missions are not active. In 2016, there were a total of 9,911 general aviation movements at RAAF, including 1,183 air carrier movements.

The airfield area includes approximately 1,770 acres with a large portion along the west side located in Research, Development, Test, and Evaluation (RDT&E) and Light Maneuver Training Areas. It has approximately 25 buildings within its boundary occupied by tenants such as RTC, U.S. Army Aviation and Missile Research, Development and Engineering Center and the Garrison. There are approximately 200 acres of easily developable land in this area, having relatively easily manageable land use constraints. Most of this land is located along the Rideout Road corridor. There are also several large tracts adjacent to the airfield that may be considered easily developable as well. Future build-out planning was completed for the airfield which highlights notional buildable parcels as well as building and road opportunities.



Test Areas

Approximately 25,500 acres of Redstone Arsenal is used as range and test areas. This includes nine RDT&E ranges, four light demolition ranges, one heavy demolition range, and more than 7,000 acres for light maneuver training.

Redstone Gateway

The U.S. Army and Redstone Arsenal have entered into an Enhanced Use Lease (EUL) agreement with a private developer for a 468-acre parcel of land on the north side of the installation near I-565 and adjacent to Gate 9. The EUL project allows private developers and businesses to utilize non-essential federal land to provide business and shopping opportunities to the public. This EUL, called Redstone Gateway, is a master-planned project that includes both secured and unsecured Class A office buildings and retail and hospitality amenities to support the office park, while also serving Redstone Arsenal employees and visitors. Access to Redstone Gateway does not require going through Redstone Arsenal security. The project is being built in three phases and will ultimately contain 4.6 million square feet of space. Current development that has been completed includes a Boeing office building with 363,000 square feet, a DRS Technologies building with 131,600 square feet, a Marriott TownePlace Suites hotel with 120 rooms, and retail space including dining options.

Wheeler National Wildlife Refuge

Within Redstone Arsenal, 4,085 acres of land are part of the Wheeler National Wildlife Refuge, which is controlled by the U.S. Fish and Wildlife Service. This land is undevelopable for military operations, but there are agreements in place between the U.S. Army, NASA, and U.S. Fish and Wildlife Service to utilize some of the land for certain types of activities. The refuge is an important area for many bird species and provides a variety of recreation activities such as hiking, bird watching, boating, and hunting. In total, the refuge covers approximately 35,000 acres, most of which is to the west of Redstone Arsenal.

Tennessee Valley Authority

When the Tennessee Valley Authority (TVA) was created in 1933, its purpose was to address the Tennessee Valley's most important issues in energy, environmental stewardship, and economic development. Today, TVA is the largest public utility provider and one of the largest electricity providers in the United States. TVA provides flood control, navigation and land management for the Tennessee River system and assists local power companies and state and local governments with economic development and job creation.

Military Strategic Importance

Redstone Arsenal is not only important to the local communities through its economic benefit, but also for the capabilities provided by the various mission components of its tenants in support of a variety of assets located in Alabama and the US. While Redstone Arsenal is an Army installation, it is also a Federal Center of Excellence and has more than 70 Army organizations and other federal tenants, which is many more than a typical Army installation. As such, Redstone Arsenal is unique in that the various missions carried out there are dependent upon functional synergies between the tenants and the local and regional communities that are part of Team Redstone. These synergies are logistics service, space operations and missile defense, intelligence and homeland defense, RDT&E, and sustainment of Redstone Arsenal.

Redstone Arsenal is the center of testing, development, and doctrine formation for the Army's rocket and missile programs and was instrumental in the development of the first U.S. ballistic missiles and space exploration rocket systems, as well as hosting the Marshall Space Flight Center, NASA's field center for propulsion analysis and development. It is home to the U.S. Army Aviation and Missile Command, the Space and Missile Defense Command, and Army Materiel Command (AMC) headquarters, numerous Program Executive Offices (PEOs) and major

components of the Defense Intelligence Agency and the Missile Defense Agency. Several other tenant and satellite organizations are also at Redstone Arsenal. More information on the major tenants and how they contribute to Redstone Arsenal's military strategic importance is described in the following section.

Redstone Arsenal Tenants

The U.S. Army Garrison (USAG) – Redstone Arsenal executes daily operations effectively and efficiently with a qualified and professional workforce of civil service and contractor personnel. Each member of the Garrison strives for excellence to make certain tenant organizations can execute their peacetime and wartime missions without concern about any interruption in home station support. USAG – Redstone Arsenal's mission is to operate an installation that assures the success of joint and interagency teams working around the globe and into space. The garrison maintains over 14 million square feet of administrative and RDT&E building space (not including the approximately five million square feet of facilities owned and managed by NASA), 200 lane miles of roads, eight major test ranges, an airfield, a railhead with two spurs, two barge docks, and six gates on the installation. USAG – Redstone Arsenal is committed to the health, welfare and morale of the Soldiers, their families and the civilian workforce located at the installation.

Most of the 70+ tenants located at Redstone Arsenal report to their own headquarters offices that are generally located at other installations outside of Redstone Arsenal, and do not report directly to the Redstone Arsenal Garrison Commander, but each tenant organization maintains an Installation Support Agreement with the USAG – Redstone Arsenal.

The following is a list of some of the larger tenants at Redstone Arsenal. More information on each of these tenants can be found in Chapter 3, Redstone Arsenal Profile, in the JLUS Background Report. This list is not inclusive of all tenants at Redstone Arsenal.

- U.S. Army Aviation & Missile Research, Development & Engineering Center
- NASA – Marshall Space Flight Center
- U.S. Missile Defense Agency
- Headquarters, U.S. Army Aviation & Missile Command
- Headquarters, U.S. Army Materiel Command
- Program Executive Office – Aviation
- US Army Redstone Test Center
- Headquarters, U.S. Army Contracting Command
- Program Executive Office – Missiles & Space
- US Army Engineering & Support Center, Huntsville
- Logistics Support Activity
- Defense Intelligence Agency - Missile & Space Intelligence Center
- US Army Space & Missile Defense Command



- Headquarters, U.S. Army Security Assistance Command
- Fox Army Health Center
- Test, Measurement and Diagnostics Equipment
- Federal Bureau of Investigations
- Bureau of Alcohol, Tobacco, Firearms and Explosives

Military Mission Footprints

Mission activities conducted on and around Redstone Arsenal can generate potential impacts on, or receive potential impacts from, surrounding communities. Examples of potential mission impacts on surrounding communities include noise and vibration from weapons and component testing, and safety hazards associated with aircraft flight operations. Conversely, the military mission is susceptible to hazards and other incompatibilities created by certain types of civilian development or activities, such as physical obstructions to airspace or location of intensive lighting fixtures near areas used for nighttime operations. The military mission footprints are those areas of influence that go outside the installation boundaries over surrounding communities. Understanding the intersecting or overlapping spatial patterns of these Redstone Arsenal mission footprints is essential for informing and promoting compatible land use decisions, and developing the recommended compatibility strategies presented in Chapter 6 of this JLUS Report. The following pages include a summary of the mission footprints that go outside Redstone Arsenal's boundaries. More information on these footprints can be found in Chapter 3, Redstone Arsenal Profile, in the JLUS Background Report.

Noise Zones

The U.S. Army has an obligation to provide information on noise generated by activities at installations and recommend land uses within the noise zones that will protect citizens from noise and other hazards and protect the public's investment in U.S. Army training facilities. Day-night average sound level (DNL) is used to represent an average sound exposure over a 24-hour period. During the nighttime period (10:00 p.m. to 7:00 a.m.), averages are artificially increased by 10 decibels (dB). This weighting reflects the added intrusiveness and the greater disturbance potential of nighttime noise events attributable to the fact that community background noise typically decreases by 10 dB at night. A-weighted day-night average sound level (ADNL) decibels are commonly used by the FAA and DOD to represent aircraft noise levels and C-weighted day-night average sound level (CDNL) decibels are commonly used by the DOD to represent large arms and demolitions noise levels. A peak unweighted decibel (or Linear Peak Decibel), identified as dBP, is a unit designation for the peak unweighted decibel level and is used to identify small arms weapons noise.

The Army uses a series of noise zones to identify noise levels associated with military operations and what types of land uses are either compatible or not recommended within the specific zones. Army Regulation (AR) 200-1 lists housing, schools, and medical facilities as examples of noise-sensitive land uses, which are identified as land uses that are acceptable within the Noise Zone I, normally not recommended in Noise Zone II, and not recommended in Noise Zone III. The Army utilizes four noise zones:

- **Noise Zone III** is the zone located closest to the source of noise. It includes dBP greater than 104, ADNL greater than 75, and/or CDNL greater than 70. No noise-sensitive uses should occur within this area due to the severity of noise.
- **Noise Zone II** includes areas where the dBP is between 87 and 104, the ADNL is between 65 and 75, and/or the CDNL is between 62 and 70. Although local conditions such as availability of developable land or cost may

require noise-sensitive land uses in Zone II, this type of land use is strongly discouraged within this zone. All viable alternatives should be considered to limit development in Zone II to non-sensitive activities such as industry, manufacturing, transportation, agriculture, and resource protection.

- **Noise Zone I** does not have an established boundary, but refers to land around a noise source and outside of the Zone II contour where noise can be heard. Noise-sensitive land uses are generally acceptable but military operations may still be loud enough to be heard, or even judged to be loud on occasion.
- The **Land Use Planning Zone (LUPZ)** is a subdivision of Noise Zone I and includes areas where the CDNL is between 57 and 62 or the ADNL is between 60 and 65. It does not include a measure for dBP. This zone accounts for variability in seasonal operations where certain times of the year may include greater than normal frequency in operations. Noise-sensitive uses are generally acceptable within this area; however, this may vary on a case-by-case basis.

It should be noted that these noise zones are based on statistical and annual operations data and are not meant to be definitive boundaries of where certain levels of noise can be heard. Noise levels may vary based on factors such as weather, wind, or personal perception of the listener.

The primary noise producing activities that occur at Redstone Arsenal are the Test Areas, training facilities, demolition ranges, and aircraft operations.

Demolition and Large Caliber Noise Zones

There are four demolition ranges at Redstone Arsenal, which account for the majority of the noise created on a day-to-day basis. The McKinley, Hazardous Devices, and Open Burn / Open Detonation ranges are clustered in the southern portion of Redstone Arsenal. The Copano Range is just south of Martin Road. Noise zones for the Copano Range are contained within Redstone Arsenal's boundaries. The noise zones for demolition and large caliber noise extend outside the boundaries of Redstone Arsenal to the east, southeast, and southwest. This includes some residential properties in and near the communities of Laceys Spring and Valhermoso Springs, and some wooded and undeveloped areas. The demolition and large caliber noise zones that go outside of Redstone Arsenal's boundaries are shown on Figure 2.

Complaint Risk Potential

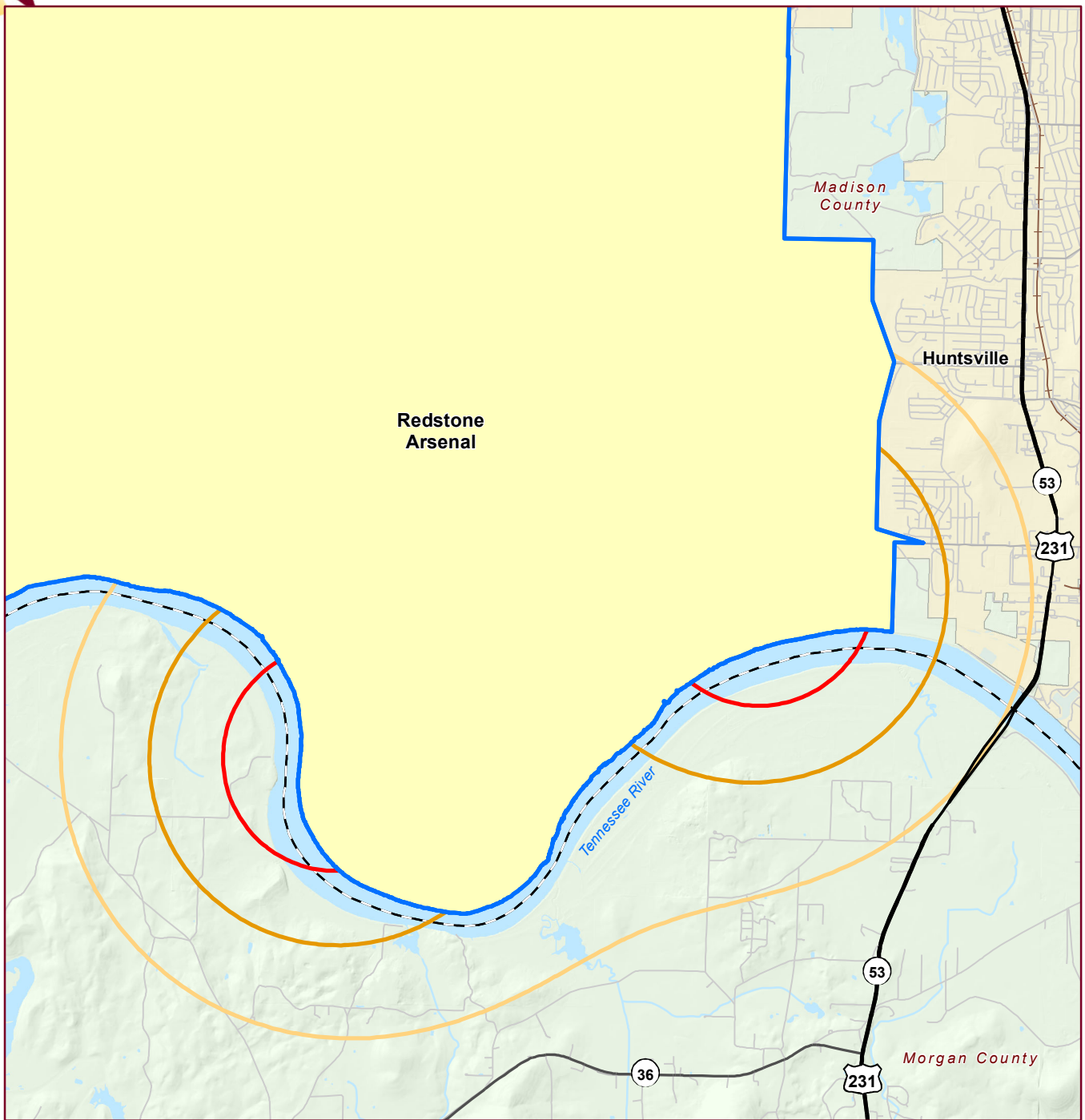
While noise zones are useful in long-term planning and development around Redstone Arsenal, noise complaints are often submitted as a result of a specific event, such as a particularly loud detonation or test. The Army has developed noise complaint risk guidelines for demolitions and large caliber weapons based on Peak decibels (dB Peak). These levels may also correlate with vibrations felt that are associated with the sound. The vibrations associated with demolitions and large caliber weapons are air-borne, as opposed to ground-borne, and may be felt inside a structure. However, it is unlikely that structural damage will occur for peak sound pressure levels less than 140 dB Peak. Table 4 shows the Army's complaint risk guidelines for demolitions and large caliber weapons.

Table 4. Complaint Risk Guidelines

Perceptibility*	dB Peak	Risk of Receiving Noise Complaints
May be audible	< 115	Low
Noticeable, distinct	115 – 130	Moderate
Very loud, may startle	> 130	High

**Perceptibility is subjective. The classifications are based on how the average person might describe the event.*

Source: Redstone Arsenal Installation Compatible Use Zone Plan, November 2015



Legend

Noise Zone

- LUPZ (57-62 CDNL dB)
- Noise Zone II (62-70 CDNL dB)
- Noise Zone III (> 70 CDNL dB)

- Redstone Arsenal
- City of Huntsville
- JLUS County Partner
- County Boundary

- US Route
- State Route
- Major Road
- Local Road
- Railroad
- Stream / River
- Water Body



Source: Redstone Arsenal, 2003



0 1 Miles

Figure 2
Mission Footprint: Demolition and Large Caliber Noise

Peak decibel levels can be affected by weather conditions, which may cause varying levels of noise for the same activity depending on factors such as cloud cover and temperature. For this reason, Redstone Arsenal has implemented detonation guidelines and limitations based on weather conditions. The weather scenario used to model Peak levels at Redstone Arsenal is based on neutral weather conditions that do not favor noise propagation in any given direction, and measured as PK50(met), the Peak level that would be expected 50 percent of the time.

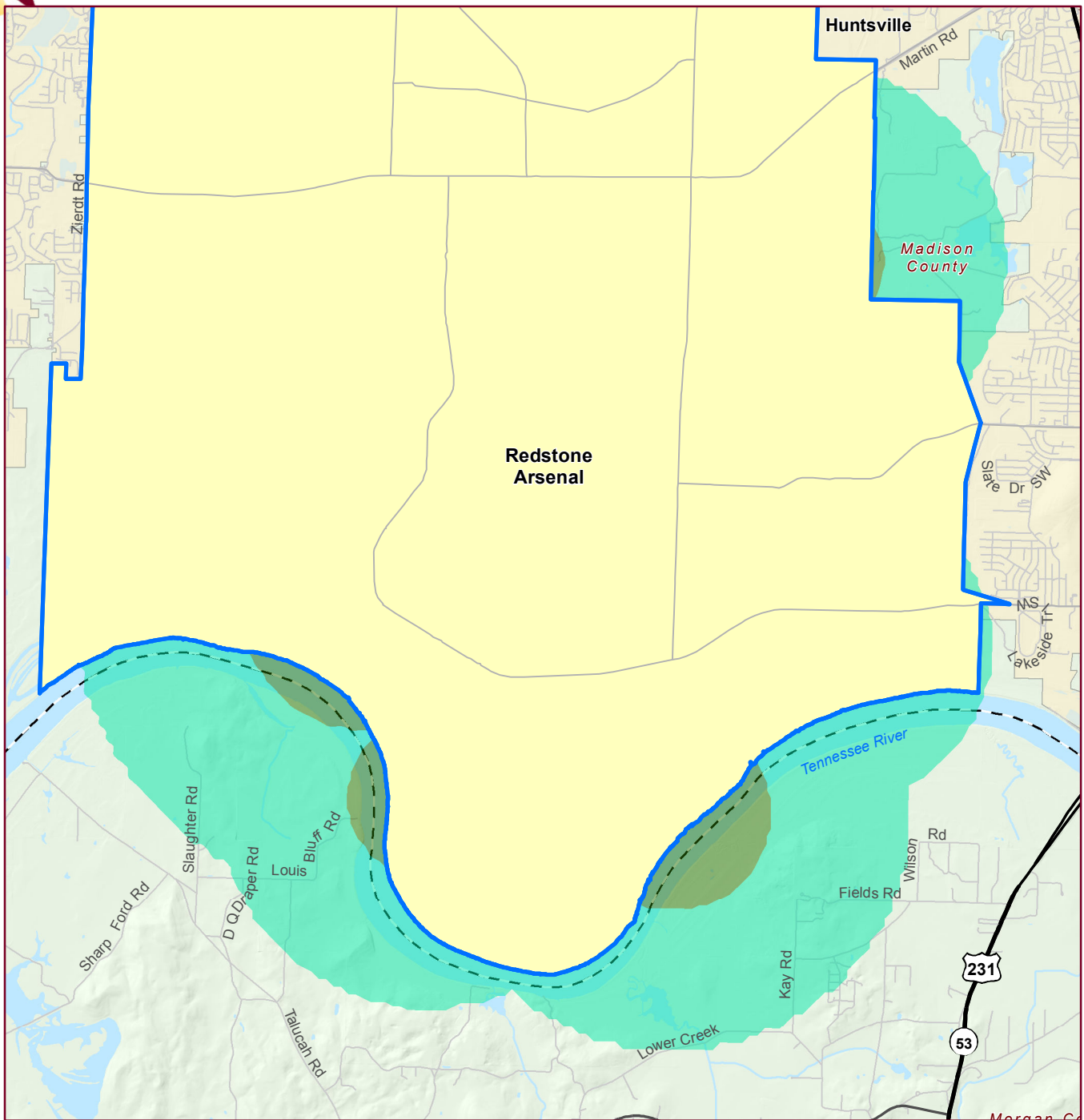
Three geographic complaint risk areas have been developed for different locations at Redstone Arsenal – demolition ranges, Test Area facilities, and Arena Test. Figure 3 illustrates the noise complaint risk areas under neutral weather conditions and Figure 4 illustrates them for unfavorable weather conditions. It should be noted that these complaint risk areas are developed based on an individual event and factoring in specific circumstances, so they are not meant to be applied to every noise-generating activity. The following describes the complaint risk areas from the ICUZ.

- The **High Complaint Risk** area for the demolition ranges extends outside Redstone Arsenal's boundary to the east approximately 150 meters (0.1 miles), to the southeast approximately 1,000 meters (0.6 miles), and to the southwest approximately 550 meters (0.3 miles), primarily over the Tennessee River and wooded areas.
- The **Moderate Complaint Risk** area for the demolition ranges extends outside the boundary to the east approximately 1,800 meters (1.1 miles), to the southeast approximately 3,000 meters (1.9 miles), and to the southwest approximately 2,300 meters (1.4 miles), over primarily undeveloped land with some scattered residential development.
- The **High Complaint Risk** area for the Test Area facilities is within the boundary of Redstone Arsenal.
- The **Moderate Complaint Risk** area for the Test area facilities extends past the boundary to the south approximately 700 meters (0.4 miles) over undeveloped land.
- The **High Complaint Risk** area for the Arena Test extends past the boundary to the southwest approximately 500 meters (0.3 miles) over the Tennessee River and an undeveloped wooded area.
- The **Moderate Complaint Risk** area extends past the southwestern boundary approximately 2,800 meters (1.7 miles) over Valhermoso Springs and some scattered residential development.

Proposed Bureau of Alcohol, Tobacco, and Firearms Noise Contours

The Operational Noise Consultation for Redstone Arsenal that was completed in December 2006 included noise contours for proposed Bureau of Alcohol, Tobacco, and Firearms (ATF) demolition activities at Corkern, McKinley, and River Ranges. This Noise Consultation was replaced by the Redstone Arsenal Installation Compatible Use Zone (ICUZ) Plan in November 2015. While the ICUZ Plan did not include ATF noise contours, it is important to consider them for the region. There were five noise scenarios that were modeled for the proposed ATF activity:

- **Existing demolition operations including the Ordnance Missile and Munitions Center and School (OMMCS) plus proposed ATF activity.** These noise contours were developed based on existing demolition activity at Redstone Arsenal and the proposed increase in demolition activity from the ATF. The LUPZ extends outside the eastern, southern, and southwestern boundaries between 1,000 and 2,800 meters (0.6 and 1.7 miles, respectively). Noise Zone II extends beyond the eastern, southern, and southwestern boundaries between 300 and 1,500 meters (0.2 and 0.9 miles, respectively). The Noise Zone III extends beyond the eastern, southern, and southwestern boundaries less than 700 meters (0.4 miles). These noise contours are illustrated on Figure 5.



Legend

Risk of Complaints Under Neutral Weather Conditions

- Moderate (115-130 dB PK)
- High (>130 dB PK)

- Redstone Arsenal
- City of Huntsville
- JLUS County Partner
- County Boundary

- US Route
- State Route
- Major Road
- Local Road
- Railroad
- Stream / River
- Water Body



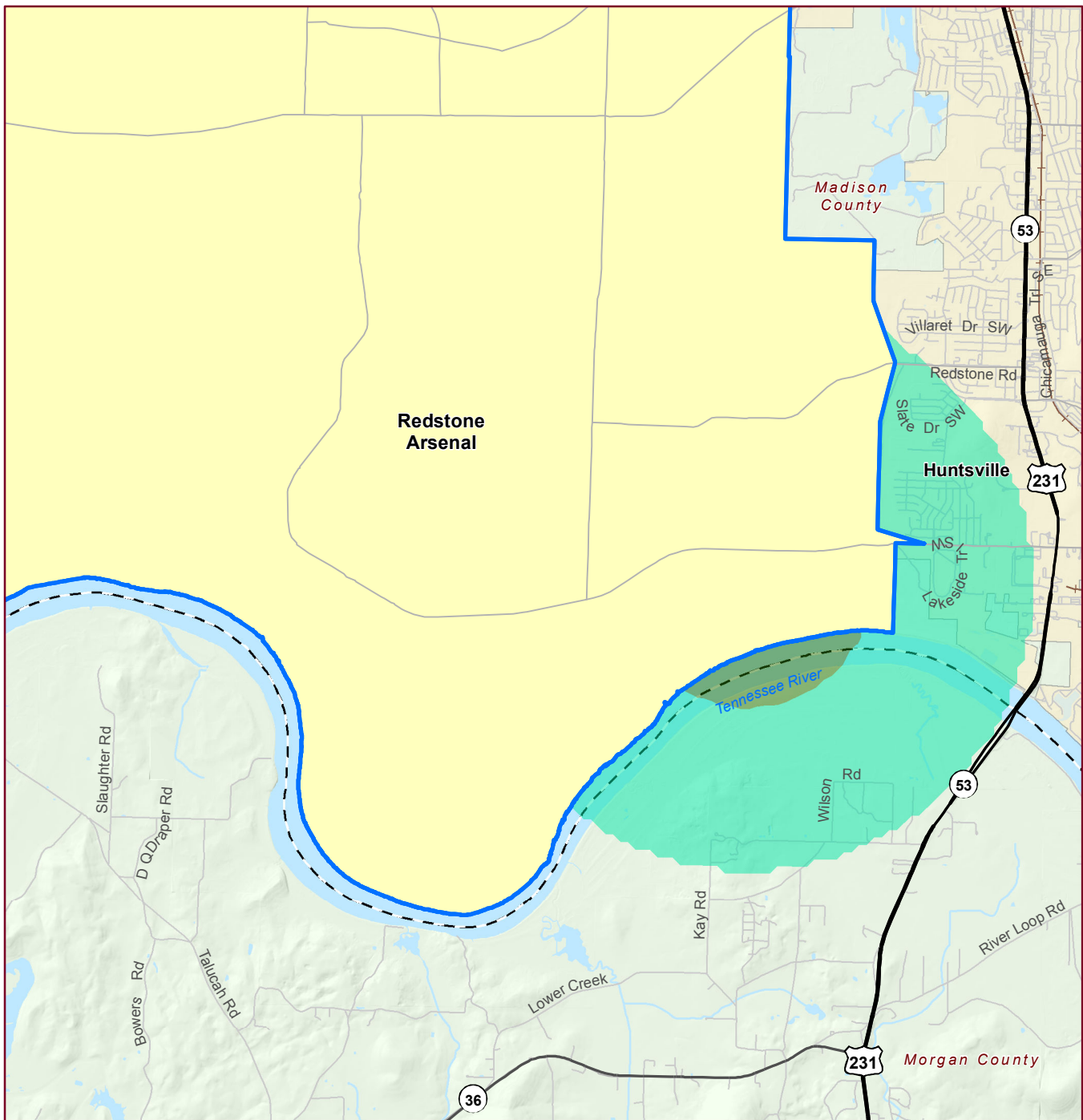
0 1 Miles



Source: Redstone Arsenal Installation Compatible Use Zone Study, November 2015.



Figure 3
Mission Footprint: Noise Complaint Risk Under Neutral Weather Conditions



Legend

Risk of Complaints Under Unfavorable Weather Conditions

- Moderate (115-130 dB PK)
- High (>130 dB PK)

- Redstone Arsenal
- City of Huntsville
- JLUS County Partner
- County Boundary

- US Route
- State Route
- Major Road
- Local Road
- Railroad
- Stream / River
- Water Body



0 1 Miles



Source: Redstone Arsenal Installation Compatible Use Zone Study, November 2015.

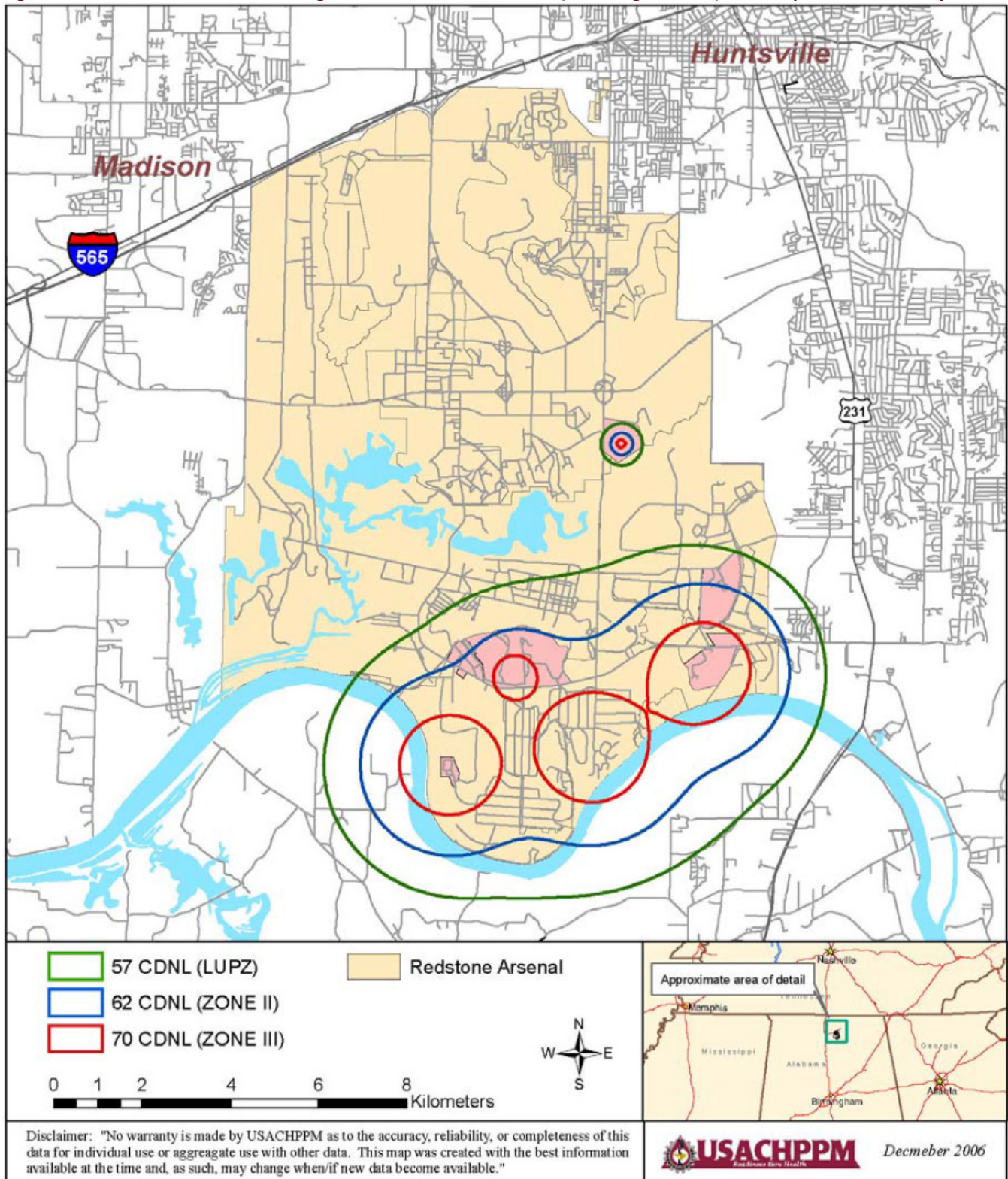


Mission Footprint: Noise Complaint Risk Under Unfavorable Weather Conditions

Figure 4



Figure 5. Redstone Arsenal Existing Demolition Noise Contours (Including OMMCS) Plus Proposed ATF Activity



Source: Operational Noise Consultation, No. 52-ON-05Q0-07, Redstone Arsenal, AL Dec 06

■ **Existing demolition activity after the departure of OMMCS, but doubling the proposed ATF operations.**

These contours were developed based on the existing operations at Redstone Arsenal without the demolition activity related to the OMMCS and the proposed increased (doubled) ATF activity distributed between the Corkern, McKinley and River Ranges. The LUPZ extends beyond the eastern, southern, and southwestern boundaries between 800 and 2,800 meters (0.5 and 1.7 miles, respectively). The Noise Zone II extends beyond the eastern, southern, and southwestern boundaries between 300 and 1,600 meters (0.2 and 1.0 miles, respectively). The Noise Zone III extends beyond the eastern, southern, and southwestern boundaries less than 700 meters (0.4 miles). These noise contours are illustrated on Figure 6.

■ **Complaint risk for large caliber weapons with existing OMMCS.** To predict the risk of complaints for large caliber weapon operations, PK15(met) noise contours were developed. The contours offer supplemental information which can be used in addition to the CDNL contours for planning purposes. The 115 dB PK15(met) noise contour extends beyond the eastern, southern, and southwestern boundaries between 800 and 6,600 meters (0.5 and 4.1 miles, respectively). The 130 dB PK15(met) noise contour extends beyond the southeastern and southwestern boundaries less than 1,900 meters (1.2 miles). The contours indicate a moderate probability of RSA receiving noise complaints. These complaint risk areas are illustrated on Figure 7.

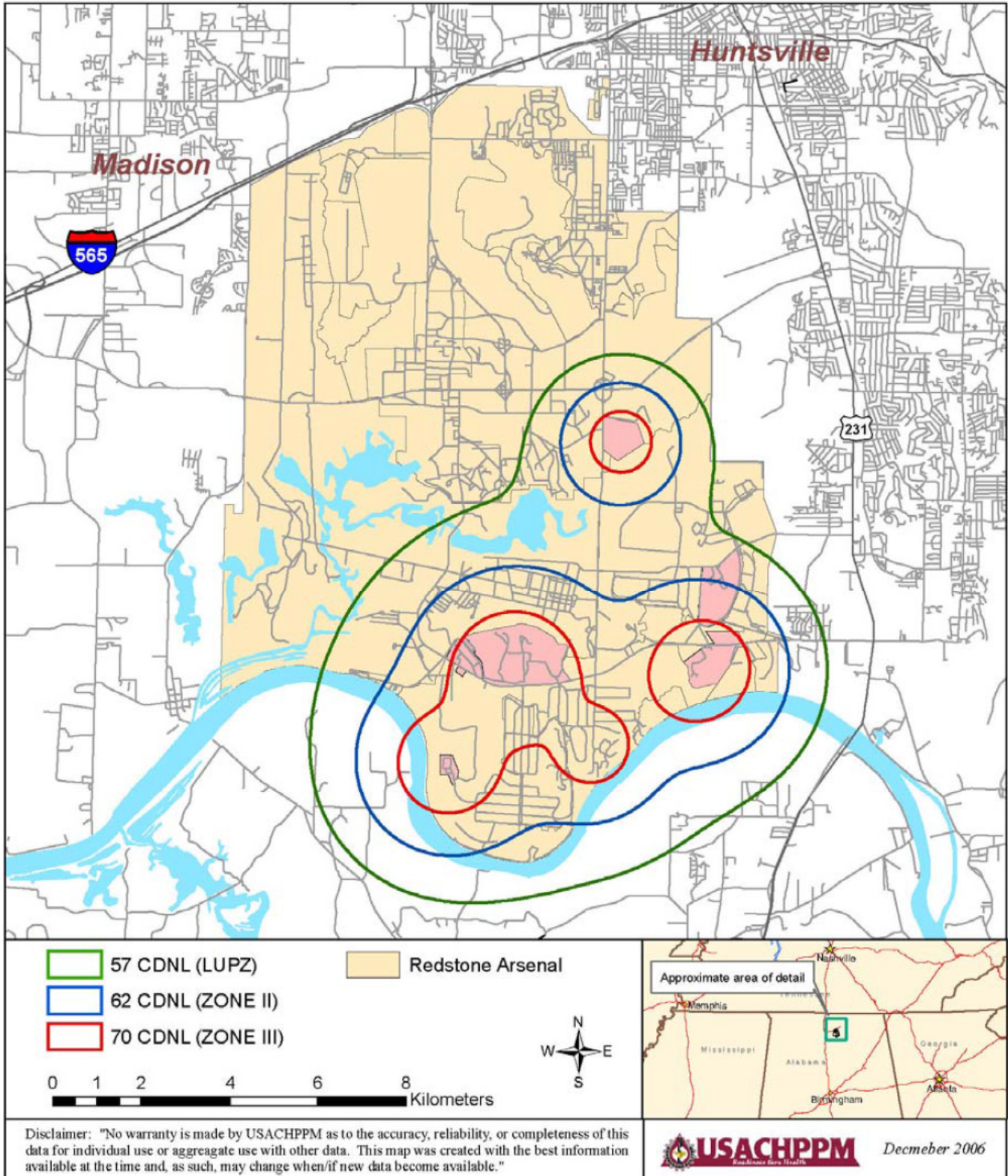
■ **Complaint risk for large caliber weapons without existing OMMCS.** The 115 dB PK15(met) noise contour extends beyond the eastern, southern, and southwestern boundaries between 800 and 6,600 meters (0.5 and 4.1 miles, respectively). The 130 dB PK15(met) noise contour extends beyond the southeastern and southwestern boundaries less than 1,900 meters (1.2 miles). The contours indicate a moderate probability of receiving noise complaints. These complaint risk areas are illustrated on Figure 8.

■ **Proposed 500-pound “car bomb”.** Unlike the other activity at RSA the “car bomb” noise contours are slightly influenced by the terrain. The “car bomb” range location has an elevation of approximately 160 meters. Larger hills with elevations of approximately 450 meters lie in the region 13 kilometers distance from the range, partially shielding some areas in the North-Northeast (Huntsville), East, Southeast (Marshall County) and South-Southeast directions. Due to the relatively large charge size of the “car bomb”, the attenuation provided by the hills is negligible (< 2 decibels). The 115 dB PK15(met) noise contour extends beyond the boundary in all directions approximately 10,000 meters (6.2 miles). The 130 dB PK15(met) noise contour extends beyond the southwestern boundary approximately 1,000 meters (0.6 miles). The contours indicate a moderate to high probability of receiving noise complaints over a large area surrounding the installation. These noise contours are illustrated in Figure 9.

The geographic information system (GIS) data used to create these maps was not available as part of this JLUS project, so an assessment of the existing land under the noise contours could not be conducted as part of Issue NOI-1 in Chapter 5 of this Background Report.

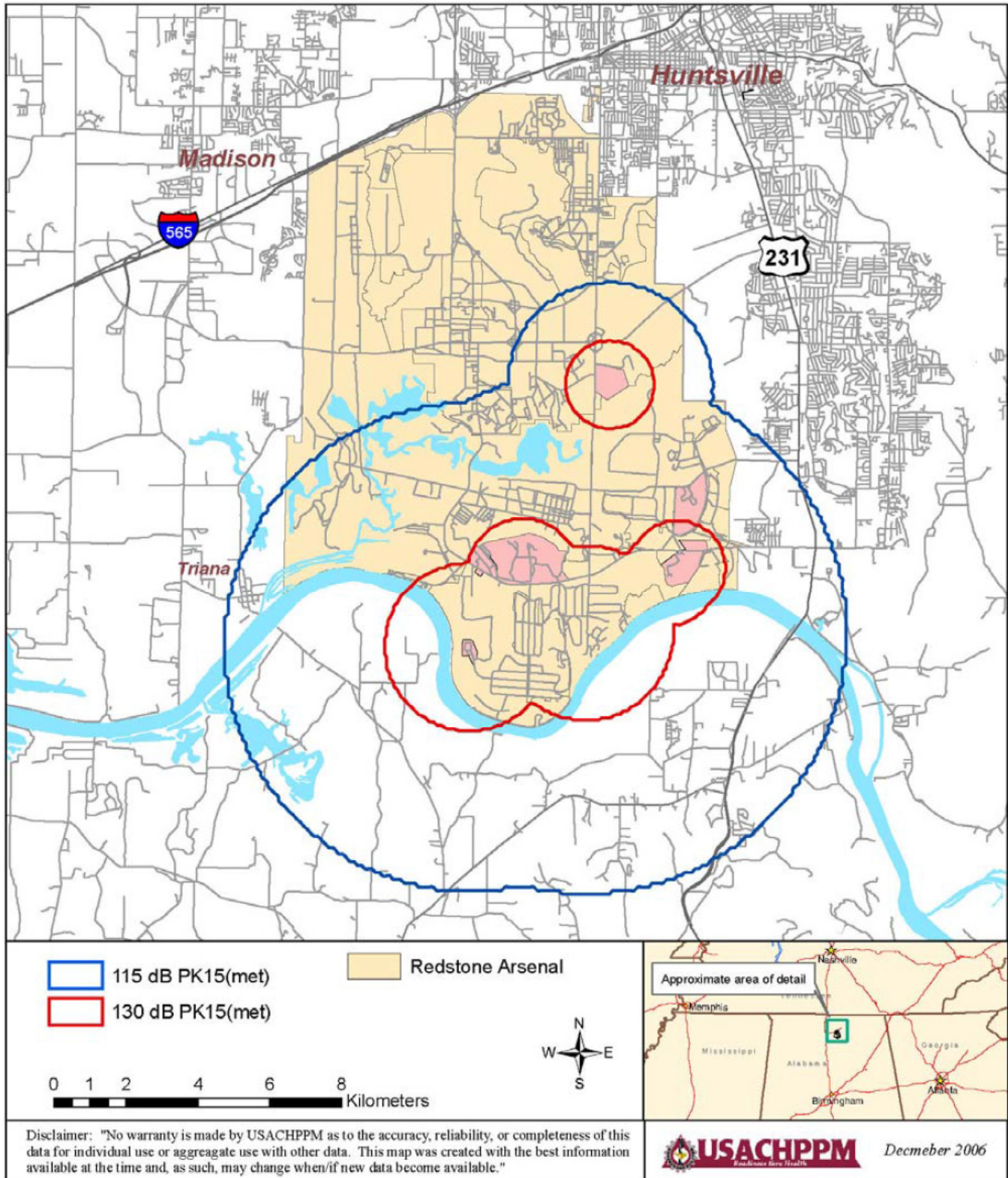


Figure 6. Redstone Arsenal Existing Demolition Noise Contours (Without OMMCS) Plus Proposed Increased (Doubled) ATF Activity



Source: Operational Noise Consultation, No. 52-ON-05Q0-07, Redstone Arsenal, AL Dec 06

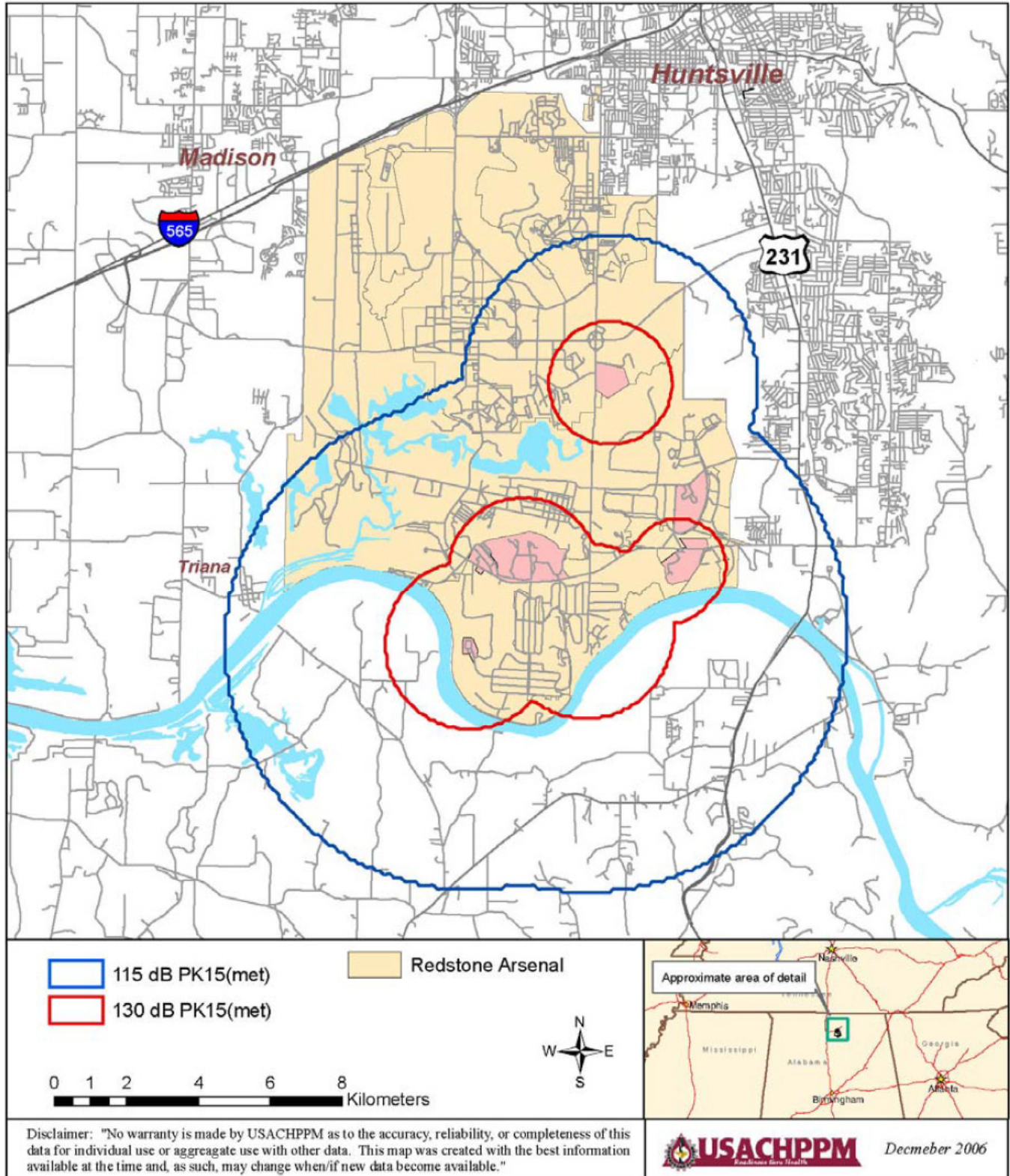
Figure 7. Redstone Arsenal Existing Demolition PK15(met) Noise Contours (Including OMMCS) Plus Proposed ATF Activity



Source: Operational Noise Consultation, No. 52-ON-05Q0-07, Redstone Arsenal, AL Dec 06

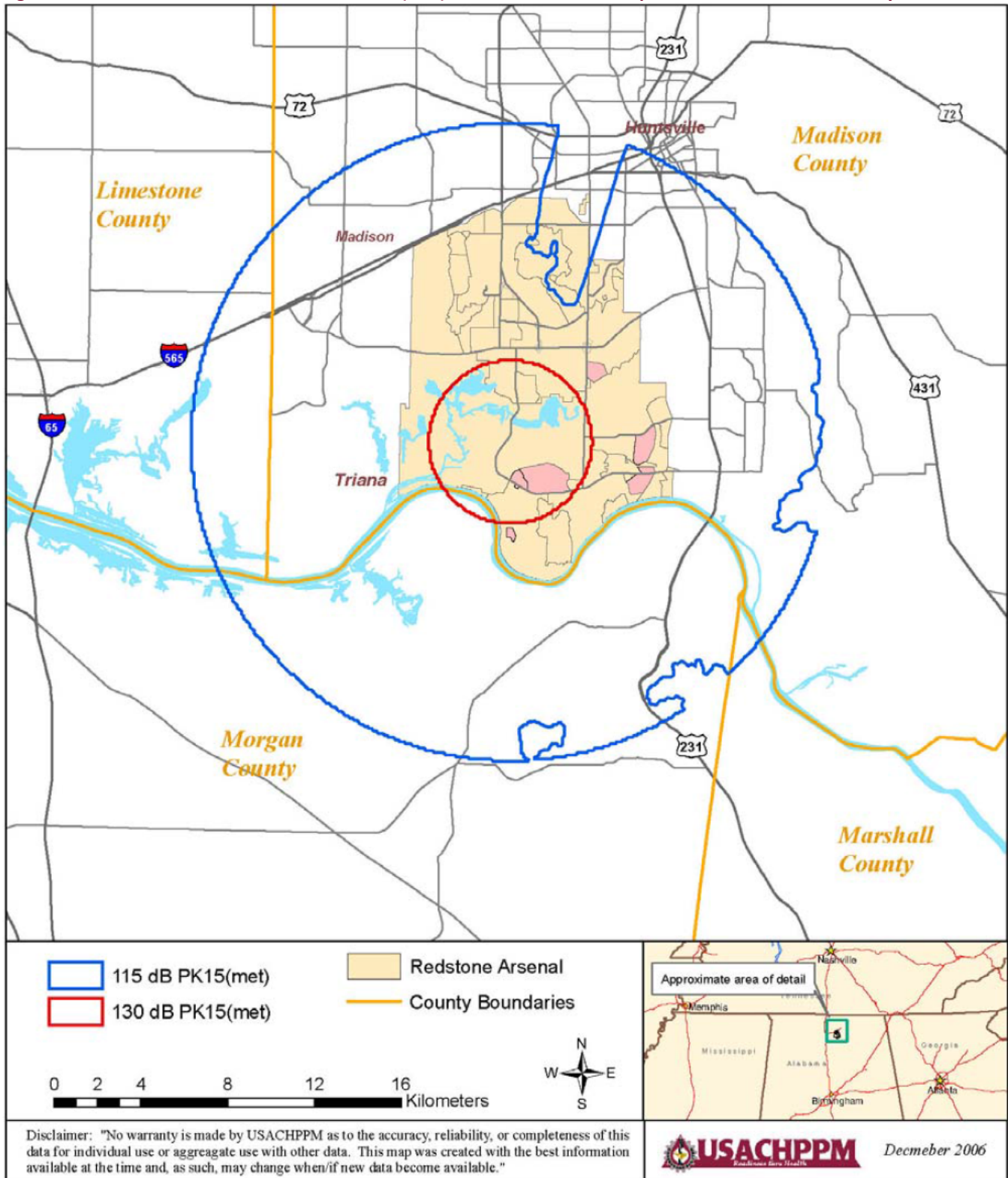


Figure 8. Redstone Arsenal Existing Demolition PK15(met) Noise Contours (Without OMMCS) Plus Proposed Increased (Doubled) ATF Activity



Source: Operational Noise Consultation, No. 52-ON-05Q0-07, Redstone Arsenal, AL Dec 06

Figure 9. Redstone Arsenal Demolition PK15(met) Noise Contours for Proposed "Car Bomb" ATF Activity



Source: Operational Noise Consultation, No. 52-ON-05Q0-07, Redstone Arsenal, AL Dec 06



Airfield Safety Zones

There are three airfield safety zones associated with Redstone Army Airfield used to guide development and protect the safety of the public and aircrews while simultaneously allowing for continued compatible economic growth. The DOD has created these safety zones around runways and landing areas based on historical data of where an aircraft accident is most likely to occur. These safety zones are clear zones (CZ), accident potential zone I (APZ I), and accident potential zone II (APZ II) and are based on the size, type, and dimensions of the runway. There is a CZ, APZ I, and APZ II off each end of the runway. These safety zones for Redstone Army Airfield are illustrated on Figure 10. The CZs and APZs for Redstone Army Airfield's runway are described as follows.

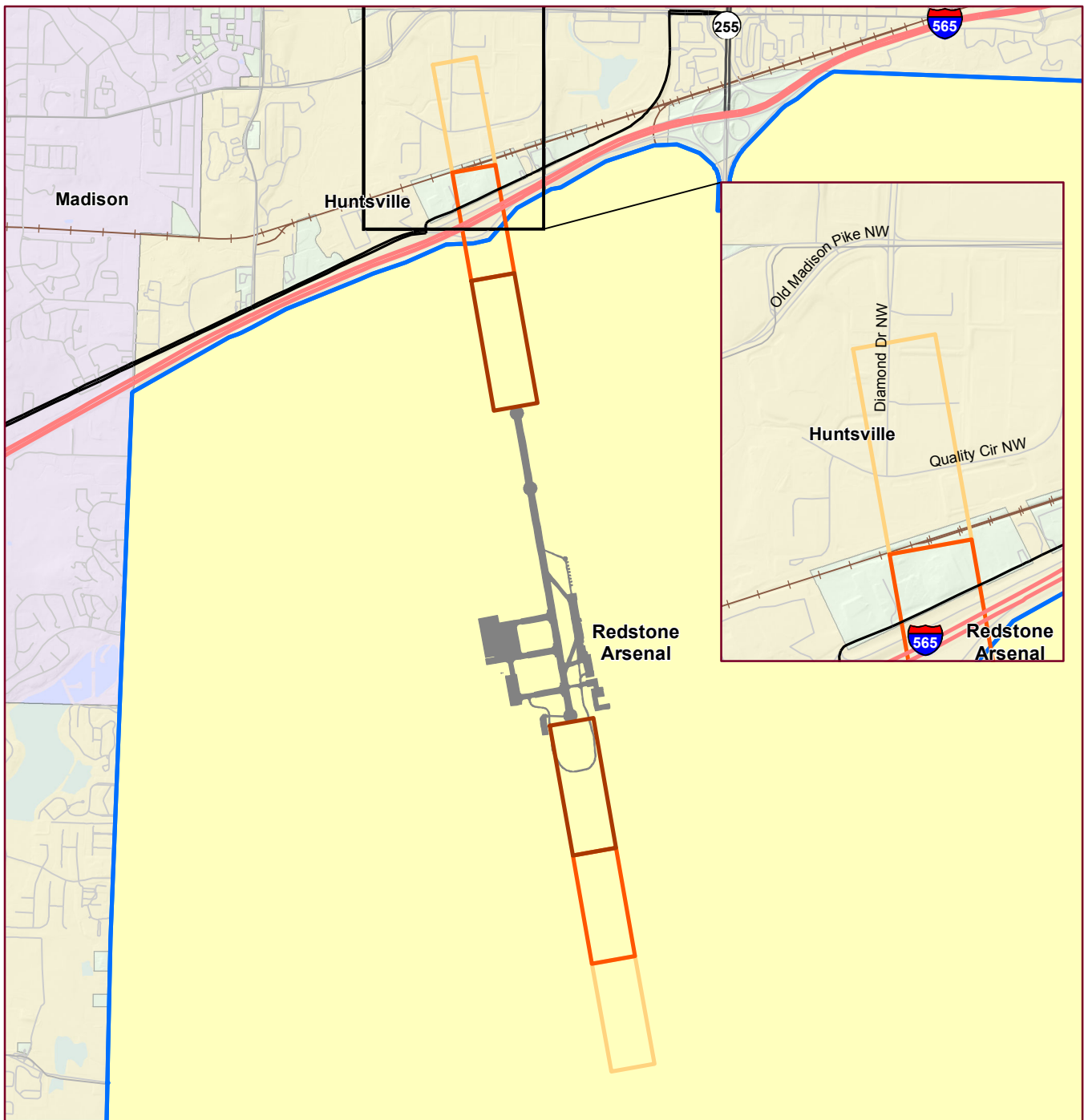
- The **CZ** is the area where an aircraft mishap is most likely to occur. The CZs for Redstone Army Airfield's runway measure 3,000 feet long from each end of the runway, with a width of 1,000 feet. Permitted land uses within this zone are substantially limited and include transportation, communication, and utilities infrastructure necessary for airfield operations, as well as unoccupied open space and limited agricultural.
- **APZ I** is located adjacent to the CZ boundary and extends for a length of 2,500 additional feet, with a width of 1,000 feet. This area typically experiences fewer accidents than the CZ; and therefore, has less restrictions. Compatible land uses within this zone are limited to non-occupied structures, thus residential land uses are not recommended.
- **APZ II** begins at the outer boundary of APZ I and extends for a length of 2,500 feet with a width of 1,000 feet. The APZ II is where development is the least restricted due to the lower risk of accidents as it is further from the runway. Uses such as warehouse and maintenance facilities are compatible within the footprint, as well as single family residential properties up to two dwelling units per acre maximum, as recommended by DOD guidelines for APZ II.

Imaginary Surfaces

Imaginary surfaces were developed by the Federal Aviation Administration to describe airspace around an airfield that may be impacted by heights of buildings, structures, or objects based on the distance from the airfield. Imaginary surfaces are meant to provide safe and unobstructed airspace for aircraft takeoff and landing operations. The DOD has developed additional criteria for imaginary surfaces to support its missions and flight operations that vary from civilian operations. Imaginary surfaces define volumes of airspace that must remain free of obstructions to air navigation in order to maintain safety of flight in the airspace around the airfield.

The imaginary surfaces of an active runway are used to determine where vertical obstructions could exist near aviation operations. The various imaginary surfaces build upon one another and are designed to eliminate obstructions to air navigation and operations, either natural or man-made. The extent or size of an imaginary surface depends on the type of runway. The imaginary surfaces are meant to be used as tools for local communities, as the DOD does not have any authority to limit land uses outside of an installation within these areas. It is up to the communities to enact this through zoning or land use policy within their jurisdiction.

Figure 11 illustrates the imaginary surfaces around Redstone Army Airfield.



Legend

Safety Zone

- Clear Zone
- Accident Potential Zone I
- Accident Potential Zone II

- Redstone Army Airfield
- Redstone Arsenal
- City of Huntsville
- City of Madison
- JLUS County Partner

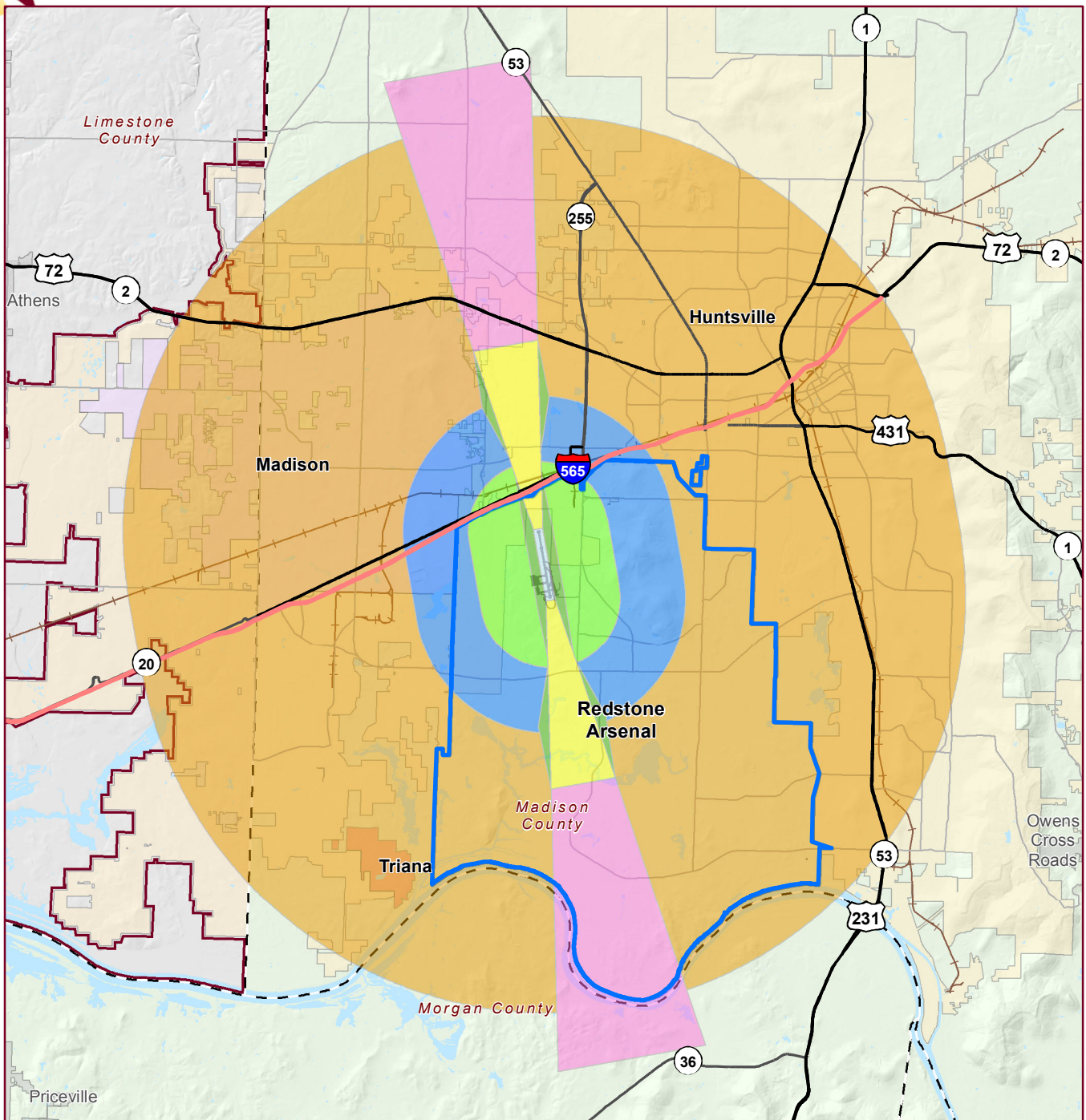
- Interstate
- US Route
- State Route
- Major Road
- Local Road
- Railroad
- Water Body



Source: Redstone Arsenal, 2017



Figure 10
Mission Footprint: Safety Zones



Legend

Airfield Imaginary Surface

- Primary Surface
- Approach/Departure Clearance Surface (50:1)
- Approach/Departure Clearance Surface (Horizontal)

- Inner Horizontal Surface
- Conical Surface (20:1)
- Outer Horizontal Surface
- Transitional Surface (7:1)

- Redstone Arsenal
- City of Huntsville
- City of Madison
- Town of Triana
- JLUS County Partner
- JLUS Study Area
- Other City / Town
- County Boundary

- Interstate
- US Route
- State Route
- Major Road
- Railroad
- Water Body
- Redstone Army Airfield



Source: Redstone Arsenal, 2017



0 5 Miles

Figure 11
Mission Footprint: Imaginary Surfaces

Federal Aviation Regulation Part 77 Vertical Obstruction Evaluation

An important outcome of the Act was Federal Aviation Regulation Title 14 Part 77, commonly known as Part 77, which provides the basis for evaluation of vertical obstruction compatibility with aircraft flight operations. This regulation provides information to evaluate the potential for a vertical obstruction based on the elevation of the airfield, the height and resulting elevation of the new structure or facility, and the location of the structure or facility relative to the airfield in question. This regulation determines compatibility based on the height of proposed structures or natural features relative to their distance around a runway. Using a distance formula from this regulation, local jurisdictions can easily assess the height restrictions near airfields. Additional information on Part 77 is located on the Federal Aviation Administration Internet site at <http://www.faa.gov/>.

This regulation promulgates obstruction standards relative to their distance from the ends of a runway as well as their relationship to airport imaginary surfaces. A height that is 200 feet above ground level or above the established airport elevation, whichever is higher, and within three nautical miles of the established reference point of an airport, excluding heliports, with its longest runway more than 3,200 feet in actual length is considered a vertical obstruction. This height increases in the proportion of 100 feet for each additional nautical mile of distance from the airport up to a maximum of 499 feet.

The FAA Part 77 Obstruction Evaluation areas around Redstone Army Airfield are indicated on Figure 12.

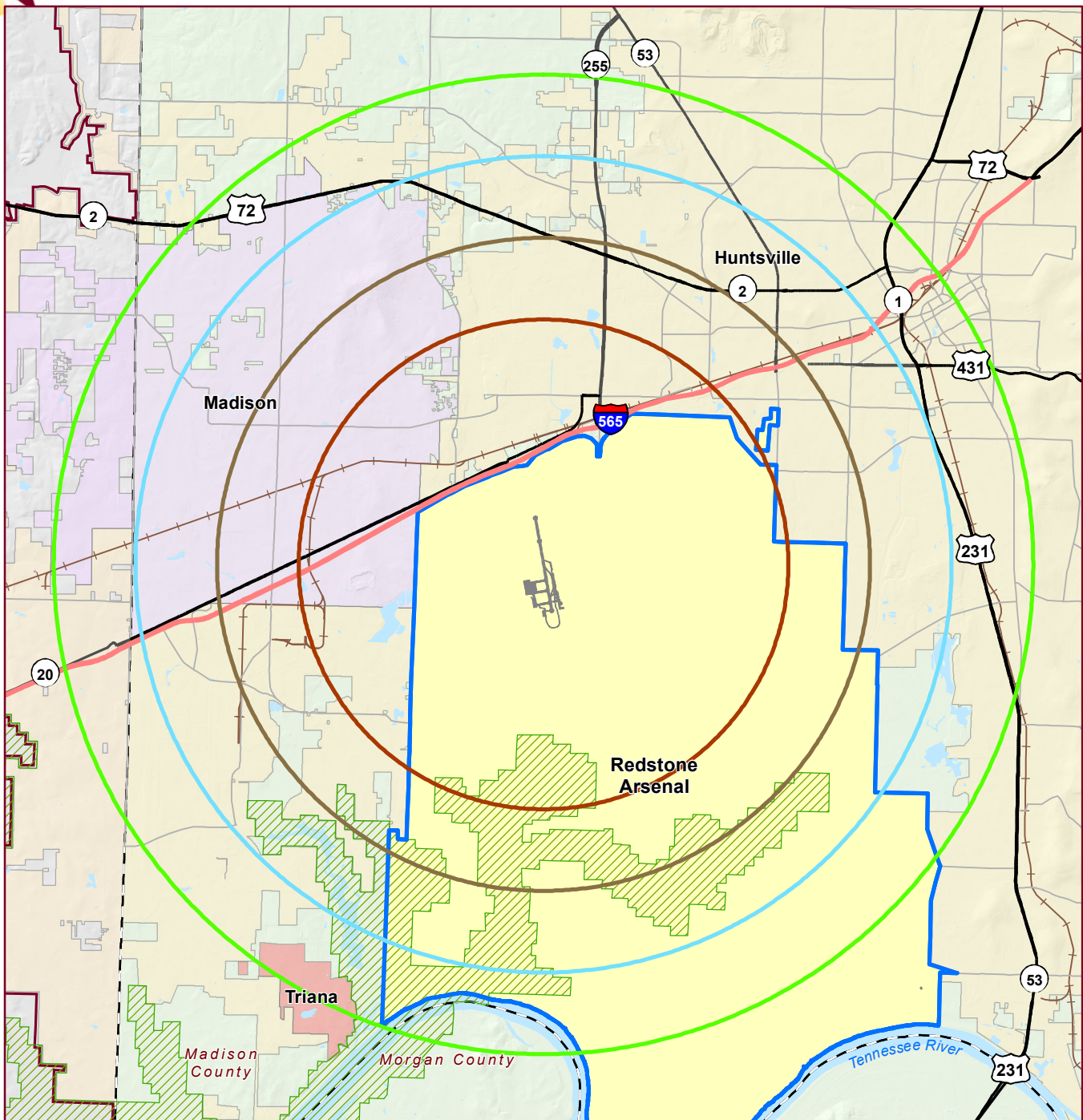
Wildlife Aircraft Strike Hazard

Birds and other wildlife can present a significant hazard to military flight operations. Wildlife Aircraft Strike Hazard (WASH) constitutes a safety concern due to the potential for damage to aircraft, property, and potential injury to aircrew and / or the public if a collision were to occur in a populated area. Although aircraft may encounter birds at altitudes of 30,000 feet AGL or higher, most birds fly close to the ground, and over 95 percent of reported bird strikes occur below 3,500 feet AGL. It is important to note that helicopters are less likely to incur major damage from WASH incidents due to the lower speeds at which they operate.

The primary recommendation made by the FAA is a minimum separation distance between an airfield and wildlife attractants. The minimum separation distance extends five miles out from the entire perimeter of the airfield operations area, including paved and unpaved areas associated with aircraft movement such as runways, taxiways, and aprons. Figure 13 illustrates the five-mile WASH Relevancy Area.

Runway Class Airspace / Special Use Airspace

To help air traffic controllers and pilots deal with varying traffic conditions in the sky, United States airspace has been separated into six different classes (A, B, C, D, E, and G). These different classes have different requirements for entry into the airspace, pilot qualifications, radio and transponder equipment, and Visual Flight Rules (VFR) weather minimums. Redstone Arsenal is situated within Class C and Class D airspace designations that are surrounded by several Special Use Airspace (SUA). Class C Airspace consists of areas from the surface to 4,600 feet, while Class D Airspace consists of areas from the surface to 2,400 feet. For both Class C and Class D airspace, two-way radio communication must be established with Air Traffic Control prior to entry and thereafter maintain those communications while in the airspace. Additionally, aircraft flying under VFR in Class C and Class D airspace must have three miles of visibility and fly at an altitude at least 500 feet below, 1,000 feet above, or 2,000 feet laterally from clouds. The airspace surrounding Redstone Arsenal is depicted on Figure 14.



Legend

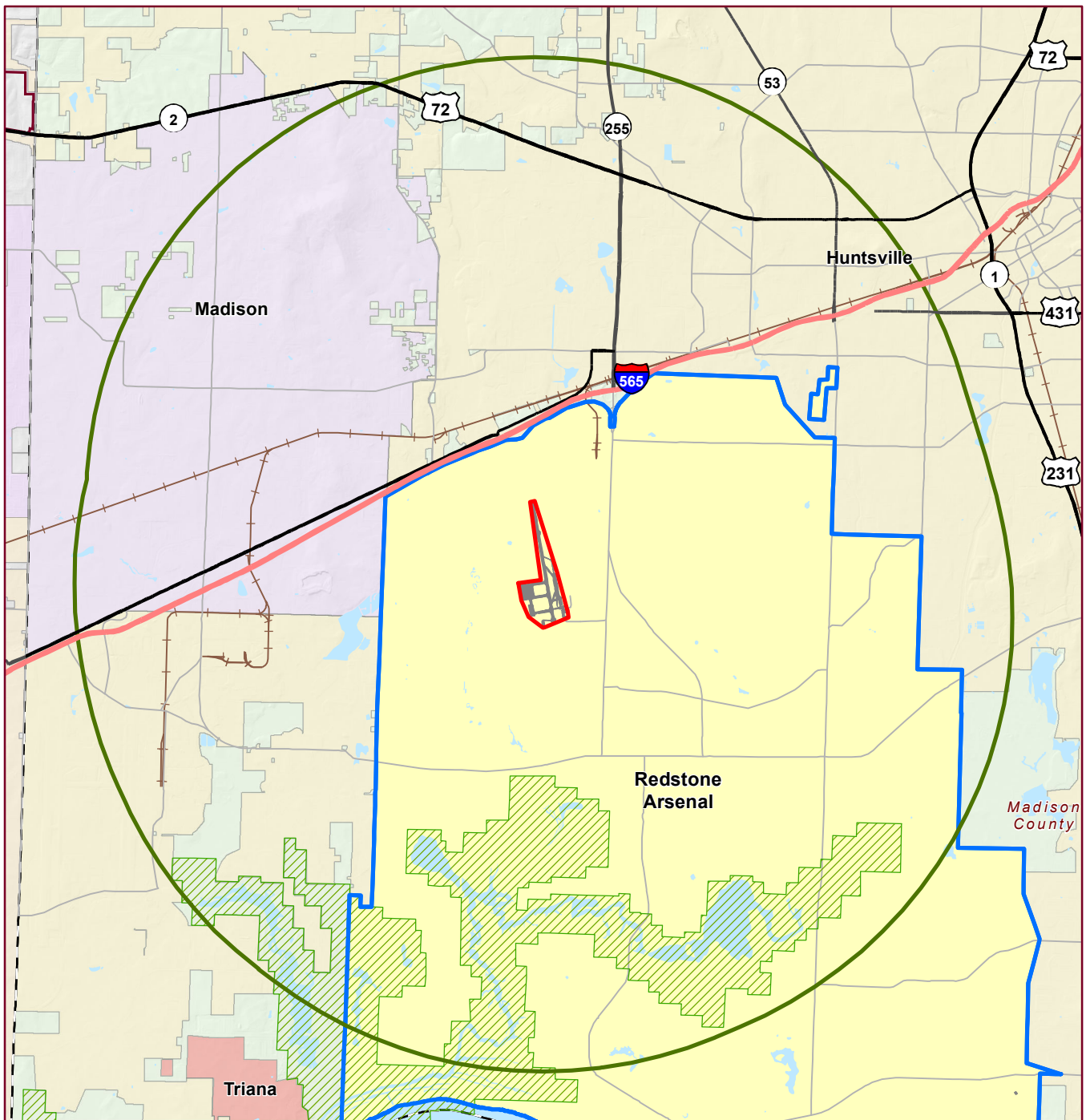
FAR Part 77

- | | | | |
|------------------|----------------------------------|-----------------|------------------------|
| Up to 200' @ 3NM | Redstone Arsenal | JLUS Study Area | Water Body |
| Up to 300' @ 4NM | City of Huntsville | County Boundary | Redstone Army Airfield |
| Up to 400' @ 5NM | City of Madison | Interstate | |
| Up to 500' @ 6NM | Town of Triana | US Route | |
| | JLUS County Partner | State Route | |
| | Wheeler National Wildlife Refuge | Major Road | |
| | | Railroad | |

Source: Matrix Design Group, 2017



Figure 12
Mission Footprint: Part 77 Compliance Areas



Legend

- | | | | |
|----------------------------------|---------------------|-----------------|------------------------|
| 5-mile WASH Relevancy Area | Redstone Arsenal | JLUS Study Area | Water Body |
| Airfield Operations Area | City of Huntsville | County Boundary | Redstone Army Airfield |
| | City of Madison | Interstate | |
| | Town of Triana | US Route | |
| | JLUS County Partner | State Route | |
| Wheeler National Wildlife Refuge | | Major Road | |
| | | Railroad | |

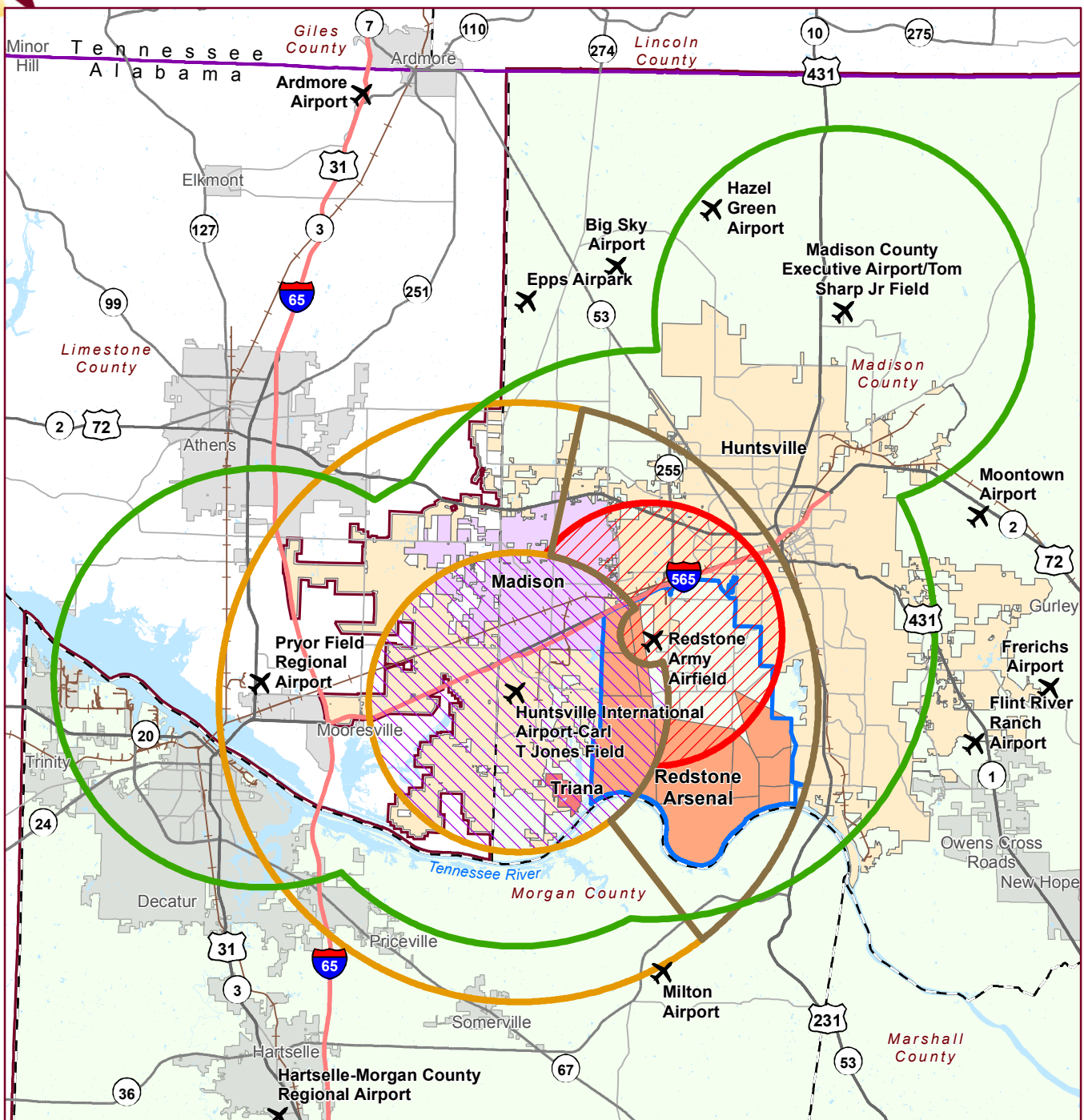


Source: Matrix Design Group, 2017



0 1 2 Miles

Figure 13
Mission Footprint: WASH Relevancy Area



Legend

Airspace Controller

- KHUA Class D, Surface to 2,400ft
- KHSV Class C 01, Surface to 4,600ft
- KHSV Class C 02, 2,000ft to 4,600ft
- KHSV Class C 03, 2,400ft to 4,600ft
- Huntsville Class E5, 700ft to 17,999ft Airspace

- Restricted Airspace Area
- Redstone Arsenal
- City of Huntsville
- City of Madison
- Town of Triana
- JLUS County Partner
- JLUS Study Area

- Other City / Town
- County Boundary
- State Border
- Interstate
- US Route
- State Route
- Major Road

- Railroad
- Water Body
- ✈ Airport



Source: Redstone Arsenal, 2017; United States Geological Survey, 2017



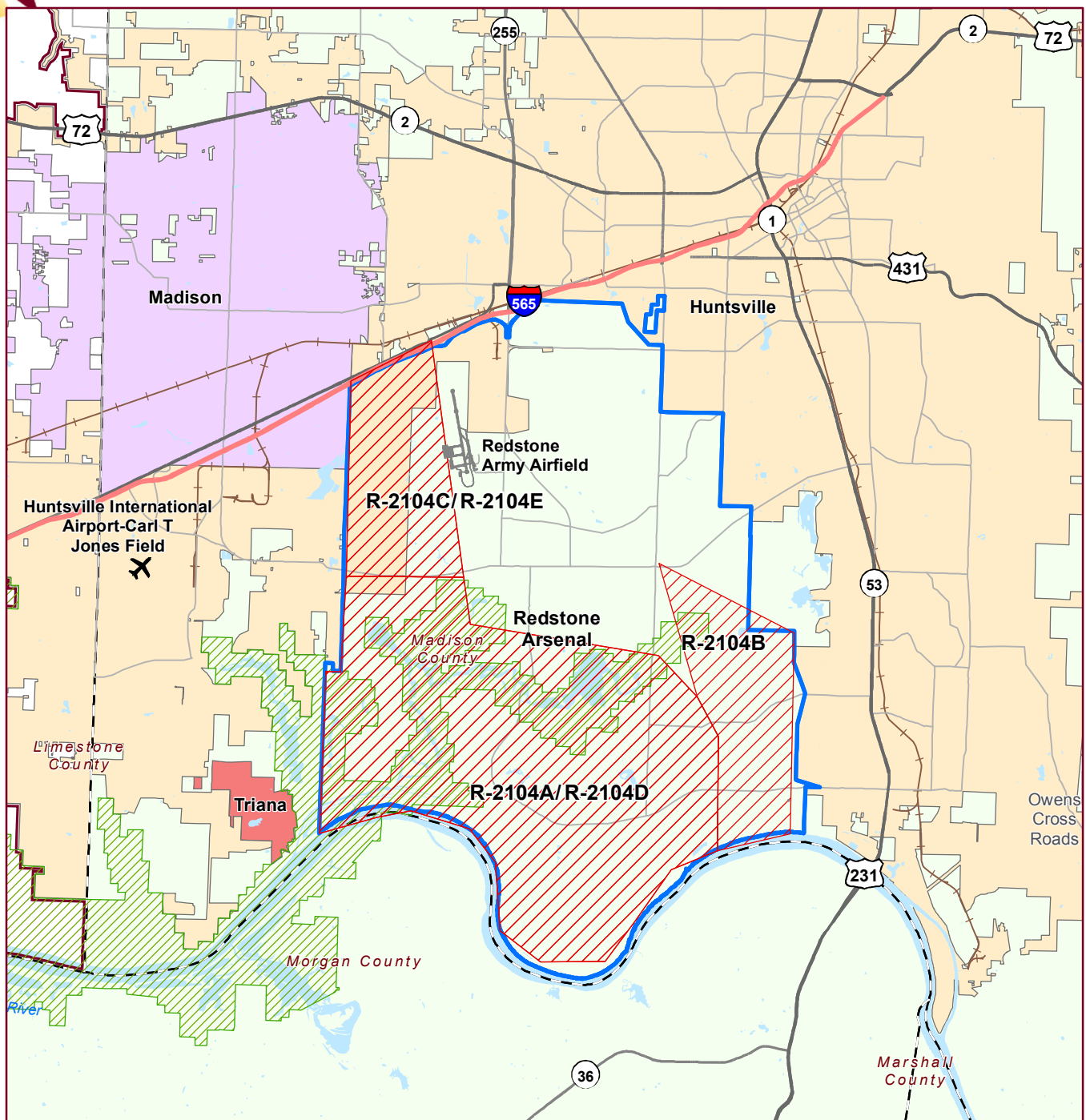
0 5 Miles

Figure 14
Mission Footprint: Airspace Control

Restricted Airspace

Restricted Airspace designates areas where ongoing or intermittent activities occur that create usual and often invisible hazards to aircraft. Restricted airspace is specifically designated in areas where flight or ground activities must be confined as they could be considered hazardous to non-participating aircraft. Restricted airspace is bounded by a floor (minimum altitude a plane can fly) and a ceiling (maximum altitude a plane can fly). Restricted airspace is designated under 14 Code of Federal Regulations (CFR) Part 73 and is utilized for hazardous flight activity and aircraft testing including high speed maneuvering, abrupt altitude changes, and other dynamic, non-standard aircraft activity.

A majority of the airspace above Redstone Arsenal is restricted under Restricted Airspace Areas R-2104 A, B, and C, with small portions of the installation being designated R-2104 A/D and C/E. Restricted Areas A and C control air traffic up to and including 12,000 feet mean sea level (MSL) from 6 AM until 8 PM Monday through Saturday. However, this airspace can be traversed with a six-hour advanced notice and approval. The R-2401 B restriction controls air traffic continuously to 2,400 feet. Restricted Areas R-2104D and R-2104E are subareas and control air traffic between 300 feet to 12,000 feet MSL. The Restricted Areas are shown on Figure 15.



Legend

- | | | | | |
|----------------------|---------------------|----------------------------------|-------------|---------|
| Special Use Airspace | Redstone Arsenal | Wheeler National Wildlife Refuge | Interstate | Airport |
| City of Huntsville | City of Madison | Other City / Town | US Route | |
| Town of Triana | JLUS County Partner | County Boundary | State Route | |
| JLUS Study Area | State Border | Railroad | Major Road | |
| | | Water Body | | |



Note: R-2104C and R-2104E have the same boundary, but different elevations.

Source: Office of Economic Adjustment, 2016



0 5 Miles

Figure 15
Mission Footprint: Restricted Airspace

This section provides an overview of plans and programs that are currently used or applied in evaluating and addressing compatibility issues in the Redstone Arsenal JLUS Study Area. Relative to compatibility planning, there are a number of existing plans and programs that are designed to address compatibility either directly or indirectly.

This is not meant as an exhaustive list of plans and programs that influence planning in this Study Area, but rather a highlight of the plans and programs for the Redstone Arsenal JLUS. For a more detailed list of plans and programs refer to Chapter 4 of the Redstone Arsenal JLUS Background Report.

Federal Programs and Policies

Army Compatible Use Buffer Program

Title 10, Section 2684a of the United States Code authorizes the Department of Defense (DOD) to partner with non-federal governments and private organizations to establish buffer zones around critical active military assets. Within the Department of the Army, this is called the Army Compatible Use Buffer (ACUB) program. Through the ACUB program, Army installations can work with organization partners, such as land trusts, to acquire land or development rights to establish buffer zones that can help protect habitats, sensitive areas, and military training areas without acquiring any new land for Army ownership. The partner organization is the entity that acquires and manages the land or land rights.

Army Regulation 200-1, Environmental Protection and Enhancement

This regulation implements federal, state, and local environmental laws and DOD policies for preserving, conserving, and restoring the environment. This regulation should be used in conjunction with 32 Code of Federal Regulation (CFR) Part 651, which provides Army policy on National Environmental Policy Act (NEPA) requirements and supplemental program guidance.

This regulation defines Army Environmental Management System (EMS) framework and the five interconnected EMS areas which are policy, planning and implementation, program management and operation, checking and corrective action, and management review. This is pertinent to Army military installations that have environmental resources such as habitats for protected species.



Clean Water Act

The Clean Water Act (CWA) governs the management of water resources and controls and monitors water pollution in the US. The CWA establishes the goals of eliminating the release of toxic substances and other sources of water pollution to ensure that surface waters meet high quality standards. As a result, the CWA is key to prevent the contamination of nearshore, underground, and surface water sources.

The CWA's scope is extensive and relates not only to drinking water but also to storm water. Some states have rigorous regulatory programs, while others may have programs which meet only the minimum CWA requirements. In addition, the application of standards and requirements will vary in relationship to the physical setting (climate, topographic and soil conditions, etc.). Implementation of the CWA in and around a military facility can be either a compatibility challenge, a beneficial element, or perhaps even both simultaneously, depending upon the specific circumstances.

National Pollutant Discharge Elimination System

Pursuant to the CWA, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources such as pipes or man-made ditches that discharge pollutants into U.S. waters. According to the law, individual homes that are connected to a municipal system, use a septic system, or do not have a surface discharge do not need an NPDES permit; however, industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. Traditionally, NPDES focused on point sources; however, more recently the focus has shifted to nonpoint sources. Nonpoint sources generally include street flow runoff from pavement, agricultural fields and lawn areas, which by their nature, are more difficult to regulate.

Resource Conservation and Recovery Act

This law was designed to assist in the clean-up of sites with hazardous contaminants in order to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. The Resource Conservation and Recovery Act (RCRA):

- established prohibitions and requirements concerning closed and abandoned hazardous waste sites,
- provided for liability of persons responsible for releases of hazardous waste at these sites, and
- established a trust fund to provide for cleanup when no responsible party could be identified.

RCRA has relevance as a potential JLUS tool through the Superfund environmental program, established to address hazardous waste sites. Hazardous waste is sometimes present in or around military installations, particularly where munitions and ordnance are stored and used for training purposes, and if not disposed of properly could potentially be harmful to the installation tenants and surrounding communities. While the Superfund cleanup process may be complex, it protects communities and the environment from further contamination.

Department of Defense Conservation Partnering Initiative

In 2003, Congress amended Title 10 U.S.C. §2684a and §2692a (P.L. 107-314), the National Defense Authorization Act, to add authority to the DOD to partner with other federal agencies, states, local governments, and conservation-based non-governmental organizations (NGOs) to set aside lands near military bases for conservation purposes and to prevent incompatible development from encroaching on, and interfering with, military missions.

This law provides an additional tool to support smart planning, conservation, and environmental stewardship on and off military installations. The purpose of the program is to acquire real property interests, such as conservation easements or development rights to address current and potential encroachment or compatibility threats to an installation's mission.

Readiness and Environmental Protection Integration

To implement the authority provided by the DOD Conservation Partnering Initiative, the DOD established the Readiness Environmental Protection Integration (REPI). This initiative enables DOD to work with state and local governments, NGOs, and willing landowners to limit encroachment and incompatible land use. REPI funds are used to support a variety of DOD partnerships that promote compatible land use. By relieving encroachment pressures, the military is able to test and train in a more effective and efficient manner. By preserving the land surrounding military installations, habitats for plant and animal species are conserved and protected. The REPI gives local agencies the opportunity to partner with the military and other local agencies. This could allow for the establishment of buffers around the base to assist in the protection of the military mission.

Department of Defense Operational Noise Management Program

The Operational Noise Management Program (ONMP) is a program that provides a methodology for assessing impacts of noise generated by military operations on surrounding communities. This program was established by the Department of the Army to assist installations and surrounding communities develop guidelines for land use planning to mitigate noise and other hazards to the general public while protecting the public investment in the installation. This program encourages compatibility measures for both the U.S. Army and surrounding communities through the development of an ONMP.

The Operational Noise Manual was prepared by the U.S. Army Center for Health Promotion and Preventive Medicine and released in November 2005. It provides a practical reference for military and civilian personnel with duties and responsibilities in operational noise management so that they can work together to be good neighbors and reduce noise issues. The manual assists personnel to understand and implement current DOD environmental policy and guidance. Most of the manual is devoted to the following subjects: Characteristics of Sound; Effects of Noise; Military Noise Sources; Noise Monitoring; Reduction of Noise Conflicts and more.

Department of Defense Partners in Flight Program

The DOD implemented a program entitled Partners in Flight that sustains and enhances the military testing, training, and safety mission through habitat-based management strategies to maintain healthy landscapes and training lands. The program assists natural resource managers in monitoring, inventory, research, and management of birds and their habitats. As part of the Partners in Flight program, a strategic plan is created that can be incorporated into a Bird / Wildlife Aircraft Strike Hazard (BASH) plan. This program reaches beyond the boundaries of the installation to facilitate community partnerships. The Partners in Flight program not only helps to ensure mission critical aviation activity at Redstone Arsenal but also to promote the protection of important local bird species.

Department of Housing and Urban Development Noise Regulation

The United States Department of Housing and Urban Development (HUD) has instituted policies through Section 24 CFR Part 51 that are designed to promote the creation of controls and standards for community noise abatement by state and local governments. The focus of these regulations is to reduce noise levels within residential developments funded by HUD. New housing construction assisted or supported by HUD must meet the exterior noise standards outlined in the regulation. HUD funds may also be available to encourage noise abatement planning and acoustical treatment for proposed and existing incompatible land uses.



Approvals of mortgage loans from the Federal Housing Administration and the Veterans Administration are subject to this HUD circular. The circular sets forth a discretionary policy to withhold funds for housing projects when noise exposure is in excess of prescribed levels. Residential construction may be permitted within certain noise contours, provided sound attenuation is accomplished. The added construction expense of sound attenuation, however, may make siting in these noise exposure areas financially less attractive. Because the HUD policy is discretionary, variances may also be permitted, depending on regional interpretation and local conditions. These new structures could then incorporate noise-inhibiting features into their design and construction when using these loans.

Endangered Species Act

The Endangered Species Act (ESA) first established in 1973, is a program for the conservation of threatened and endangered plants and animals and their habitats. The U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) are the lead implementing agencies of ESA. The USFWS has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of NOAA Marine Fisheries Service (NMFS) are mainly marine wildlife. Under the ESA, species may be listed as either endangered or threatened.

“Endangered” means a species is in danger of extinction throughout all or a significant portion of its range.

“Threatened” means a species is likely to become endangered within the foreseeable future.

The ESA requires federal agencies, in consultation with the USFWS and / or the NMFS, to ensure that actions they “authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species.” The ESA also prohibits any action that results in a taking of any listed species of endangered plant, fish, or wildlife without an approved permit. The ESA provides a platform for the protection of critical habitat and species that may be at risk of extinction.

Federal Aviation Act

The Federal Aviation Act was passed in 1958 to provide methods for overseeing and regulating civilian and military use of airspace. The Act requires the Secretary of Transportation to make long-range plans that formulate policy for the orderly development and use of navigable air space. The intent is to serve the needs of both civilian aeronautics and national defense. Military planning strives to work alongside local, state, and federal aviation regulations and policies, but sometimes must supersede these due to national security interests. The Federal Aviation Administration (FAA) was created because of the Act and serves a variety of purposes, including the management of airspace over the US. The prime objectives of the FAA are to promote air safety and the efficient use of the navigable airspace.

Another important outcome of the Act is Title 14 CFR Part 77, commonly referred to simply as Part 77, which provides the basis for evaluating if a proposed structure or object will result in a vertical obstruction or flight hazard to navigable airspace. Using a distance formula from this regulation, local jurisdictions can assess the height restrictions near airfields. Additional information on Part 77 can be found on the FAA website at <http://www.faa.gov/>. The FAA uses its Obstruction Evaluation / Airport Airspace Analysis tool to generate Determinations of Hazards / No Hazards for proposed structures or objects.

When FAA identifies concerns, it may require avoidance or minimization, lighting, or other measures to ensure airspace safety for military and civilian purposes. If potential impacts to military operations are identified, the project must also undergo formal or informal review by the U.S. Department of Defense Siting Clearinghouse, to evaluate the compatibility of the proposed project with military missions. The Part 77 review process by law requires that military interests be addressed if a proposed project may impact them.

The FAA has identified certain imaginary surfaces around runways to determine how structures and facilities are evaluated and whether they pose a vertical obstruction in relation to the airspace around a runway. The imaginary surfaces build upon one another and are designed to eliminate obstructions to air navigation and operations, either natural or man-made. The dimension or size of an imaginary surface depends on the runway classification.

Federal Aviation Administration Modernization and Reform Act of 2012

The FAA Modernization and Reform Act of 2012 established rules for the recreational use of model aircraft, which includes civilian use of unmanned aerial vehicles (UAVs). Under these rules, civilian UAVs are limited to 55 pounds and must be operated to ensure they do not interfere with any manned aircraft. It also established that if the UAV is flown within five miles of an airport, the operator must notify the airport operator and the air traffic control tower; however, the operator does not need approval from the air traffic control tower. The operator must also maintain visual line-of-sight with the UAV.

Federal Aviation Administration Small Unmanned Aircraft Rule

Operational rules for use of commercial UAVs were put into effect by the FAA on August 29, 2016. The rule, 14 CFR Part 107, provides operating requirements, including maintaining a visual line-of-sight and getting approval from the air traffic control tower before operating in Class B, C, D, and E airspace. It also sets operational limitations, including a weight limit of 55 pounds, speed limit of 100 miles per hour, and height limit of 400 feet. Recreational UAVs do not require certification and the rules do not apply to model aircraft.

Part 107 also establishes pilot certification and responsibilities, requiring either a certified UAV pilot, or the supervision of a certified UAV pilot, to operate a UAV.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) of 1969 is a federal regulation that established a U.S. national policy promoting the protection and enhancement of the environment. It requires federal agencies to analyze and consider the potential environmental impact of their actions. The purpose of NEPA is to promote informed decision-making by federal agencies by providing detailed information concerning significant environmental impacts to ecological and natural resources and the human environment, such as community character, public health and safety, and cultural resources.

All federal agencies, including the military, and projects receiving federal funding require NEPA compliance and documentation prior to receiving a permit, approval, or funding. For Redstone Arsenal's purposes, NEPA requires that the military review the potential impact of proposed actions on the environment, including surrounding civilian communities, and measures to reduce, avoid or mitigate identified adverse environmental impacts. Not all federal actions require a full Environmental Impact Statement (EIS). In cases where an action may not cause a significant impact, the agency would be allowed to produce a less detailed Environmental Assessment (EA) and make a Finding of No Significant Impact (FONSI).

A NEPA document can serve as a valuable planning tool for local planning officials. An EA can assist in the determination of potential impacts that may result from changing military actions or operations and their effect on municipal policies, plans and programs, and the surrounding community. If the EA finds there will be no significant impacts, a Finding of No Significant Impact (FONSI) will be issued. If the EA finds the proposed changes to military actions and operations will create significant impacts, an EIS will be prepared to further detail and outline the impacts upon the environment to the public. An EIS will result in a Record of Decision (ROD) that explains the decision made



based on the information presented in the EIS, describes the alternatives considered, and outlines mitigation and monitoring plans.

Noise Control Act of 1972

The Noise Control Act of 1972 identified that noise not adequately controlled has the potential of endangering the health and welfare of people. It states that all Americans are entitled to an environment free from noise that can jeopardize their general health and quality of life. Along with state, local, and territorial governments, actions from the federal government were needed to ensure that the objectives of the Act were met.

Concurrently, military installations were experiencing the impacts from encroaching urban development located adjacent to the installation and the resulting complaints regarding noise from military flight operations. The DOD responded by establishing the AICUZ program.

The Noise Control Act and the AICUZ program are essential because encroaching development and increased population near military installations often create compatibility concerns. As communities grow, it is important that the military installation, developers, and the communities work together to mitigate the issue of noise and develop ways to coexist.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) is the main federal law that ensures the quality of drinking water in the United States. The SDWA authorizes the EPA to set national health-based drinking water standards to protect against both naturally-occurring and man-made water contaminants. The SDWA applies to every public water system in the US. A reliable and clean water source is necessary for any population center to function and grow. A decrease in the quality of the drinking water in the Study Area may decrease the amount of people that can reside in the region. If a reliable and clean water source is not available to Redstone Arsenal, it may impact mission activities.

Redstone Arsenal Plans and Programs

The Redstone Arsenal plans and programs provide guidance for land uses and development activities specific to Redstone Arsenal. These tools govern land use decisions that occur inside the fence line or within the boundary of the Redstone Arsenal operational footprints in relation to the military missions. These tools provide guidance and establish measures for standard operating procedures during certain events such as weapons testing and aircraft operations. There are various installation tools that are instrumental in assisting and guiding land use decisions as they relate to the military mission.

Wildlife Aircraft Strike Hazard Plan

Redstone Arsenal has prepared a Wildlife Aircraft Strike Hazard (WASH) Plan, titled Redstone Arsenal Pamphlet 385-90-1, through its Safety Management Program to minimize the threat of bird strikes to aircraft and protect local wildlife. The plan is based on hazards from both resident and seasonal wildlife populations that have the potential to cause safety hazards to aircraft operations, either in the air or on the ground. Implementation of specific actions within the plan is continuous, while other recommendations are implemented as required by wildlife activity. These measures are especially significant to support helicopter operations conducted at Redstone Arsenal. The WASH Plan is designed to increase awareness, promote safety, establish procedures, and increase coordination with other agencies to mitigate wildlife aircraft strike hazards. The WASH Plan calls for a Wildlife Hazard Working Group (WHWG) and outlines its responsibilities while establishing procedures to identify high hazard situations and their mitigation. The WASH Plan also addresses procedures for reporting incidents when they do occur. All damaging and non-damaging wildlife strikes are reported to the WHWG for assessment and cataloguing.

Hazardous Waste Permit

Redstone Arsenal operates under an Alabama Department of Environmental Management Hazardous Waste Permit (Permit # AL7 210 020 742). This permit stipulates criteria for how Redstone Arsenal manages its hazardous waste activities on the installation such as waste management in the Compliance Branch, hazardous waste cleanup activities in the Restoration Branch, energetic treatment of waste munitions by open burn and open detonation, and the treatment and disposal of recovered munitions or other items that may contain chemical agent or industrial chemical fills. This permit also references other installation wide environmental management documents and protocols such as the Installation Wide Groundwater Interim Record of Decision, which regulates and ensures that no groundwater on Redstone Arsenal can be used for potable water use and recommends that surrounding communities, especially to the east, west and south, not use groundwater / well water for potable water use. Redstone Arsenal has submitted a Memorandum of Agreement (MOA) to the City of Huntsville, City of Madison, and Town of Triana requesting that they not allow wells to be installed near the installation's boundaries due to potential groundwater contamination.

Integrated Natural Resources Management Plan

As authorized by the Sikes Act, an Integrated Natural Resource Management Plan (INRMP) provides the opportunity for the proper inventorying, cataloging, and management of natural resources found on U.S. government-managed lands. The DOD must complete INRMPs for each installation every five years to update the needs of local natural resource management policies. These policies effect all aspects of an installation's physical environment, including water quality, biodiversity, ecosystem and habitat quality, and mineral resources. These plans create the opportunity for the DOD and local base commanders to work with other federal, state, and local agencies to properly manage significant local resources for the maximization of compatible mixed use.

The INRMP outlines the various natural resources and addresses other related topics including important habitat found on the installation, soil types, management of noxious weeds and wildland fire, wildlife and riparian management, water resources and water rights, inter-agency responsibilities and coordination efforts. It also provides the overall management plan for natural resources on Redstone Arsenal to ensure no loss of capability for military training exercises.

State of Alabama Plans and Programs

The State of Alabama plans and programs provide further assistance and protection of land uses in the State of Alabama. The tools authorize or mandate local counties and cities to provide for the protection of the state's valuable industries including the DOD and agriculture. In addition, the state's plans and programs require communities and developers to protect and preserve the state's natural resources, including land and water, by establishing further regulatory measures to ensure the natural environment is preserved and protected from over-consumptive practices.

Alabama Military Stability Foundation

The Military Stability Foundation is a private, non-profit foundation that assists sustainability and expansion of military bases and their surrounding communities. The primary goal of the Military Stability Foundation is to create and help implement processes and plans to develop strong collaborative association, to secure present and future economic stability due to military installations in Alabama, and to assist with any future Base Realignment and Closure. The Military Stability Foundation has a leading Board of Directors that are representatives of areas that maintain large footprint of defense concentration.

Due to the goal of sustaining and expanding military installations and the benefits they provide to the surrounding communities the Alabama Defense Industry Diversification Analysis Project Overview 2017 (ADIDAP) was developed. There are two main tasks associated with the ADIDAP, promoting a sustainable defense industrial base mapping tool



and providing market diversification services to the defense-dependent organization. To be successful in these endeavors, the Military Stability Foundation assist many businesses that were to start or expand in Alabama that will benefit the military Installations that are in Alabama.

Military Land Use Planning Act

The Military Land Use Planning Act of 2014 is codified in Title 11, Article 3, Chapter 106, Sections 11-106-1 through 11-106-5 in the Code of Alabama. The Act states that local governments should “cooperate with military installations located within the state in order to encourage compatible land use, help prevent incompatible encroachment upon military installations, and facilitate the continued presence of major military installations within the state”. The legislation requires local governments whose jurisdictional boundaries are within two miles of a military installation to notify affected installations of proposed land use changes and to allow installations 30 calendar days to comment on proposed land use changes and before any final action is taken or any public hearing is scheduled.

The Act was amended to add Section 11-52-8 of the Alabama Code, which requires municipalities to acknowledge and show military installations in any master plans and relevant maps that are adopted by municipal planning commissions.

Regional Plans and Programs

Huntsville Area Metropolitan Planning Organization

The Huntsville Area Metropolitan Planning Organization (MPO) plans and programs all transportation plans and projects, including federal projects for the Huntsville Urbanized Area. The transportation projects listed in the Transportation Improvement Program and the Long-Range Transportation Plan adopted by the Huntsville Area MPO. The Huntsville Area MPO has a Redstone Arsenal Technical Coordinating Committee member to assist with technical support of all transportation documents processed.

The Huntsville Area MPO operates under a signed agreement for the transportation planning process of the Huntsville Urbanized Area. The agreement that was updated in 1995 and signed by Madison County; the municipalities of Huntsville, Madison, Owens Cross Roads, and Triana; the State of Alabama; and the Top of Alabama Regional Council of Governments, and indicates that the Huntsville Urbanized Area will carry out a 3-C (cooperative, comprehensive, and continuing) transportation planning process. The 3-C provides for coordination with the planned development of the Huntsville Urban Area, allowing the designated jurisdictions to qualify for federal funding assistance for transportation improvements.

North-central Alabama Regional Council of Governments

The North-central Alabama Regional Council of Governments (NARCOG) serves the counties of Cullman, Lawrence, and Morgan. Originally created in 1966 as the North Central Alabama Regional Planning and Development Commission, NARCOG was re-established with its new name and subsequently certified on November 1, 1971. NARCOG operates under the authority of Section 3 of Act No. 1126 of the 1969 Regular Session of the Legislature of Alabama. Providing regional planning and development commissions that allow comprehensive planning that assesses regional needs, resources, and development opportunities and formulating goals, objectives, policies, and standards that guide multiple developmental factors such as physical, economic, and human resources.

North-central Alabama Rural Planning Organization

The North-central Alabama Rural Planning Organization (NARPO) is the interface between rural elected officials and the ALDOT determining transportation issues. The NARPO serves Cullman, Lawrence, and Morgan counties. The activities of NARPO are financed in part by the U.S. Department of Transportation, Federal Highway Administration, the Federal

Transit Administration, the Alabama Department of Transportation, and was created by the North-central Alabama Regional Council of Governments (NARCOG) to fulfill federal and state requirements. The NARPO is committed to ensuring public participation in the development of all transportation plans and programs and that the transportation planning process is accessible, transparent, and inclusive as stated in the North-central Alabama RPO.

Tennessee Valley Regional Growth Coordination Plan

The Tennessee Valley Regional Growth Coordination Plan (TVRGCP) has been developed to determine the impacts of the 2005 BRAC process on the region. The 1988 BRAC had no impact on operations at Redstone Arsenal. The 1991 BRAC Commission recommended moving 1,200 positions from Rock Island to Redstone Arsenal, a decision that was reversed by the BRAC Commission in 1993. The 1995 BRAC process, however, resulted in the realignment of the Army's Aviation Command and affiliated components (and 1,600 jobs) from St. Louis to Redstone Arsenal. An estimated 3,000+ military contractors' jobs also relocated to the greater Huntsville area in the wake of the consolidation of the Aviation Command with the Missile Command.

This report is intended as an aid to planners, managers, elected officials, and other decision-makers in the Tennessee Valley / Redstone Arsenal region. The aim is not to dictate what should be done, but to assist in ongoing efforts to achieve goals and objectives identified and valued by the residents of the region. The recommendations presented in the TVRGCP are suggestions that allow assessing efficiency for the region to work towards goals and objectives that are beneficial for the region.

Top of Alabama Regional Council of Governments

The Top of Alabama Regional Council of Governments (TARCOG) was established through a local initiative in 1968 and serves the counties of DeKalb, Jackson, Limestone, Madison, and Marshall. The TARCOG's membership is made up of representatives from the five counties and the municipalities within them, including elected officials, community leaders, business owners, and private citizens. The TARCOG's main function is to identify and address common regional issues, opportunities, and challenges within the five counties and their municipalities. It supports its member communities by providing a wide range of regional planning services such as community planning (including comprehensive plans and small area plans), environmental planning, and transportation planning.

Top of Alabama Rural Planning Organization

The Top of Alabama Rural Planning Organization (RPO) serves as the decision-making organization that provides guidance for conducting planning processes for DeKalb County, Jackson County, portions of Limestone County, and Marshall County in northeast Alabama. The RPO was required to be created in 2003 due to new regulations requiring a consultation process for transportation planning. The RPO is comprised of three committees as follows:

- **Policy Committee.** Serves as the official decision-making body that handles the responsibilities of providing overall guidance to the planning process, review and approval of all process plans and programs, and appointing Technical Advisory Committee and citizens Advisory Committee members.
- **Technical Advisory Committee.** The Technical Advisory Committee provides technical support to the Policy Committee.
- **Citizens Advisory Committee.** The Citizens Advisory Committee provides active public participation for the transportation planning process.



City of Huntsville

Zoning Ordinance

The City of Huntsville's Zoning Ordinance adopted in 1963 and was recompiled in 1989. The current zoning ordinance includes amendments adopted through November 2016. The ordinance is meant to promote the public health, safety, morals, convenience, order, prosperity, and general welfare of the City of Huntsville. It establishes 39 zoning districts for land within the city, some of which are special districts such as the Airport Obstruction and Noise Exposure District. Many of these districts relate to different densities or uses of a similar type of land use. For example, there are nine districts that focus on residential uses and five districts that focus on research parks.

The zoning ordinance includes an Airport Obstruction and Noise Exposure District (Article 63), but this only relates to land around the Huntsville-Madison County International Airport and does not address potential conflicts for safety, height, and noise related to operations at the Redstone Army Airfield. Redstone Army Airfield has impact zones that go outside of the installation boundaries that would benefit from a zoning overlay district to regulate incompatible land uses as well.

Article 73.20 relates to the requirements for siting and constructing wireless telecommunications towers. This article states that the heights of towers must be in compliance with Federal Aviation Administration and Federal Communications Commission regulations, and section 73.20.7 establishes a maximum height of towers in non-residential districts of 180 feet. This height is generally compatible with aircraft operations outside of Redstone Arsenal, except for land located in parts of the approach and departure corridors for Redstone Army Airfield.

City of Madison

Madison Comprehensive Plan

The City of Madison Comprehensive Plan was adopted in 1995 and has had policy revisions through August 2006. The City developed several other plans that are incorporated into the Comprehensive Plan, including the 2025 Major Street Plan, Greenway & Trails Master Plan (2003), Parks and Recreation Master Plan (2014), and West Side Master Plan (2016), and completed an update to its Street Plan in the form of a 2040 Transportation Master Plan in May 2018. The Comprehensive Plan and its related elements provide a snapshot of the existing conditions within the city and future projections for growth, including policies for growth and new development, infrastructure, roadways, etc. it is linked closely to the city's Zoning Ordinance as well.

Zoning Ordinance

The Official Zoning Ordinance of the City of Madison, Alabama was most recently revised in July 2018. The intent of the zoning ordinance includes promoting the health and general welfare of the general public, lessening congestion in the streets, preventing overcrowding of land, and facilitating the adequate provision of public infrastructure. It establishes 24 districts within the city, eight of which relate to different types and densities of residential.

Section 5-13A provides regulations for siting of wireless communications towers and section 5-13C provides regulations for broadcast / TV / radio towers. Section 5-13A-11 identifies a maximum height for telecommunications towers of 300 feet and section 5-13C-9 identifies a maximum height for broadcast towers of 300 feet. This height is generally compatible with aircraft that operate outside of Redstone Arsenal's boundaries, as long as they are not within the approach and departure corridors for Redstone Army Airfield.

Section 5-17 identifies an Airport Influence Area for all land within the NEF 30 or higher noise contour associated with Huntsville-Madison County International Airport and calls out special requirements within the subdivision regulations. There is no such influence area associated with noise from Redstone Arsenal.

Section 5-21 identifies regulations relating to Airport Obstruction and Clear Zones around Huntsville-Madison County International Airport. This section regulates height and land uses within various areas around the airport such as within the imaginary surfaces. However, this section does not apply to Redstone Army Airfield.

Section 5-22 identifies regulations for outdoor lighting control to increase compatibility of different land uses by minimizing light pollution, glare, and light trespass caused by inappropriate or misaligned light fixtures. Although these regulations do not specifically mention Redstone Arsenal, they help to reduce light pollution through methods such as shielded lighting fixtures, which provides a more desirable night environment for night training operations.



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Compatibility can be defined in relation to military readiness as the balance or compromise between community needs and interests and military needs and interests. The goal of compatibility planning is to promote a collaborative environment in which both

community and military entities communicate, coordinate, and implement mutually supportive actions that allow both parties to achieve their respective objectives. This collaborative approach will serve the basis for the resulting policies and actions recommended by the study.

Several factors determine whether community and military plans, programs, and activities are compatible or conflict with community activities. For this Joint Land Use Study (JLUS), 25 compatibility factors were used to identify, assess, and establish a set of key compatibility issues in the Redstone Arsenal JLUS Study Area that prompted the resulting recommendations in the Implementation Plan. The 25 compatibility factors are shown above.

An action undertaken by either the military or a community that minimizes, hinders, or presents an obstacle to the action of the other is characterized as a compatibility issue. Issues resulting from military and community activities / operations are grouped according to the relevant factor and listed in this chapter. For each identified issue, a compatibility assessment that discusses the nature and cause of the issue is provided, followed by a set of key findings that summarize the compatibility assessment.

COMPATIBILITY FACTORS			
AQ	Air Quality	LU	Land Use
AT	Anti-Terrorism / Force Protection	LEG	Legislative Initiatives
BIO	Biological Resources	LG	Light and Glare
COM	Coordination / Communication	MAR	Marine Environments
CR	Cultural Resources	NOI	Noise
DSS	Dust / Smoke / Steam	PS	Public Services
ED	Energy Development	PT	Public Trespassing
FSC	Frequency Spectrum Capacity	RC	Roadway Capacity
FSI	Frequency Spectrum Impedance / Interference	SA	Safety Zones
HA	Housing Availability	SNR	Scarce Natural Resources
IE	Infrastructure Extensions	VO	Vertical Obstructions
LAS	Land / Air / Sea Spaces	V	Vibration
		WQQ	Water Quality / Quantity



Compatibility Issue Identification and Evaluation

The methodology for the development of Redstone Arsenal JLUS compatibility issues consisted of a comprehensive and inclusive discovery process to identify key stakeholder issues associated with the compatibility factors. During the beginning phase of the project, a week-long stakeholder interview process took place where representatives from various stakeholder groups were interviewed to discuss the JLUS process and identify any compatibility issues they felt were existing or could occur in the future.

Additional compatibility issues were identified through meetings with the JLUS Policy Committee (PC) and Technical Review Group (TRG), at public workshops, and through technical evaluation and related experience by the project consultant. Opportunities for additional stakeholder input were provided through the project website.

Ultimately, the extensive number of opportunities that were provided for the public, local and regional stakeholders, the JLUS committees, and Redstone Arsenal to give input resulted in the identification of key existing and potential future compatibility issues that could impact Redstone Arsenal missions and/or the safety and growth of the community within the JLUS Study Area.

The development of strategies for addressing compatibility issues (see Chapter 6: Implementation Plan) was both directly and indirectly affected by the evaluation process. Issue assessment included determining the severity of each issue's impact(s) on both Redstone Arsenal's missions and the nearby residents' quality of life. In turn, the severity of impact(s) helped determine the strategies that could be applied most effectively. The severity of impacts can also be used to help priorities implementation. The Implementation Plan identifies the responsible party(ies) tasked with complete each strategy and the timeframe for completion.

When reviewing the assessment information that is provided here, it is important to note the following:

- The intent is to provide enough information for stakeholders to be sufficiently aware of and knowledgeable about both issues and potential mitigation strategies to develop specific, viable JLUS recommendations. The discussion is not designed or intended to be utilized as an exhaustive technical evaluation of existing or future conditions within the JLUS Study Area.
- Of the 25 compatibility factors considered, 12 were determined to be inapplicable to this JLUS based on stakeholder / public input and team member background research indicating there are no issues relating to those factors. The 12 inapplicable factors are listed below.
 - Air Quality
 - Anti-Terrorism / Force Protection
 - Cultural Resources
 - Dust / Smoke / Steam
 - Energy Development
 - Frequency Spectrum Impedance / Interference
 - Housing Availability
 - Infrastructure Extensions
 - Legislative Initiatives
 - Marine Environments
 - Public Services
 - Scarce Natural Resources

The following pages provide a summary of the compatibility factors and compatibility issues that were identified for the Redstone Arsenal JLUS. More information on each of the issues and how they impact the military mission or quality of life in the community can be found in Chapter 5, Compatibility Assessment of the JLUS Background Report. The recommendations in Chapter 6, Implementation Plan of this JLUS were developed to address the following compatibility factors.

Biological Resources (BIO)

Biological resources include federal and state listed species (threatened and endangered species) and their habitats. These resources may also include areas such as wetlands and migratory corridors that are critical to the overall health and productivity of an ecosystem. The presence of sensitive biological resources may require special development considerations and should be included early in the planning process. The following Biological Resources issue was identified.

- **Threatened and endangered species on Redstone Arsenal could limit operations**

The presence of federally-listed threatened and endangered species on Redstone Arsenal and in the surrounding region may cause loss in usability of land on the installation to preserve areas for the protection of the species.

Communication / Coordination (COM)

Communication / coordination refers to the programs and plans that promote interagency communication and coordination. Interagency communication serves the general welfare by promoting a more comprehensive planning process, inclusive of all affected stakeholders. Interagency coordination also seeks to develop and include mutually beneficial policies for local communities and the military in local planning documents, such as comprehensive plans. The following Communication / Coordination issues were identified.

- **Channels of communication between Redstone Arsenal and local communities could be enhanced through formalized processes**

Redstone Arsenal and the surrounding communities generally have good communication processes in place, but they are not formalized. This can result in the loss of communication efforts through actions such as staff turnover.

- **Decentralized communication from numerous tenants at Redstone Arsenal complicates information sharing between the installation and the surrounding communities**

There are 78 various tenants on Redstone Arsenal, each with their own procedures and communication processes. While the Redstone Arsenal Garrison has a Public Affairs Office that shares general information with local communities, there is no consolidated coordination and communication effort between all the various tenants on Redstone Arsenal and the local communities.

- **Limited formal communication between Redstone Arsenal and Huntsville International Airport**

Although air traffic controllers at Redstone Arsenal and Huntsville International Airport communicate with each other for safe and effective coordination of aircraft operations, there is no formal communication process in place between the management entities at the two facilities.



■ **Improved external communication with communities on Redstone Arsenal operations**

There is a desire in the surrounding community for better communication from Redstone Arsenal about the types of activities that occur on the installation, particularly activities that generate noise and vibration and their potential impacts.

Frequency Spectrum Capacity (FSC)

Frequency spectrum refers to the range of electromagnetic waves capable of carrying signals for point-to-point wireless communications. In a defined area, the frequency spectrum is limited, and increasing demand for frequency bandwidth from commercial applications such as cellular phones, computer networking, GPS units, and mobile radios, is in direct competition with the capacity that is needed to maintain existing and future missions and communications on installations. The following Frequency Spectrum Capacity issue was identified.

■ **Community concerns for wireless device interference**

Members of the public who live in communities surrounding Redstone Arsenal have expressed some concerns regarding interference with their wireless devices, including cell phone interruptions. Competition for use of the frequency spectrum has increased in recent decades due to growth in wireless communication devices and other technology enhancements.

Land / Air Space Competition (LAS)

The military manages or uses land, air, and sea space to accomplish testing, training, and operational missions. These resources must be available and of a sufficient size, cohesiveness, and quality to accommodate effective training and testing. Military and civilian air and sea operations can compete for limited air and sea space, especially when the usage areas are in close proximity to each other. Use of this shared resource can impact future growth in operations for all users. While this JLUS assesses land and airspace competition, due to Redstone Arsenal's location, there is no sea space competition. The following Land / Air Space Competition issues were identified.

■ **Limited land capacity and time availability of range usage to accommodate all testing needs**

There is not enough land space available on Redstone Arsenal to accommodate all the testing needs associated with long-range components. Additionally, there is not enough test range availability for all the testing needs. This results in testing operations having to be conducted at other installations.

■ **Environmental aspects on Redstone Arsenal limit developable land and could limit future operations**

Federal and state requirements to maintain and preserve wetlands can limit the use of certain wetland areas on Redstone Arsenal from being used for development or mission operations.

■ **Concerns related to elements of Redstone Arsenal tenants being located off-installation**

There are components of the Redstone Arsenal tenants that are located off the installation within building space in the City of Huntsville and other outlying areas. The use of off-site facilities can cause disconnects between the components that are on the installation and those that aren't.

■ **Potential for conflict with operations and unmanned aerial vehicle (UAV) operations around Redstone Arsenal**

As UAVs become more common and more accessible for public and commercial use, there is the potential for an increase in public UAV activities to occur in Huntsville and the region surrounding Redstone Arsenal that may conflict with operations and testing at the installation.

Land Use (LU)

Land use planning and regulation is situated in the government's role in protecting the public's health, safety, and welfare. Local jurisdictions' comprehensive plans and zoning ordinances can be the most effective tools for preventing or resolving land use compatibility issues. These tools ensure the separation of land uses that differ significantly in character. Land use separation also applies to properties where the use of one property may adversely impact the use of another. For instance, industrial uses are often separated from residential uses to avoid impacts from noise, odors, and lighting. The following Land Use issues were identified.

- **Development of land adjacent to Redstone Arsenal's boundary has caused encroachment, and there is potential for more encroachment in the future**

There is a large amount of existing development adjacent to Redstone Arsenal's boundaries on several sides of the installation. This has reduced operational capabilities and/or forced incompatible operations, such as those that cause noise or vibrations, to move. Any future development close to the installation boundary will increase the impacts.

- **Interstate 565 interchange modification could cause encroachment to installation**

Modification of the I-565 and Madison Boulevard interchange just north of Redstone Arsenal could impact land uses on the installation, such as an airfield beacon and Army Space and Missile Defense Command buildings. Additionally, new development outside the installation around the interchange may encroach upon the installation.

- **Development of Exploration Park should be compatible with Redstone Arsenal**

Development of Exploration Park will include land that is currently within the fenced boundary of Redstone Arsenal. The development will require coordination among all parties to ensure compatibility.

Light and Glare (LG)

This compatibility factor refers to man-made lighting (street lights, airfield lighting, building lights) and glare (direct or reflected light) that disrupts vision. Light sources from commercial, industrial, recreational, and residential uses at night can cause excessive glare and illumination, impacting the use of military night vision devices and aircraft operations. Conversely, high intensity light sources generated from a military area (such as ramp lighting) may have a negative impact on the adjacent community. The following Light and Glare issues were identified.

- **Lighting impacts to night vision device operations and certain flight operations**

Helicopter pilots using night vision technology experience degradation in the functionality of the night vision equipment and other impacts from lighting in the local communities, particularly along the approach corridor to Redstone Army Airfield.

- **Certain Redstone operations create light impacts on the local community**

Some nighttime operations at Redstone Arsenal, such as dropping flares from helicopters, creates light that can impact the local community if near residential development.



Noise (NOI)

Sound that reaches unwanted levels is referred to as noise. The central issue with noise is its impact, or perceived impact, on people, animals (wild and domestic), and general land use compatibility. Exposure to high noise levels can have a significant impact on human activity, health, and safety. The decibel (dB) scale is used to quantify sound intensity. To understand the relevance of decibels, normal conversation typically occurs at 60 dB, while an ambulance siren from 100 feet away is about 100 dB. Noise associated with military operations (arrival / departure of military aircraft, firing of weapons, etc.) may be in higher dB ranges. The following Noise issue was identified.

- **Operational noise impacts the surrounding community**

Noise generated by operations at Redstone Arsenal can be heard within the local community and may impact residents' quality of life.

Public Trespassing (PT)

This factor addresses public trespassing, either purposeful or unintentional, onto a military installation. The potential for trespassing increases when public use areas are in close proximity to an installation. The following Public Trespassing issue was identified.

- **Potential trespassing on Redstone Arsenal land along the Tennessee River**

Land located on Redstone Arsenal and adjacent to the Tennessee River is accessible to boating craft, which poses challenges for managing trespassing on the installation.

Roadway Capacity (RC)

Roadway capacity references the capacity for existing freeways, highways, arterials, and other local roads to provide adequate mobility between military installations and their surrounding communities.

As urban development expands into rural areas, roads that were primarily used to access agricultural land uses and by limited local traffic begin to function as major arterial roadways. These once rural roads often become the main transportation corridors for all types of traffic—from residential to commercial trucking—and can assist or impede access to military installations. As transportation systems grow and increase in capacity, these systems induce and encourage growth by making rural areas more accessible. The following Roadway Capacity issue was identified.

- **Roadway congestion during peak times**

Local roadways in the communities around Redstone Arsenal experience heavy congestion and traffic delays during peak hours when employees are entering and exiting installation gates. The roadway congestion impacts community members' quality of life.

Safety (SA)

Safety zones are areas in which development should be more restrictive regarding uses by and concentrations of people due to the higher risks to public safety. Issues to consider include aircraft accident potential zones. Military installations often engage in activities or contain facilities that, due to public safety concerns, require special consideration by local jurisdictions when evaluating compatibility. It is important to regulate land use near military airfields to minimize risk from potential aircraft mishaps and to reduce air navigation hazards. To help mitigate potential issues, the Department of Defense has delineated Clear Zones (CZ) and Accident Potential Zones (APZ) near airfield runways. APZs are usually divided into APZ I and APZ II. Each zone was developed based on the statistical review of aircraft mishaps. Studies show that most mishaps occur on or near the airfield, predominately along its extended centerline. The following Safety issues were identified.

- **Existing incompatible development in Redstone Army Airfield accident potential zones is a safety concern and limits future expansion of the runway**

Accident potential zones for Redstone Army Airfield extend outside the northern installation boundary. There is existing incompatible development within the APZs. Future incompatible development could limit the ability to expand the airfield.

- **Presence of wildlife near Redstone Army Airfield causes concerns for aircraft safety**

There is a variety of wildlife that live at Redstone Arsenal and the area around Redstone Army Airfield that causes concern for potential collisions with aircraft operating at the airfield and over Redstone Arsenal.

Vertical Obstructions (VO)

Vertical obstructions are created by buildings, trees, structures, or other features that may encroach into the navigable airspace or that impede line-of-sight radar signals used by the military. These obstructions can be a safety hazard to both the public and military personnel and potentially impact military readiness.

Vertical obstructions can compromise the value of low-level flight training by limiting the areas where such training can occur. These obstructions can include man-made structures, such as telephone poles, utility transmission towers, and radio antennas, as well as natural phenomena, such as tall trees and land features. Vertical obstructions can also interfere with radar transmissions, compromising the integrity of data transmission. Though most critical near the transmitter, the geographic area impacting the transmissions, or radar viewshed, can be broad depending on the distance between the transmitter and receivers. The following Vertical Obstruction issue was identified.

- **Potential for future incompatible development in imaginary surfaces**

The imaginary surfaces associated with Redstone Army Airfield extend outside the boundaries of Redstone Arsenal. There is a potential for future development in the surrounding communities to extend into these imaginary surfaces, which could pose vertical obstruction hazards for aircraft operations.



Vibration (V)

Vibration is an oscillation or motion that alternates in opposite directions and may occur as a result of an impact, explosion, noise, mechanical operation, or other change in the environment. Vibration may be caused by military and / or civilian activities. The following Vibration issue was identified.

- **Vibration concerns in local community**

The local communities around Redstone Arsenal sometimes experience vibrations from activities that occur at the installation. Some property owners have submitted complaints about damage to their property from vibrations caused by activities at Redstone Arsenal.

Water Quality / Quantity (WQQ)

Water quality / quantity concerns include the assurance that adequate water supplies of good quality are available for use by the installation and surrounding communities as the area develops. Water supply for agriculture and industrial use is also considered. The following Water Quality / Quantity issues were identified.

- **Community's concerns with environmental issues related to past activity**

There are environmental and groundwater contamination concerns within the local communities resulting from past activities that occurred at Redstone Arsenal and with the burial of items such as munitions and contaminants that may impact the public health and safety of residents. There is a groundwater contamination plume on the eastern side of Redstone Arsenal.

- **Upstream flooding and debris in waterways that transect Redstone Arsenal**

Local flooding events sometimes cause garbage generated in the local communities to flow onto Redstone Arsenal through waterways such as Indian Creek and McDonald Creek.

This chapter identifies and organizes the recommended courses of action (strategies) that have been developed through a collaborative effort between representatives from local jurisdictions, regional organizations, state and federal agencies, Redstone Arsenal and its tenants, environmental and natural resource agencies, the public, and other stakeholders that own or manage land or resources in the region. Since the Redstone Arsenal JLUS is the result of a collaborative planning process, the strategies represent a true consensus plan; a realistic and coordinated approach to compatibility planning developed with the support of stakeholders involved throughout the process.

The JLUS strategies incorporate a variety of actions that promote education, communication, compatible land use, and resource planning. Upon implementation, existing and potential compatibility issues arising from the civilian / military interface can be eliminated or significantly mitigated. The recommended strategies function as the heart of the JLUS document and are the culmination of the planning process.

It is important to note that the JLUS is not an enforceable plan, but rather a recommended set of strategies which should be implemented by the JLUS stakeholders in order to address current and potential future compatibility issues.

Each of the JLUS strategies that are included in this chapter is meant to address the specific compatibility issues that are described in greater detail in Chapter 5 of the Redstone Arsenal JLUS Background Report document. The issues correspond to the compatibility factors in Chapter 5 of the JLUS Background Report document for easy reference and can be used to read additional information on the specifics of the issues. The issues are identified before each set of associated strategies as a point of reference to what the strategies are addressing.

The key to the implementation of strategies is the establishment of a Redstone Arsenal JLUS Implementation Committee (see Strategy COM-1A) to oversee the execution of the JLUS strategies. Through this committee, local jurisdictions, Redstone Arsenal, developers, and other stakeholders can continue their collaboration to establish procedures, recommend or refine specific actions, and make adjustments to strategies over time to ensure the JLUS continues to resolve key compatibility issues into the future through realistic strategies and implementation. Appropriate local jurisdictions and local stakeholder groups, especially those engaged in a compatibility issue at the local level, will be formally invited to participate as committee members to ensure local input and social inclusion.



Implementation Plan Guidelines

The key to a successful Implementation Plan is balancing the different needs of all involved stakeholders. To produce a balanced plan, several guidelines were used as the basis for strategy development. These guidelines include:

- Recommended strategies must not result in a taking of property value, meaning they do not render the property undevelopable or unable to achieve economic gain by removing all development rights of the property, as defined by state law. The use of eminent domain, defined as a government entity taking private property, with compensation, for public use, is not included in any of the recommended strategies.
- In some cases, the recommended strategies can only be implemented with new enabling legislation.
- In order to minimize regulation, many of the strategies are only recommended within the specific geographic area for which the issue they address occurs (e.g., within the Redstone Arsenal noise contours), instead of recommended for the whole JLUS Study Area.
- Similar to other planning processes that include numerous stakeholders, the challenge is to create a solution or strategy that meets the needs of all parties. In lieu of eliminating strategies that do not have 100 percent buy-in from all stakeholders, it was determined that the solution / strategy may result in the creation of multiple strategies that address the same issue but tailored to individual circumstances.
- Since this JLUS is meant to be a “living document”, and state and federal regulations are subject to change, before implementing one of the suggested strategies included in the Implementation Plan, the implementing jurisdiction or party should ensure there is no conflict between the strategy and any existing local, state, or federal law.

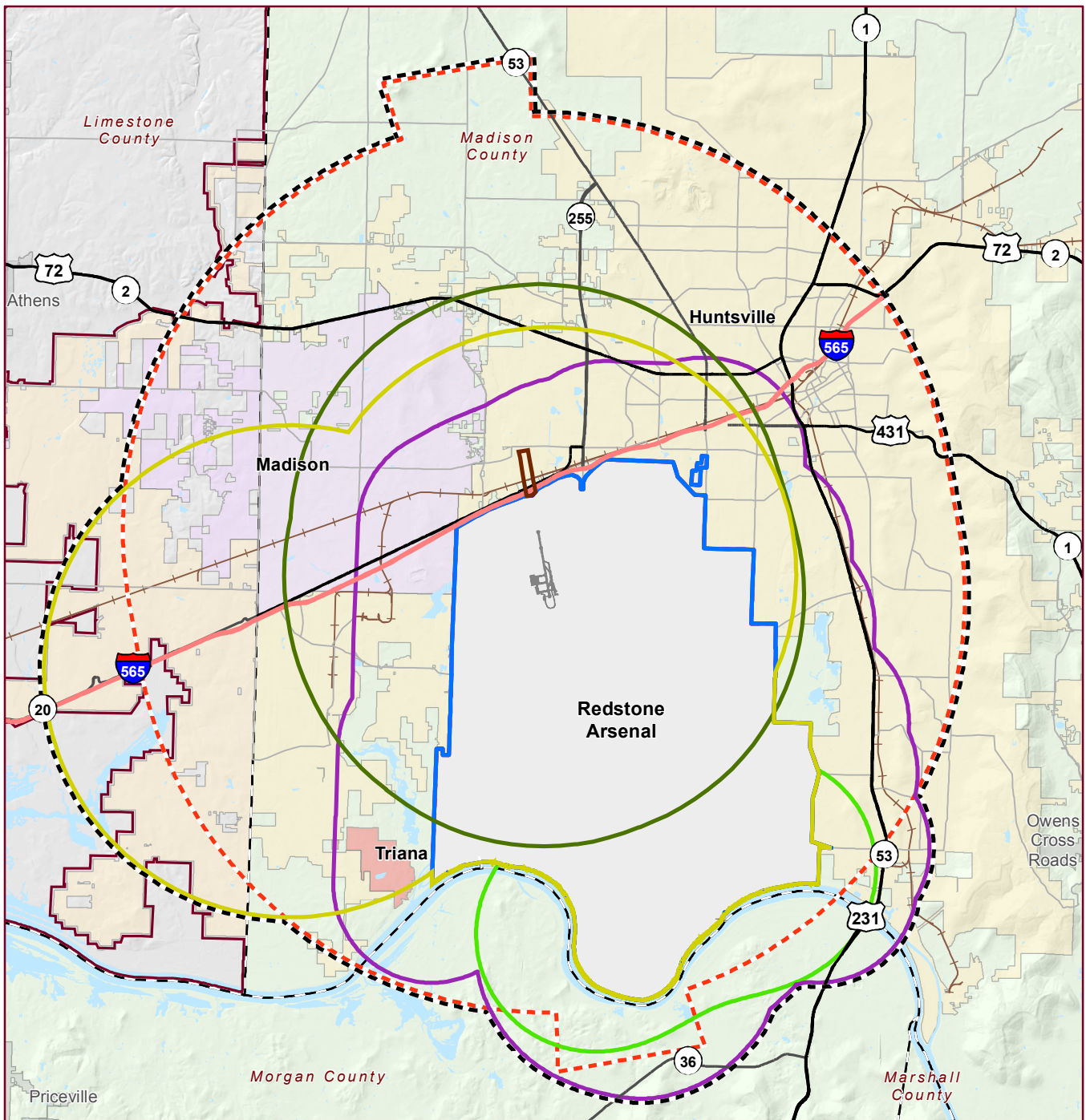
Redstone Arsenal Military Compatibility Areas

For this JLUS, the term Redstone Arsenal Military Compatibility Area (MCA) is used to identify a geographic area where Redstone Arsenal operations may impact local communities, and conversely, where local activities may affect the installation’s ability to carry out its missions. The recommended strategies within the Redstone Arsenal MCAs are designed to accomplish the following:

- Protect public health, safety, and welfare.
- Promote an orderly transition between community and military land uses so that land uses remain compatible.
- Maintain operational capabilities of Redstone Arsenal and its tenants.
- Promote an awareness of the size and scope of military activities to protect areas outside Redstone Arsenal (e.g., critical air space) used for mission operations.
- Inform the local community of compatibility recommendations within the designated areas that are part of this JLUS.

The Redstone Arsenal MCAs are used to define the geographic areas where certain JLUS strategies are to be applied. This technique ensures the strategies are applied to the appropriate areas, and that locations deemed not subject to a specific compatibility issue are not adversely impacted by strategies inappropriate for their location or circumstance. These Redstone Arsenal MCAs are recommended under Strategy LU-1A in Table 5 later in this chapter.

The proposed Redstone Arsenal Composite MCA is an area that incorporates all the individual MCAs. The Redstone Arsenal Composite MCA is illustrated on Figure 16. The individual MCAs are described on the following pages and illustrated on Figures 17 through 22.



Legend

- | | | | |
|--|-----------------------------|---------------------|------------------------|
| Redstone Arsenal Composite MCA | Vertical Obstruction MCA | Redstone Arsenal | Interstate |
| Wildlife Aircraft Strike Hazard MCA | Unmanned Aerial Systems MCA | City of Huntsville | US Route |
| Safety MCA | Noise MCA | City of Madison | State Route |
| Alabama Military Land Use Planning Act MCA | | Town of Triana | Major Road |
| | | JLUS County Partner | Railroad |
| | | Other City / Town | Water Body |
| | | County Boundary | Redstone Army Airfield |



Source: Redstone Arsenal, 2017



Figure 16
Redstone Arsenal Composite Military Compatibility Area



Redstone Arsenal Safety MCA (Figure 17)

The Safety MCA defines specific land use types and densities /intensities that are compatible in areas outside Redstone's boundary and within the existing and potential future Accident Potential Zones (APZs) I and II for Redstone Army Airfield's runway. Redstone Arsenal has plans to extend the runway in the future, which would extend the existing APZs further beyond the installation boundaries. In order to prevent potential incompatible development, areas that fall within the future APZs should be protected now in support of future expansion. Additionally, protecting the potential future safety zones will also protect the existing safety zones. Each accident potential zone (APZ) would be a subzone of the Safety MCA. The Safety MCA is illustrated on Figure 17 and extends past the northern boundary of Redstone Arsenal into the City of Huntsville.

The Safety MCA is needed to prevent the development of incompatible land uses in areas with the greatest potential for an aircraft mishap. These safety zones were identified as a result of the military's guidance that defines APZs as areas where an aircraft mishap is most likely to occur (in the unlikely event that one was to occur). The APZs follow departure, arrival, and flight patterns and are based upon analysis of historical data.

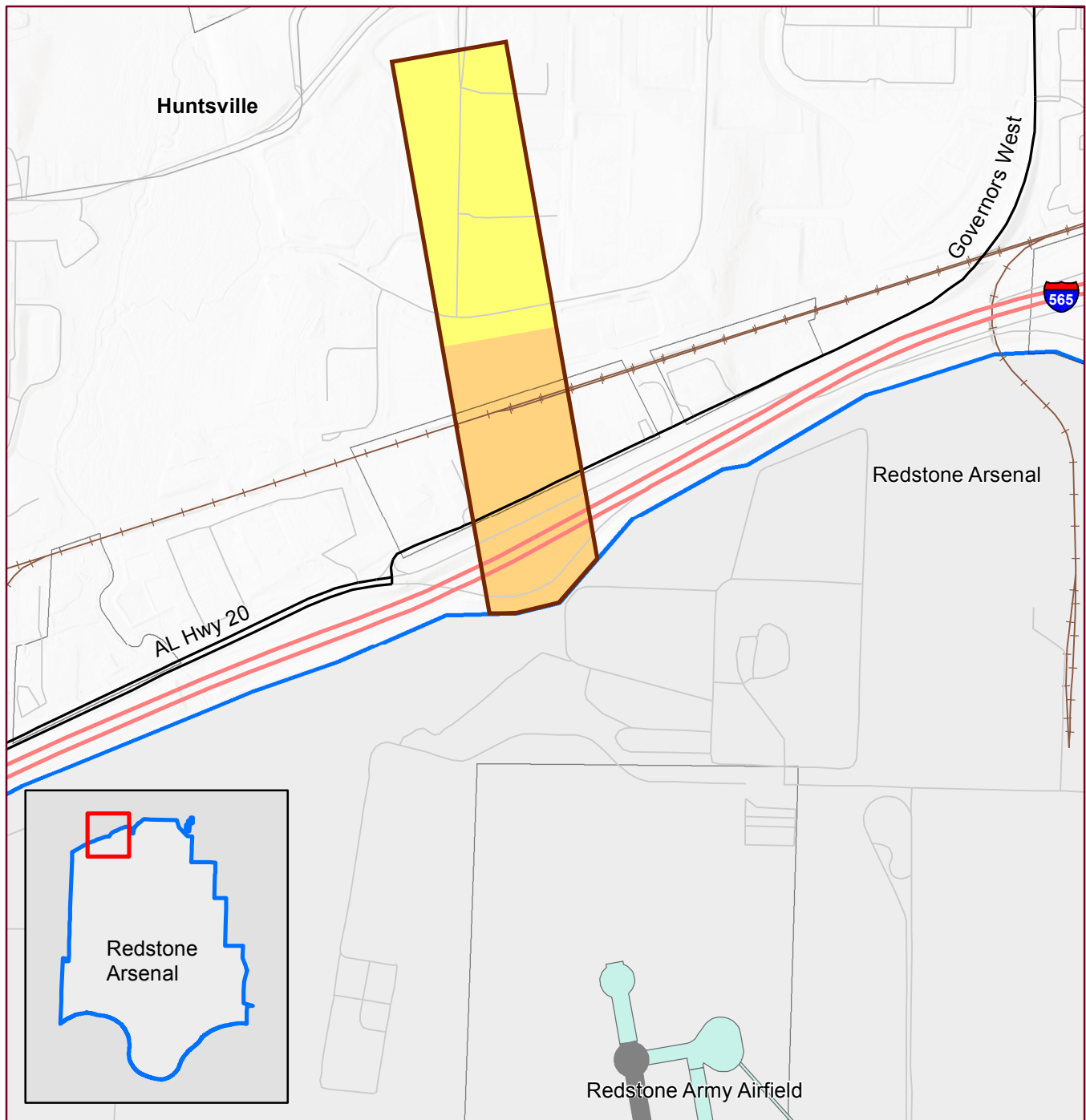
Compatibility guidelines recommend that land uses that concentrate large numbers of people (such as residences, apartments, hospitals, churches, and schools) not be constructed within the APZs. While the likelihood of a mishap is low, the military recommends low density land uses within the APZs to ensure the maximum protection of public health, safety, welfare, and property. Low density single family residential uses (1 to 2 units per acre) can be compatible when located within APZ II. Other generally compatible uses include agriculture, limited intensity office / retail, and light industrial.

Redstone Arsenal Noise MCA (Figure 18)

The Noise MCA includes all land located off-installation and within Redstone Arsenal noise contours for large arms and demolitions, as identified in the most recent Redstone Arsenal Installation Compatible Use Zone (ICUZ) Report. The Noise MCA is illustrated on Figure 18. The Noise MCA extends outside Redstone Arsenal's boundary to the east, including the City of Huntsville, and to the south, including parts of Morgan County and the unincorporated communities of Lacey's Spring and Valhermoso Springs. It is recommended that residential developments and other noise-sensitive land uses within this MCA consider sound attenuation construction measures to reduce interior noise impacts and achieve a maximum interior noise level of 45 dB DNL.

Restrictions within the Noise MCA are important, as without proper sound attenuation to reduce interior sound levels, certain noise-sensitive developments such as homes, schools, healthcare facilities, and churches are considered incompatible where noise levels reach 65 dB DNL or greater. Uses that are compatible within airfield noise contours include office / retail and manufacturing / industrial when interior noise levels are less than 70 dB DNL. If prescribed sound attenuation ordinances are determined not to be necessary in the Noise MCA due to personal preferences of property owners, providing educational materials or real estate disclosures for existing and future property owners and residents can help to alert buyers on the potential for noise impacts in areas close to Redstone Arsenal.

Due to the nature of noise and how it can be affected by factors such as cloud coverage, temperature, and terrain, an additional Noise Awareness Area is included on the Noise MCA map. This area is a two-mile buffer around the boundary of Redstone Arsenal that is meant to include recommendations to advise current and future residents that Redstone Arsenal is an active military installation that may cause noise outside of the identified noise zones that make up the MCA. The two-mile buffer is based on Alabama Military Land Use Planning Act of 2014 distance. The Noise Awareness Area is not meant to be regulatory or include any zoning or building code requirements.



Legend

- | | | |
|-------------------------------------|------------------------------------|------------|
| Safety MCA | Existing Runway / Airfield Surface | Interstate |
| Safety Sub Areas | Proposed Runway / Airfield Surface | US Route |
| Extended Accident Potential Zone I | Redstone Arsenal Boundary | Major Road |
| Extended Accident Potential Zone II | | Local Road |
| | | Railroad |

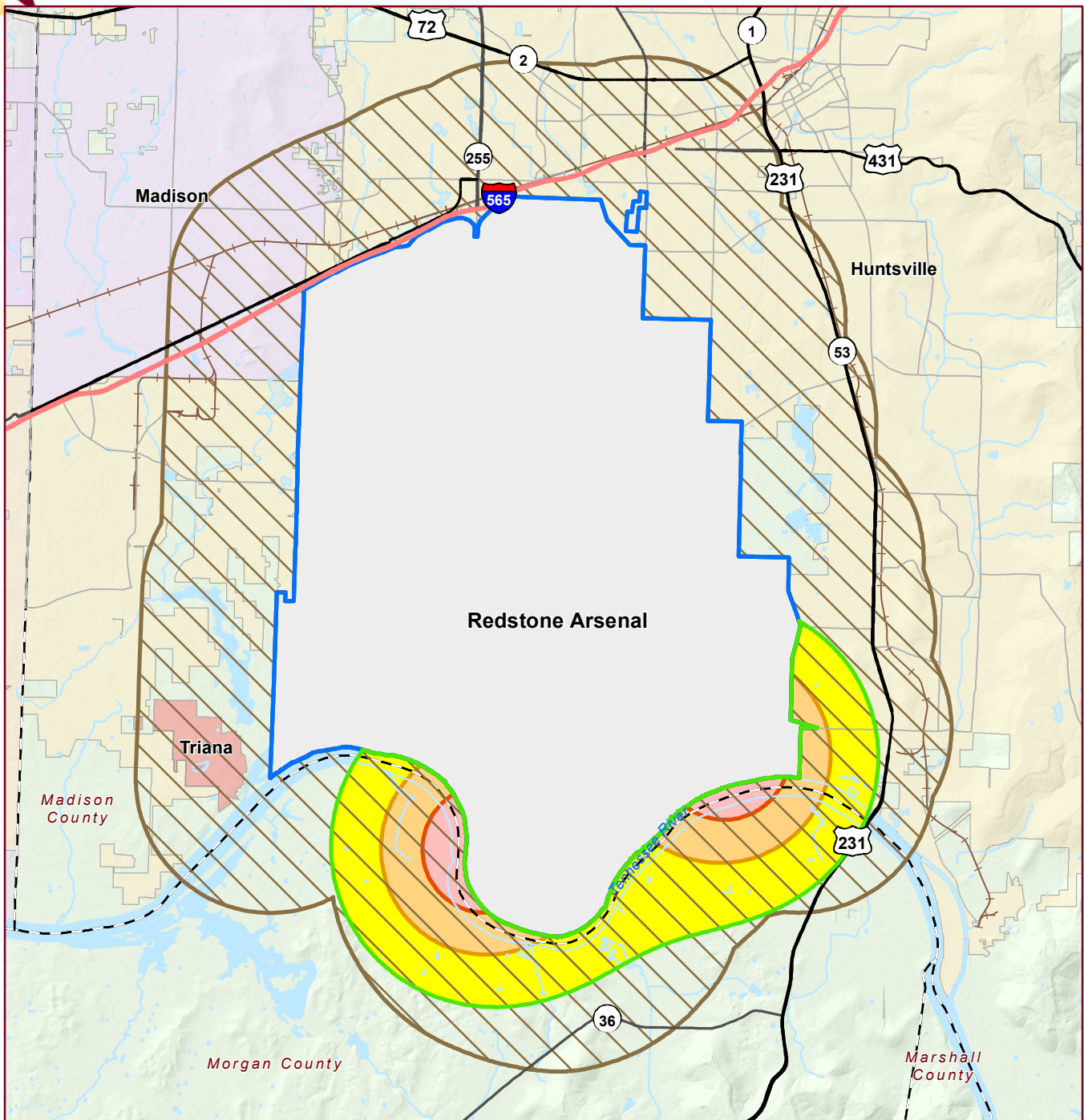


Source: Redstone Arsenal, 2017; Matrix Design Group, 2018.



0 500 1,000
Feet

Figure 17
Redstone Arsenal Safety Military Compatibility Area



Legend

- | | | | |
|--------------------------------|---------------------|-------------|----------------|
| Noise MCA | Redstone Arsenal | Interstate | US Route |
| Noise Awareness Area | City of Huntsville | State Route | Major Road |
| Noise Sub Areas | | | |
| LUPZ (57-62 CDNL dB) | City of Madison | Railroad | Stream / River |
| Noise Zone II (62-70 CDNL dB) | Town of Triana | Water Body | |
| Noise Zone III (> 70 CDNL dB) | JLUS County Partner | | |
| | County Boundary | | |

Source: Redstone Arsenal, 2003



Figure 18
Noise Military Compatibility Area

Redstone Arsenal Wildlife Aircraft Strike Hazard MCA (Figure 19)

The primary recommendation made by the Federal Aviation Administration (FAA) is a minimum separation distance between an airfield and wildlife attractants. The minimum separation distance extends five miles out from the entire perimeter of the airfield operations area, including paved and unpaved areas associated with aircraft movement such as runways, taxiways, and aprons. The proposed Wildlife Aircraft Strike Hazard (WASH) MCA (Figure 19) extends for a radius of five miles and encircles the airfield operations area at Redstone Army Airfield. The MCA includes areas near the airfield that would have the greatest aircraft strike hazard concerns if concentrations of wildlife or wildlife-attractant uses were located there. Wildlife strikes with aircraft can pose serious safety threats, including the potential destruction of aircraft and loss of life. Even minor wildlife strikes can result in costly repairs to aircraft and impact training missions. The five-mile distance associated with the WASH MCA is based on FAA recommendations for managing wildlife attractants around runways. Recommendations within this MCA include managing wildlife species, coordination on land use outside of Redstone Arsenal to minimize wildlife concentrations, and developing educational materials for communities and residents on the types of uses that attract wildlife that could pose hazards to aircraft.

Redstone Arsenal Vertical Obstruction MCA (Figure 20)

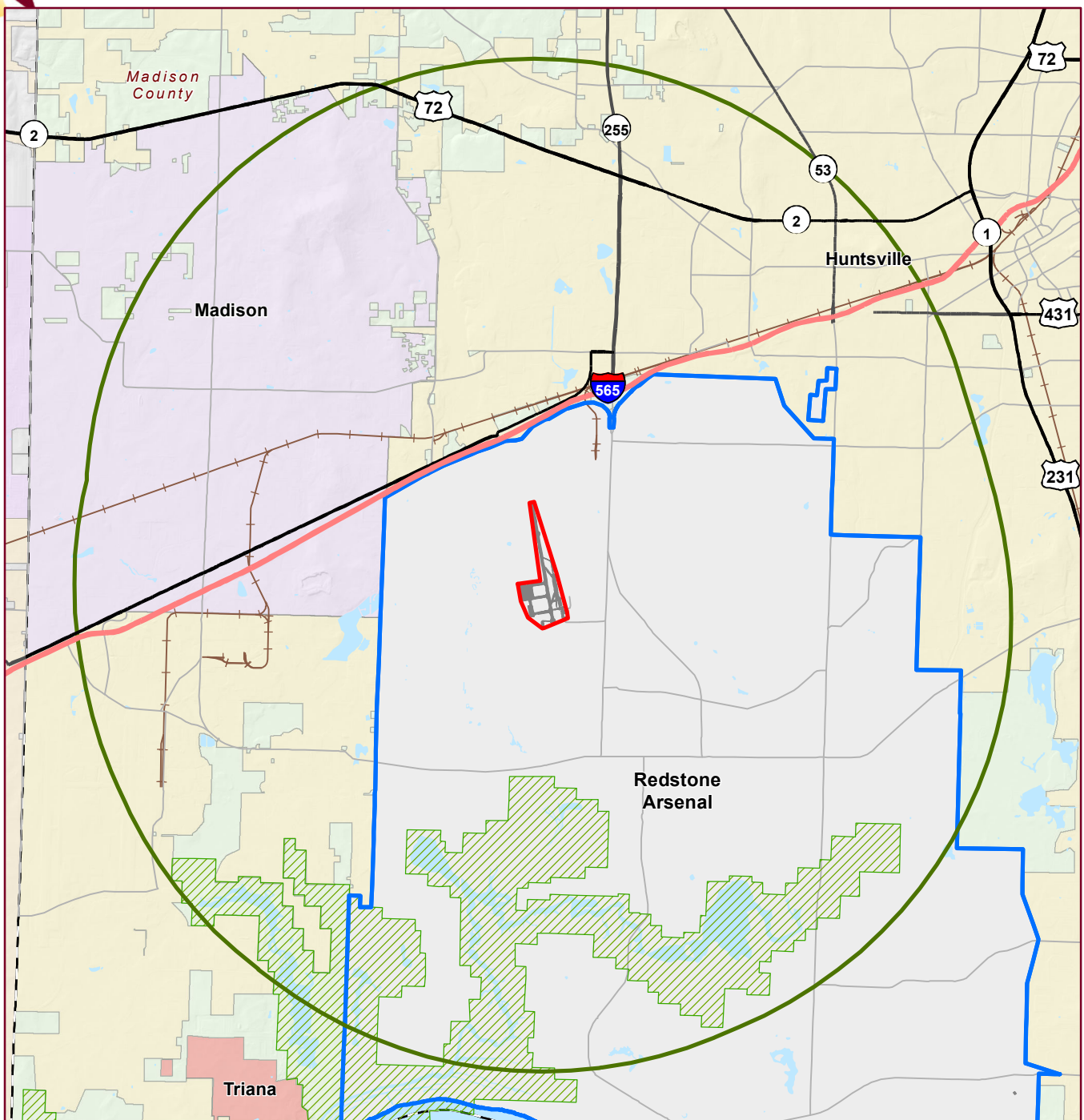
The purpose of the Vertical Obstruction MCA is to monitor and recommend the height of all structures and buildings within the area defined by FAA guidance and DOD instructions known as imaginary surfaces. The imaginary surfaces are 3-D geospatial areas that include approach and departure airspace corridors and safety buffers. The height of buildings and structures is a major concern for flight operations and training due to the potential for a structure to extend into navigable airspace and impede safe flight operations, which can put both pilots and citizens on the ground at risk from an aircraft mishap. Vertical obstructions that can affect flight safety include, but are not limited to, cell towers, power lines, wind turbines, buildings, and trees, depending on their distance from the runway or location within flight paths. The imaginary surfaces are explained in more detail in Chapter 3, Redstone Arsenal Profile in the JLUS Background Report. As shown on Figure 20, this MCA is broken into various sub areas that relate to each of the different imaginary surfaces to monitor and recommend heights of structures based on which imaginary surface the underlying land falls in.

Redstone Arsenal Unmanned Aerial Systems MCA (Figure 21)

The FAA has enacted restrictions and / or bans on UAVs flying over areas such as national parks, military installations, and within a five-mile radius of medium and large airports. As illustrated on Figure 21, the Unmanned Aerial Systems MCA includes two sub areas related to airspace in which the usage of unmanned aerial systems (UASs) is banned or limited in order to reduce unsafe UAS usage near Redstone Arsenal, Redstone Army Airfield, and Huntsville International Airport. The first sub area includes all of the airspace over Redstone Arsenal, and all UAS flights are banned in accordance with FAA regulations. The second sub area has a five-mile radius extending out from both Redstone Army Airfield and Huntsville International Airport. Unmanned aerial systems should not be operated in this second sub area without prior coordination and approval from either Redstone Arsenal or the Huntsville Airport Manager.

Alabama Military Land Use Planning Act MCA (Figure 22)

The Alabama Military Land Use Planning Act of 2014 states that local governments should “cooperate with military installations located within the state in order to encourage compatible land use, help prevent incompatible encroachment upon military installations, and facilitate the continued presence of major military installations within the state.” The legislation requires local governments whose jurisdictional boundaries are within two miles of a military installation to notify affected installations of proposed land use changes and to allow installations 30 calendar days to comment on proposed land use changes before any final action is taken or any public hearing is scheduled. As such, this MCA encompasses all land within two miles of the Redstone Arsenal perimeter (see Figure 22).



Legend

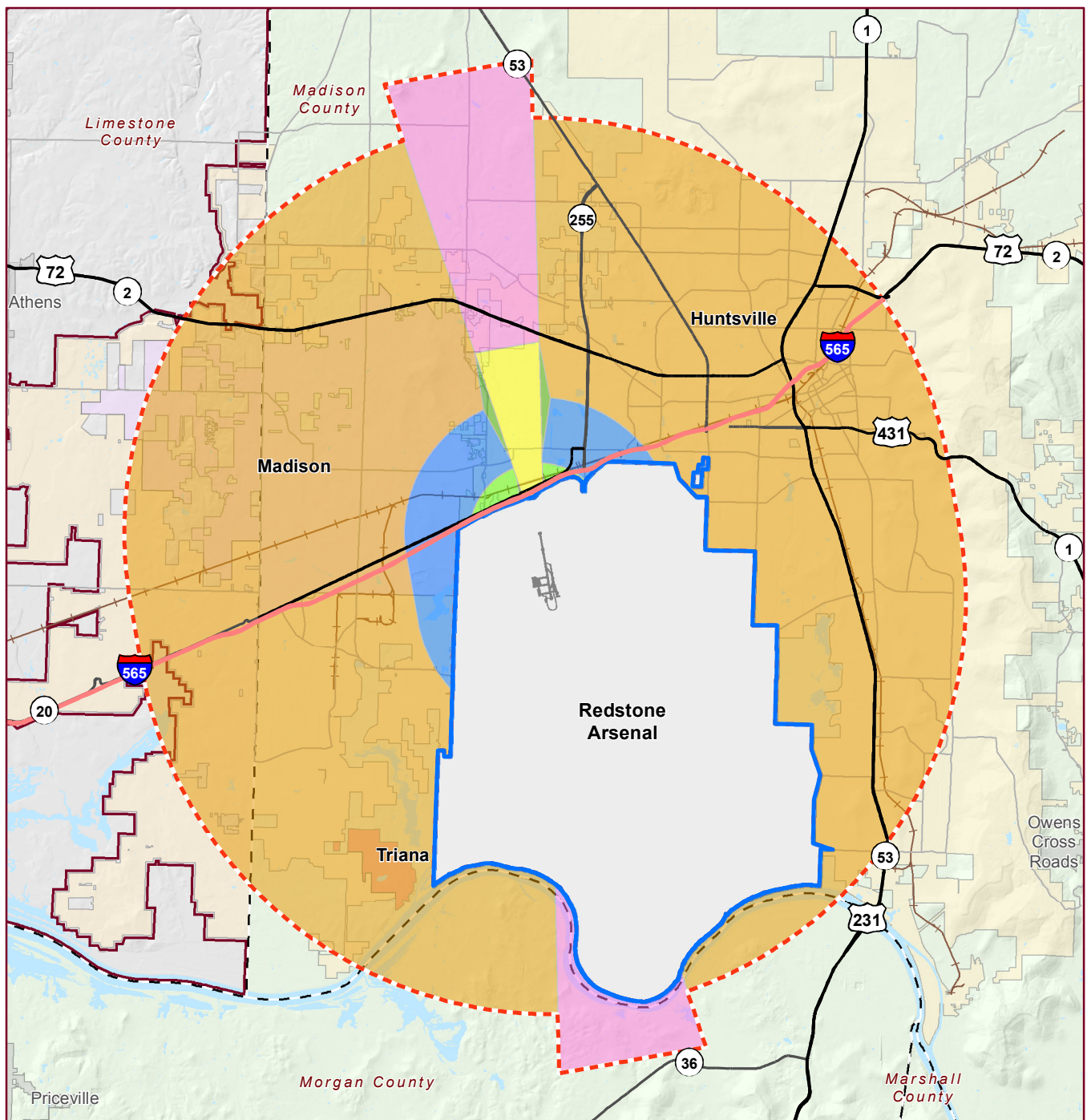
- | | | | |
|-------------------------------------|------------------------|-----------------|------------|
| Wildlife Aircraft Strike Hazard MCA | Redstone Arsenal | County Boundary | Water Body |
| Airfield Operations Area | Redstone Army Airfield | Interstate | |
| | City of Huntsville | US Route | |
| | City of Madison | State Route | |
| | Town of Triana | Major Road | |
| | JLUS County Partner | Railroad | |
| Wheeler National Wildlife Refuge | | | |

Source: Matrix Design Group, 2017



0 1 2 Miles

Figure 19
Wildlife Aircraft Strike Hazard Military Compatibility Area



Legend

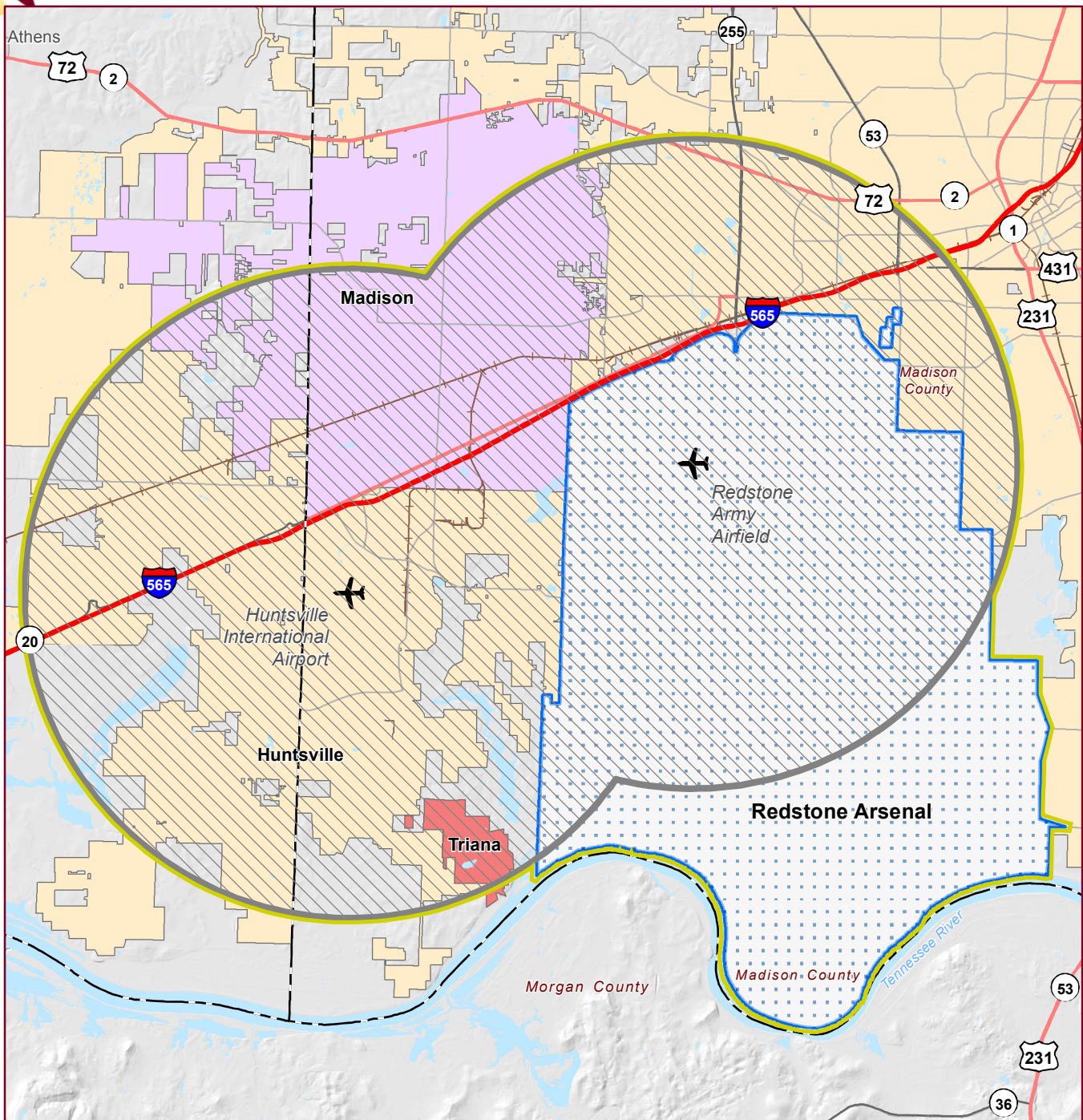
- | | | | |
|---|----------------------------|------------------------|-----------------|
| Vertical Obstruction MCA | Inner Horizontal Surface | Redstone Arsenal | County Boundary |
| Airfield Imaginary Surface Sub Areas | Conical Surface (20:1) | Redstone Army Airfield | Interstate |
| Approach/Departure Clearance Surface (50:1) | Outer Horizontal Surface | City of Huntsville | US Route |
| Approach/Departure Clearance Surface (Horizontal) | Transitional Surface (7:1) | City of Madison | State Route |
| | | Town of Triana | Major Road |
| | | JLUS County Partner | Railroad |
| | | JLUS Study Area | Water Body |
| | | Other City / Town | |



Source: Redstone Arsenal, 2017



Figure 20
Vertical Obstruction Military Compatibility Area



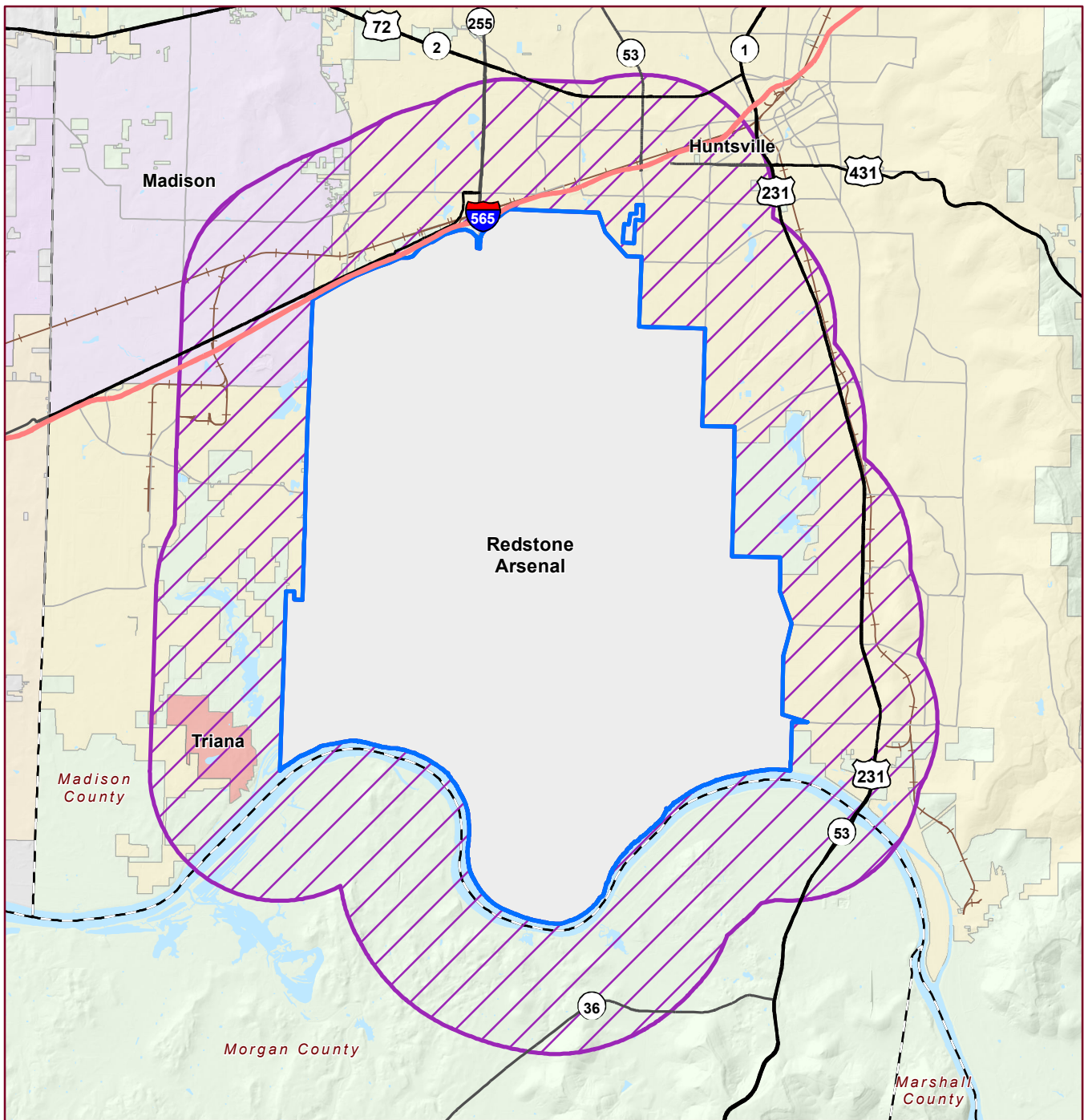
- | | | |
|----------------------------------|--------------------|-------------|
| Unmanned Aerial Systems MCA | Redstone Arsenal | Interstate |
| UAS Sub Areas | City of Huntsville | US Route |
| FAA UAS 5-mile Coordination Area | City of Madison | State Route |
| UAS Flight Restriction | Town of Triana | Major Road |
| | Other City / Town | Railroad |
| | County Boundary | Water Body |



Source: United States Geological Survey, 2017; Matrix Design Group, 2018.



Figure 21
Unmanned Aerial Systems Military Compatibility Area



Legend

- | | | |
|--|------------------|-------------|
| Alabama Military Land Use Planning Act MCA | Redstone Arsenal | Interstate |
| City of Huntsville | US Route | State Route |
| City of Madison | Major Road | Railroad |
| Town of Triana | Water Body | |
| JLUS County Partner | | |
| County Boundary | | |



Source: State of Alabama Military Land Use Planning Act, Act 2014-13, SB80. 2014



0 1 Miles

Alabama Military Land Use Planning Act Military Compatibility Area

Figure 22



How to Read the Implementation Plan

The strategies are designed to address the issues identified during preparation of the Redstone Arsenal JLUS. The purpose of each strategy is to:

- eliminate or reduce existing compatibility issues where possible,
- avoid future actions, operations, or development that would cause a compatibility issue; and
- provide for enhanced and on-going communications and collaboration.

To make the strategies easier to use, they are presented in a table format that identifies the issue, documents the strategy and provides information on when and how that strategy will be implemented. The strategies are arranged to correspond with the applicable compatibility factor. The issue associated with each factor is presented first to provide a linkage between the strategy and the condition it is intended to resolve or minimize. The following paragraphs provide an overview of how to read the information presented for each strategy. Figure 23 illustrates how to read the strategies.

Issue or Strategy ID. The issue ID and strategy ID are unique alpha-numeric numbers that provide a reference for each specific issue and strategy. A strategy's reference number is composed of the Compatibility Issue identification number and this ID. For example, the first communication / coordination compatibility issue is identified as COM-1 and the associated strategies are identified as COM-1A, COM-1B, etc.

Strategy. The strategy title is documented in bold type and describes the strategy. This is followed by the complete strategy statement that describes the recommended action.

Current status "stamps". Some of the strategies include a stamp in the "Issue / Strategy" column. These stamps indicate that this strategy has either been completed during the JLUS process, is in progress of being implemented, or is already on-going. The following defines the status stamp types:



Completed Stamp. This stamp indicates this strategy was identified during the JLUS process and completed before the end of the process concluded.



In Progress Stamp. This stamp indicates this strategy has been initiated by the responsible parties indicated in the table.



On-Going Stamp. This stamp indicates this strategy is currently on-going by the responsible parties indicated in the table. In addition, this provides awareness that the responsible parties are already implementing the strategy.

Redstone Arsenal MCA. This column indicates the applicable Redstone arsenal MCA in which the strategy should be applied, or if the strategy relates to the whole JLUS Study Area. The Redstone Arsenal MCA geographies for the Redstone Arsenal JLUS strategies are defined in Strategy LU-1A. Some of the strategies are designated as "N/A", meaning that they do not have a specific geography associated with them.

Timeframe. This column indicates the projected timeframe to begin implementation of each strategy. The timeframes describe the year in which a strategy will be initiated or if it is an on-going action.

Short-Term	Strategy proposed for initiation in 2019 (within a year of JLUS completion)
Mid-Term	Strategy proposed to be initiated in 2020 / 2023 (within 2-5 years of JLUS completion)
Long-Term	Strategy proposed to be initiated in 2024 or beyond (6 or more years from JLUS completion)

Responsible Party. On the right side of the table are a series of columns, one for each jurisdiction, Redstone Arsenal, JLUS Implementation Committee, or other entity with responsibility for implementing the JLUS strategies. If an entity has responsibility relative to implementing a strategy, a mark is shown under their name. This mark is one of two symbols that represents their role. A solid square (■) designates that the entity identified is responsible for implementing the strategy. A hollow square (□) designates that the entity plays a key supporting role, but is not directly responsible for implementation. The responsible parties are identified by their name or assigned acronym in the heading at the top of each page. There is also an “Other” column in the table. This column is for parties that are not primary JLUS Partners, but may play a role in the implementation of the respective strategy. Parties are identified as responsible or supporting in this column, and are specifically identified by name at the bottom of the Issue / Strategy column. The Implementation Plan is provided in Table 5, organized alphabetically by compatibility factor.



Figure 23. How to Read the Implementation Plan

Strategy #	Issue / Strategy	Timeframe	Redstone Arsenal MCA	Madison County	Marshall County	Morgan County	City of Huntsville	City of Madison	Town of Triana	Redstone Arsenal	JLUS Implementation Committee	Other
COM-1A	<p>Establish a Redstone Arsenal JLUS Implementation Committee</p> <p>Following completion of the JLUS, a Redstone Arsenal JLUS Implementation Committee should be established to maintain efficient and effective coordination among the JLUS Partners and other affected stakeholders, oversee the implementation of JLUS recommendations, and enhance long-term coordination on military compatibility issues. The issues discussed and addressed by this committee will be oriented on land uses and future development within the JLUS Study Area, but may also address other compatibility factors as appropriate. As a starting point, all members of the JLUS Policy Committee and Technical Review Group will be invited to the JLUS Implementation Committee. The list of membership may evolve, and new stakeholder groups may be invited to join as appropriate in the future. The Redstone Arsenal JLUS Implementation Committee should meet on a regular basis as agreed upon by the Committee.</p> <p>To continue the momentum produced through the JLUS process, it is recommended that the City of Huntsville be the lead agency on developing and maintaining the Redstone Arsenal JLUS Implementation Committee.</p> <p>The Committee should review JLUS recommendations and implementation tracking as well as emerging issues from either the community perspective or from Redstone Arsenal to ensure long term military operational utility and compatibility as missions evolve.</p> <p><i>Other Partners: Other stakeholder groups as appropriate to address land use issues</i></p>	Short, On-going	N/A	■	■	■	■	■	■	■		□

Entities included as "Other" are identified at the bottom of the strategy box.

Issue or Strategy ID Number: Alpha-numeric identifier used for reference.

Strategy: Description of the strategy.

Timeframe: Year in which each strategy should be initiated.

- Short-term (2019)
- Mid-term (2020 / 2023)
- Long-term (2024 and beyond)
- On-going

Redstone Arsenal MCA: The geographic area in which each strategy applies.

Responsible Party: The primary and partner responsible agencies. For example, the ■ denotes a primary agency who will take the lead in implementation. The □ denotes a partner agency who will assist the primary agency in implementation.

Table 5. Implementation Plan (Alphabetically by Compatibility Factor)

Strategy #	Issue / Strategy	Timeframe	Redstone Arsenal MCA	Madison County	Marshall County	Morgan County	City of Huntsville	City of Madison	Town of Triana	Redstone Arsenal	JLUS Implementation	Other
BIOLOGICAL RESOURCES (BIO)												
BIO-1	Threatened and endangered species on Redstone Arsenal could limit operations The presence of federally-listed threatened and endangered species on Redstone Arsenal and in the surrounding region may cause loss in usability of land on the installation to preserve areas for the protection of the species.											
BIO-1A	Utilize ACUB to acquire conservation land Redstone Arsenal should consider partnering with local conservation organizations to look at options for conserving listed species habitat through the Army Compatible Use Buffer (ACUB) Program. This may involve coordination with the U.S. Fish and Wildlife Service (USFWS) to identify opportunities for species habitat mitigation bank criteria. Redstone Arsenal and potential ACUB partners should also explore the Regulatory In-lieu Fee and Bank Information Tracking System for guidance on establishing appropriate mitigation and conservation banks for land outside of Redstone Arsenal. <i>Other Primary Partners: Alabama Department of Conservation and Natural Resources (ADCNR), Regional environmental and land preservation organizations</i> <i>Other Supporting Partners: USFWS</i>	Long	N/A							■		■ □
BIO-1B	Protect Environmentally-Sensitive Land through the Sentinel Landscapes Program Seek partnership opportunities with federal, state and local agencies, conservation organizations, and willing private property owners to acquire real property or conservation easements and to provide incentives to protect working agricultural land with intent of sustaining military readiness and protecting valuable natural resources in northern Alabama. <i>Other Primary Partners: ADCNR, Regional environmental and land preservation organizations</i> <i>Other Supporting Partners: USFWS</i>	Long	N/A							■		■ □



Strategy #	Issue / Strategy	Timeframe	Redstone Arsenal MCA	Madison County	Marshall County	Morgan County	City of Huntsville	City of Madison	Town of Triana	Redstone Arsenal	JLUS Implementation	Other
BIO-1C	<p>Explore Readiness and Environmental Protection Integration (REPI) funding</p> <p>Redstone Arsenal should consider partnering with local conservation organizations and willing landowners to apply for REPI funding to support the ACUB program in safeguarding mission capability and protect known or important habitat within areas adjacent to Redstone Arsenal.</p> <p><i>Other Primary Partners: Alabama Department of Conservation and Natural Resources (ADCNR), Regional environmental and land preservation organizations</i></p> <p><i>Other Supporting Partners: USFWS</i></p>	Mid	N/A							<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
BIO-1D	<p>Incorporate green space and habitat protection policies into local planning documents</p> <p>The jurisdictions surrounding Redstone Arsenal should update their comprehensive plans or other land use planning directives, as appropriate, to incorporate policies for the protection of natural green space and species habitat when considering future development. This should identify important habitat areas that are large enough to support species needs without being fragmented and could include policies requiring developers to set aside land for forest, field, wetland, and habitat preservation in their proposed development plans. Efforts should be made to ensure that land set aside is of adequate quality to support habitat, and is connected to prevent fragmentation of habitat. A conservation plan should be developed by the local jurisdictions working with the Alabama Department of Conservation and Natural Resources and other conservation organizations to guide the establishment of areas set aside by developers for conservation and species management.</p>	Mid	N/A	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			


Strategy #	Issue / Strategy	Timeframe	Redstone Arsenal MCA	Madison County	Marshall County	Morgan County	City of Huntsville	City of Madison	Town of Triana	Redstone Arsenal	JLUS Implementation	Other
BIO-1E	<p>Incorporate green space and habitat protection requirements into local zoning laws</p> <p>The jurisdictions surrounding Redstone Arsenal should update their zoning ordinances, as appropriate, to establish forest, field, wetland, or habitat preservation districts, and to require set aside land for forest, field, wetland, and habitat preservation of a certain size determined at the discretion of the jurisdiction.</p>	Mid	N/A	■	■	■	■	■	■			
BIO-1F	<p>Coordinate the protection and conservation of sensitive species regionally</p> <p>The JLUS Partners, counties, communities and regional conservation groups should work with USFWS and Alabama Department of Conservation and Natural Resources regarding the management of natural resources and areas suitable for sensitive species to ensure that military training operations are unimpeded, and safety is maintained. Emphasis should be placed on habitat loss among all communities at the regional level to ensure that Redstone Arsenal is not unduly burdened with habitat protection efforts due to habitat destruction or fragmentation elsewhere in the region that may result in Redstone Arsenal becoming a wildlife refuge island, leaving the military as the primary source of viable habitat.</p> <p><i>Other Primary Partners: Alabama Department of Conservation and Natural Resources (ADCNR), Regional environmental and land preservation organizations, USFWS</i></p>	Short	N/A	■	■	■	■	■	■	■	■	■



Strategy #	Issue / Strategy	Timeframe	Redstone Arsenal MCA	Madison County	Marshall County	Morgan County	City of Huntsville	City of Madison	Town of Triana	Redstone Arsenal	JLUS Implementation	Other
COORDINATION / COMMUNICATION (COM)												
COM-1	Channels of communication between Redstone Arsenal and local communities could be enhanced through formalized processes Redstone Arsenal and the surrounding communities generally have good communication processes in place, but they are not formalized. This can result in the loss of communication efforts through actions such as staff turnover.											
COM-1A	Establish a Redstone Arsenal JLUS Implementation Committee Following completion of the JLUS, a Redstone Arsenal JLUS Implementation Committee should be established to maintain efficient and effective coordination among the JLUS Partners and other affected stakeholders, oversee the implementation of JLUS recommendations, and enhance long-term coordination on military compatibility issues. The issues discussed and addressed by this committee will be oriented on land uses and future development within the JLUS Study Area, but may also address other compatibility factors as appropriate. As a starting point, all members of the JLUS Policy Committee and Technical Review Group will be invited to the JLUS Implementation Committee. The list of membership may evolve, and new stakeholder groups may be invited to join as appropriate in the future. The Redstone Arsenal JLUS Implementation Committee should meet on a regular basis as agreed upon by the Committee. To continue the momentum produced through the JLUS process, it is recommended that the City of Huntsville be the lead agency on developing and maintaining the Redstone Arsenal JLUS Implementation Committee. The Committee should review JLUS recommendations and implementation tracking as well as emerging issues from either the community perspective or from Redstone Arsenal to ensure long term military operational utility and compatibility as missions evolve. <i>Other Partners: Other stakeholder groups as appropriate to address land use issues</i>	Short, On-going	N/A	■	■	■	■	■	■	■		□


Strategy #	Issue / Strategy	Timeframe	Redstone Arsenal MCA	Madison County	Marshall County	Morgan County	City of Huntsville	City of Madison	Town of Triana	Redstone Arsenal	JLUS Implementation	Other
COM-1B	<p>Develop a charter for the Redstone Arsenal JLUS Implementation Committee</p> <p>Members of the Redstone Arsenal JLUS Implementation Committee (see Strategy COM-1A) should develop a charter that delineates the roles and responsibilities. The charter should contain information such as:</p> <ul style="list-style-type: none"> ■ Purpose of the committee; ■ Members on the committee; ■ Point of contact and contact information for each organization / partner; ■ Role in addressing compatibility issues with the base; ■ Responsibility for addressing compatibility issues; ■ When the committee meets; and ■ Triggers for coordination and communication, e.g., infrastructure planning, water resources planning, economic development, mission changes at Redstone Arsenal, etc. <p><i>Other Partners: Other stakeholder groups as appropriate to address land use issues</i></p>	Short	N/A	■	■	■	■	■	■	■		□
COM-1C	<p>Include local planning staff on Redstone Arsenal Real Property Planning Board</p> <p>Redstone Arsenal should include local planning staff members on its Real Property Planning Board to provide these community leaders with more insight regarding facility planning on-post, as well as any new or future plans, changes to their mission(s), or any issues that may impact the community. Likewise, this also provides an opportunity for community planners and leaders to inform Redstone Arsenal of any issues or future plans that may impact the installation.</p>	Short	N/A	□	□	□	□	□	□	■		





Strategy #	Issue / Strategy	Timeframe	Redstone Arsenal MCA	Madison County	Marshall County	Morgan County	City of Huntsville	City of Madison	Town of Triana	Redstone Arsenal	JLUS Implementation	Other
COM-1D	Establish internal information liaisons Each JLUS Partner jurisdiction that participated in the development of the JLUS and Redstone Arsenal should identify an internal liaison within their organization responsible for internally disseminating information from external organizations to ensure that appropriate people have a shared awareness of pertinent information.	Mid	N/A	■	■	■	■	■	■	■	■	
COM-1E 	Continue use of multi-media methods to disseminate information Redstone Arsenal Garrison should continue to utilize a mix of media methods to disseminate information, including increased training missions that may produce atypical noise levels, other activities that have a community impact, and a point of contact for questions or concerns. This information should be made available on the Redstone Arsenal website and through other jurisdiction's public service announcement and media outlet methods, both traditional media and social media. When possible and appropriate, Redstone Arsenal should prepare a weekly or monthly general schedule of any special or unusual activities or night operations that may be occurring that week / month to be published in local media, as long as the information does not conflict with Operations Security principles that could result in security concerns.	On-going	N/A							■		

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COM-1F	<p>Develop and maintain a GIS web-based portal</p> <p>The City of Huntsville, in collaboration with the Redstone Arsenal JLUS Implementation Committee, local jurisdictions, Redstone Arsenal, and relevant federal and state land management agencies should work collaboratively to develop a publicly accessible and interactive GIS web-based portal to share GIS data, e.g., military footprints, existing land use, zoning, and other pertinent JLUS-relevant GIS data, to promote enhanced, long-range, and coordinated compatibility planning. In addition, a protocol for accessing and updating the information should be developed to ensure accuracy and appropriate security measures are established to continuously enhance the portal and ensure the data is kept up-to-date.</p>	Short, On-going	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
COM-1G	<p>Develop a Redstone Arsenal community / military compatibility reference guide</p> <p>The JLUS Partners should develop a brief reference guide providing information about the various agencies in the JLUS Study Area and designate sensitive areas that may conflict with certain types of development that may cause encroachment (e.g., areas of environmental concern, mission sensitive areas, mission footprint areas, etc.). This guide should contain at a minimum:</p> <ul style="list-style-type: none"> ■ Map(s) identifying the important resources provided by each agency in the area; ■ Contact information for the agency representative that would be instrumental in cases of community-military compatibility; ■ Communication protocol for all levels of engagement; and ■ Other non-governmental organizations committed to compatibility planning. 	Short	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	



Strategy #	Issue / Strategy	Timeframe	Redstone Arsenal MCA	Madison County	Marshall County	Morgan County	City of Huntsville	City of Madison	Town of Triana	Redstone Arsenal	JLUS Implementation	Other
COM-1H 	Good Neighbor Program Redstone Arsenal should conduct, on an annual basis, a Good Neighbor Program where they notify adjacent property owners and community members inviting them to a Redstone Arsenal Neighbor Town Hall meeting to provide a platform for two-way communications. Redstone Arsenal would inform the attendees of any upcoming activities that may have an impact on the surrounding community and the community can provide input and feedback.	On-going	N/A							■		
COM-1I	Redstone Arsenal informational news briefs and social media The Redstone Arsenal Public Affairs Office should develop short (1-5 minutes in duration) promotional and informational news briefs that provide an overview of the general mission and operations at Redstone Arsenal and some quick facts of recent or future installation activities. These should be updated quarterly, annually, or another time increment as necessary to present fresh and current information. These video spots can be used to provide information to the local communities and could be aired on local news stations, social media networks, at movie theaters, on appropriate web sites, or other venues. In order to reduce costs, existing coordination and media communication contracts should be leveraged.	Short, On-going	N/A							■		
COM-1J	Links on websites Each of the JLUS communities should include a link to Redstone Arsenal's website on their respective websites.	Short	N/A	■	■	■	■		■	□		

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COM-1K 	Redstone Explorer smartphone app Near the beginning of the JLUS process, Redstone Arsenal developed a smartphone app called Redstone Explorer. It can be downloaded on smartphones and serves as a one stop shop for official information about Redstone Arsenal. It app provides critical alerts, links to Team Redstone social media feeds, information about resources on Redstone Arsenal, and maps pointing out gates and gate traffic, as well as where recreation and other services are located.	Short	N/A					■		■		
COM-2	Decentralized communication from numerous tenants at Redstone Arsenal complicates information sharing between the installation and the surrounding communities There are 78 tenants at Redstone Arsenal, each with their own communication procedures and processes. While the Redstone Arsenal Garrison has a Public Affairs Office that shares general information with local communities, there is no consolidated coordination and communication effort between all the various tenants on Redstone Arsenal and the local communities.											
COM-2A 	Continue Redstone Arsenal Public Communications Committee The Redstone Arsenal Garrison Public Affairs Office has established a Public Communications Committee with the public affairs office of all tenants on Redstone Arsenal to consolidate public outreach and communication efforts. This committee provides Redstone Arsenal tenants with a centralized platform to communicate information to local communities.	On-going	N/A							■		
COM-2B	Create a public awareness campaign The Redstone Arsenal Garrison Public Affairs Office should create a public awareness campaign to educate tenants, local jurisdictions, and the public about the Public Communications Committee and how it can be used to convey consolidated public information from Redstone Arsenal's tenants.	Short	N/A							■		




Strategy #	Issue / Strategy	Timeframe	Redstone Arsenal MCA	Madison County	Marshall County	Morgan County	City of Huntsville	City of Madison	Town of Triana	Redstone Arsenal	JLUS Implementation	Other
COM-3	Limited formal communication between Redstone Arsenal and Huntsville International Airport Although air traffic controllers at Redstone Arsenal and Huntsville International Airport communicate with each other for safe and effective coordination of aircraft operations, there is no formal communication process in place between the management entities at the two facilities.											
COM-3A	Establish a Military-Community Airport / Airspace Advisory Committee Creating a military community partnership including Federal Aviation Administration (FAA) representation to discuss airspace and other operational capabilities will help identify and reduce conflicts between military and civilian aircraft and training activities. <i>Other Primary Partners: Huntsville-Madison County Airport Authority, FAA</i>	Short	N/A							■		■
COM-3B	Redstone Arsenal Ex-Officio Representative on the Huntsville-Madison County Airport Authority Invite a representative from Redstone Arsenal to serve as an ex-officio member of the Huntsville-Madison County Airport Authority to be aware of actions that take place by the Authority and to relay the information to Redstone Arsenal command. <i>Other Primary Partner: Huntsville-Madison County Airport Authority,</i>	Short	N/A							□		■
COM-4	Improved external communication with communities on Redstone Arsenal operations There is a desire in the surrounding community for better communication from Redstone Arsenal about the types of activities that occur on the installation, particularly activities that generate noise and vibration and their potential impacts.											
	For related Strategies that address this issue, please see Strategies COM-1A through COM-1K.											

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FREQUENCY SPECTRUM CAPACITY (FSC)												
FSC-1	Community concerns for wireless device interference Members of the public who live in communities surrounding Redstone Arsenal have expressed some concerns regarding interference with their wireless devices, including cell phone interruptions. Competition for use of the frequency spectrum has increased in recent decades due to growth in wireless communication devices and other technology enhancements.											
FSC-1A	Dual band towers Encourage cellular transmission tower operators to have dual band capability to broadcast on multiple frequencies should a frequency be blocked by military activity. Local jurisdictions can recommend that cellular providers work with Federal Communications Commission (FCC) and Redstone Arsenal to ensure appropriate regulatory guidance and the commercial systems do not interfere with military frequencies. <i>Other Partners: Cellular transmission tower operators, FCC</i>	On-going	N/A	■	■	■	■	■		□		□
FSC-1B	Ensure compatible frequencies The Federal Communications Commission is the government entity responsible for managing frequency usage. The military is assigned certain frequencies to use that generally do not interfere with civilian uses. The continued usage of only assigned frequencies should ensure no interference between military and civilian uses. <i>Other Primary Partner: FCC</i>	On-going	N/A	□	□	□	□	□	□	□		■
LAND / AIR SPACE COMPETITION (LAS)												
LAS-1	Limited land capacity and time availability of range usage to accommodate all testing needs There is not enough land space available on Redstone Arsenal to accommodate all the testing needs associated with long-range components. Additionally, there is not enough test range availability for all the testing needs. This results in testing operations having to be conducted at other installations.											
LAS-1A	Redstone Arsenal Real Property Master Plan Redstone Arsenal should continue to update and utilize its Real Property Master Plan to identify and maximize useable land area to support range activities and testing needs.	On-going	N/A							■		



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LAS-1B	Redstone Arsenal range scheduling Redstone Arsenal should continue to work with organizations that use the range facilities to deconflict schedules and determine if users can adjust their range work schedule to timeframes of lower range usage. This could include adjustments to the time of the year, days of the week or time of day that the range is used. Policies should be adopted to ensure any range cancellations are made early enough to ensure the possibility of other users taking advantage of available range time. Efficient / effective range time slots should be established to allow users to execute their mission, but also minimize time on the range to free up time slots for other users.	On-going	N/A							■		

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LAS-2	Environmental aspects on Redstone Arsenal limit developable land and could limit future operations Federal and state requirements to maintain and preserve wetlands can limit the use of certain wetland areas on Redstone Arsenal from being used for development or mission operations.											
LAS-2A	Explore the potential for utilizing ACUB program for wetland mitigation credits Redstone Arsenal should consider partnering with local conservation organizations to look at options for developing wetland mitigation credits through the protection and restoration of poor quality wetlands off-post to help free existing wetlands on-post for additional maneuver and training space. This may involve coordination with the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, and the Alabama Department of Environmental Management to identify wetland mitigation bank criteria, and the U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration Fisheries to identify species habitat mitigation bank criteria. Redstone Arsenal and any potential ACUB partners should also explore the Regulatory In-lieu Fee and Bank Information Tracking System for guidance on establishing appropriate mitigation and conservation banks for land outside of Redstone Arsenal. <i>Other Primary Partners: ADCNR, Regional environmental and land preservation organizations</i> <i>Other Supporting Partners: USFWS</i>	Mid	N/A							■		■ □
LAS-3	Concerns related to elements of Redstone Arsenal tenants being located off-installation There are components of the Redstone Arsenal tenants that are located off the installation within building space in the City of Huntsville and other outlying areas. The use of off-site facilities can cause disconnects between the components that are on the installation and those that aren't.											
LAS-3A 	Redstone Gateway tenant utilization Utilize undeveloped land in Redstone Gateway for tenant operations that are currently housed outside of Redstone Arsenal's boundaries.	Mid	N/A							■		



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LAS-3B	Conduct a facility space survey / study Redstone Arsenal should conduct a facility space survey / study to determine if organizations including tenants are using more facility footprint that is needed for their current mission. Many times, facility footprint is maintained or “grown into” by organizations even though current needs do not warrant the additional space. Facility standards should be adopted and enforced to limit facility square footage to the minimum required for the type of operation (e.g. administrative, storage, industrial, etc.).	Mid	N/A							■		
LAS-4	Potential for conflict with operations and unmanned aerial vehicle (UAV) operations around Redstone Arsenal As UAVs become more common and more accessible for public and commercial use, there is the potential for an increase in public UAV activities to occur in Huntsville and the region surrounding Redstone Arsenal that may conflict with operations and testing at the installation.											
LAS-4A	Adopt ordinances regulating unmanned aircraft The JLUS Partner jurisdictions should adopt an ordinance for use of unmanned aerial systems incorporating Federal Aviation Administration rules for recreational, commercial, and other users to establish and enforce rules and regulations of unauthorized unmanned aerial systems usage including the issuance of fines for offenders. Working with Redstone Arsenal, establish areas where such systems may and may not be permissible due to their potential impacts to flight operations. New guidance on overflight of installations and their rules of engagement should be publicized in local community web pages and language adopted to restrict overflight of UAVs over Redstone Arsenal. <i>Other Partner: FAA</i>	Mid	UAV	■	■	■	■	■	■	□	■	□

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LAS-4B	Develop information on proper usage Redstone Arsenal should work with the FAA to develop a public information packet on proper usage of unmanned aerial systems near Redstone Arsenal to distribute to local communities. The educational materials should include contact information at Redstone Arsenal for coordinating unmanned aerial systems flights within five miles of Redstone Army Airfield. Civilian operation of unmanned aerial systems within five miles of the airports should only be allowed if prior coordination and approval is given by Redstone Arsenal. Key coordination includes communication, sighting, coordinated response and agreed upon rules of engagement between jurisdictions and law enforcement agencies. <i>Other Partner: FAA</i>	Short	UAV	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
LAS-4C	Website information on unmanned aerial systems Update the Redstone Arsenal and jurisdiction websites with information on requirements for unmanned aerial systems in the region, including FAA regulations and any local ordinances that may be adopted in the future. <i>Other Partners: AMC, RTC, AMRDEC, FBI</i>	Short	UAV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>
LAS-4D	Create a Drone Hazard Plan Redstone Arsenal should work with the JLUS Partner jurisdictions to develop a Drone Hazard Plan. The plan would identify areas surrounding Redstone Army Airfield and Redstone Arsenal where unmanned aerial system operations could be detrimental to aircraft operations and illustrate these areas on a Drone Hazard Map. The Plan may also identify Drone Fly Zones where recreational drone operations would generally be allowed, unless they need to be closed for critical aircraft operations. The Plan may include conditions where unmanned aerial systems may be authorized to operate in Drone Hazard areas if prior coordination and approval from Redstone Arsenal is obtained. <i>Other Partners: AMC, RTC, AMRDEC, FBI</i>	Mid	UAV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>



Strategy #	Issue / Strategy	Timeframe	Redstone Arsenal MCA	Madison County	Marshall County	Morgan County	City of Huntsville	City of Madison	Town of Triana	Redstone Arsenal	JLUS Implementation	Other
LAS-4E	Advertise FAA B4UFLY app The JLUS Partner jurisdictions should advertise the FAA B4UFLY app to inform the public of the app and that unmanned aerial system operations should not occur within five miles of Redstone Army Airfield and over Redstone Arsenal.	Short	UAV	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
LAND USE (LU)												
LU-1	Development of land adjacent to Redstone Arsenal's boundary has caused encroachment, and there is potential for more encroachment in the future There is a large amount of existing development adjacent to Redstone Arsenal's boundaries on several sides of the installation. This has reduced operational capabilities and/or forced incompatible operations, such as those that cause noise or vibrations, to move. Any future development close to the installation boundary will increase the impacts.											
LU-1A	Define and establish Redstone Arsenal Military Compatibility Areas Create Redstone Arsenal Military Compatibility Areas (MCAs) that reflect the types and intensity of compatibility issues, and are tied into the GIS Web Portal identified in Strategy COM-1F. The Redstone Arsenal MCAs should be used by local jurisdictions to identify areas where specific compatibility issues are more likely to occur. These areas are meant to provide education for future land planning decisions based on the likely location of Redstone Arsenal operational impacts, and are used to identify where certain recommendations from this JLUS will apply. Implementation of the Redstone Arsenal MCAs and associated strategies for these zones are intended to: <ul style="list-style-type: none"> ■ Create a broader framework for making sound planning decisions around military installations; ■ More accurately identify areas that can affect or be affected by military missions; ■ Protect the public's health, safety, and welfare; ■ Protect military missions; ■ Identify a compatible mix of land uses for consideration; and 	Short	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Strategy #	Issue / Strategy	Timeframe	Redstone Arsenal MCA	Madison County	Marshall County	Morgan County	City of Huntsville	City of Madison	Town of Triana	Redstone Arsenal	JLUS Implementation	Other
LU-1A (cont'd)	<ul style="list-style-type: none">■ Promote an orderly transition and rational organization of land uses around military installations. <p>The Redstone Arsenal MCAs are defined as follows.</p> <ul style="list-style-type: none">■ Redstone Arsenal Safety MCA – Composed of the potential future Accident Potential Zones (APZs) I and II that go outside the boundaries of Redstone Arsenal.■ Redstone Arsenal Noise MCA – Composed of the noise zones for large arms and demolitions, as identified in the Redstone Arsenal ICUZ Report, that go outside Redstone Arsenal's boundaries. Supplemental to this is a two-mile Noise Awareness Area to advise of the potential noise generation outside the noise zones.■ Redstone Arsenal Wildlife Aircraft Strike Hazard (WASH) MCA – Includes an area within five miles of the air operations area at Redstone Army Airfield, an area where most bird strikes are statistically likely to occur.■ Redstone Arsenal Vertical Obstruction MCA – Includes land under the imaginary surfaces for the runway at Redstone Army Airfield.■ Unmanned Aerial Systems MCA – Includes airspace above Redstone Arsenal and within five miles of Redstone Army Airfield and Huntsville International Airport.■ Alabama Military Land Use Planning Act MCA – This MCA is two miles around the perimeter of Redstone Arsenal where local governments are required to notify Redstone Arsenal of proposed land use changes and to allow installations 30 calendar days for Redstone Arsenal to comment on proposed land use changes and before any final action is taken or any public hearing is scheduled.■ Redstone Arsenal Composite MCA – This comprises the outermost boundary of all the Redstone Arsenal MCAs.											



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LU-1B	Maintenance and update of Redstone Arsenal MCAs Redstone Arsenal should provide updated information to the Redstone Arsenal JLUS Implementation Committee (see Strategy COM-1A) when changes in operations or circumstances result in the need to update or modify one of the Redstone Arsenal MCA boundaries. The Redstone Arsenal JLUS Implementation Committee will be responsible for making a recommendation to its members to incorporate these changes into appropriate policies, plans and regulations. Any proposed changes will go through the normal public process for review and comment prior to the adoption of any final decisions. This would be tied into the GIS Web Portal identified in Strategy COM-1F.	On-going	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
LU-1C	Incorporate Alabama Military Land Use Planning Act into local decisions The Military Land Use Planning Act of 2014 requires local governments whose jurisdictional boundaries are within two miles of a military installation to notify affected installations of proposed land use changes and to allow installations 30 calendar days to comment on proposed land use changes and before any final action is taken or any public hearing is scheduled. The Cities of Huntsville and Madison should incorporate this state legislation into their development proposal and review process to ensure Redstone Arsenal is included as appropriate.	Short, On-going	Alabama	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
LU-1D	Provide public version of the Redstone Arsenal Installation Compatible Use Zone document Redstone Arsenal should provide a public version of its Installation Compatible Use Zone (ICUZ) document on its website and through the interactive GIS web-based portal (see Strategy COM-1F) so that community planners and the public have a list of which land uses are compatible in the various Redstone Arsenal noise zones and safety zones.	Short	N/A								<input checked="" type="checkbox"/>	

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LU-1E	Add a Redstone Arsenal element to comprehensive plans JLUS Partner jurisdictions should incorporate a Redstone Arsenal element into their comprehensive plans that consider compatibility and encroachment issues with the installation.	Mid	N/A				■	■	■	□		
LU-1F	Create a map identifying potential encroachment issues Redstone Arsenal and community planners should work together to map current or potential encroachment issues, as they relate to the MCAs identified in Strategy LU-1A or other areas outside the MCAs, to help inform and guide decision making. This would be tied into the GIS Web Portal identified in Strategy COM-1F.	Short	N/A	□	□	□	□	□	□	■	□	
LU-1G	Add Redstone Arsenal safety zones and noise zones to community and county maps The JLUS communities and other entities should include Redstone Arsenal safety zones and noise zones (using the Safety and Noise MCAs identified in Strategy LU-1A) on existing land use maps, future land use maps, services area maps, and / or websites for the purpose of providing information. The inclusion on maps would not necessarily mean land under the zones are regulated, but would be meant as informational to viewers of the maps. This would be tied into the GIS Web Portal identified in Strategy COM-1F.	Short	Safety, Noise	■		■	■			□		
LU-1H	Establish a Redstone Arsenal Encroachment Working Group Redstone Arsenal should establish an Encroachment Working Group made up of subject matter personnel from different organizations on the installation to collaborate in a group setting to discuss and address the various compatibility factors that were part of the JLUS, as well as propose solution sets for future mitigation.	Short	N/A							■		



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LU-11	<p>Prepare and execute a formal MOU for development proposal review</p> <p>The JLUS Partner jurisdictions should establish MOUs with Redstone Arsenal to formalize a process that provides Redstone Arsenal with copies of certain types of development proposals, rezoning, and other land use or regulation changes for land located within the Redstone Arsenal MCAs (see Strategy LU-1A) for review and comment. Such review periods shall conform to existing community review periods and / or statutory requirements. This supports a proactive approach for identifying potential conflicts early in the proposed development review process.</p> <p>The process of formalizing Redstone Arsenal review and comment should include:</p> <ul style="list-style-type: none"> ■ Definition of project types that require review ■ Definition of project types that require military participation at pre-application meetings ■ Identification of the points of contact for all coordination ■ Establishing a formal procedure for requesting and receiving comments ■ Establishing a standard timeline for responses, keeping in mind mandated review time periods as specified by state law and local procedures ■ Providing notice to Redstone Arsenal on all public hearings regarding projects that require review ■ Procedures should be reviewed annually and updated as appropriate by the Redstone arsenal JLUS Implementation Committee (see Strategy COM-1A). 	Short	Composite MCA	■	■	■	■	■	■	□	□	

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LU-1J	Consider web-based tool for coordinated development reviews Consider implementing a web-based tracking tool for coordinating development reviews with Redstone Arsenal using automation through e-mail notifications. The tool could provide a clearinghouse to discuss various project types and a forum for discussion on broader long-term project review, such as comprehensive plan updates, zoning ordinance language, and capital improvement plans for public facilities. Ensure that project uploads include contact information, project location information, a project description, and a deadline for comments.	Mid	Composite MCA	■	■	■	■	■	■	□		
LU-1K	Foster enhanced public awareness through accurate mapping Redstone Arsenal should provide surrounding local, county, regional, and state governments with an accurate geographic information system (GIS) data layer or geodatabase of the installation boundaries and military footprints that extend outside the installation for inclusion on all land use, transportation, park and recreation, public facilities, and other related planning documents.	On-going	Composite MCA	□	□	□	□	□	□	■	□	
LU-2	Interstate 565 interchange modification could cause encroachment to installation Modification of the I-565 and Madison Boulevard interchange just north of Redstone Arsenal could impact land uses on the installation, such as an airfield beacon and Army Space and Missile Defense Command buildings. Additionally, new development outside the installation around the interchange may encroach upon the installation.											
LU-2A	Coordinate future I-565 interchange development with Redstone Arsenal The Alabama Department of Transportation and City of Huntsville should continue to coordinate future development options of the modified I-565 interchange with Redstone Arsenal to ensure compatible development. <i>Other Primary Partner: Alabama Department of Transportation</i>	On-going	N/A				■			□		■



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LU-3	Development of Exploration Park should be compatible with Redstone Arsenal Development of Exploration Park will include land that is currently within the fenced boundary of Redstone Arsenal. The development will require coordination among all parties to ensure compatibility.											
LU-3A <div>ON-GOING</div>	Ensure Exploration Park plans, and proposed land uses are compatible with Redstone Arsenal Redstone Arsenal should review all proposed plans for Exploration Park and ensure that they are compatible with Redstone Arsenal operations and security protocols. This should include identifying potential impacts on Redstone Arsenal housing near Exploration Park, proposed uses that may cause increased security concerns, and land uses that could impact safe flight operations for Army aircraft. <i>Other Partner: U.S. Space and Rocket Center</i>	Mid	N/A				<input type="checkbox"/>			<input checked="" type="checkbox"/>		<input type="checkbox"/>
LIGHT AND GLARE (LG)												
LG-1	Lighting impacts to night vision device operations and certain flight operations Helicopter pilots using night vision technology experience degradation in the functionality of the night vision equipment and other impacts from lighting in the local communities, particularly along the approach corridor to Redstone Army Airfield.											
LG-1A	Create a dark skies ordinance to minimize ambient light generation The Cities of Huntsville and Madison should adopt "dark skies" ordinances that minimize urban sky glow and the potential for light trespass onto adjacent properties. Require dark skies initiative as part of legislation. Develop specific zoning for light encroachment issues adjacent to the installation boundary. The lighting ordinance should also include regulation of lighting such as LED billboards in important flight paths and the approach and departure corridors and provide standards for steel light poles to reduce lighting trespass and utilize more energy efficient lighting methods.	Long	N/A				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				

Strategy #	Issue / Strategy	Timeframe	Redstone Arsenal MCA	Madison County	Marshall County	Morgan County	City of Huntsville	City of Madison	Town of Triana	Redstone Arsenal	JLUS Implementation	Other
LG-1B	Education on "Dark-Sky" standards JLUS partner communities should consider educating their constituents and in turn exploring implementation of "Dark-Sky" lighting standards for all fixtures, and adopt such lighting regulations in their zoning laws.	On-going	N/A	■	■	■	■	■	■		■	
LG-1C	Redstone Arsenal dark sky considerations Redstone Arsenal should consider dark sky standards to the extent possible when planning nighttime operations to minimize light impacts on the surrounding community.		N/A							■		
LG-2	Certain Redstone operations create light impacts on the local community Some nighttime operations at Redstone Arsenal, such as dropping flares from helicopters, creates light that can impact the local community if near residential development.											
LG-2A	Schedule time and location of nighttime operations Redstone Arsenal should try and conduct nighttime operations at range locations that is as far from residential areas as feasible. This includes both on and off base residential areas. In addition, there may be certain nights of the week when the light impacts to residences would be less of a concern (this could be a discussion item at a community town hall type meeting).	Short	N/A							■		
LG-2B	Educate communities on nighttime operations To the extent possible the Redstone Arsenal could provide general information on nighttime operations to residents and communities making them more aware in advance of the activities, minimizing concerns. This could be accomplished via the base public affairs website and fact sheets provided to anyone voicing a concern or lodging a complaint.	Short	N/A							■		



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NOISE (NOI)												
NOI-1	Operational noise impacts the surrounding community Noise generated by operations at Redstone Arsenal can be heard within the local community and may impact residents' quality of life.											
NOI-1A	Signage alerting of Redstone Arsenal location and operations The JLUS communities should work with Redstone Arsenal to develop signage to install along key roads that alert drivers they are entering an area subject to impacts from Redstone Arsenal and that military operations are present that may cause noise, vibrations, etc. Verbiage such as "Proud home of Redstone Arsenal", "Warning: entering a noise area", or similar should be included on the signage.	Short	Noise Awareness Area	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
NOI-1B	Incorporate sound attenuation and noise reduction measures in building codes Responsible entity for building codes should recommend new construction to incorporate sound attenuation and noise reduction measures in their building codes within noise-prone locations. <i>Other Primary Partner: State of Alabama Building Commission</i>	Long	Noise	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
NOI-1C	Create zoning regulations for noise zones The City of Huntsville should adopt zoning regulations within noise zones that extend off-post, depending on which noise zone that area is within. Redstone Arsenal should assist by providing guidance on land use types that are compatible and incompatible within the various noise zones, as contained within the Installation Compatible Use Zones Study.	Long	Noise				<input checked="" type="checkbox"/>			<input type="checkbox"/>		

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NOI-1D	Real estate disclosures JLUS Partner jurisdictions should coordinate with Huntsville Area Association of Realtors to consider updating their requirements for providing real estate disclosure notifications when transacting property within the noise zones associated with operations at Redstone Arsenal. <i>Other Primary Partner: Huntsville Area Association of Realtors</i>	Long	Noise Awareness Area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
NOI-1E	Develop a Redstone Arsenal awareness program Develop a Redstone Arsenal awareness program targeted to the property owners and homeowners to ensure they are aware of the impacts of training and testing operations in areas surrounding Redstone Arsenal. This should be tailored for current and future property owners and land developers. Information should be added to Redstone Arsenal's existing website that includes information from the existing ICUZ, such as the installation's noise zones, to provide information for local communities and residents.	On-going	Noise Awareness Area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
NOI-1F	Voluntary notification to renters / leasees of Redstone Arsenal operations and impacts Landlords who rent property or homes within the noise zones associated with operations at Redstone Arsenal should be encouraged to voluntarily include as part of the rental / lease agreement that the property is located within an area that may be impacted by operations at Redstone Arsenal. <i>Other Primary Partners: Rental Property Owners</i>	On-going	Noise Awareness Area								<input type="checkbox"/>	<input checked="" type="checkbox"/>
NOI-1G	Consider cloud coverage for explosive activities To the extent it will not impact mission timelines, Redstone Arsenal should take into consideration cloud coverage and weather patterns when conducting explosive detonations or similar activities to minimize noise impacts outside the installation.	On-going	Noise Awareness Area							<input checked="" type="checkbox"/>		



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NOI-1H	<p>Develop and provide sound attenuation educational materials</p> <p>JLUS jurisdictions should develop and provide educational materials, either through inclusion in the adopted building codes or as a supplemental educational document, describing building techniques which can be used to achieve the recommended 45 dB DNL interior noise maximum threshold.</p> <p>The JLUS Implementation Committee or local jurisdictions could pursue funding from DOD to produce educational materials, with other stakeholders distributing and using these materials.</p> <p>The materials would be educational and not mandatory requirements.</p>	Long	Noise	■	■	■	■	■	■		■	
NOI-1I	<p>Consider developing a voluntary sound attenuation retrofit program for residential uses</p> <p>Consider developing a program that provides guidance on sound attenuation standards for retrofitting existing residential and commercial facilities. The program could include information on grant opportunities available to assist property owners in retrofitting structures in noise-sensitive areas. Other funding sources for retrofitting homes should be identified and provided within the program materials. The program would be voluntary and serve to assist willing property owners wishing to upgrade their homes with resources and guidance.</p> <p><i>Other Partners: Rental Property Owners</i></p>	On-going	Noise	■		■	■				□	■
NOI-1J	<p>Apply for HUD funding for sound attenuation</p> <p>JLUS Partner jurisdictions that are affected by noise zones extending off Redstone Arsenal should encourage property owners within the noise zones to apply for Property Improvement Loan Insurance (Title I) HUD funding to help in sound attenuation improvements.</p>	Long	Noise	■		■	■					
	For another strategy that addresses this issue, please see Strategy LU-1G											

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PUBLIC TRESPASSING (PT)												
PT-1	Potential trespassing on Redstone Arsenal land along the Tennessee River Land located on Redstone Arsenal and adjacent to the Tennessee River is accessible to boating craft, which poses challenges for managing trespassing on the installation.											
PT-1A	Consider constructing perimeter fencing along Tennessee River Redstone Arsenal should coordinate with the Tennessee Valley Authority to evaluate if perimeter fencing can be installed on the installation, considering concerns such as flooding. Installation of fencing by Redstone Arsenal should consider nearby land uses and should be designed to be attractive to the nearby neighbors. <i>Other Primary Partner: Tennessee Valley Authority</i>	Short	N/A							■		■
PT-1B	Self-policing educational brochure Redstone Arsenal should work with the local communities to develop an educational brochure about the installation's boundaries and the Tennessee River to inform the public of Redstone Arsenal's boundaries along the Tennessee River and to avoid them. This brochure should be made available on JLUS Partners and boating and other recreational activity websites to ensure maximum awareness.	Short	N/A	□	□	□	□	□	□	■	■	
PT-1C	Continue to install and maintain shoreline signage Redstone Arsenal should continue to install, maintain, repair, and / or replace signage as necessary to clearly delineate the installation boundary and provide no trespassing notice.	On-going	N/A							■		
PT-1D	Consider remote monitoring camera system Redstone Arsenal should consider installing a remote camera system along unfenced parts of the installation bordered by the Tennessee River to assist in maintaining security and monitoring potential trespassing incidents.	Mid	N/A							■		



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ROADWAY CAPACITY (RC)												
RC-1	Roadway congestion during peak times Local roadways in the communities around Redstone Arsenal experience heavy congestion and traffic delays during peak hours when employees are entering and existing installation gates. The roadway congestion impacts community members' quality of life.											
RC-1A	Promote carpool programs Redstone Arsenal should promote and incentivize park-and-ride and carpool programs to reduce the number of vehicles entering through the gates during heavy traffic periods. <i>Other Partner: Huntsville Area Metropolitan Planning Organization (MPO)</i>	On-going	N/A							■		□
RC-1B	Promote alternative transportation Redstone Arsenal should work with the City of Huntsville to reduce congestion via multimodal transportation, such as public transit, biking, or walking. <i>Other Partner: Huntsville Area Metropolitan Planning Organization (MPO)</i>	On-going	N/A				■			■		□
RC-1C	Consider staggered work shift starts Redstone Arsenal tenants should evaluate utilizing and optimizing staggered work shifts to spread out the number of personnel entering and exiting the base and reduce vehicle volumes during peak traffic times.	On-going	N/A							■		
RC-1D	Bicycle facility enhancements Reasonable accommodations should be taken by Redstone Arsenal to explore bicycle commuter options that consider federal, state, and local law.	Mid	N/A							■		

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RC-1E	Consider implementing Transportation Demand Management Assess, develop, and consider implementing Transportation Demand Management strategies and policies to reduce travel demand (specifically single-occupancy private vehicles), or to redistribute the trip generation across space (additional entry gates) or time (staggered work hours / telecommuting). <i>Other Partner: Huntsville Area Metropolitan Planning Organization (MPO)</i>	Long	N/A							■		□
RC-1F	Consider developing a transit center outside of Redstone Arsenal Gate 9 Consider constructing a facility at Redstone Gateway to host a multi-modal transit center that facilitates access to the community and shopping areas from personnel on the base. Associated with this transit center would be the development of internal transit within Redstone Arsenal. <i>Other Partner: Huntsville Area Metropolitan Planning Organization (MPO)</i>	Long	N/A				■			■		□
SAFETY (SA)												
SA-1	Existing incompatible development in Redstone Army Airfield accident potential zones is a safety concern and limits future expansion of the runway Accident potential zones for Redstone Army Airfield extend outside the northern installation boundary. There is existing incompatible development within the APZs. Future incompatible development could limit the ability to expand the airfield.											
SA-1A	Redevelopment plan for land within existing and potential future accident potential zones Consider developing and adopting neighborhood redevelopment plans which create opportunities for expanded economic development while addressing encroachment in the APZs. Prioritize actions for implementation that result from the redevelopment plan.	Mid	Safety				■			□		



Strategy #	Issue / Strategy	Timeframe	Redstone Arsenal MCA	Madison County	Marshall County	Morgan County	City of Huntsville	City of Madison	Town of Triana	Redstone Arsenal	JLUS Implementation	Other
SA-1B	Create zoning for Redstone Army Airfield safety zones The City of Huntsville should create and adopt zoning regulations for the existing and potential future accident potential zones that extend off-post. To assist with this, Redstone Arsenal should provide guidance on land use types that are compatible and incompatible within the accident potential zones, as contained within the Installation Compatible Use Zones Study.	Mid	Safety				■			□		
SA-1C	Develop deed notifications for future land sales and exchanges All land divisions, building permits, and other proposed development actions located within an Accident Potential Zone should be required to file a deed notification that identifies the property's location within such zone as defined by the U.S. military. This notice should describe Redstone Arsenal's mission and activities and the potential impacts associated with Redstone Arsenal's operations.	Short	Safety				■			□		
SA-1D	Real estate disclosures The City of Huntsville should coordinate with Huntsville Area Association of Realtors to consider updating their requirements for providing real estate disclosure notifications when transacting property within the Redstone Army Airfield accident potential zones. <i>Other Primary Partner: Huntsville Area Association of Realtors</i>	Mid	Safety				□			□		■

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SA-2	Presence of wildlife near Redstone Army Airfield causes concerns for aircraft safety There is a variety of wildlife that live at Redstone Arsenal and the area around Redstone Army Airfield that causes concern for potential collisions with aircraft operating at the airfield and over Redstone Arsenal.											
SA-2A	Wildlife Aircraft Strike Hazard consideration in jurisdiction or agency projects All projects sponsored by a local jurisdiction or agency within five miles of Redstone Army Airfield should consider bird attractants and require consultation with Redstone Arsenal representatives on the review and mitigation of significant direct and indirect bird attractant features such as golf course water features, detention ponds, landfills or transfer stations.	On-going	WASH	■			■	■		□		
SA-2B	Amend zoning ordinances to include Wildlife Aircraft Strike Hazard regulations Amend zoning ordinances to regulate land uses and guide building standards that will not attract birds and other wildlife around Redstone Arsenal, specifically within the Approach / Departure Clearance Surface. Such controls should prohibit certain trees and foliage that attract birds in this area.	Long	WASH				■	■		□		
SA-2C	Develop and distribute Wildlife Aircraft Strike Hazard educational materials Provide educational information to local jurisdictions, agencies, and landowners in the region relative to reducing the potential for bird and wildlife attractants that may impede safe aircraft operations and outline compatible solutions and techniques to minimize conflicts. Include education materials on the Redstone Arsenal and jurisdiction websites.	Short On-going	WASH	□			□	□		■		
SA-2D	Educate public about relationship between military presence and wildlife habitat Enhance education and awareness of Redstone Arsenal's existing partnerships with natural resources and conservation groups to identify methods of protection at and surrounding the Wheeler National Wildlife Refuge <i>Other Partner: Wheeler National Wildlife Refuge</i>	Short On-going	WASH							■		□





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SA-2E	Monitor bird and wildlife attractants near Redstone Army Airfield Redstone Arsenal should continue to work directly with local jurisdictions and other appropriate agencies on control of bird and wildlife attractants near the base and within flight paths.	Short On-going	WASH	■			■	■		■		
SA-2F	Identify water body design concerns for Wildlife Aircraft Strike Hazard Redstone Arsenal and JLUS Partner jurisdictions should work with resource agencies to develop designs for stormwater facilities, wetland habitat reconstruction, species habitat protection, or similar items that could attract birds to minimize Wildlife Aircraft Strike Hazard concerns through design. <i>Other Partners: Alabama Department of Conservation and Natural Resources, Regional environmental and land preservation organizations, USFWS</i>	Short On-going	WASH	■			■	■		■		□
SA-2G	Determination of Wildlife Aircraft Strike Hazard relevant species Redstone Arsenal should coordinate with other DOD installations, the USFWS and Alabama Department of Conservation and Natural Resources to identify certain species that pose greatest Wildlife Aircraft Strike Hazard risk in order to manage their presence in the region through best practices. <i>Other Primary Partners: USFWS, Alabama Department of Conservation and Natural Resources, Other DOD installations</i>	Mid	WASH							■		■

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VERTICAL OBSTRUCTIONS (VO)												
VO-1	Potential for future incompatible development in imaginary surfaces The imaginary surfaces associated with Redstone Army Airfield extend outside the boundaries of Redstone Arsenal. There is a potential for future development in the surrounding communities to extend into these imaginary surfaces, which could pose vertical obstruction hazards for aircraft operations.											
VO-1A	Develop a 3-dimensional imaginary surfaces model Develop a 3-dimensional GIS-based modeling tool that can accurately portray the height limitations on a given property to preserve the critical airspace around the Redstone Army Airfield. This model would be based upon the imaginary surfaces and would include surrounding terrain elevations. This model could be used early in the development review process for evaluating development applications.	Short	Vertical							■	■	
VO-1B	Amend zoning regulations and procedures for imaginary surface heights and slopes The Cities of Huntsville and Madison should amend their zoning regulations to explain imaginary surface slopes and heights, how structure heights are assessed for compliance, provisions for nonconformities that are substantially damaged or destroyed, and incorporate notification requirements to Redstone Arsenal for structures that are less than 200 feet tall and not subject to a Federal Aviation Administration Obstruction Evaluation.	Long	Vertical				■	■		□		
VO-1C	Incorporate FAA review documentation as a requirement for tower applications Amend local planning documents to require a Determination of No Hazard to Air Navigation from the Federal Aviation Administration to be submitted with telecommunication tower development applications.	Short	Vertical	■	■	■	■	■	■	□		



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VO-1D	Create a cell tower siting awareness program Develop a brochure that provides information about best practices for cell tower siting to telecommunications companies and local jurisdictions. Include instructions for coordinating with Redstone Arsenal when considering the placement of cell towers.	Mid	Vertical	■	■	■	■	■	■	□		
VO-1E <i>ON-GOING</i>	Ensure Federal Aviation Regulation Part 77 compliance For all new, redeveloped or rehabilitated structures (including electrical transmission towers/lines, cellular and radio transmission towers, etc.), ensure compliance with Federal Aviation Regulation Part 77 height limit requirements to minimize vertical obstructions (e.g., buildings, telecommunications facilities, recreational facilities, energy transmission / generation towers, etc.). In addition, ensure the developments and structures are compatible / recommended with, and do not pose a safety hazard to, air operations in the region.	On-going	Vertical	■	■	■	■	■	■	□		
VIBRATION (V)												
V-1	Vibration concerns in local community The local communities around Redstone Arsenal sometimes experience vibrations from activities that occur at the installation. Some property owners have submitted complaints about damage to their property from vibrations cause by activities at Redstone Arsenal.											
V-1A	Inform residents of the DOD claims process for reimbursing property damage from vibration Redstone Arsenal and local community leaders should inform residents of the DOD claims process for reimbursing property damage due to vibration from training and testing activities.	On-going	N/A	□		□	□	□	□	■		

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V-1B	Prepare a damage claims package Redstone Arsenal should consider preparing a damage claims process that includes a package for homeowners to complete if damage from vibrations felt by military activities is believed to occur. The process should include instructions for completing the claims forms, an overview of the inspection process, procedures for Redstone Arsenal review of potential damage, and potential courses of action.	Short	N/A							■		
	For related Strategies that address this issue, please see Strategies NOI-1A through NOI-1I.											
WATER QUALITY / QUANTITY (WQQ)												
WQQ-1	Community's concerns with environmental issues related to past activity There are environmental and groundwater contamination concerns within the local communities resulting from past activities that occurred at Redstone Arsenal and with the burial of items such as munitions and contaminants that may impact the public health and safety of residents. There is a groundwater contamination plume on the eastern side of Redstone Arsenal.											
WQQ-1A 	Address groundwater contamination concerns and issues Concerted efforts need to be undertaken to ensure adequate community awareness of the extent and effects of groundwater contamination of Army property and the potential impacts, if any, this may cause to the surrounding community outside the boundary of Redstone Arsenal.	On-going	N/A	□	□	□	□	□	□	■		
WQQ-1B 	Continue to monitor groundwater levels Redstone Arsenal should continue to monitor water quality for stormwater and other water runoff leaving the installation to ensure water quality requirements are being met. If issues with runoff is determined, the base should work with state regulators to develop additional controls to capture and treat contaminated runoff.	On-going	N/A							■		



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WQQ-2	Upstream flooding and debris in waterways that transect Redstone Arsenal Local flooding events sometimes cause garbage generated in the local communities to flow onto Redstone Arsenal through waterways such as Indian Creek and McDonald Creek.											
WQQ-2A	Work with local communities to establish volunteer clean up days Redstone Arsenal could coordinate with off base communities and organizations to conduct regular creek clean up days. Teams of military working with community volunteers could collect trash along the creeks and in the watershed areas. This could be part of a larger effort to enhance community and installation collaboration.	Short	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		



