A Citizen's Guide to Noise Management

January 2016

GENERAL

The information in this document summarizes Aberdeen Proving Ground's Installation Compatible Use Zone study. The Operational Noise Management Program helps the Army analyze noise associated with military operations and provides land use guidelines designed to help achieve compatibility between the noise generated by Army testing activities and the surrounding communities.

The Army has an obligation to citizens and local government decision makers to recommend land uses on and around its installations that protect citizens from noise and other hazards, and protect the public's investment in the installation and the military readiness it provides our nation.

The goal in developing this document is to help our neighbors understand the nature of noise emanating from Aberdeen Proving Ground and how we can work together to share information to better manage that noise in a way that ensures our military readiness.

NOISE MODELING AND NOISE CONTOURS

Noise is defined as unwanted sound, a concept which is highly subjective in nature. Noise from Aberdeen Proving Ground is primarily generated by weapons firing, explosive operations, and aircraft operations. These activities produce very different types of sound and we measure and assess them differently.

A human ear is not uniformly sensitive to all frequencies of sound. Most common sound sources are measured using *A-weighted* decibels (dBA). The A-weighting corresponds to the ear's sensitivity. In military environments, this includes sounds from generators, aircraft, and general transportation. *C-weighted* decibels (dBC) quantify sounds containing large amounts of low frequency energy. Although people cannot hear low frequencies well, they may feel vibrations that low frequency energy can generate. At Aberdeen Proving Ground, large caliber weapons firing, and detonations are assessed with C-weighted decibels. In addition, *unweighted* peak levels correlate well with community perception of low frequency sounds.

We analyze aviation, demolition and large caliber weapons noise using *"Day-Night average Levels" (DNL)*. The DNL is a 24-hour cumulative average noise level that includes a 10-decibel adjustment, or penalty, for activity occurring between 10 p.m. and 7 a.m. The 10-decibel addition considers that people are more sensitive to noise during these hours. Additionally, sounds may seem louder since background noise levels are generally lower at night. For land use planning, DNL is usually averaged over a year. Therefore, DNL will include days of light and heavy military operations, as well as periods with no activity at all.

Small caliber weapons (.50 caliber and below) are analyzed using *"Peak"* levels and therefore the Noise Zones will not vary based on number of rounds fired.

Army Regulation (AR) 200-1 lists housing, schools, and medical facilities as examples of noise-sensitive land uses. The noise exposure on a community is translated into Noise Zones, defined by the decibel level within those zones. The program defines four Noise Zones: Noise-sensitive land uses are not recommended in *Zone III*.

- 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 on the installation and in surrounding communities. All viable alternatives should be considered to limit development in *Zone II* to non-sensitive activities such as industry, manufacturing, transportation and agriculture.
- Noise-sensitive land uses are generally acceptable within the *Zone I*. However, though an area may only receive *Zone I* levels, military operations may be loud enough to be heard- or even judged loud on occasion. *Zone I* is not one of the contours shown on the map; rather it is the entire area outside of the *Zone II* contour.
- A *Land Use Planning Zone (LUPZ)* is a subdivision of Zone I. The *LUPZ* is 5 dB lower than the Zone II. Within this area, noise-sensitive land uses are generally acceptable. However, communities and individuals often have different views regarding what level of noise is acceptable or desirable. To address this, some local governments have implemented land use planning measures out beyond the Zone II limits. Additionally, implementing planning controls within the *LUPZ* can develop a buffer to avert the possibility of future noise conflicts.

Often, some communities have existing "noise-sensitive" land uses that would be inadvisable under the guidelines. In most cases, this is not a risk to community quality of life or mission sustainment. This is because long-term neighbors often acknowledge hearing military operations, but they are usually not alarmed or bothered. AR 200-1 offers land use recommendations, which if adopted on and off the installation, facilitate future development that mitigates the potential for conflict and citizen concern. Table 1 lists the land use guidelines applicable to Aberdeen Proving Ground as they appear in AR 200-1.

Table 1. Land Use Guidelines (Army Regulation 200-1)

Noise Zone	**Small Arms (dBP)**	**Aviation (ADNL)**	**Large Arms, Demolitions, Etc. (CDNL)**
Land Use Planning Zone (LUPZ)	N/A	60 – 65	57 – 62
Zone I	<87	< 65	<62
Zone II	87 – 104	65 – 75	62 – 70
Zone III	>104	> 75	>70
Legend: > = greater than, < = less than, N/A = not applicable			

Weather conditions significantly affect sound propagation. Wind and temperature influence how far sound travels and how loud it will be at the receiver's location. Sound levels are typically higher downwind than upwind from the source.

When temperature inversions are present, military operations may sound much louder, being heard at further distances than normal. The inversion layer acts as a boundary for the sound, trapping it close to the ground. This can create areas of high intensity sound far from the source.

As a result, on most days it may be possible to conduct military operations without disturbing the community (neutral weather conditions), while on another day with a temperature inversion, the detonation of as little as one pound of explosives at the same location may cause some annoyance (unfavorable weather conditions).

Figure 1 illustrates how a temperature inversion bends (refracts) the sound created by a typical explosion. The sound waves from the explosion initially travel upward, but the inversion reflects the sound back down toward the ground, generating high noise levels many miles away. Noise levels at that distance would otherwise be much lower.

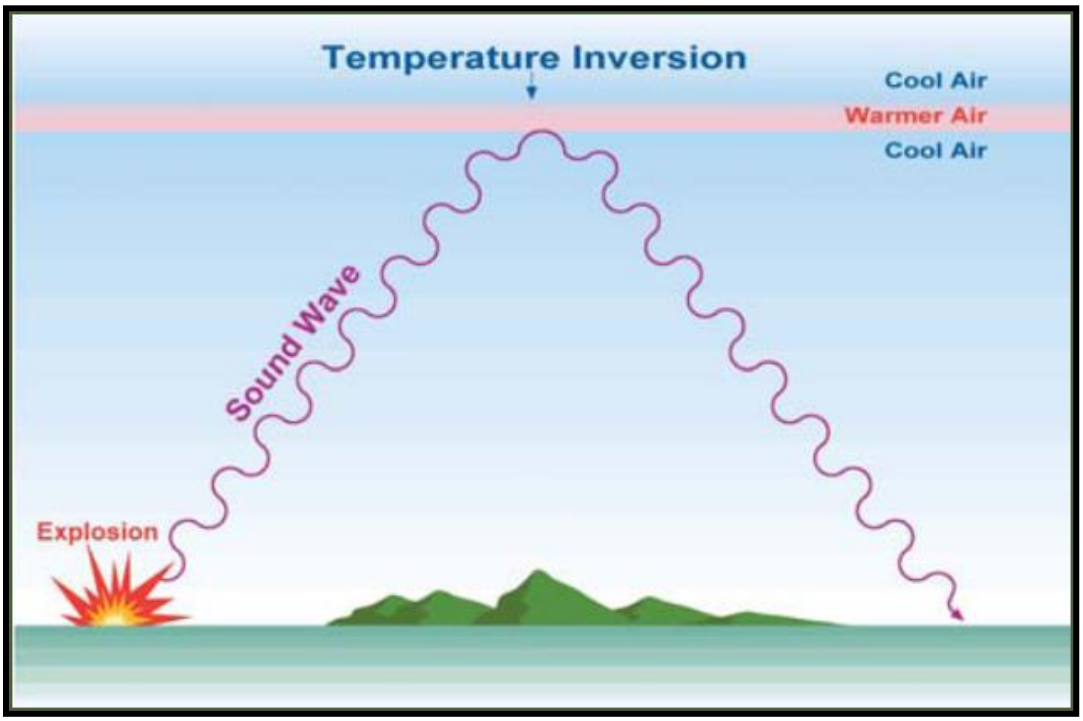

Figure 1. Temperature Inversion Illustration

NOISE EXPOSURE IN THE COMMUNITY

Test and support facilities allow instrumented firing of weapons on a variety of state-of-the-art ranges, testing of tanks and other tracked vehicles over specifically engineered courses, and a wide variety of laboratory-type investigations. Newly designed weapons and other combat material are put through the most grueling field and laboratory workouts conceivable. Despite the many reorganizations and name changes since 1917, the mission of APG has remained basically the same: to provide the best equipment and support in the world for the United States Warfighter.

LARGE ARMS WEAPONS AND EXPLOSIVES

Some of the nosiest activities on Aberdeen Proving Ground are military operations with large caliber weapons (20mm and greater) and detonations. These activities can produce noise by firing the weapon itself and the subsequent explosion of the ammunition at the target. These activities often require large areas for accurate testing and safety concerns. Thus, these activities are spread out across Aberdeen Proving Ground to maximize available space.

According to Army guidelines, the noise from demolition and large arms weapons operations is compatible with the surrounding community. Other than a small portion of the Land Use Planning Zone (LUPZ), the Noise Zones remain within APG or extend into the surrounding bodies of water (Figure 2). The LUPZ extends slightly beyond the northern boundary encompassing an undeveloped area of Swan Creek Point. Although land use guidelines indicate compatibility individual events will be audible in the surrounding community.

In addition to annual average noise levels, using Peak level (Unweighted) assessments we can forecast where sound may focus under adverse weather conditions. Figure 3 depicts where noise from demolition activity, medium and large caliber weapons firing may be noticeable, and some may find objectionable, when weather conditions enhance sound propagation (left side). Under more favorable weather conditions, noise levels from the range areas will be lower as indicated on the right side of the map. Table 2 provides information on how loud singular noise events may be.

Table 2. Peak Levels of Large Caliber Weapons and Demolitions

Perceptibility	dB Peak
May be audible	< 115
Noticeable, Distinct	115 - 130
Very Loud, May Startle	> 130

Interestingly, vibration that sometimes accompanies noise from large caliber weapons and demolition activity is air-borne (not ground-borne). Neighbors located near the "loud" area in the map below may occasionally notice picture or window rattling from air-borne vibration; however, this rattling does not indicate damage.

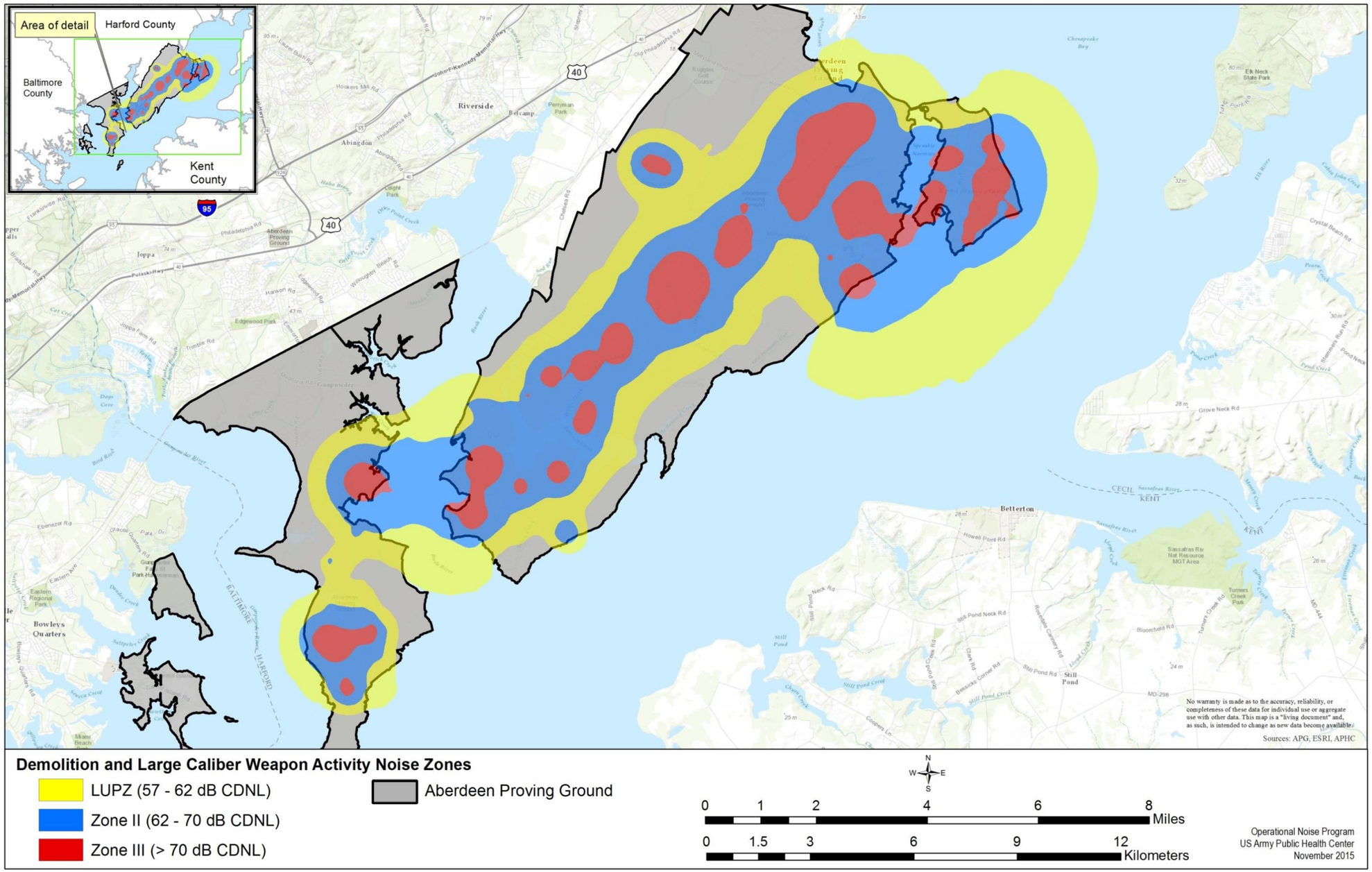

Figure 2. Large Caliber and Demolition Noise Zones

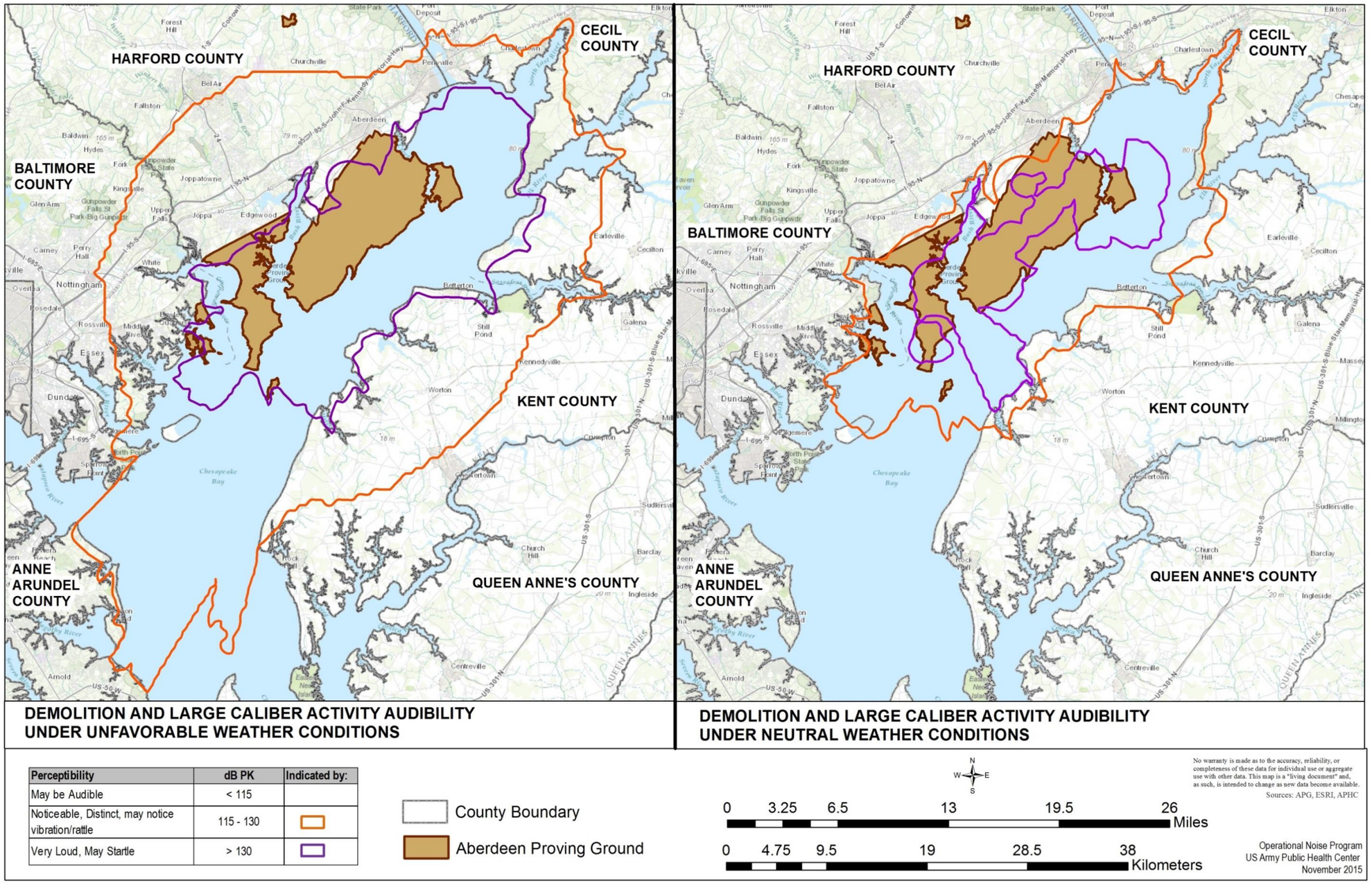

Figure 3. Perceptibility of Noise Generated by Peak Sound Levels

SMALL ARMS WEAPONS

The APG range areas where small arms are fired are far enough from the installation boundary and on-post noise-sensitive areas that incompatibilities from the operations do not occur. The only facilities with the potential to impact the community are the Air Base Range Areas and the non-fixed firing at Lauderick Creek Training Area.

Noise Zone III for the Air Base Range Areas remains on APG. Zone II extends beyond the western boundary into the community of Perryman. The land uses in the Zone II are a mix of residential areas, scattered homes, industrial, and agricultural use. According to Army guidelines, the noise from small caliber weapons operations at the Air Base Range Areas is compatible with the majority of surrounding land use.

There are numerous single family homes located along Willoughby Beach Road as well as Deerfield Elementary School, Edgewood Middle School, and Edgewood High School. The training that occurs at Lauderick Creek may be audible in these areas and could annoy or generate complaints for individuals residing in those areas.

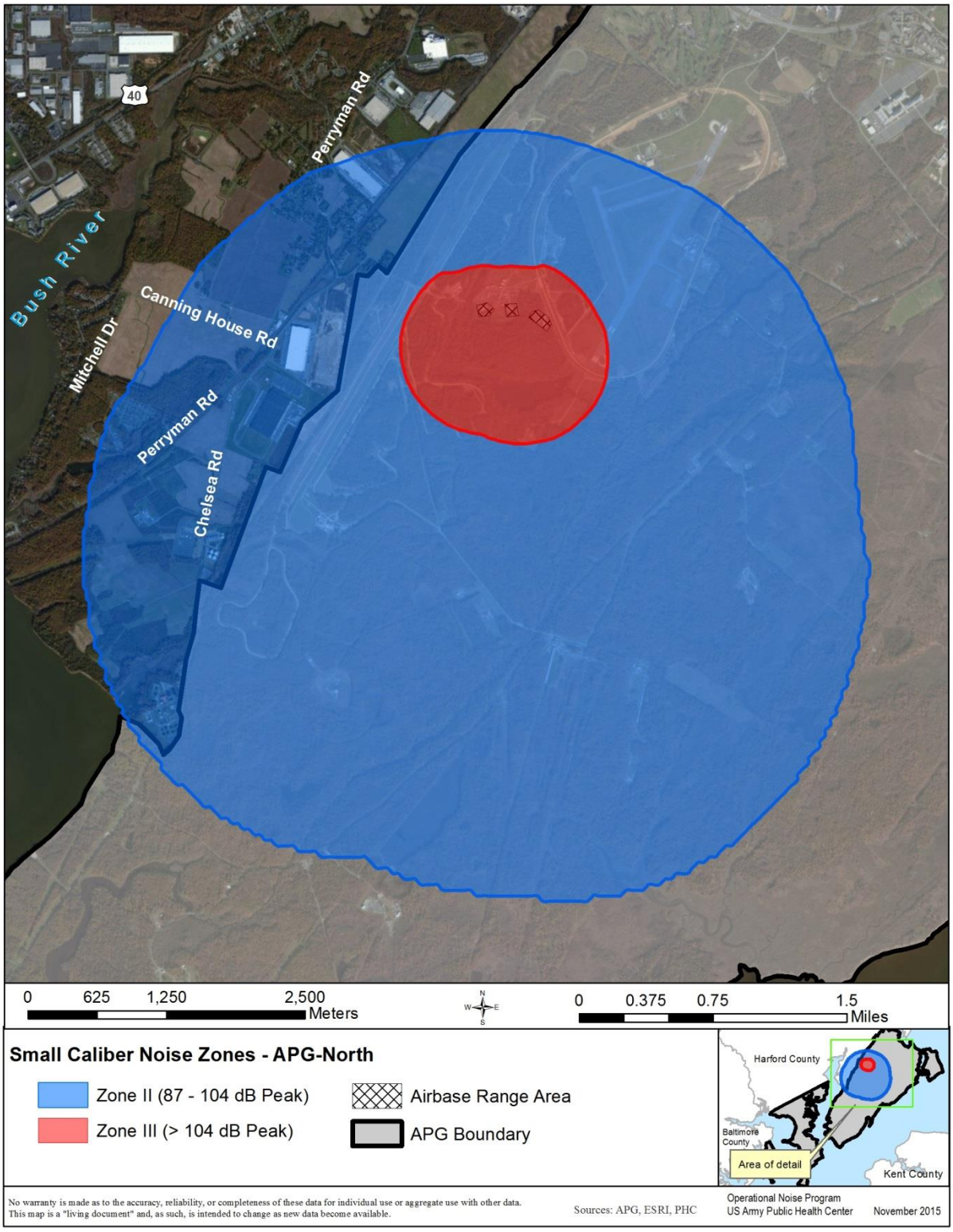

Figure 4. Small Caliber Noise Zones for Air Base Range Areas

AVIATION ACTIVITY

Aberdeen Proving Ground supports a broad spectrum of aviation operations (rotary/fixed-wing aircraft) which is conducted in the local airspace and at Phillips Army Airfield and Weide Army Heliport. Fixed-wing and rotary-wing units from the U.S. Army, Navy, Marine Corps, Air Force and Air National Guard conduct air missions in the local airspace

Noise Zones from airfield operations remain within APG (Figures 5 and 6) boundary. Although the lack of off-post Noise Zones indicates compatibility, individual aircraft overflights can be audible as the aircraft transition through the airspace to APG.

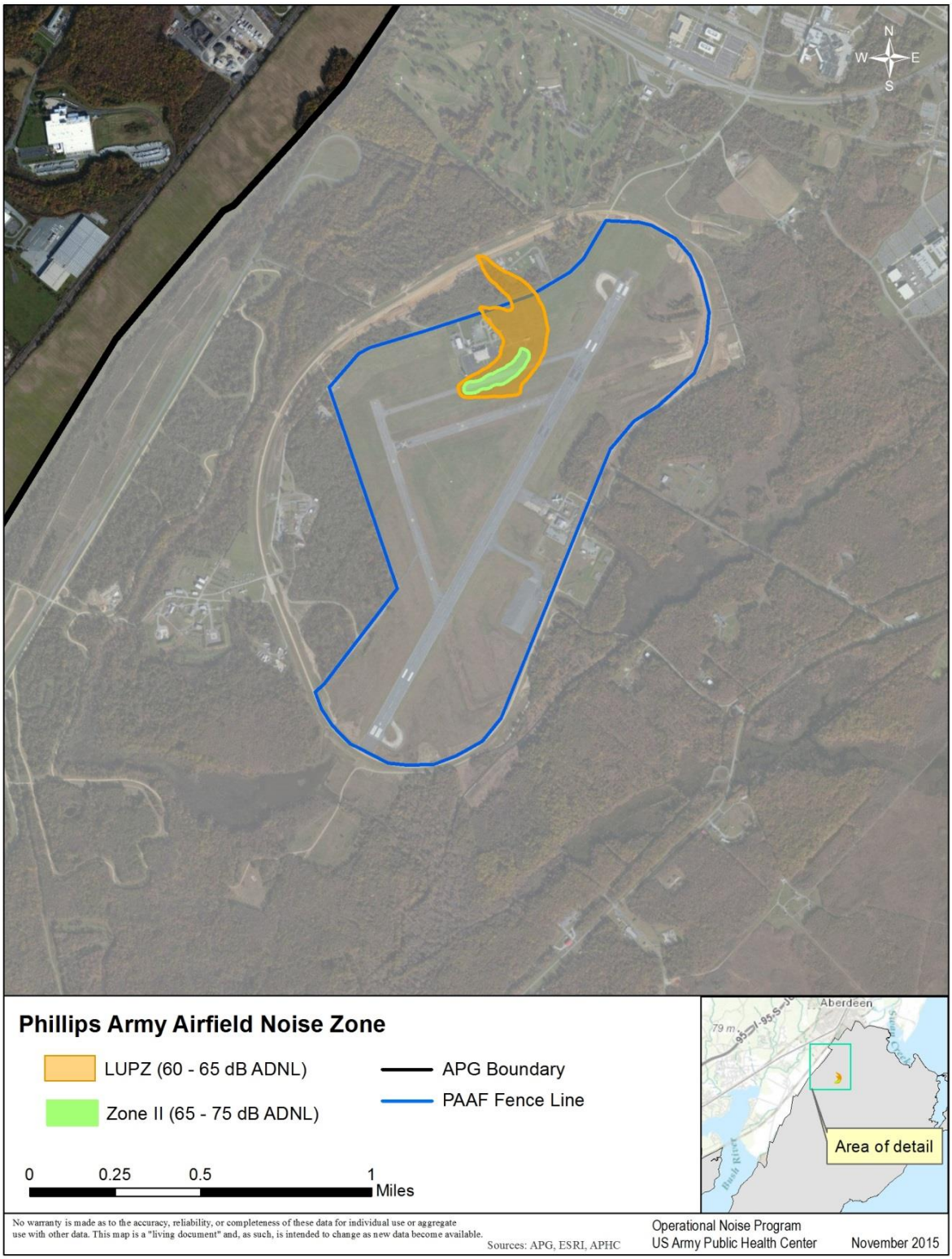

Figure 5. Phillips Army Airfield Noise Zones

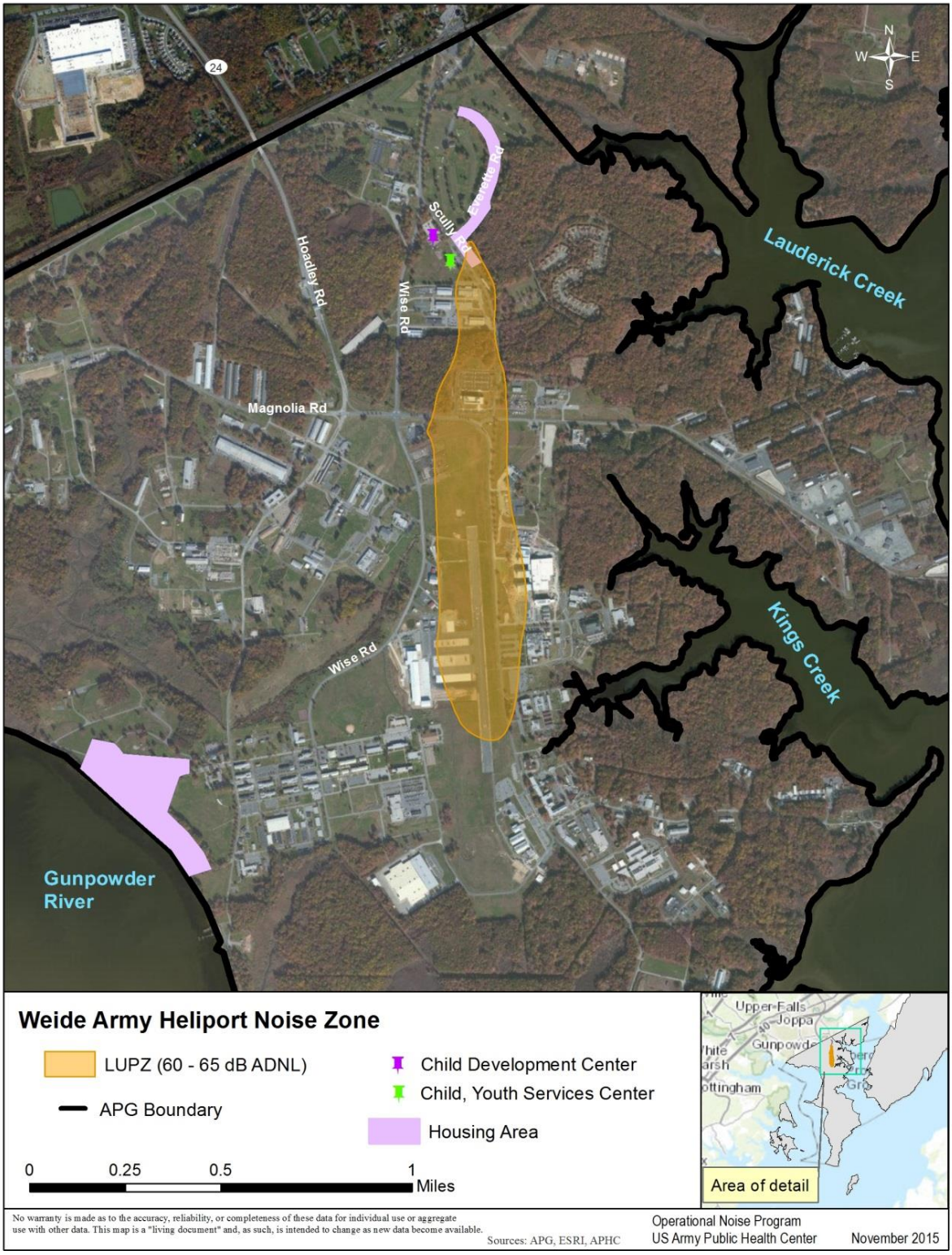

Figure 6. Weide Army Heliport Noise Zone

VEHICLE TEST AREAS

Churchville Test Area

The Churchville Test Area is a 221-acre facility with 11 miles of interconnecting roads and test courses located approximately 10 miles north of APG-North. The roads and test courses contain mud, dirt, gravel surfaces on varying grades, and are used to test the endurance and reliability of cross-country tracked and wheeled vehicles. The facility is generally used 6 days a week from 07:30 AM to 01:30 AM. The number of vehicles on the course, number of miles driven, and number of hours driven are all dependent on the vehicle test load.

The vehicle noise footprint shown in Figure 7 is based on the loudest vehicle tested (M1 Tank) and the outermost test track. Within this area, the noise exposure may vary in duration and/or loudness. People living near the Churchville Test Area may occasionally hear the vehicle testing, although the ambient background noise of Route 136 is also a factor in the noise environment in this area.

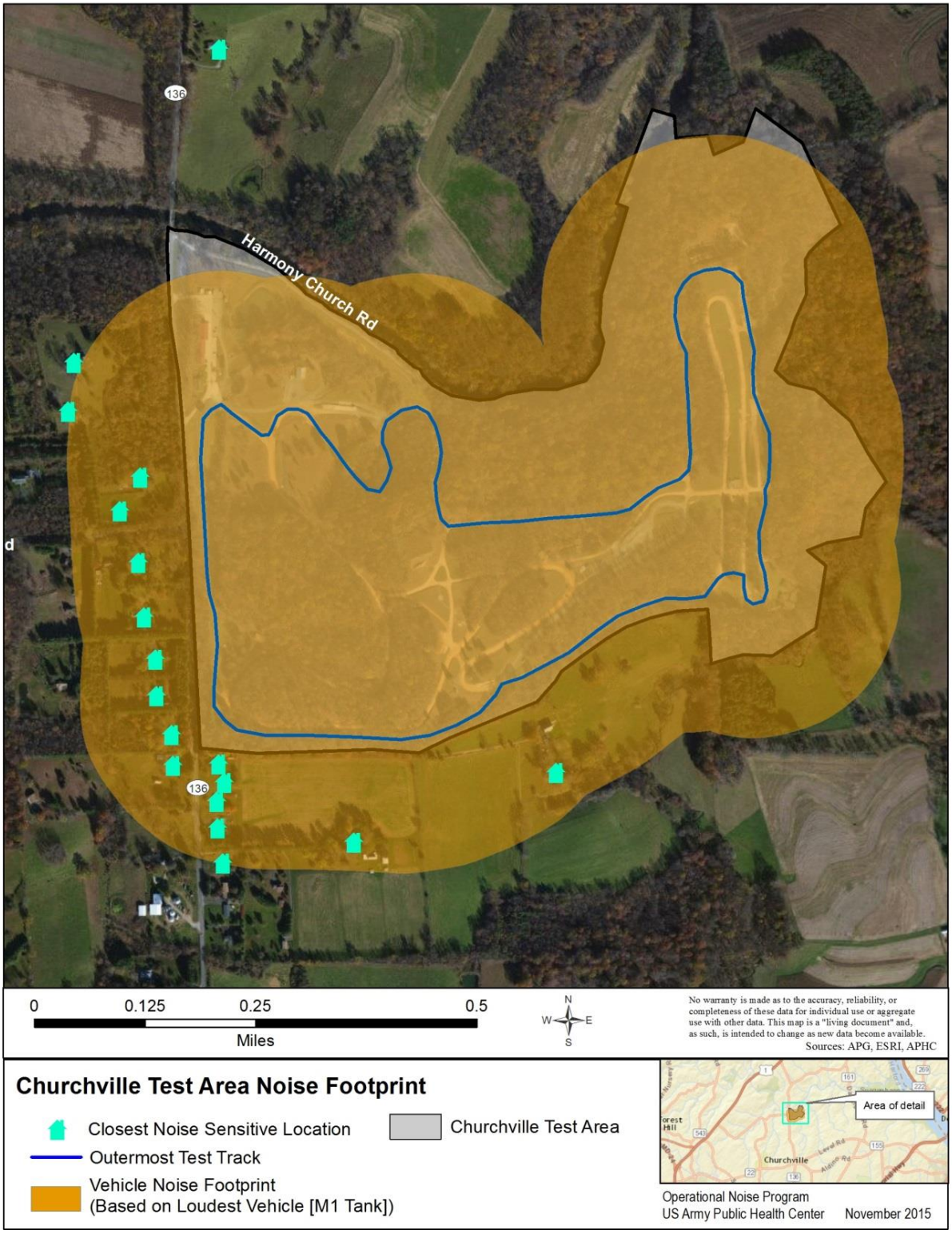

Figure 7. Churchville Test Area Noise Footprint

Perryman Test Area

The Perryman Test Area encompasses approximately 2,000 acres along the northwestern boundary of APG. The facility generally operates six days per week from 07:30 AM to 01:30 AM. The number of vehicles on the course, number of miles driven, and number of hours driven are all dependent on the vehicle test load. The facility test a wide variety of both wheeled (light, medium, & heavy) and tracked (light, medium, & heavy) vehicles.

The vehicle noise footprint shown in Figure 8 is based on the loudest vehicle tested (M1 Tank) and the outermost test track. Within this area, the noise exposure may vary in duration and/or loudness. People living near the Perryman Test Area may occasionally hear the vehicle testing.

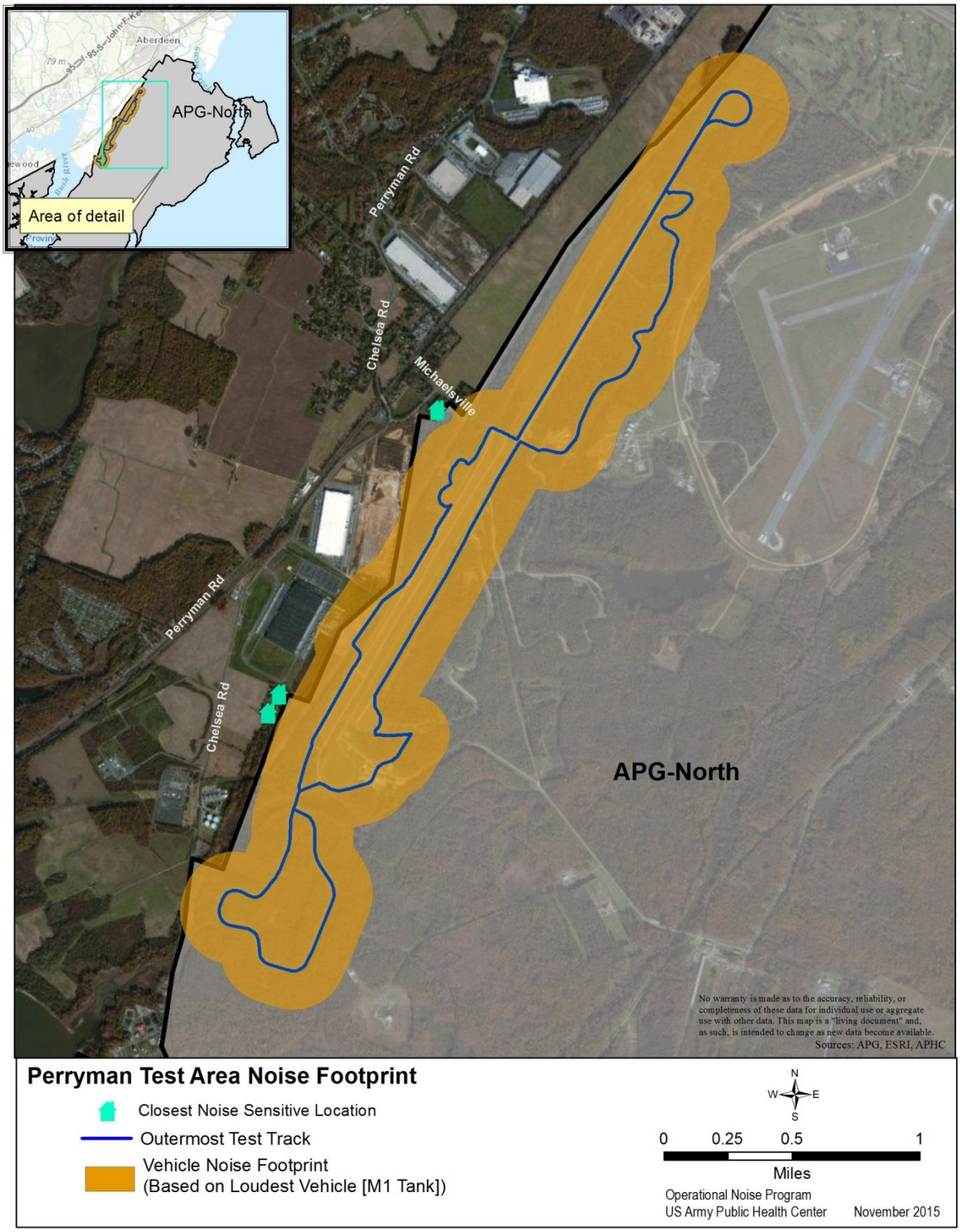

Figure 8. Perryman Test Area Noise Footprint

NOISE MANAGEMENT AT ABERDEEN PROVING GROUND

The Department of Defense's Environmental Planning Program promotes development and implementation of noise programs on military installations. The noise programs strive to guide compatibility between the activities and operations within the installation, and between the activities and operations of the installation and neighboring civilian communities.

Army Regulation 200-1 outlines the noise management policy. The policy includes:

- Evaluate and document the impact of noise produced by ongoing and proposed actions/activities and minimize annoyance to humans to the extent practicable.
- Develop installation noise management plans or Installation Compatible Use Zone Studies as appropriate. The documents are a tool used by the installation and local planning committees to facilitate compatible development.

Aberdeen Proving Ground's noise management practices are intended to minimize noise levels and/or impacts on our local communities. Key components of the management program are:

- Joint Planning Commission and stakeholder committees (Aberdeen Proving Ground, Chesapeake Science and Security Corridor, Matrix Design Group, local governments of Harford, Cecil, and Kent Counties; and the cities of Aberdeen and Havre de Grace).
- Aircraft Fly-neighborly procedures
- Aberdeen Proving Ground Public Affairs Office
- Aberdeen Test Center Noise Office (modeling and monitoring)
- Army Compatible Use Buffer (ACUB) program
- Joint Land Use Study

The APG Directorate of Public Works-Environmental Division, Aberdeen Test Center Environmental Division, Harford Land Trust, and Eastern Shore Land Conservancy execute the ACUB program, using APG and Department of Defense, and partner match funds to purchase conservation easements from willing landowners. The ACUB benefits of conservation easements are as follows:

- To Aberdeen Proving Ground:
  - Manages development adjacent to and near Aberdeen Proving Ground
  - Protects effective operational test space to the installation boundaries
  - Averts operational restrictions
  - Mitigates against noise complaints
- To Aberdeen Proving Ground's Community Partners:
  - Protects Aberdeen Proving Ground's mission and strength
  - Does not remove lands from tax base
  - Maintains agricultural lands and wild lands in Maryland
- To Landowners:
  - Maintains current, compatible land uses
  - Provides cash in hand
  - Retain rights to ownership and management of land

For Fiscal Years 2014-2015, Aberdeen Proving Ground's ACUB Working Group has identified over 24 easements, 6,182 acres around the installation to target for limiting development to address mission, encroachment and wildlife habitat related concerns (Figure 9). Aberdeen Proving Ground and its partners have invested about $7,500,000.00 in these easements and the ACUB program.

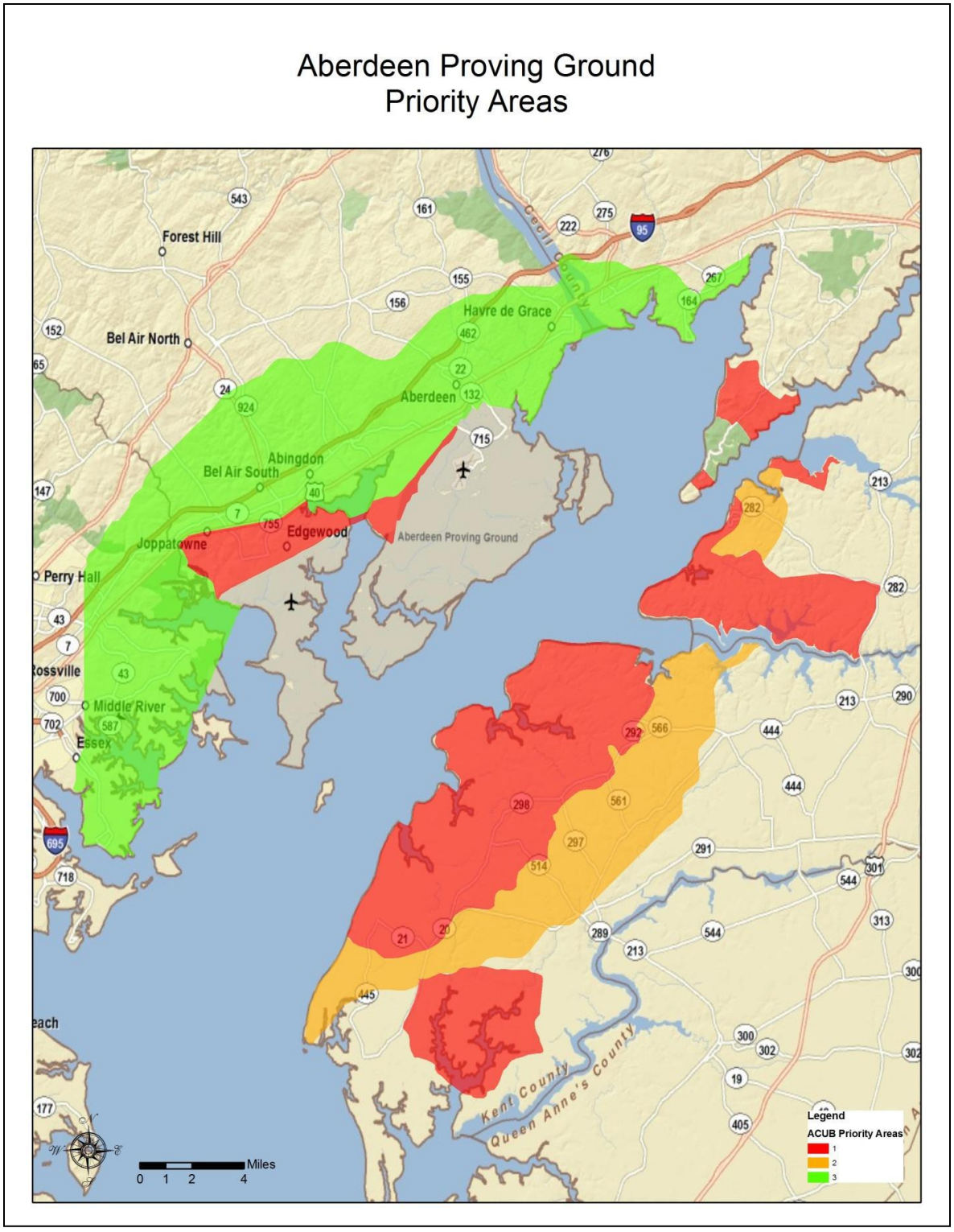

Figure 9. Currently Protected Lands With the Aberdeen Proving Ground Priority Areas

The JLUS is a collaborative land use planning effort involving the military installation and adjacent local governments that evaluates the planning rationale necessary to support and encourage compatible development of land surrounding the installation. Stated another way, it is a means for the installation and local governments to develop a land use plan that effectively addresses the long-term land use needs of the surrounding communities, yet still provides the military with the mission flexibility it needs to meet operational requirements.

The JLUS program is sponsored by the Department of Defense Office of Economic Adjustment, and it provides technical and financial assistance to the planning agencies for developing master plans that are consistent, when economically feasible, with the noise, accident potential, and safety concerns from an installation's training and operations.

The Aberdeen Proving Ground JLUS commenced in March 2014 and will be adopted by the jurisdictions in 2016. The APG JLUS was a collaborative effort between APG, Chesapeake Science and Security Corridor, Matrix Design Group, local governments of Harford, Cecil, and Kent Counties; and the Cities of Aberdeen and Havre de Grace. The Military Compatibility Area Overlay District is depicted in Figure 10.

Although there are many elements to the JLUS, one of the main focus areas is centered on noise exposure. The report identifies conservation, communication and coordination strategies as options for all participating jurisdictions within the region as well as compatibility tools for the Army.

While the study report makes certain recommendations, each participating jurisdiction must decide which recommendations are best suited to their particular needs. Implementation follows the final recommendations at the discretion of elected officials in each jurisdiction and the installation military command.

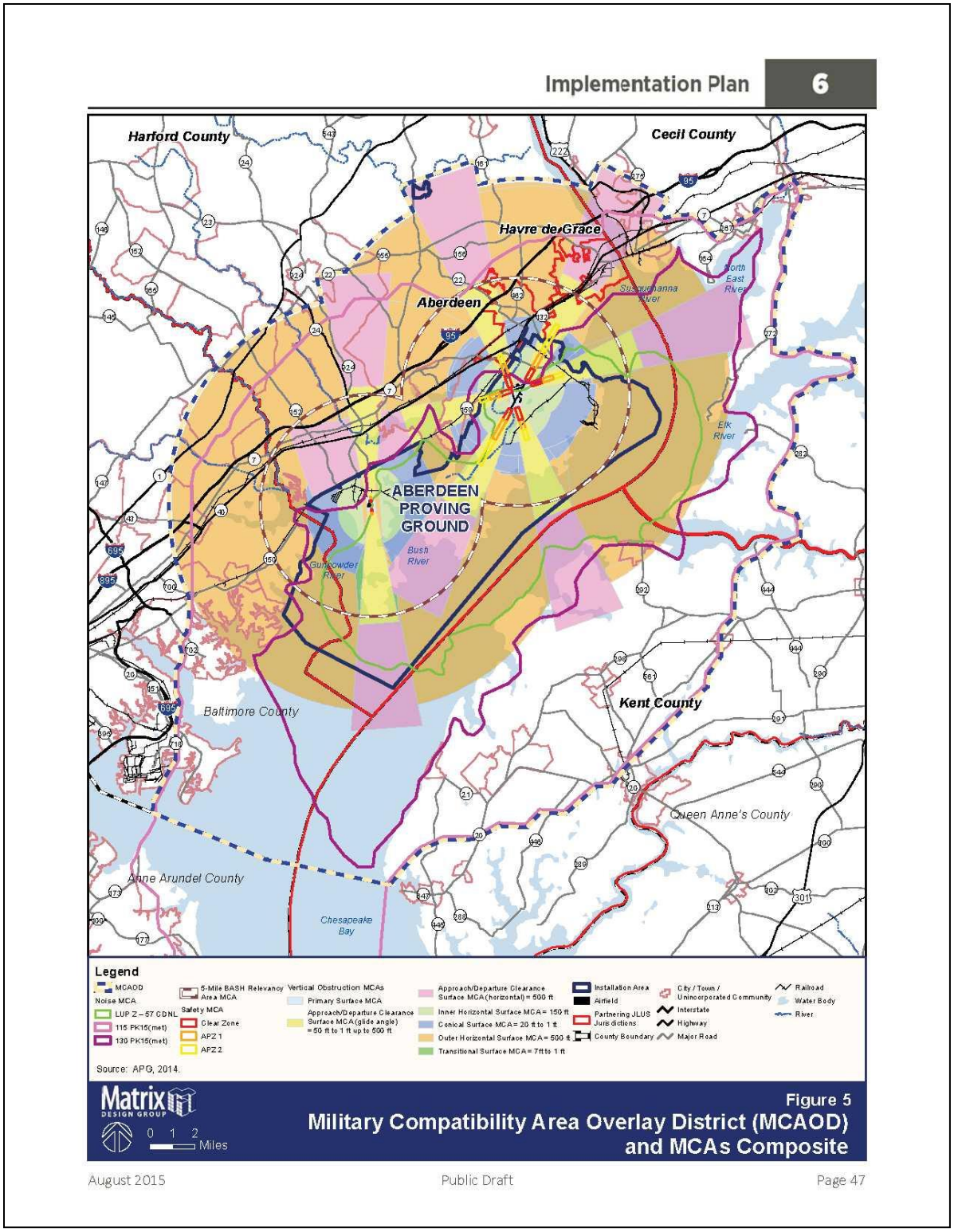

Figure 12. Aberdeen Proving Ground JLUS Military Compatibility Overlay District
Source: Matrix Design Group

SUMMARY

This document summarizes Aberdeen Proving Ground's Installation Compatible Use Zone Plan. The goal in developing this document is to help our neighbors understand the nature of noise emanating from Aberdeen Proving Ground and the assessment techniques used to quantify this noise. This noise management guide also serves as a quick reference to Aberdeen Proving Ground's Noise Zones, which are used to help achieve compatibility between the noise generated by military operations and our surrounding communities.

Citizens may call **(410) 278-1150** (Public Affairs Office) anytime with questions or concerns. After hours, on weekends, or depending on immediate staff availability, your call may be directed to voicemail. A Public Affairs Office staff member will contact you on the next business day.

U.S. Army Aberdeen Proving Ground
Public Affairs Office
(410) 278-1150
https://www.apg.army.mil/PublicAffairs/CommandInformation

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