

## **SECTION 4 EFFECTS OF AIRCRAFT OPERATIONS**

### **4.1 INTRODUCTION**

This section has two purposes. The first is to describe the imaginary surfaces associated with obstructions to air navigation, noise exposure, CZs, and APZs. The second purpose is to present applicable land-use compatibility guidelines and the Air Force's participation in the land-use planning process.

### **4.2 RUNWAY AIRSPACE IMAGINARY SURFACES**

Obstructions to air navigation are considered to be:

- Natural objects or man-made structures that protrude above the planes or imaginary surfaces, and/or;
- Man-made objects that extend more than 500 feet above ground level (AGL) at the site of the structure.

#### **4.2.1 Explanation of Terms**

The following elevation, runway length, and dimensional criteria apply:

- Controlling Elevation—Whenever surfaces or planes within the obstruction criteria overlap, the controlling (or governing) elevation becomes that of the lowest surface or plane.
- Runway Length—Andrews AFB has two runways. Runways 01L/19R and 01R/19L are 9,300 and 9,755 feet long, respectively. Both runways are Class B runways that are designed and built for sustained aircraft landings and take-offs:
- Established Airfield Elevation—The established elevation for the Andrews AFB airfield is 280 feet above MSL.
- Dimensions—All dimensions are measured horizontally unless otherwise noted.

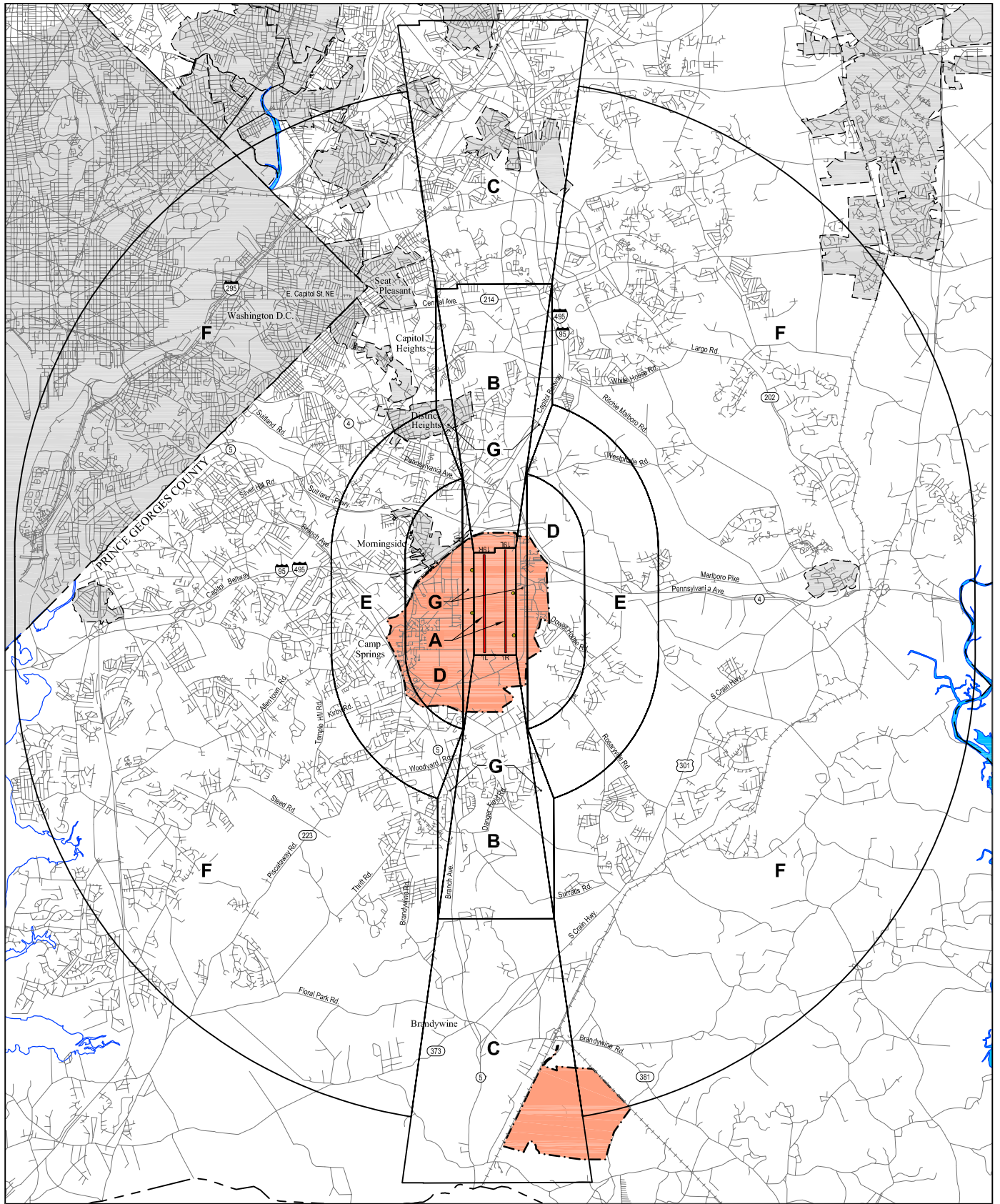
#### **4.2.2 Runway Airspace Imaginary Surfaces**

Runway airspace imaginary surfaces, in graphical form, are the result of the application of obstruction height criteria to Andrews AFB. Imaginary surfaces are surfaces in space around airfields in relation to runways. The surfaces are designed to define the obstacle-free airspace at and around the airfield. Refer to Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design*, for a more complete description of runway airspace imaginary surfaces for Class B runways. Air Force obstruction criteria in UFC 3-260-01 are based on those contained in Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*, Subpart C. FAR Part 77 provides guidance on submittal of FAA Form 7460-1, *Notice of Proposed Construction or Alteration*. The form is used to

notify the FAA of construction or alteration of structures proximate to imaginary surfaces around airfields.

Figure 4.1 depicts the runway airspace imaginary surfaces for the Andrews AFB Class B runways. The following paragraphs contain definitions of the runway airspace imaginary surfaces for Air Force class B runways:

- **Primary Surface**—An imaginary surface symmetrically centered on the runway, extending 200 feet beyond each runway end that defines the limits of the obstruction clearance requirements in the vicinity of the landing area. The width of the primary surface is 2,000 feet, or 1,000 feet on each side of the runway centerline.
- **Clear Zone Surface**—An obstruction-free surface (except for features essential for aircraft operations) on the ground symmetrically centered on the extended runway centerline beginning at the end of the runway and extending outward 3,000 feet. The CZ width is 3,000 feet (1,500 feet to either side of runway centerline).
- **Accident Potential Zone Surfaces**—APZ I begins at the outer end of the CZ and is 5,000 feet long and 3,000 feet wide. APZ II begins at the outer end of APZ I and is 7,000 feet long and 3,000 feet wide.
- **Approach-Departure Clearance Surface**—This imaginary surface is symmetrically centered on the extended runway centerline, beginning as an inclined plane (glide angle) 200 feet beyond each end of the primary surface, and extending for 50,000 feet. The slope of the approach-departure clearance surface is 50:1 until it reaches an elevation of 500 feet above the established airfield elevation. It then continues horizontally at this elevation to a point 50,000 feet from the starting point. The width of this surface at the runway end is 2,000 feet, flaring uniformly to a width of 16,000 feet at the end point.
- **Inner Horizontal Surface**—This imaginary surface is an oval plane at a height of 150 feet above the established airfield elevation. The inner boundary intersects with the approach-departure clearance surface and the transitional surface. The outer boundary is formed by scribing arcs with a radius 7,500 feet from the centerline of each runway end and interconnecting these arcs with tangents.
- **Conical Surface**—This is an inclined imaginary surface extending outward and upward from the outer periphery of the inner horizontal surface for a horizontal distance of 7,000 feet to a height of 500 feet above the established airfield elevation. The slope of the conical surface is 20:1. The conical surface connects the inner and outer horizontal surfaces.
- **Outer Horizontal Surface**—This imaginary surface is located 500 feet above the established airfield elevation and extends outward from the outer periphery of the conical surface for a horizontal distance of 30,000 feet.







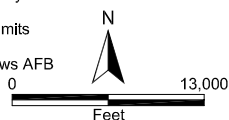
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**Andrews Air Force Base 2007 AICUZ**

**LEGEND**

- A** Primary Surface
- B** Approach-Departure Clearance Surface (50:1 Slope Ratio)
- C** Approach-Departure Clearance Surface (Horizontal)
- D** Inner Horizontal Surface (45.72m [150'] Elevation)
- E** Conical Surface (20:1 Slope Ratio)
- F** Outer Horizontal Surface (152.40m [500'] Elevation)
- G** Transitional Surface (7:1 Slope Ratio)

-  Runway
-  Roadway
-  City Limits
-  Andrews AFB



**Class B Air Force Runway  
Airspace Imaginary  
Surfaces**

**Figure 4.1**

- Transitional Surface—This imaginary surface extends outward and upward at right angles to the runway centerline and extended runway centerline at a slope of 7:1. The transitional surface connects the primary and the approach-departure clearance surfaces to the inner horizontal, the conical, and the outer horizontal surfaces.

### **4.3 RESTRICTED AND/OR PROHIBITED LAND USES**

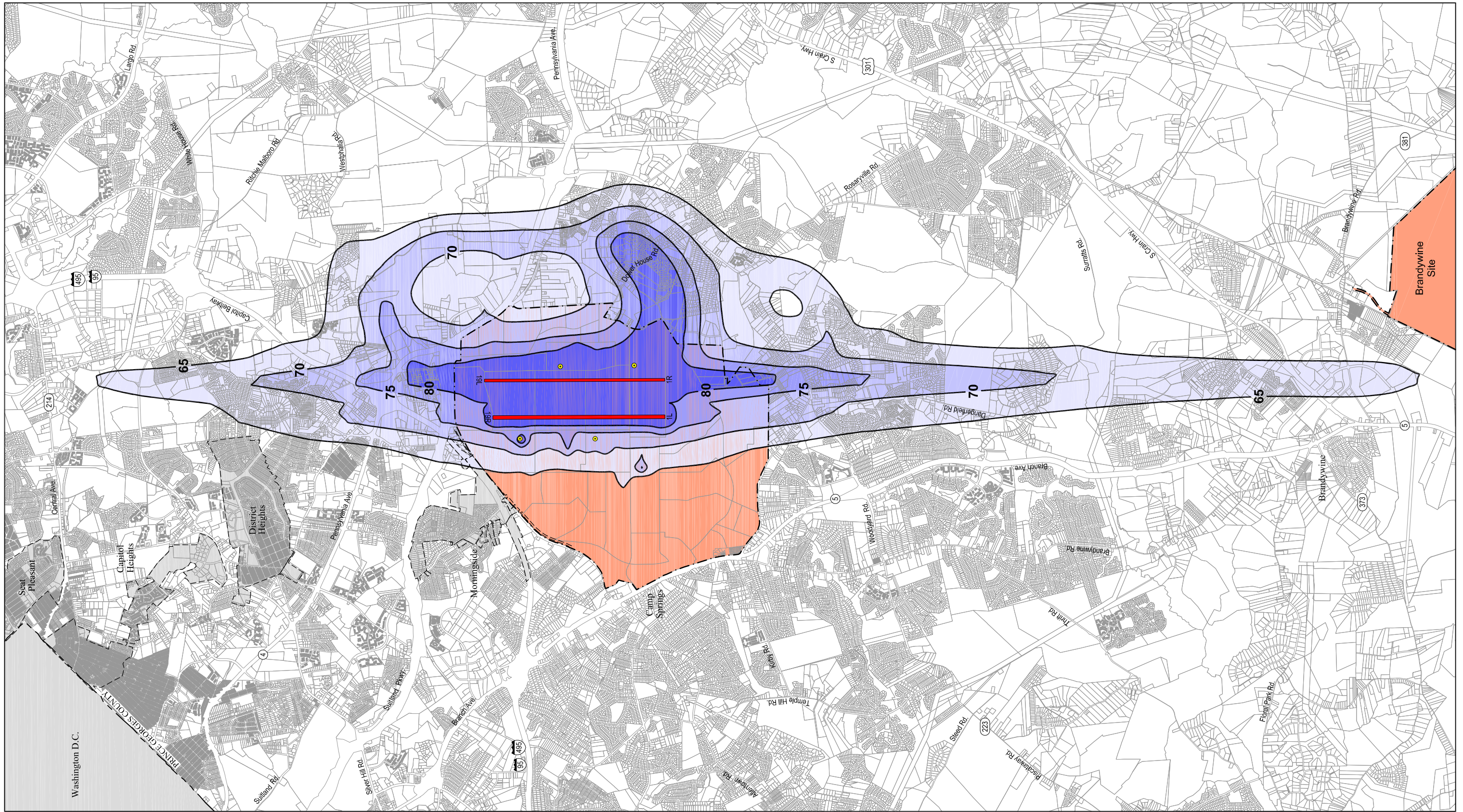
The land areas outlined by these criteria should be regulated to prevent uses that might otherwise be hazardous to aircraft operations. The following uses should be restricted and/or prohibited:

- Releases into the air of any substance that would impair visibility or otherwise interfere with the operation of aircraft (*e.g.*, steam, dust, or smoke);
- Light emissions, either direct or indirect (reflective), that would interfere with pilot vision;
- Electrical emissions that would interfere with aircraft communications systems or navigational equipment;
- Uses that would attract birds or waterfowl, including but not limited to, operation of sanitary landfills, waste transfer facilities, maintenance of feeding stations, sand and gravel dredging operations, storm water retention ponds, created wetland areas, or the growing of certain vegetation; and
- Structures within 10 feet of aircraft approach-departure and/or transitional surfaces.

### **4.4 NOISE EXPOSURE**

NOISEMAP Version 7.296 was used to calculate and plot the DNL noise contours based on the average busy-day aircraft operations data collected in 2007 and described in Subsections 3.1 through 3.6. Figure 4.2 shows the DNL noise contours plotted in 5 dB increments, ranging from DNL 65 dB to DNL at or above 80 dB.










Different sounds have different frequency content. When describing sound and its effect on a human population, A-weighted (dB) sound levels are typically used to account for the response of the human ear. The term “A-weighted” refers to a filtering of the sound signal to emphasize frequencies in the middle of the audible spectrum and to de-emphasize low and high frequencies in a manner corresponding to the way the human ear perceives sound. This filtering network has been established by the American National Standards Institute. The A-weighted noise level has been found to correlate well with people’s judgments of the noisiness of different sounds and has been in use for many years as a measure of community noise. The noise levels presented in this AICUZ Study are A-weighted.



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**Andrews Air Force Base 2007 AICUZ**

**LEGEND**

- |   |              |   |             |   |         |
|---|--------------|---|-------------|---|---------|
|  | DNL 65-69 dB |  | Runway      |  | Hellpad |
|  | DNL 70-74 dB |  | Roadway     |   |         |
|  | DNL 75-79 dB |  | City Limits |   |         |
|  | DNL 80+ dB   |  | Andrews AFB |   |         |

**Average Busy-Day Noise Contours for 2007**

Figure 4.2

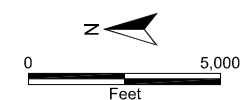


Table 4.1 shows the off-installation noise exposure within the DNL 65 dB and greater noise exposure area for aircraft operations at Andrews AFB in terms of acreage and estimated population. DNL is the measure of the total noise environment. DNL averages the sum of all aircraft noise producing events over a 24-hour period, with a 10 dBA upward adjustment added to the nighttime events (between 10:00 p.m. and 7:00 a.m.). The population data used in preparing this estimate was obtained from the United States Census Bureau 2000 census. To estimate affected population, it was assumed that population was equally distributed within a census tract area. Using this assumption, the total acreage and population in each census tract surrounding Andrews AFB was collected and assessed. Using the noise contour information, the number of acres of land in each noise zone (*i.e.*, DNL 65-69 dB, 70-74 dB, 75-79 dB, and 80 dB and greater) was divided by the number of acres of land in each census tract to determine what portion of the census tract was contained within each noise zone. The population total in each block-group was then multiplied by this ratio to estimate population exposed to aircraft noise at and above DNL 65 dB.

**Table 4.1 Area and Population within DNL 65 dB and Greater Noise Exposure Area (Off-Installation)**

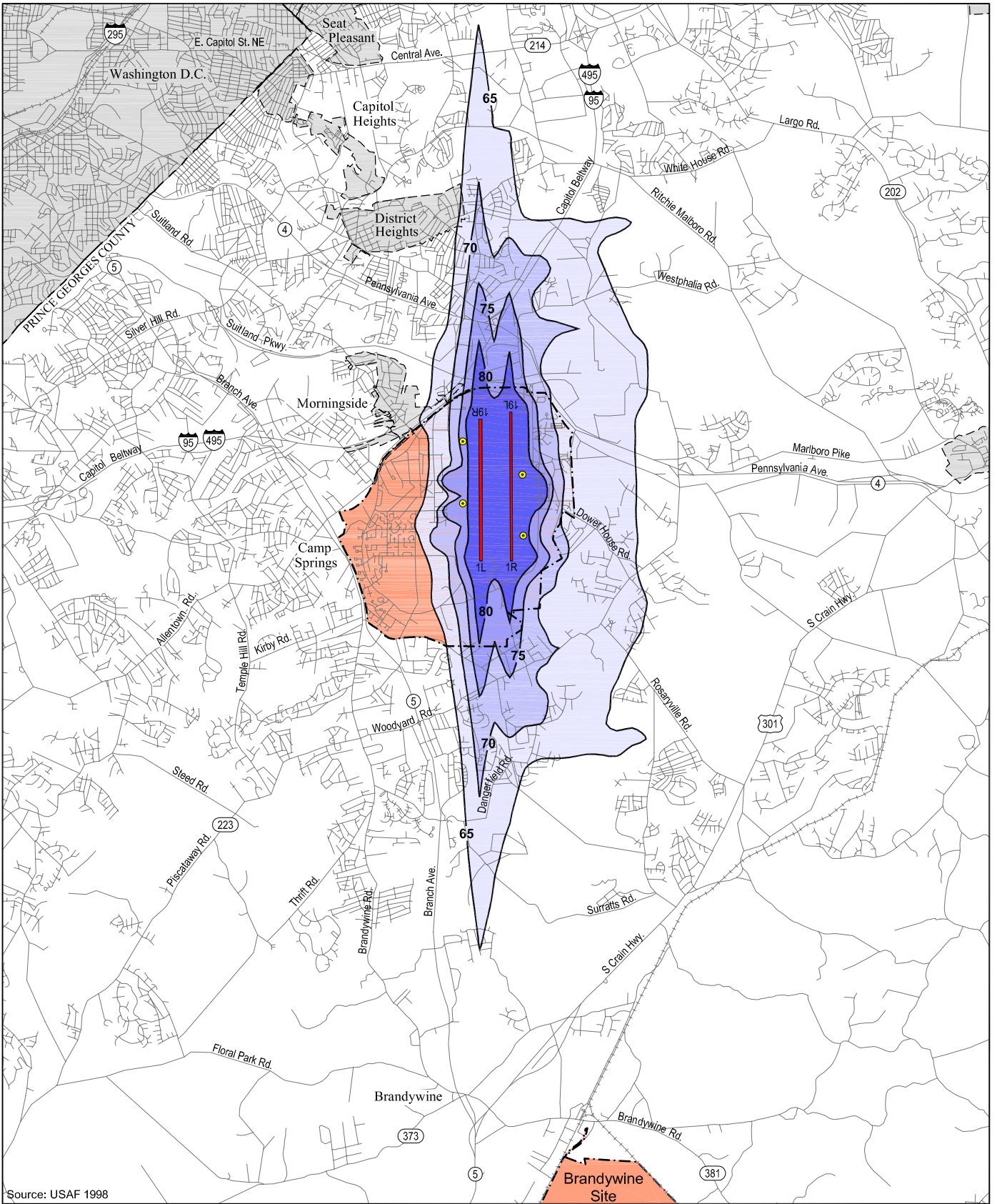
<b>DNL Noise Zone</b>	<b>Acres</b>	<b>Population</b>
65-69	5,008	7,462
70-74	2,187	2,431
75-79	701	789
80+	394	401
<b>Total</b>	<b>8,290</b>	<b>11,083</b>

From Table 4.1, a total of 8,290 acres and 11,083 persons are expected to be in the off-installation area within the DNL 65 dB and greater noise exposure area. The largest affected population is within the DNL 65-69 dB noise zone. This area is estimated to contain 5,008 acres in off-installation land area (60 percent of the total) and an estimated population of 7,462 persons (67 percent of the total) based on the calculated population densities for the area.

As mentioned in Subsection 3.2, helicopters from the 1st Helicopter Squadron accomplish operations at the Brandywine and Davidsonville sites. Appendix D contains the noise contours resulting from operations at the two locations.

#### **4.5 COMPARISON WITH 1998 AICUZ STUDY**

Noise contours presented in this study are similar in both shape and extent of coverage when compared to the noise contours in the 1998 AICUZ Study. Figure 4.3 depicts the 1998 AICUZ Study contours and Figure 4.4 compares the 2007 and 1998 contours. The off-installation exposure for this AICUZ Study is about 7 acres less than the 1998 AICUZ Study. Table 4.2 lists the total noise exposure for the four noise zones in each study. Although there are fewer off-installation acres within the DNL 65-69 dB noise zone in the 2007 AICUZ Study when compared to the 1998 Study, the number of acres within each of the

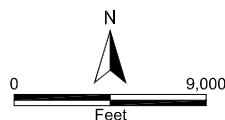


Source: USAF 1998

**Andrews Air Force Base 2007 AICUZ**

**LEGEND**

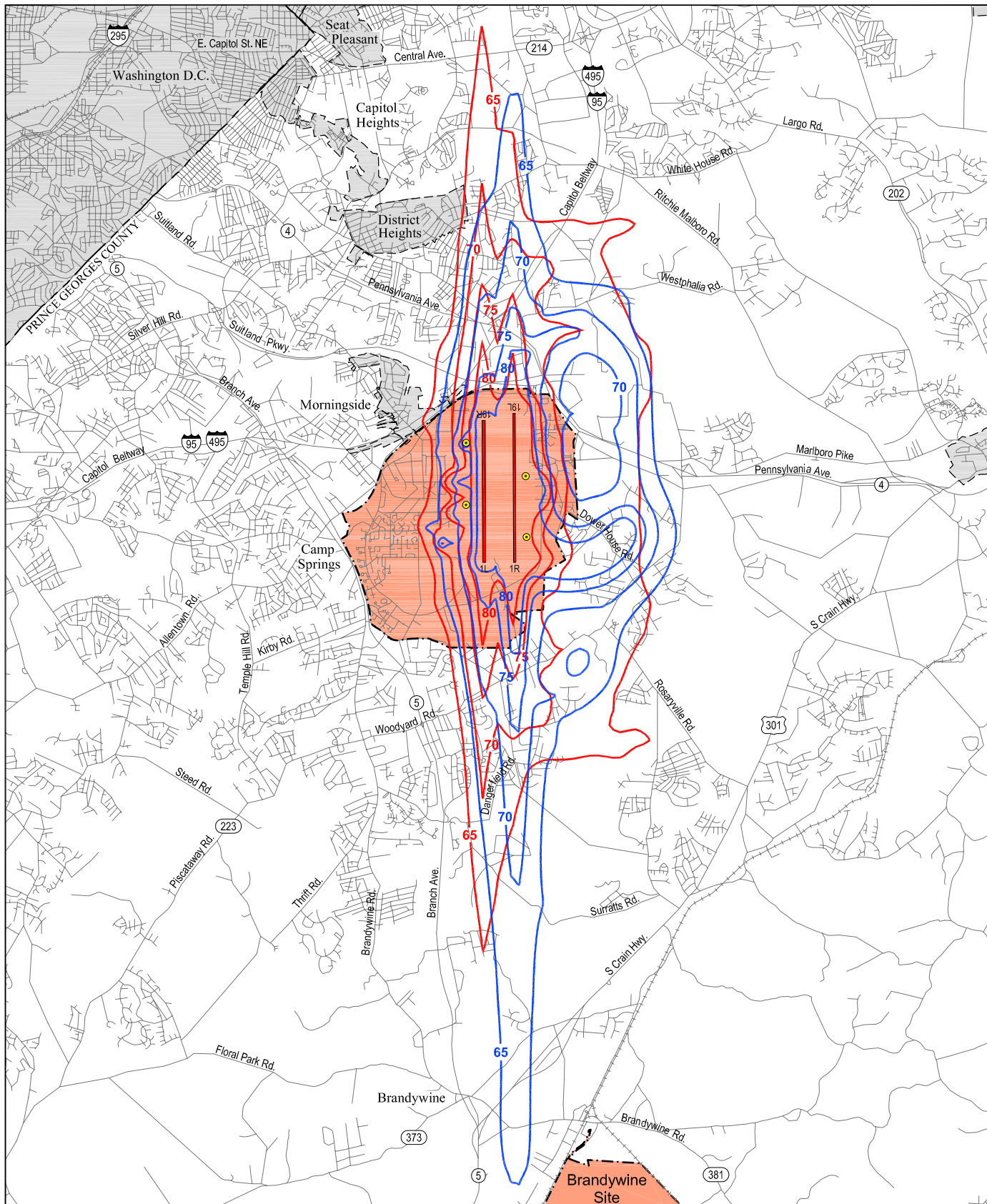
- |  |              |  |             |  |          |
|--|--------------|--|-------------|--|----------|
|  | DNL 65-69 dB |  | Runway      |  | Heli-pad |
|  | DNL 70-74 dB |  | Roadway     |  |          |
|  | DNL 75-79 dB |  | City Limits |  |          |
|  | DNL 80+ dB   |  | Andrews AFB |  |          |



**1998 AICUZ Study Noise Contours**

Figure 4.3

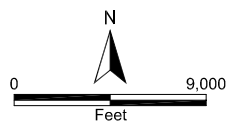
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**Andrews Air Force Base 2007 AICUZ**

**LEGEND**

- 1998 Noise Contour
- 2007 Noise Contour
- Andrews AFB
- Runway
- Roadway
- City Limits
- Helipad



**Comparison of 2007 and 1998 AICUZ Study Noise Contours**

Figure 4.4

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other three zones is greater in the 2007 Study. Differences in the contours occur to the south where the 2007 contour extends farther and to the northeast and southeast where the 1998 contour covers more land. Additional differences occur to the northeast, east, and southeast of the installation where area that was exposed to DNL 65-69 dB in the 1998 study is exposed to DNL 70-80+ dB in the 2007 Study. The changes in the contours result from a greater number of operations being accomplished on Runway 19L/01R for 2007 when comparing the aircraft operations conditions for the 2007 and 1998 studies. The increase in operations on Runway 19L/01R causes the slight eastward “shift” of the contours when comparing 2007 and 1998. Additionally, there is a greater number of closed pattern flight tracks on the east side of the airfield under the 2007 Study, and the operations on these tracks contribute to the increased noise exposure to the northeast, east, and southeast of the installation.

**Table 4.2 Total Acres within the 2007 and 1998 AICUZ Study Noise Zones (Off-Installation)**

DNL Noise Zone	Acres	
	2007 Study	1998 Study
65–69	5,008	6,172
70–74	2,187	1,574
75–79	701	491
80+	394	60
<b>Total</b>	<b>8,290</b>	<b>8,297</b>

#### **4.6 CLEAR ZONES AND ACCIDENT POTENTIAL ZONES**

The purpose of this section is to describe the basis for CZs and APZs and apply the zones to the Andrews AFB runways.

##### **4.6.1 Basis for Clear Zones and Accident Potential Zones**

Areas around airports are exposed to the possibility of aircraft accidents even with well-maintained aircraft and highly trained aircrews. Despite stringent maintenance requirements and countless hours of training, past history makes it clear that accidents may occur.

The risk of people on the ground being killed or injured by aircraft accidents is miniscule. However, an aircraft accident is a high-consequence event and, when a crash does occur, the result is often catastrophic. Because of this, the Air Force does not attempt to base its safety standards on accident probabilities. Instead it approaches this safety issue from a land use-planning perspective. Designation of safety zones around the airfield and restriction of incompatible land uses can reduce the public’s exposure to safety hazards.

The AICUZ program includes three safety zones: the CZ, APZ I, and APZ II. These zones were developed from analysis of over 800 major Air Force accidents that occurred within 10 miles of an Air Force installation between 1968 and 1995. Figure B-3 in Appendix B summarizes the location of these accidents.

The CZ has the highest accident potential of the three zones, as 27 percent of accidents studied occurred in this area. Due to the relatively high accident potential, the Air Force

adopted a policy of acquiring real estate interests in the CZ through purchase or easement when feasible.

APZ I is an area that possesses somewhat less accident potential than the CZ, with 10 percent of the accidents studied occurring in this zone. APZ II has less accident potential than APZ I, with 6 percent of the accidents studied occurring in this zone. While the potential for aircraft accidents in APZs I and II does not warrant land acquisition by the Air Force, land-use planning and controls are strongly encouraged in these areas for the protection of the public.

#### **4.6.2 Clear Zones and Accident Potential Zones**

Figure 4.5 depicts the CZs and APZs for Runways 01L/19R and 01R/19L at Andrews AFB. Each end of the runways has a 3,000 foot by 3,000 foot CZ and two APZs. Accident potential on or adjacent to the runway or within the CZ is so high that the necessary land use restrictions would prohibit reasonable economic use of land. It is Air Force policy to request that Congress authorize and appropriate funds to purchase the real property interests in this area to prevent incompatible land uses.

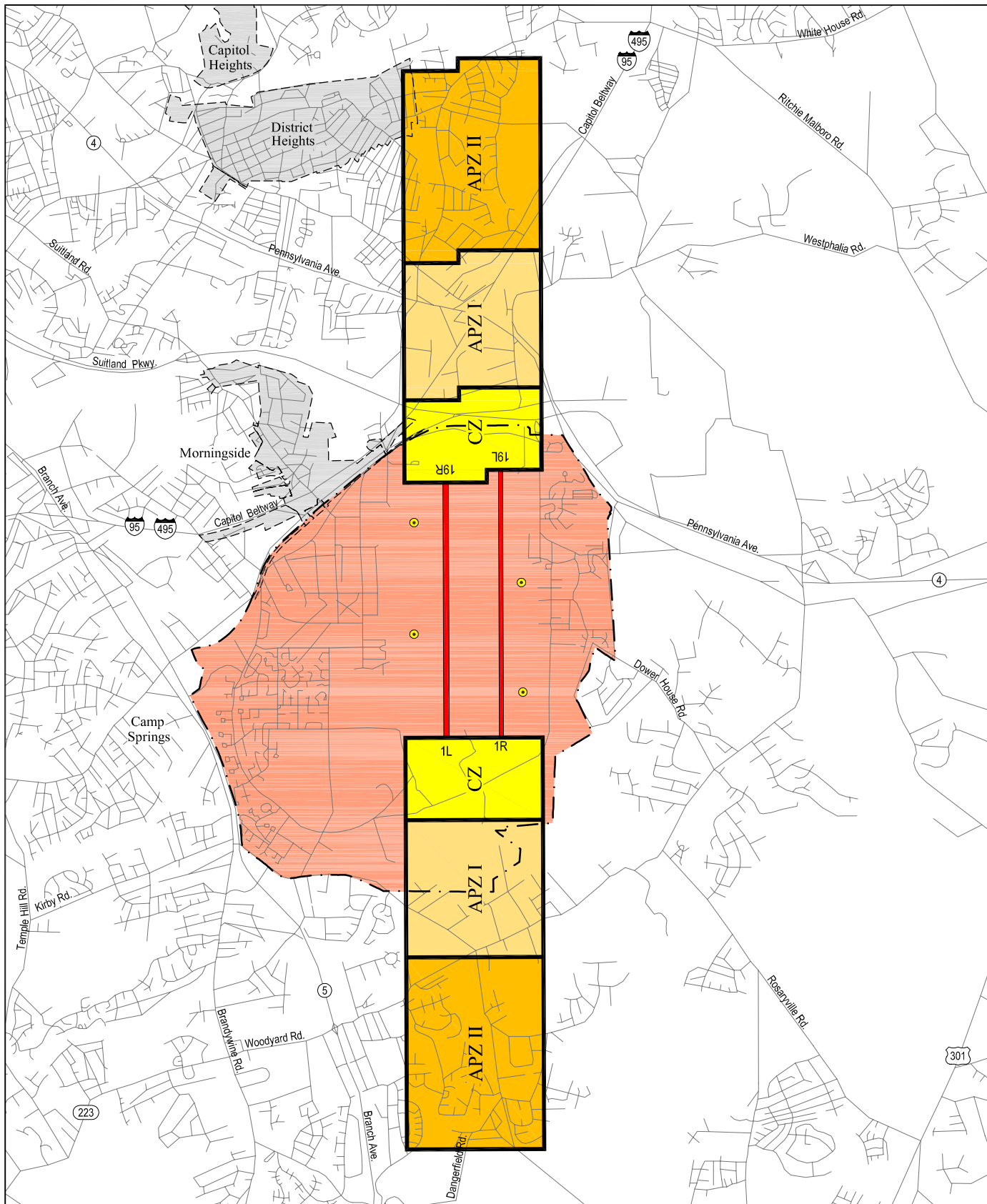
Accident potential in zone I is less critical than the CZ, but still possesses a significant risk factor. This 3,000 foot by 5,000 foot area has land use compatibility guidelines that are sufficiently flexible to allow reasonable economic use of the land, such as industrial/manufacturing, transportation, communication/utilities, wholesale trade, open space, recreation, and agriculture. However, uses that concentrate people in small areas are not acceptable.

Accident potential zone II is less critical than APZ I, but still possesses potential for accidents. Accident potential zone II, also 3,000 feet wide, is 7,000 feet long extending to 15,000 feet from the runway threshold. Acceptable uses include those of APZ I, as well as low density single family residential and those personal and business services and commercial/retail trade uses of low intensity or scale of operation. High density functions such as multi-story buildings, places of assembly (*e.g.*, theaters, churches, schools, restaurants, *etc.*), and high density office uses are not considered appropriate.

High people densities should be limited to the maximum extent possible in APZ II. The optimum density recommended for residential usage (where it does not conflict with noise criteria) in APZ II is one dwelling per acre. For most nonresidential usage, buildings should be limited to one story and the lot coverage should not exceed 20 percent.

#### **4.6.3 Land Use Compatibility Guidelines**

Subsection 4.6.3.1 introduces the AICUZ concept and Subsection 4.6.3.2 presents the land-use compatibility guidelines applicable to Andrews AFB.

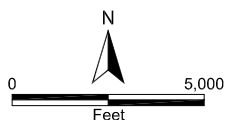


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**Andrews Air Force Base 2007 AICUZ**

**LEGEND**

- Runway
- Roadway
- City Limits
- Andrews AFB
- CZ** Clear Zone
- APZ** Accident Potential Zone
- Helipad



**Clear Zones and Accident Potential Zones**

Figure 4.5

#### **4.6.3.1 Introduction**

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

AICUZ reports describe three basic types of constraints that affect, or result from, flight operations. The first constraint involves areas that the FAA and the DoD identified for height limitations (see Subsection 4.2).

The second constraint involves noise zones based on the DNL metric and the DoD NOISEMAP method. Using the NOISEMAP program, which is similar to FAA's INM, the Air Force produces noise contours showing the noise levels generated by aircraft operations. The AICUZ report contains noise contours plotted in 5 dB increments, ranging from DNL 65 dB to 80+ dB.

The third constraint involves CZs and APZs based on statistical analysis of past DoD aircraft accidents. DoD analysis has determined that areas immediately beyond the ends of runways and along the approach and departure flight paths have greater potential for aircraft accidents (see Figure 4.5).

#### **4.6.3.2 Land-Use Compatibility Guidelines**

Each AICUZ Study contains land-use guidelines. Table 4.3 identifies land uses and possible noise exposure and accident potential combinations for Andrews AFB. These noise guidelines are essentially the same as those published by the Federal Interagency Committee on Urban Noise in the June 1980 publication, *Guidelines for Considering Noise in Land-Use Planning and Control*. The U.S. Department of Transportation publication, *Standard Land Use Coding Manual (SLUCM)*, has been used to identify and code land-use activities. The designations are a combination of criteria listed in the Legend and Notes at the end of the table. For example, Y<sup>1</sup> means land use and related structures are compatible without restriction at a suggested maximum density of 1-2 dwelling units per acre, possibly increased under a Planned Unit Development where lot coverage is less than 20 percent.

### **4.7 PARTICIPATION IN THE PLANNING PROCESS**

The Air Force provides the AICUZ Study to local communities to assist them in preparing their local land use plans. This section discusses how the base participates in the community planning process. Subsection 6.3 addresses the role played by the local community in enhancing compatible land use.

Airspace obstructions, construction in the APZs, residential development, and the construction of other noise-sensitive uses near the base are of great concern to Andrews AFB. The Air Force is very interested in minimizing increases in incompatible usage and in

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encouraging voluntary conversion of non-compatible usage to compatible usage. Applying the categories for compatible land use described in Table 4.3, the Base evaluates the impact aircraft operations have on surrounding properties and the effect new development or changes in land use might have on Andrews AFB operational capabilities.

In addition to working with local governing entities and planning professionals, the Andrews AFB Base Public Affairs Office works to address complaints and concerns expressed by off-airfield neighbors.

Andrews AFB conducts active outreach to the community by meeting with various community groups and speaking with individuals as needed. The Andrews AFB Base Civil Engineer and Public Affairs Offices work together providing public meetings and informational workshops to disseminate information about base operations, forecasts, plans, and mitigation strategies.

**Table 4.3 Land Use Compatibility Guidelines**

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

**Table 4.3 Land Use Compatibility Guidelines (continued)**

Land Use		Accident Potential Zones			Noise Zones			
SLUCM No.	Name	Clear Zone	APZ I	APZ II	65-69	70-74	75-79	80+
25	Furniture and fixtures; manufacturing	N	Y <sup>2</sup>	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
26	Paper & allied products; manufacturing	N	Y <sup>2</sup>	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
27	Printing, publishing, and allied industries	N	Y <sup>2</sup>	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
28	Chemicals and allied products; manufacturing	N	N	N <sup>2</sup>	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
29	Petroleum refining and related industries	N	N	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
30	<b>Manufacturing</b>							
31	Rubber and misc. plastic products, manufacturing	N	N <sup>2</sup>	N <sup>2</sup>	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
32	Stone, clay and glass products manufacturing	N	N <sup>2</sup>	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
33	Primary metal industries	N	N <sup>2</sup>	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
34	Fabricated metal products; manufacturing	N	N <sup>2</sup>	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks manufacturing	N	N	N <sup>2</sup>	Y	A	B	N
39	Miscellaneous manufacturing	N	Y <sup>2</sup>	Y <sup>2</sup>	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
40	<b>Transportation, Communications and Utilities</b>							
41	Railroad, rapid rail transit and street railroad transportation	N <sup>3</sup>	Y <sup>4</sup>	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
42	Motor vehicle transportation	N <sup>3</sup>	Y	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
43	Aircraft transportation	N <sup>3</sup>	Y <sup>4</sup>	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
44	Marine craft transportation	N <sup>3</sup>	Y <sup>4</sup>	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
45	Highway & street right-of-way	N <sup>3</sup>	Y	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
46	Automobile parking	N <sup>3</sup>	Y <sup>4</sup>	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
47	Communications	N <sup>3</sup>	Y <sup>4</sup>	Y	Y	A <sup>15</sup>	B <sup>15</sup>	N
48	Utilities	N <sup>3</sup>	Y <sup>4</sup>	Y	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>
49	Other transportation communications and utilities	N <sup>3</sup>	Y <sup>4</sup>	Y	Y	A <sup>15</sup>	B <sup>15</sup>	N

**Table 4.3 Land Use Compatibility Guidelines (continued)**

Land Use		Accident Potential Zones			Noise Zones			
SLUCM No.	Name	Clear Zone	APZ I	APZ II	65-69	70-74	75-79	80+
50	<b>Trade</b>							
51	Wholesale trade	N	Y <sup>2</sup>	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
52	Retail trade-building materials, hardware and farm equipment	N	Y <sup>2</sup>	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
53	Retail trade-general merchandise	N	N <sup>2</sup>	Y <sup>2</sup>	Y	A	B	N
54	Retail trade-food	N	N <sup>2</sup>	Y <sup>2</sup>	Y	A	B	N
55	Retail trade-automotive, marine craft, aircraft and accessories	N	Y <sup>2</sup>	Y <sup>2</sup>	Y	A	B	N
56	Retail trade-apparel and accessories	N	N <sup>2</sup>	Y <sup>2</sup>	Y	A	B	N
57	Retail trade-furniture, home furnishings and equipment	N	N <sup>2</sup>	Y <sup>2</sup>	Y	A	B	N
58	Retail trade-eating and drinking establishments	N	N	N <sup>2</sup>	Y	A	B	N
59	Other retail trade	N	N <sup>2</sup>	Y <sup>2</sup>	Y	A	B	N
60	<b>Services</b>							
61	Finance, insurance and real estate services	N	N	Y <sup>6</sup>	Y	A	B	N
62	Personal services	N	N	Y <sup>6</sup>	Y	A	B	N
62.4	Cemeteries	N	Y <sup>7</sup>	Y <sup>7</sup>	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14,21</sup>
63	Business services	N	Y <sup>8</sup>	Y <sup>8</sup>	Y	A	B	N
64	Repair services	N	Y <sup>2</sup>	Y	Y	Y <sup>12</sup>	Y <sup>13</sup>	Y <sup>14</sup>
65	Professional services	N	N	Y <sup>6</sup>	Y	A	B	N
65.1	Hospitals, nursing homes	N	N	N	A*	B*	N	N
65.1	Other medical facilities	N	N	N	Y	A	B	N
66	Contract construction services	N	Y <sup>6</sup>	Y	Y	A	B	N
67	Governmental services	N	N	Y <sup>6</sup>	Y*	A*	B*	N
68	Educational services	N	N	N	A*	B*	N	N
69	Miscellaneous services	N	N <sup>2</sup>	Y <sup>2</sup>	Y	A	B	N

**Table 4.3 Land Use Compatibility Guidelines (continued)**

Land Use		Accident Potential Zones			Noise Zones			
SLUCM No.	Name	Clear Zone	APZ I	APZ II	65-69	70-74	75-79	80+
70	<b>Cultural, Entertainment and Recreational</b>							
71	Cultural activities (including churches)	N	N	N <sup>2</sup>	A*	B*	N	N
71.2	Nature exhibits	N	Y <sup>2</sup>	Y	Y*	N	N	N
72	Public assembly	N	N	N	Y	N	N	N
72.1	Auditoriums, concert halls	N	N	N	A	B	N	N
72.11	Outdoor music shell, amphitheaters	N	N	N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	N	N	N	Y <sup>17</sup>	Y <sup>17</sup>	N	N
73	Amusements	N	N	Y <sup>8</sup>	Y	Y	N	N
74	Recreational activities (including golf courses, riding stables, water recreation)	N	Y <sup>8,9,10</sup>	Y	Y*	A*	B*	N
75	Resorts and group camps	N	N	N	Y*	Y*	N	N
76	Parks	N	Y <sup>8</sup>	Y <sup>8</sup>	Y*	Y*	N	N
79	Other cultural, entertainment and recreation	N	Y <sup>9</sup>	Y <sup>9</sup>	Y*	Y*	N	N
80	<b>Resources Production and Extraction</b>							
81	Agriculture (except livestock)	Y <sup>16</sup>	Y	Y	Y <sup>18</sup>	Y <sup>19</sup>	Y <sup>20</sup>	Y <sup>20,21</sup>
81.5 to 81.7	Livestock farming and animal breeding	N	Y	Y	Y <sup>18</sup>	Y <sup>19</sup>	Y <sup>20</sup>	Y <sup>20,21</sup>
82	Agricultural related activities	N	Y <sup>5</sup>	Y	Y <sup>18</sup>	Y <sup>19</sup>	N	N
83	Forestry activities and related services	N <sup>5</sup>	Y	Y	Y <sup>18</sup>	Y <sup>19</sup>	Y <sup>20</sup>	Y <sup>20,21</sup>
84	Fishing activities and related services	N <sup>5</sup>	Y <sup>5</sup>	Y	Y	Y	Y	Y
85	Mining activities and related services	N	Y <sup>5</sup>	Y	Y	Y	Y	Y
89	Other resources production and extraction	N	Y <sup>5</sup>	Y	Y	Y	Y	Y

**LEGEND**

**SLUCM** - Standard Land Use Coding Manual, U.S. Department of Transportation.

**Y** - (Yes) - Land use and related structures are compatible without restriction.

**N** - (No) - Land use and related structures are not compatible and should be prohibited.

**Y<sup>x</sup>** - (yes with restrictions) - Land use and related structures generally compatible; see notes 1-21.

**N<sup>x</sup>** - (no with exceptions) - See notes 1-21.

**NLR** - (Noise Level Reduction) - NLR (outdoor to indoor) to be achieved through incorporation of noise attenuation measures into the design and construction of the structures (see Appendix C, section c.4).

**A, B, or C** - Land use and related structures generally compatible; measures to achieve NLR of A (DNL 25 dB), B (DNL 30 dB), or C (DNL 35 dB) need to be incorporated into the design and construction of structures.

**A\*, B\*, and C\*** - Land use generally compatible with NLR. However, measures to achieve an overall noise level reduction do not necessarily solve noise difficulties and additional evaluation is warranted. See appropriate footnotes.

\* - The designation of these uses as "compatible" in this zone reflects individual federal agency and program consideration of general cost and feasibility factors, as well as past community experiences and program objectives.



## ***Andrews Air Force Base, Maryland***

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Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider.

### **NOTES**

1. Suggested maximum density of 1-2 dwelling units per acre possibly increased under a Planned Unit Development where maximum lot coverage is less than 20 percent.
2. Within each land use category, uses exist where further definition may be needed due to the variation of densities in people and structures. Shopping malls and shopping centers are considered incompatible in any accident potential zone (CZ, APZ I, or APZ II).
3. The placing of structures, buildings, or aboveground utility lines in the clear zone is subject to severe restrictions. In a majority of the clear zones, these items are prohibited. See AFI 32-7063 and UFC 3-260-01 for specific guidance.
4. No passenger terminals and no major aboveground transmission lines in APZ I.
5. Factors to be considered: labor intensity, structural coverage, explosive characteristics, and air pollution.
6. Low-intensity office uses only. Meeting places, auditoriums, etc., are not recommended.
7. Excludes chapels.
8. Facilities must be low intensity.
9. Clubhouse not recommended.
10. Areas for gatherings of people are not recommended.
- 11A. Although local conditions may require residential use, it is discouraged in DNL 65-69 dB and strongly discouraged in DNL 70-74 dB. An evaluation should be conducted prior to approvals, indicating a demonstrated community need for residential use would not be met if development were prohibited in these zones, and there are no viable alternative locations.
- 11B. Where the community determines the residential uses must be allowed, measures to achieve outdoor to indoor NLR for DNL 65-69 dB and DNL 70-74 dB should be incorporated into building codes and considered in individual approvals.
- 11C. NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, and design and use of berms and barriers can help mitigate outdoor exposure, particularly from near ground level sources. Measures that reduce outdoor noise should be used whenever practical in preference to measures which only protect interior spaces.
12. Measures to achieve the same NLR as required for facilities in the DNL 65-69 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
13. Measures to achieve the same NLR as required for facilities in the DNL 70-74 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
14. Measures to achieve the same NLR as required for facilities in the DNL 75-79 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
15. If noise sensitive, use indicated NLR; if not, the use is compatible.
16. No buildings.
17. Land use is compatible provided special sound reinforcement systems are installed.
18. Residential buildings require the same NLR required for facilities in the DNL 65-69 dB range.
19. Residential buildings require the same NLR required for facilities in the DNL 70-74 dB range.
20. Residential buildings are not permitted.
21. Land use is not recommended. If the community decides the use is necessary, personnel should wear hearing protection devices.

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