Chapter Three

Compatibility

Compatibility, in relation to military readiness, can be defined as the balance or compromise between community and military needs and interests. The goal of compatibility planning is to promote an environment where both entities can coexist successfully, while taking into account each other's continued success.

A number of factors influence whether community and military plans, programs, and activities are compatible or in conflict. For this Joint Land Use Study (JLUS), a list of 24 common compatibility factors was used to help characterize local issues (see the next page). These common compatibility factors fall into three broad categories: man-made, natural resources, and competition for scarce resources.

Based on input from the JLUS committees, the public, and the JLUS consulting team, issues to be addressed in the Hampton-Langley JLUS were identified under 11 of the 24 common compatibility factors evaluated. This chapter provides an overview of the compatibility factors identified within the Hampton-Langley JLUS study area. This assessment of current and future incompatibilities drives the development of the strategies presented in Chapter 5, which are designed to address the current and future issues.

3.1 METHODOLOGY AND EVALUATION

The purpose of this chapter is to detail the genesis of developing the compatibility factors associated with the Hampton-Langley JLUS. The JLUS evaluation approach consisted of a comprehensive and inclusive discovery process identifying the key stakeholder issues which could directly or indirectly affect the compatibility strategies proposed in Chapter 5. Consequently, the strategies presented in Chapter 5 were designed to address the significant compatibility issues identified in this chapter. During the preparation of the Hampton-Langley JLUS, the public, the Policy Committee (PC), and the Working Group (WG) assisted in working through all 24 factors to identify, describe and prioritize the extent of existing and potential future compatibility factors that could impact lands within or near the study area.

At the initial committee workshops and public meetings, these groups were asked to identify the location and type of compatibility factors they thought existed today or could occur in the future.

Man-Made

1. Land Use
2. Safety Zones
3. Vertical Obstruction
4. Local Housing Availability
5. Infrastructure Extensions
6. Anti-terrorism / Force Protection
7. Noise
8. Vibration
9. Dust / Smoke / Steam
10. Light and Glare
11. Alternative Energy
12. Air Quality
13. Frequency Spectrum Impedance & Interference
14. Public Trespassing
15. Cultural Sites
16. Legislative Initiatives
17. Interagency Coordination

Natural Resources

18. Water Quality / Quantity
19. T & E Species
20. Marine Environments

Competition for Scarce Resources

21. Scarce Natural Resources
22. Land, Air, and Sea Spaces
23. Frequency Spectrum Capacity
24. Ground Transportation

Other issues were also added by the consulting team based on their evaluation of available information and relevant experience on similar projects.

When reviewing this information, it is important to note the following:

- This chapter provides a general technical background on each of the issues discussed based on available information. The intent is to provide an adequate context for awareness, education, and development of JLUS recommendations. As such, it is not designed or intended to be utilized as an exhaustive technical evaluation of existing or future conditions within the study area.
- Of the 24 standard compatibility factors, 13 were determined not to be a factor for this area: Factor 5, Infrastructure Extensions; Factor 9, Dust / Smoke / Steam; Factor 11, Alternative Energy; Factor 12, Air Quality; Factor 13, Frequency Spectrum; Factor 14, Public Trespassing; Factor 15, Cultural Sites; Factor 16, Legislative Initiatives; Factor 17, Interagency Coordination; Factor 18, Water Quality / Quantity; Factor 20, Marine Environments; Factor 22, Scarce Natural Resources; and Factor 23, Frequency Spectrum Capacity.

Three criteria were utilized to identify the issues surrounding Langley Air Force Base (AFB), caused by both the military and the surrounding communities. By evaluating the issues based on these three criterion, further analysis can be concluded to determine the severity of the current or potential impact an issue has on the compatibility between military operations and the nearby communities. The three criteria are: current impact, issue location, and potential impact. The criteria utilized for this assessment included the following:

- **Current Impact.** Each issue was considered based on its current impact to compatibility of either the installation or a local jurisdiction. Issues posing the most extensive operational constraints or community concerns constitute the highest priority for mitigation measures. These include items such as incompatible land development within aircraft safety zones. Some issues pose a current impact, but are not as severe to the military mission sustainment such as the existence of threatened and endangered species within the study area.

- **Location.** This criteria measures the proximity of each issue in relation to activities occurring on the installation. Issues occurring near the installation are often more critical than those occurring remotely or in areas more distant from operational activities. Issues that were located inside the JLUS study area and were presently occurring were considered significant and in need of the most mitigation efforts. Issues located inside the JLUS study area with the potential to occur, or located outside the JLUS study area and presently occurring, were still important, but not as severe. Issues located outside the JLUS study area with minimal or no potential to occur were considered very low priority.

- **Potential Impact.** Although an issue may not present a current threat to the installation or the community, it may possess the ability to become an issue in the future. Should conditions change, adjacent or proximate development increase, or other issues become apparent, new conflicts with existing or future missions and operational activities at Langley AFB could arise. Issues were considered based on their future potential using the same criteria as established for current impact.

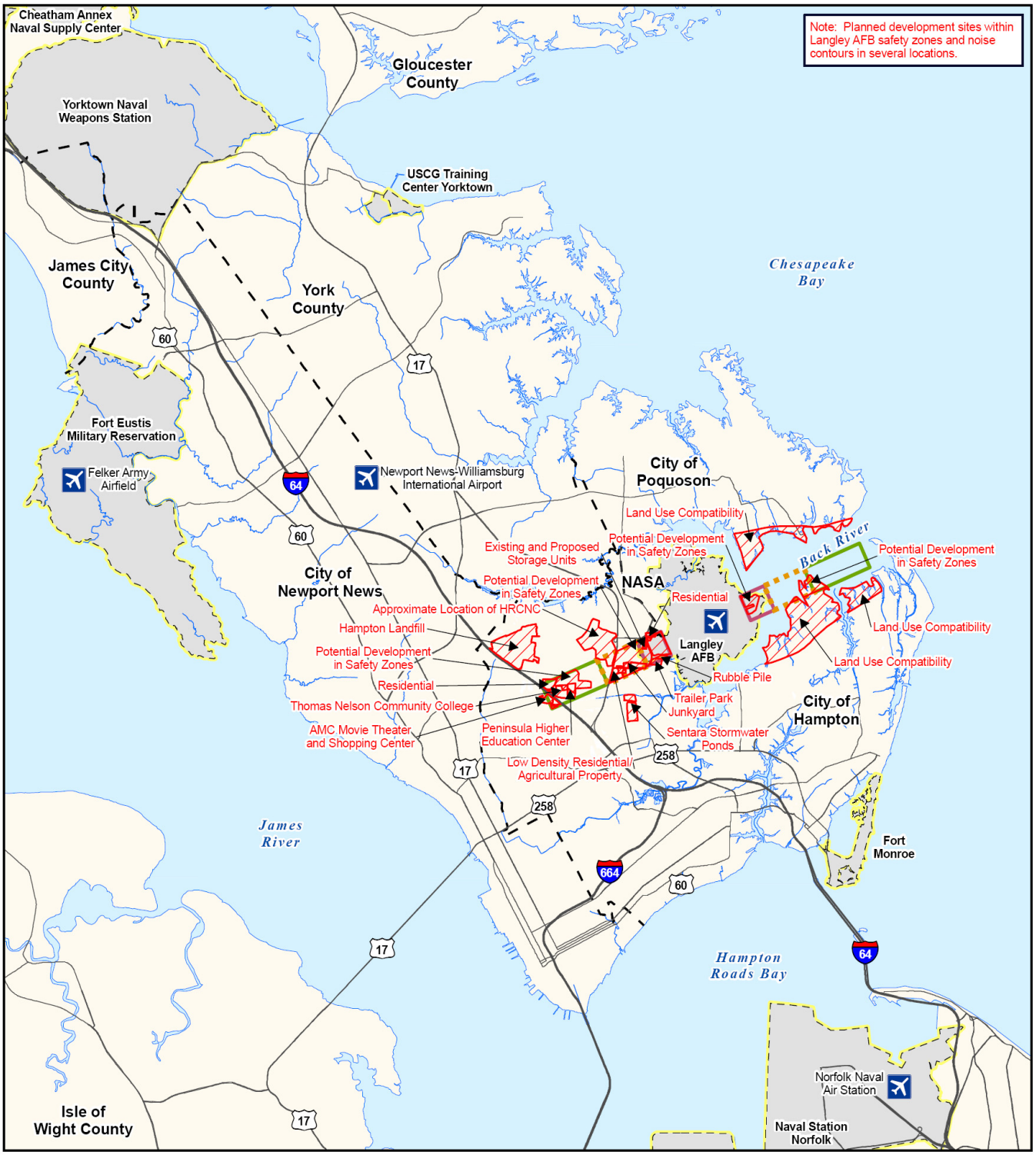
Each of the 24 compatibility factors discussed in this chapter will include a summary of the issues that were identified during the JLUS process that relate to that factor.

3.2 MAN-MADE COMPATIBILITY FACTORS

This section details the man-made compatibility factors and identified issues associated with operations at Langley AFB.

For the Hampton-Langley JLUS, most of the issues recorded fell under the man-made compatibility factors category. Man-made factors are those that are generated by community development that conflict with military activities. These conditions may also be generated by the military and encroach upon nearby communities. In either case, these issues may not only impact military readiness, but also a community's quality of life. For Langley AFB, 8 of the 17 man-made compatibility factors were identified as producing issues that need to be addressed by the installation and surrounding community stakeholders.

Figure 3-1 illustrates the location of the man-made compatibility issues identified by the JLUS committees, the public, and the consulting team during preparation of this JLUS. The locations shown on Figure 3-1 (and other similar figures in this chapter) indicate known or existing issue locations and are shown to indicate the general distribution of these issues today. However, it is important that the JLUS consider not only where current issues were identified, but evaluate the potential for issues to occur in other locations sometime in the future. The strategies presented in Chapter 5 were designed to address the significant compatibility factors and issues identified in this section.



Legend

- Man-Made Compatibility Factor
- **Air Operations Safety Zones**
  - CZ
  - APZ I
  - APZ II
- Airport
- Jurisdictional Boundary
- Military Installation
- Water Body
- River / Stream
- **Major Roads**
  - Interstate
  - Highway

0 1.5 3 6 Miles

Figure 3-1
Man-Made Compatibility Factors

1 Land Use Issues

Definition:

With respect to the JLUS and compatibility, land use refers primarily to land use planning. The basis of land use planning and regulation relates to the government's role in protecting the public's health, safety, and welfare. Local jurisdictions' general plans and zoning ordinances can be the most effective tools for avoiding 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 related to noise, odors, lighting, and so forth.

Land use planning in the vicinity of military installations is similar to the process used to evaluate other types of land uses. For instance, local jurisdictions already consider compatibility factors such as noise when locating residential developments near commercial or industrial areas. As the land between local municipalities is sold or developed, many facets of the communities and the military are affected. Virginia Code requires sellers to notify potential buyers if the real property for sale lies within noise contours 65 dBA (A-weighted decibel) or higher or an accident potential zone. Renters are also protected under Virginia State law, which requires landlords to disclose that the rental property lies within a noise contour 65 dBA or higher or an accident potential zone. Even with this disclosure requirement, new residents, tenants, or building owners are typically not fully aware of the implications of locating in close proximity to an active military installation and / or training area.

The issues identified for the land use compatibility factor in this JLUS primarily involve existing incompatible land development within Langley AFB aircraft and runway safety zones and are further described in the following discussion, as well as under other factors such as Compatibility Factor 2, Safety Zones and Compatibility Factor 7, Noise. The issues identified for land use are:

- AMC movie theater and shopping center;
- storage warehouses;
- portions of the Hampton Roads Center North Campus;
- residential development;
- existing incompatible land uses within noise contours and aircraft safety zones, including residential and educational facilities; and
- planned development sites within safety zones and noise contours throughout the study area.

Many of the issues related to land use compatibility raised by the public, PC, and WG were associated with existing developments located near the installation. Land uses may be considered incompatible with military installations and their operations based on a number of factors. Among the most common factors causing incompatibility between military airfields and their operation areas and surrounding communities are the high levels of noise created by aircraft, limits on the heights of structures near the installation, safety issues for pilots (and people on the ground) caused by certain types of land uses, and off-installation light pollution that negatively impacts the use of night vision devices (NVD) for military air and ground training (or conversely military lighting that impacts nearby residents). The development of land uses incompatible with an installation's military mission threatens that installation's

continued existence. A number of land uses around Langley AFB generated safety concerns for aircraft pilots and residents on the ground. Some other common concerns around Langley AFB were residential areas located in noise contours that could be impacted by undesirable noise generated by military aircraft. This issue could lead to noise complaints and possible restrictions on the types of operations that take place at the base.

The land use planning process is further complicated by the number of entities responsible for managing the land around Langley AFB. The Back River is adjacent to Langley AFB on the north, east, and south. The land composition to the east, south, and west is a part of the City of Hampton. The City of Poquoson lies across the Back River to the north and composes the land area north of the base. The National Aeronautics and Space Administration (NASA) owns land immediately west of Langley AFB. York County begins less than one mile west of NASA's border. The City of Newport News includes land in the JLUS study area to the southwest and west. The fact that each of these jurisdictions has their own system of land management and control creates challenges to cohesively plan for areas that are at risk for having incompatible land uses.

Most of the land surrounding Langley AFB is already developed, but there are some areas to the east and west of the base that are currently vacant with room for infill development. Without proper planning and coordination, this could pose future issues depending on the types of development proposed. The desirability and potential future development of these vacant areas creates a threat to compatibility if not carefully planned and coordinated. The majority of the land use issues that cause encroachment or incompatible use between Langley AFB and the surrounding communities overlap with other encroachment factors such as safety or noise, and so are discussed in more detail under those factors later in this section.

Parcels that are currently vacant have the potential to develop at incompatible densities or with incompatible land uses that could cause safety issues if there was an aircraft mishap, as further discussed in Compatibility Factor 2, Safety Zones. Some incompatible uses have already been developed within the designated aircraft safety zones. These include residential development, an AMC movie theater, the Hamptons Golf Course clubhouse, Thomas Nelson Community College, and Peninsula Higher Education Center. All of these uses exceed the Air Force recommended densities for number of people using them.

The AMC movie theater complex is located at the far west end of the western Accident Potential Zone (APZ) II, on the west side of Interstate 64, inline with the Langley AFB runway centerline. Based on Air Force safety recommendations, this use is not compatible with Langley's aircraft operations. Another incompatible existing use is the storage warehouses located within the western Clear Zone (CZ), just north of the runway overrun. These issues will be discussed further under Compatibility Factor 2, Safety Zones.

The noise contours generated by Langley aircraft operations overlay land uses that could result in noise complaints. It is not practical for the military to acquire all of this land; therefore, it is important for local jurisdictions to manage the type of development on the parcels. Much of the land is already developed, some with incompatible uses. Vacant parcels within Langley AFB safety zones and noise contours are of concern for future incompatible land use. The main jurisdictions impacted by this are the cities of Hampton and Poquoson.

The City of Hampton is primarily urbanized; therefore, developable vacant land is scarce. According to Hampton's 2006 Community Plan, the city is over 90 percent built out. The majority of the city's remaining developable vacant land is located west of Langley AFB between the base and Interstate 64. According to the City of Hampton GIS data, less than 10 percent of the

city's vacant land is located within the Langley AFB air operations safety zones and noise contours. The Land Use Plan portion of Hamptons Community Plan identified most of this area as a mix of rural and low density residential and business / industrial. Residential development without sound attenuation measures included during construction is not recommended for uses located within noise contours above 65 dB. Some of the residential development could be redirected and incorporated into redevelopment areas within the city that would be less impacted by military operations. The business / industrial growth designated for the land west of Langley AFB will most likely not have anywhere else to be redirected as there is only one other large region in the city for this type of development. Figure 3-2 shows the areas within the study area where vacant land exists, broken down by public and private ownership. Figure 3-3 illustrates the future land use designations of vacant land.

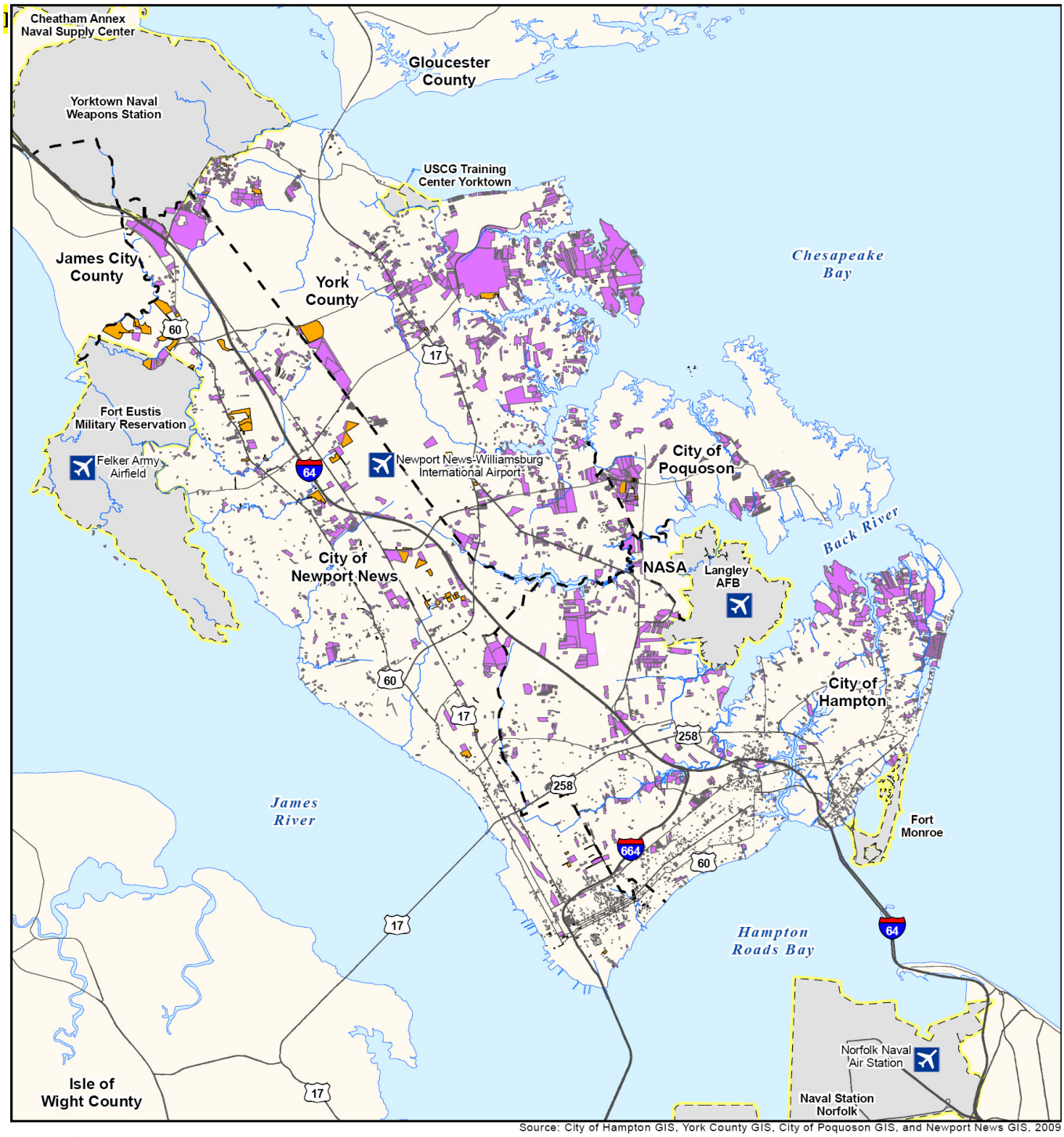
The Hampton Community Plan states that in-fill development, redevelopment, and revitalization of existing developed areas will be the main focus of growth within the city. Hampton has prepared several master plans for districts within the city, including Downtown, Buckroe, and Coliseum Central, which describe the various growth and redevelopment goals and patterns for these areas. Primary areas identified for redevelopment are five-acre or larger parcels that are individually owned and were developed more than 30 years ago. There are a variety of factors that play a role in the type and amount of redevelopment for an area, including market conditions, adjacent properties, surrounding land use, and zoning and other regulations. Redevelopment areas are often high value, high density, and / or mixed use projects.

Another concern for potential incompatible land use within this area is the Hampton Roads Center North Campus (HRCNC). The HRCNC is a 470-acre business park located along Magruder Boulevard less than two miles west of Langley AFB. The area is a State designated Enterprise Zone and a locally designated Technology Zone. The Enterprise Zone contains a large portion of Hampton's business and industrial parks. Both the Enterprise Zone and the Technology Zone provide incentives to encourage qualified business and technology companies to expand, relocate, or start up within the designated zone. The HRCNC allows business with similar interests and requirements to be located in close proximity to one another so that they can interact with each other. Approximately 31 acres of the southern portion of the campus lies within APZ I. About 140 acres of the HRCNC is located within the Langley AFB 65-70 dB noise contour, just under 131 acres are within the 70-75 dB noise contour, and nearly 12 acres are within the 75-80 dB noise contour. The HRCNC is not fully developed and includes some areas of vacant land. There is limited space for new development to occur on the campus, and all new development would be within the noise zones. Depending on the use ultimately developed on the available parcels, there is a potential for these uses to be incompatible with military activities.

2 Safety Zones

Definition:
Safety zones are areas in which development should be more restrictive in terms of use and concentrations of people due to the higher risks to public safety. Issues to consider include aircraft accident potential zones, weapons firing range safety zones, and explosives safety zones.

Military installations often have activities or facilities that require special consideration by local jurisdictions when evaluating compatibility due to public safety concerns. The issues related to uses incompatible with safety zones are:



Source: City of Hampton GIS, York County GIS, City of Poquoson GIS, and Newport News GIS, 2009

Legend

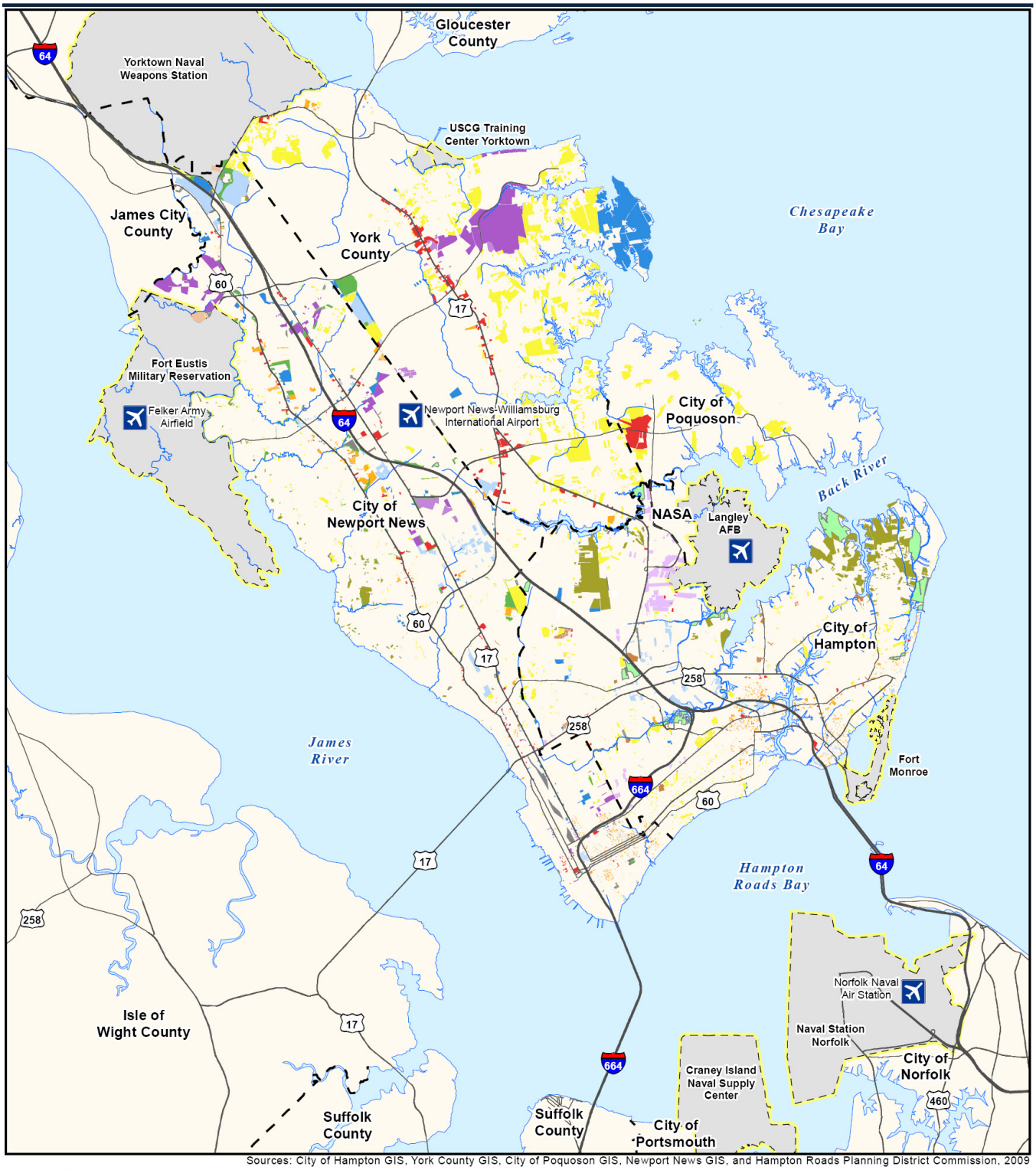
Vacant Land Ownership
- Private
- Public
- Airport

- Jurisdictional Boundary
- Military Installation
- Water Body
- River / Stream

Major Roads
- Interstate
- Highway

0 1.5 3 6 Miles

Figure 3-2
Vacant Land Ownership



Sources: City of Hampton GIS, York County GIS, City of Poquoson GIS, Newport News GIS, and Hampton Roads Planning District Commission, 2009

Legend

Vacant/Future Land Use

- Commercial/Office
- Conservation
- Heavy Industrial
- High Density Residential
- Industrial/Office Park
- Light Industrial
- Low Density Residential
- Medium Density Residential
- Military
- Mixed Use
- Open Space
- Public/Semi-Public
- Right-of-Way/Utilities
- Rural Residential
- Airport
- Jurisdictional Boundary
- Military Installation
- Water Body
- River / Stream

Major Roads

- Interstate
- Highway

0 1.5 3 6 Miles

Figure 3-3
Vacant Land - Future Land Use

- development, including residential units, in aircraft and runway safety zones that exceeds recommended densities or types of land uses;
- public gathering places such as shopping centers and educational institutions within the safety zones; and
- areas that attract birds that could pose hazards to aircraft operations such as golf courses, landfills, and wetlands.

Aircraft Safety Zones

The following discussion details the safety zones associated with military runways and air operations with emphasis on the unique aspects of aircraft operations safety within the Hampton-Langley JLUS study area.

Air Installation Compatible Use Zone

The Department of Defense (DOD) established the Air Installation Compatible Use Zone (AICUZ) program in response to the Noise Control Act of 1972. This program was designed to analyze airfield operations at military bases to promote an environment that protected the health, safety, and welfare of the public in terms of noise and safety issues derived from aircraft operations. DOD analysis determined that the areas immediately beyond the ends of runways and along the extended centerlines (approach and departure flight paths) have the highest potential for aircraft mishaps. Based on this analysis, the DOD developed three zones that have a relative potential for accidents. These zones are square and rectangular in shape and are designated as the CZ, APZ I, and APZ II. According to data gathered by the United States Air Force (USAF) on aircraft accidents between 1968 and 1995, the majority of aircraft accidents occurred either on the runway (24.9 percent) or within the CZ (27.4 percent). The data also indicated that 10.1 percent of accidents occurred in APZ I and 5.6 percent in APZ II. About 32 percent of the remaining accidents occurred within 10 miles of the airfield. It was concluded that the CZ warranted special attention due to the high incidence of accident potential, which consequently severely limited acceptable land uses. The percentages of accidents within the two APZs are such that land use restrictions are essential to ensure the public's safety. The USAF recommendation for APZs is to limit the concentrations of people exposed to flight safety hazards through appropriate land use planning.

Each installation's AICUZ Study contains general land use guidelines related to safety and noise associated with aircraft operations. The JLUS Appendix provides the USAF-recommended land use compatibility guidelines in relation to noise zones and APZs as provided in the 2007 Langley AICUZ Study. The information presented in the AICUZ table is essentially the same as the information contained in the June 1980 publication by the Federal Interagency Committee on Urban Noise (FICUN) entitled *Guidelines for Considering Noise in Land Use Planning Control* and in the *Standard Land Use Coding Manual* published in 1965 by the United States Urban Renewal Administration (USURA).

Langley AFB Safety Zones

Langley AFB has a single runway that measures 10,000 feet long by 150 feet wide and is oriented in a northeast-southwest direction. The CZ for Langley's runway measures 3,000 feet long by 3,000 feet wide, extending directly beyond the ends of the runway and outward along an imaginary extension of the runway's centerline. Above ground structures are generally not permitted in these areas, and land is optimally undeveloped. For this reason, acquiring sufficient real property interest in land within the CZ is critical to ensuring incompatible development does not occur in that area. The Air Force has adopted a stance of acquiring land or easements over land that falls within the CZ, and the majority of the land within Langley AFB's western CZ falls under this and is protected from incompatible development. There is some land within the western CZ, however, that has been developed with incompatible uses. Based on

2000 census data and aerial imagery, the July 2007 Langley AFB AICUZ Study estimated that 182 people live within the western CZ, just outside of the base boundary.

APZ I is the same width as the CZ (3,000 feet), and it begins at the end of the CZ extending along the runway's imaginary centerline 5,000 feet (see Figure 3-4). The Langley AICUZ Study estimated that 30 people live within APZ I. The outermost APZ, APZ II, is also 3,000-feet wide and extends from the end of APZ I along the runway centerline for another 7,000 feet. The AICUZ estimated that 366 people live within APZ II.

While the aircraft accident potential in APZs I and II does not warrant land acquisition by the Air Force, land use planning and controls are strongly encouraged for the protection of public safety. Within APZ I and APZ II, a variety of land uses are compatible to varying degrees; however, the primary factor to be considered is the intended densities of people and structures. Occupant-intensive land uses such as high density residential, commercial, and industrial should be avoided due to the greater potential for safety incidents in these areas. Table 3-1 displays various land uses that are both compatible and incompatible within the aircraft safety zones.

Table 3-1. AICUZ Safety Zones Generalized Land Use Criteria

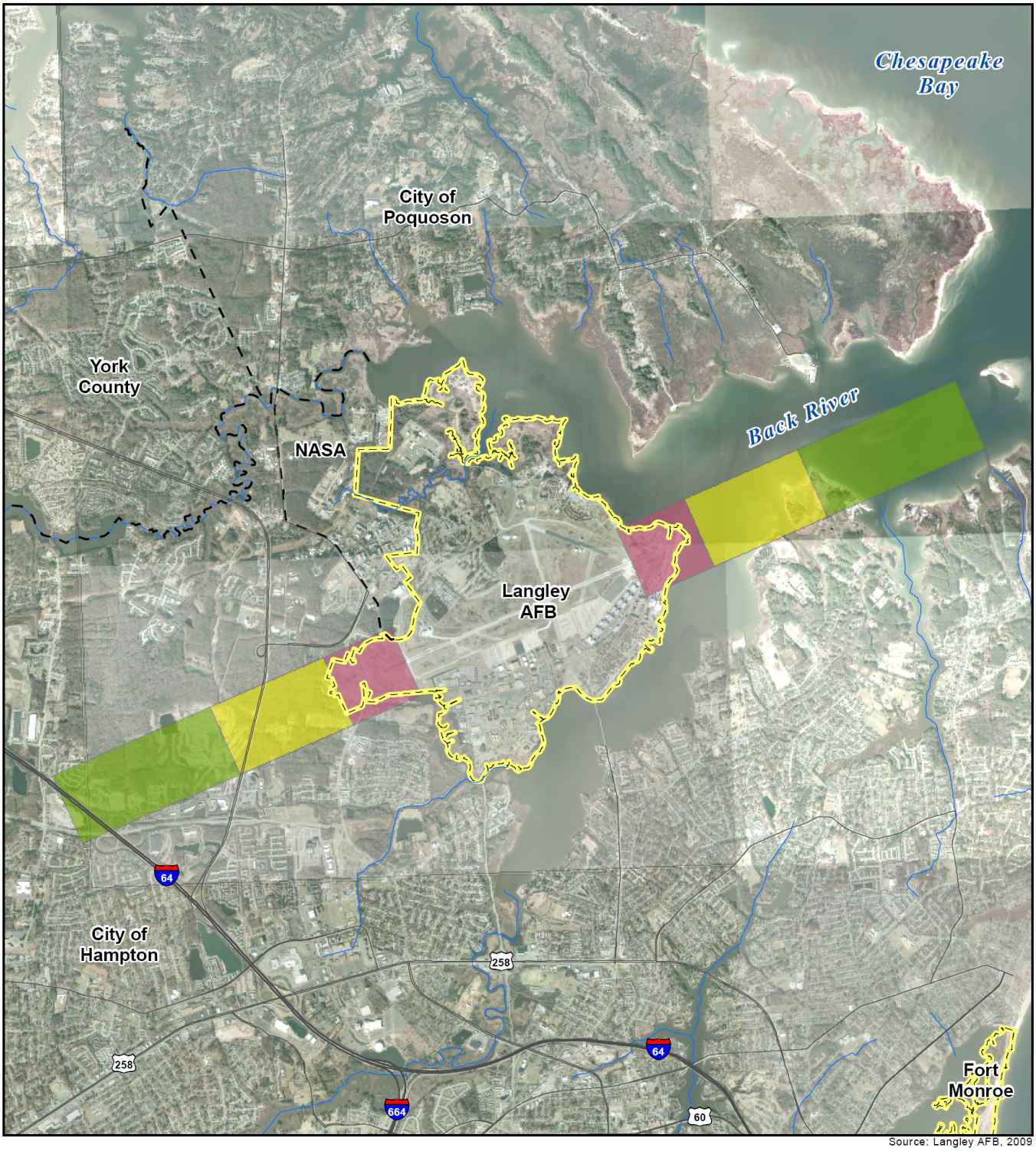
Generalized Land Use	Safety Zones		
	Clear Zone (CZ)	Accident Potential Zone I (APZ I)	Accident Potential Zone II (APZ II)
Residential	No	No	Yes1
Manufacturing	No	Yes2	Yes2
Transportation, Communications, and Utilities	No	Yes2	Yes2
Trade, Business, and Offices	No	Yes2	Yes2
Shopping Districts	No	No	Yes2
Public and Quasi-Public Service	No	No	Yes2
Recreation	No	Yes2	Yes2
Public Assembly	No	No	No
Agriculture and Mining	No3	Yes2	Yes2

Notes:

** This chart is for general information. Refer to Langley AFB 2007 AICUZ Study, Volume I, Table 3-4 for specific land use guidelines.*

1. *Suggested maximum density 1 dwelling unit per acre.*
2. *Only limited low-density, low-intensity uses recommended.*
3. *Except limited agricultural uses are permitted.*

Source: Langley AFB 2007 AICUZ Citizen's Brochure



Source: Langley AFB, 2009

Legend

Safety Zones
- CZ
- APZ I
- APZ II

Jurisdictional Boundary

Military Installation

River / Stream

Major Roads
- Interstate
- Highway

0 0.5 1 2 Miles

Figure 3-4
Langley AFB Air Operations Safety Zones

Compatibility

Issues

There are several existing developments within the Langley AFB safety zones that are incompatible with the recommended land uses. As described earlier, safety zones are located at each end of the runway (west and east), each having unique compatibility issues. Figures 3-5, 3-6, and 3-7 show the existing land uses within each safety zone and their compatibility with USAF air operations. The first map illustrates existing land uses as identified by the City of Hampton Assessor's Office, the second map shows existing land uses as provided by the City's GIS department, and the third map illustrates land use compatibility.

The City of Hampton developed specific zoning guidelines based on operations at Langley AFB. Two zoning districts have been designated – M-4, Langley Flight Approach and M-5, Langley Flight Approach. The M-4 District has two sub-districts:

- M-4A, Langley Flight Approach – Manufacturing, Distribution, and Warehousing allows light manufacturing, distribution, and sales in conjunction with AICUZ recommendations; and

- M-4B, Langley Flight Approach – Mixed Business and Manufacturing allows similar uses based on AICUZ recommendations.

The M-5 District has four sub-districts:

- M-5A, Langley Flight Approach – Hampton Roads Center (HRC) has recommended density restrictions and incorporated appropriate regulations from the Special Public Interest - Hampton Roads Center (SPI-HRC) District;

- M-5B, Langley Flight Approach – Limited Business I includes recommended density restrictions and does not include SPI-HRC requirements;

- M-5C, Langley Flight Approach – Limited Residential allows for the continuance of existing residential development, but no expansion of that residential use; and

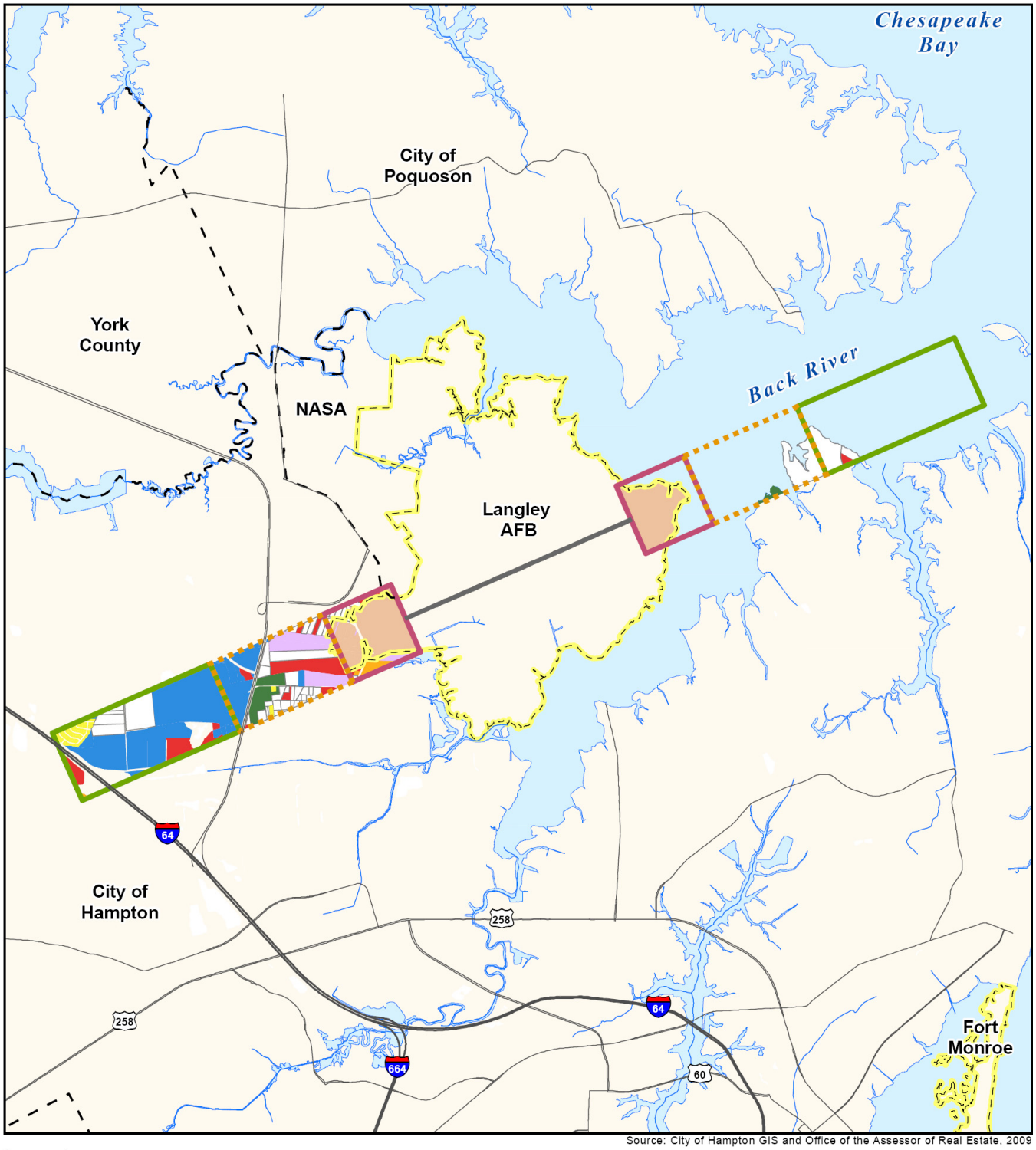
- M-5D, Langley Flight Approach – Limited Business II is similar to the Limited Business I sub-district but with special limitations.

These two districts and combined six sub-districts permit uses that are generally based on AICUZ guidelines for CZs and APZs. Hampton has adopted a Special Public Interest – Aircraft Approach Overlay Zoning District to further regulate land within the CZ and APZs. This overlay focuses on reducing hazards from light emission, dust, or the potential to create a Bird / Wildlife Aircraft Strike Hazard (BASH). Despite these efforts, incompatible land uses that existed before these regulations were put in place are still located in Langley AFB safety areas.

Data Analysis Methodology

The analysis of existing land use and zoning for land within the Langley AFB air operations safety zones included GIS data provided by the City of Hampton GIS Department and the Hampton Assessor's website database. Future land use analysis uses just the Hampton GIS data as the Assessor's Office does not maintain future land use data.

For Hampton GIS data, land use and zoning categories for all of the study area jurisdictions were evaluated for similarities and then grouped according to standardized naming conventions. The GIS data from the jurisdictions was merged, taking into account overlapping areas / parcels. This data was then intersected with safety zones to obtain impacted parcels according to categories.



Source: City of Hampton GIS and Office of the Assessor of Real Estate, 2009

Legend

Existing Land Use
- Agriculture
- Commercial/Office
- Light Industrial
- Low Density Residential
- Medium Density Residential
- Military
- Public/Semi-Public
- Vacant

Safety Zones
- CZ
- APZ I
- APZ II
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Major Roads
- Interstate
- Highway

0 0.25 0.5 1 Miles

Figure 3-5
Langley AFB Air Operations Safety Zones - Existing Land Use

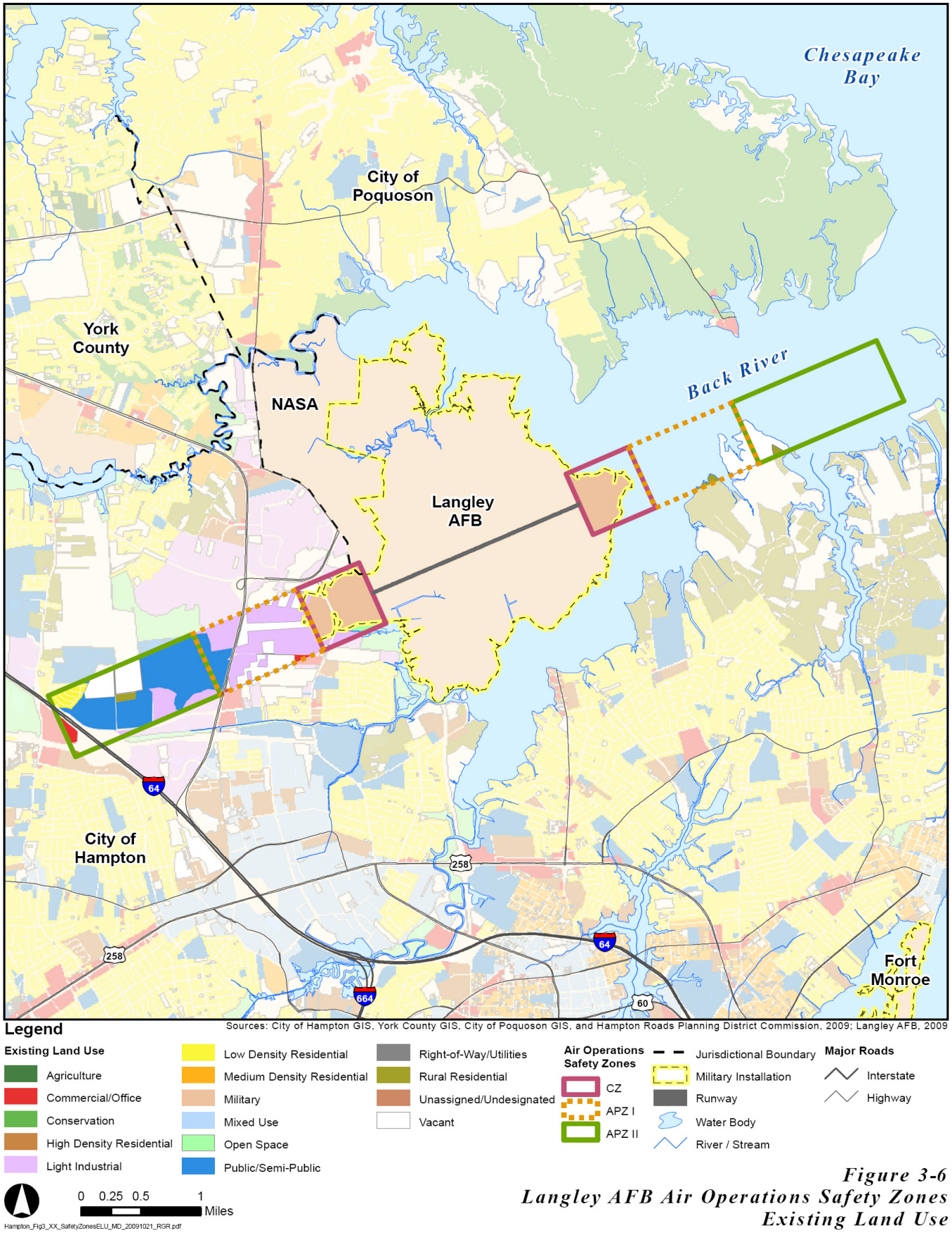


Figure 3-6
Langley AFB Air Operations Safety Zones Existing Land Use

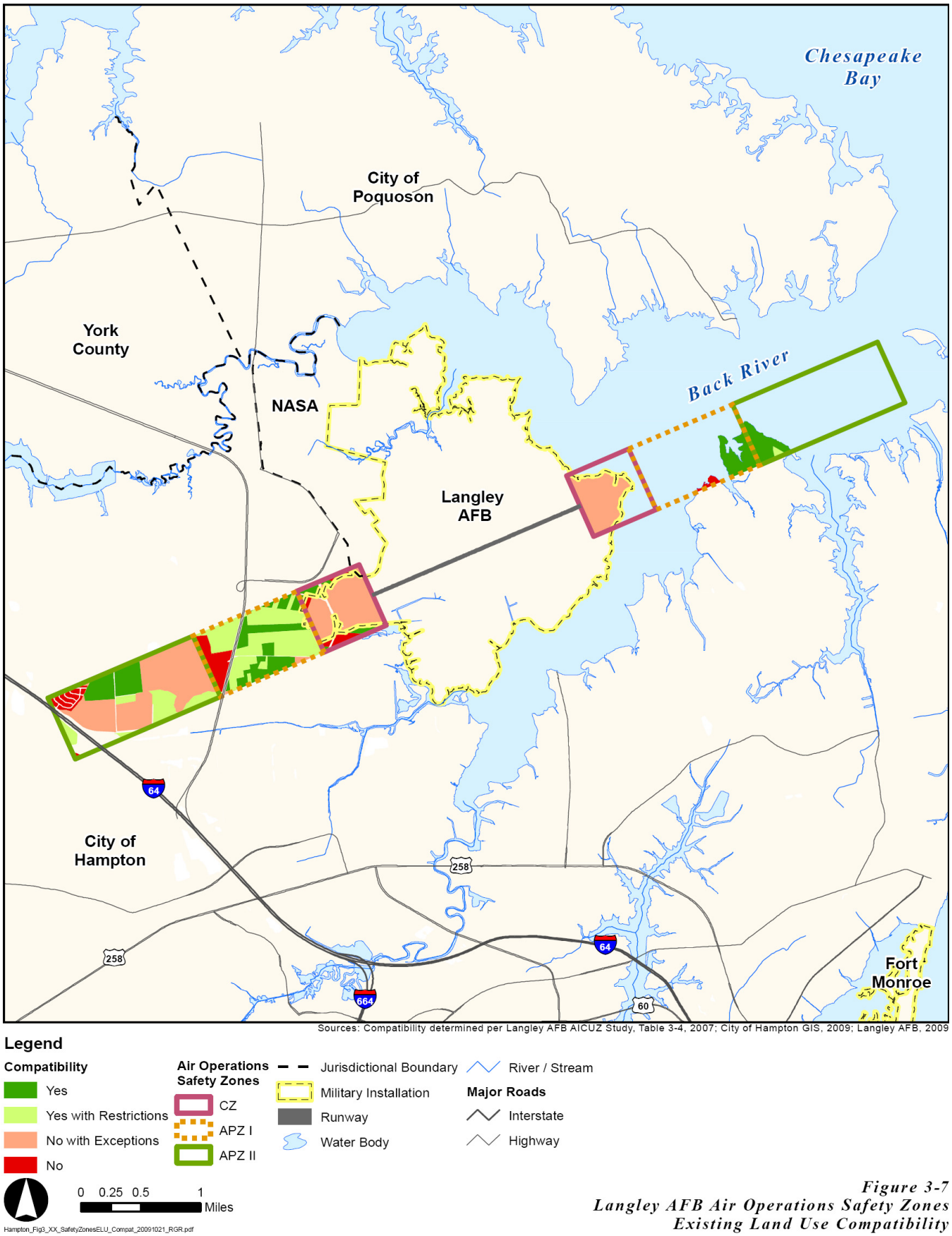


Figure 3-7
Langley AFB Air Operations Safety Zones
Existing Land Use Compatibility

For Hampton Assessor data, this data was intersected with the Langley AFB safety zones. The data was grouped together by zoning description as provided on the city's zoning webpage (www.hampton.gov/codes/zoning_ordinances.html). These zoning categories were matched as closely to the categories / groupings used for the Hampton GIS data. The tables in this section provide the reader with a comparison of the existing land uses and zoning categories as provided by the city's GIS Department and the Assessor's Office.

The final step for both datasets within the air operations safety zones was to add an "Undesignated" category to ensure the totals for each of the safety zones summed up to the total available for each zone (CZ (3,000 ft x 3,000 ft) = 207 acres, APZ I (3,000 ft x 5,000 ft) = 344 acres, APZ II (3,000 ft x 7,000 ft) = 482 acres). This category includes lands such as water, right-of-way, or another unassigned category.

Western Safety Zones

Existing Land Use

A number of land uses and developments were identified as posing safety issues in Langley AFB western air operations safety zones (see Figure 3-1). Figure 3-8 identifies existing land uses within the western safety zones as identified by the City of Hampton Assessor's Office, while Figure 3-9 shows existing land uses as provided by the city's GIS department. Land use compatibility within the western safety zones is depicted on Figure 3-10. Just outside of the base boundary, storage unit facilities have been constructed within the western CZ. Additional storage units are proposed in the same area. Since buildings or uses that draw people are not compatible with CZs, these additional storage units would also be incompatible with USAF aircraft operations safety standards.

The Hampton Town Center, complete with a 24-screen AMC movie theater and shopping venues, was built at the westernmost end of the western APZ II, on the south side of Interstate 64. Shopping malls and shopping centers are considered incompatible in any APZ II. Additionally, uses were high densities of people gather, such as auditoriums, sports arenas, theaters, and public assembly facilities are also not compatible within either APZ. Should an aircraft accident occur, land uses with large numbers of people could sustain a significant loss of life or a large number of injuries.

Located in the northern portion of the western CZ are rental storage containers / warehouses. Although the containers are not inhabited, Air Force recommendations call for no buildings or structures within the CZ. There is a proposed project for the construction of additional storage containers / warehouses just west of the existing ones and still within the western CZ.

Also located in the western APZ II are the Peninsula Higher Education Center and Thomas Nelson Community College. Educational land uses, including schools, are not compatible with any of the safety zones.

There are several residential developments throughout all three western safety zones. These developments are generally at a greater density than the one to two dwelling units per acre recommended by the USAF. Residential use with densities above this are considered incompatible. A portion of a mobile home park is located in the southern side of the western CZ. As previously stated, no type of residential use is recommended for this zone. The mobile home park and several single family homes in the CZ are the source of the estimated 182 residents estimated as living within the CZ by the Langley AFB 2007 AICUZ Study. Within the western APZ I, a realty office building and low density residential are located nearly in line with the Langley AFB centerline. Future administrative development is also proposed within APZ I and in close proximity to the realty office. There is also residential use in the northwest corner of APZ II, adjacent to the north side of Interstate 64 that is at a density higher than recommended by the Air Force for APZ II.

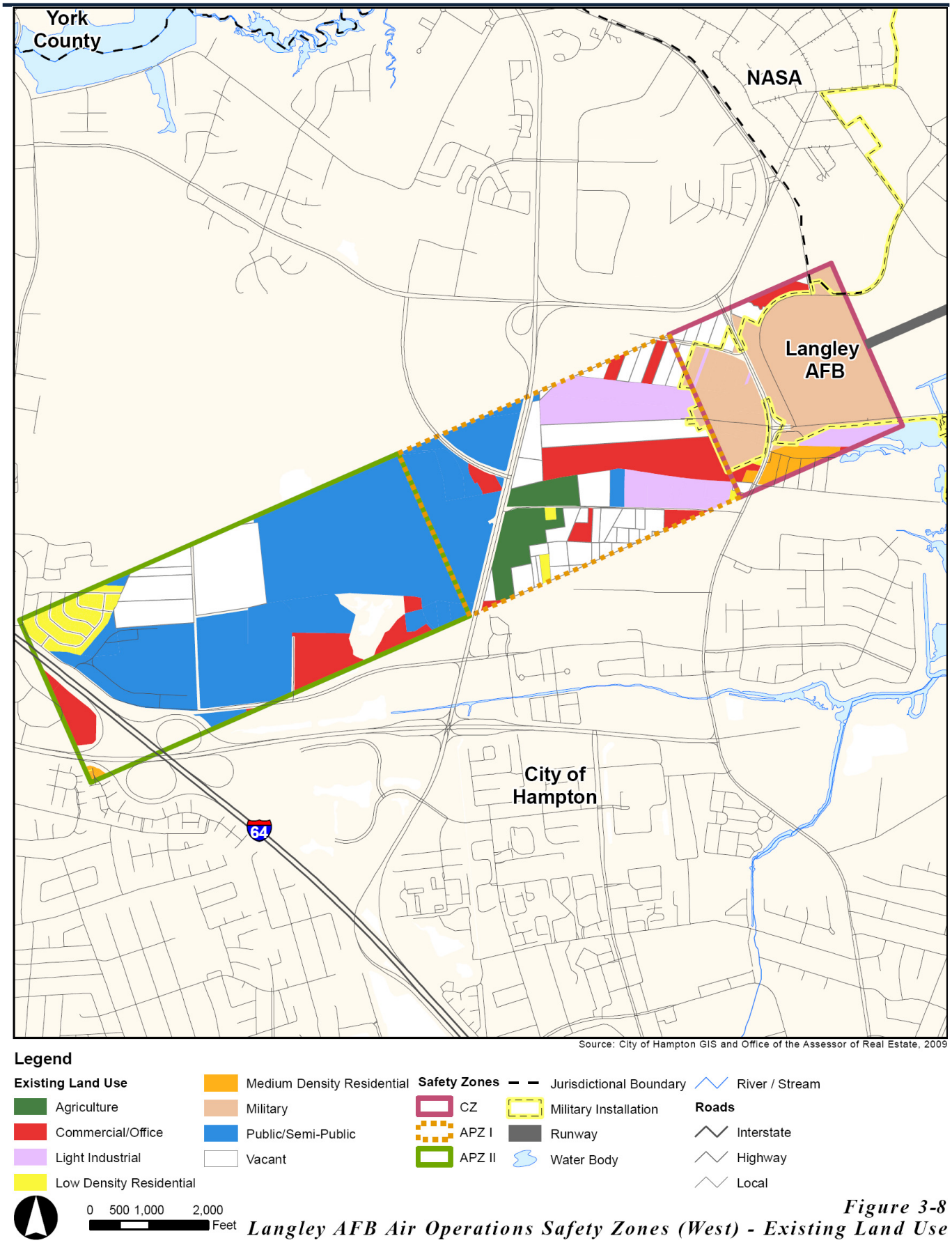
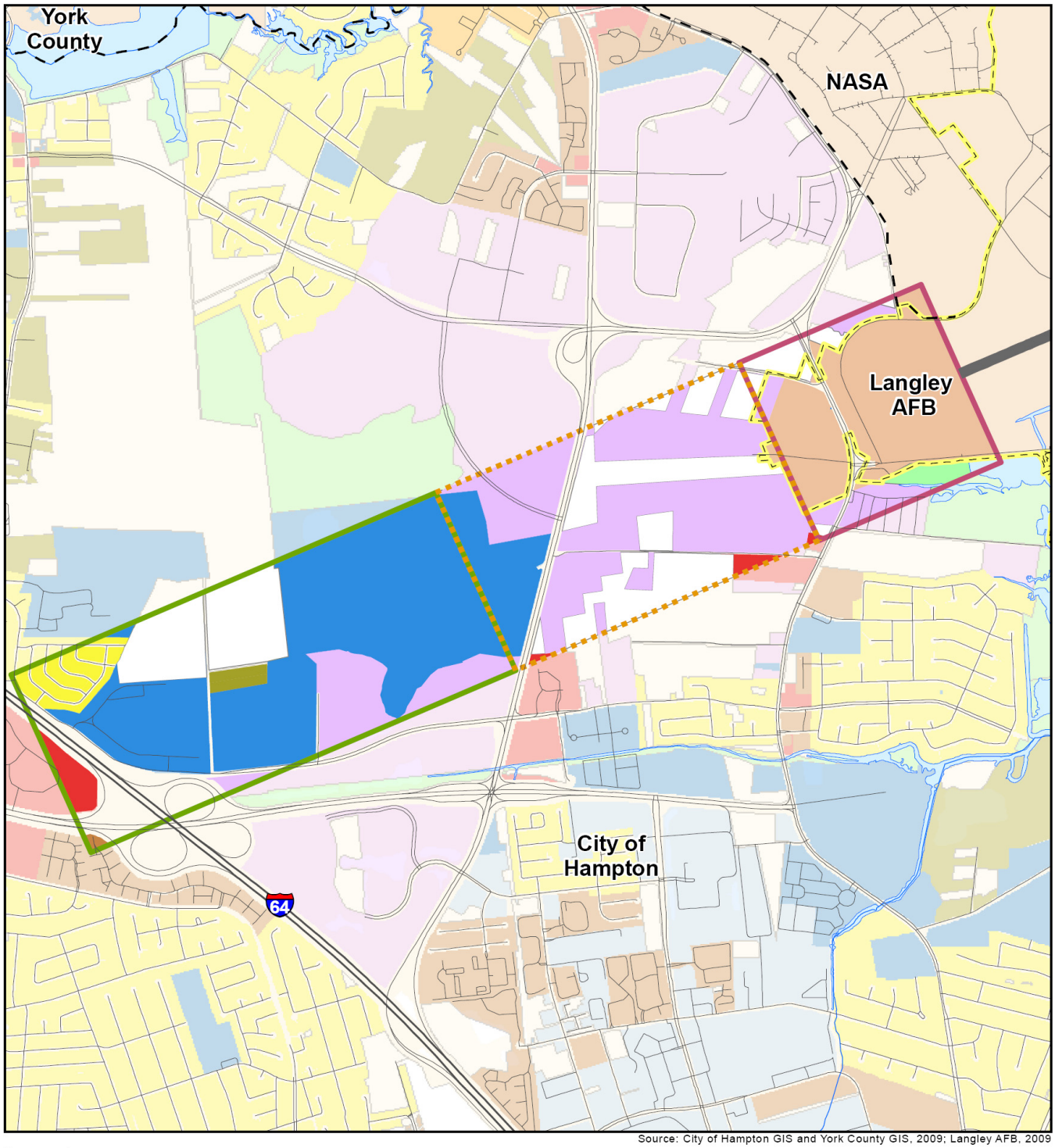


Figure 3-8
Langley AFB Air Operations Safety Zones (West) - Existing Land Use



Source: City of Hampton GIS and York County GIS, 2009; Langley AFB, 2009

Legend

Existing Land Use
- Commercial/Office
- High Density Residential
- Light Industrial
- Low Density Residential
- Medium Density Residential
- Military
- Mixed Use
- Open Space
- Public/Semi-Public
- Rural Residential
- Vacant

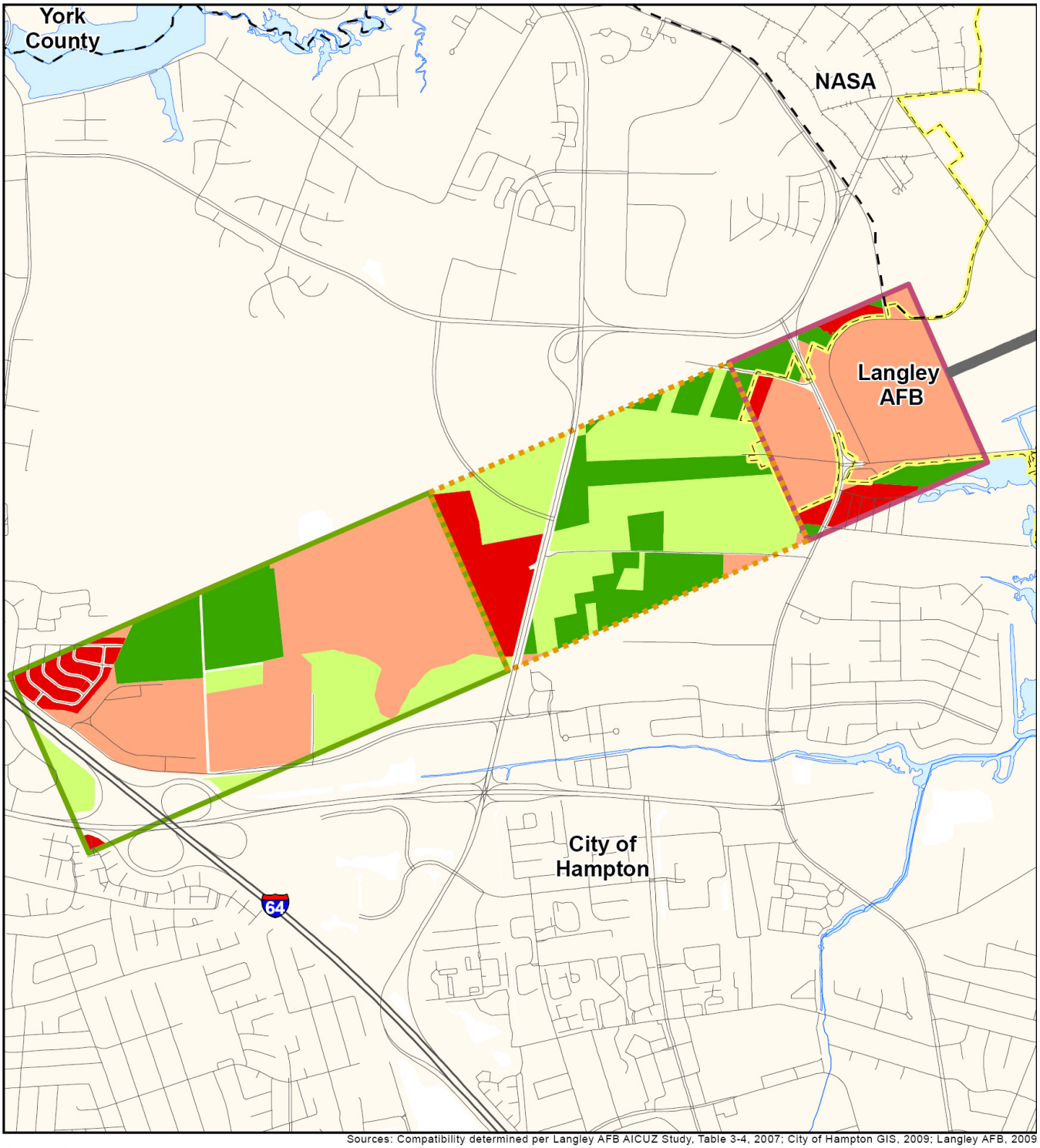
Air Operations Safety Zones
- CZ
- APZ I
- APZ II
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Roads
- Interstate
- Local

0 500 1,000 2,000 Feet

Hampton_Fig3_XX_SafetyZonesELU_West_MD_20091021_RGR.pdf

Figure 3-9
Langley AFB Air Operations Safety Zones (West) Existing Land Use



Sources: Compatibility determined per Langley AFB AICUZ Study, Table 3-4, 2007; City of Hampton GIS, 2009; Langley AFB, 2009

Legend

Compatibility
- Yes
- Yes with Restrictions
- No with Exceptions
- No

Air Operations Safety Zones
- CZ
- APZ I
- APZ II

- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Roads
- Interstate
- Highway
- Local

0 500 1,000 2,000 Feet

Figure 3-10
Langley AFB Air Operations Safety Zones (West)
Existing Land Use Compatibility

Analysis of the existing land uses within the three western safety zones demonstrates the amount of incompatible land uses that are currently located within the zones. According to land use data provided by the City of Hampton's GIS Department, the majority of the 207 acres in the CZ (70.2 percent) is owned by the DOD and is part of Langley AFB. Of the CZ land, 16 acres (8.0 percent) is currently vacant and another 12 acres is undesignated. The light industrial uses are not compatible with the CZ; however, open space is. The Hampton Assessor's Office data indicates that there is 32 acres of incompatible uses in the CZ.

Both data sets evaluated identify additional incompatible and potentially incompatible land uses in both of the APZs.

As noted in the discussion of Compatibility Issue 1, Land Use, vacant parcels throughout the JLUS study area that are within Langley's western safety zones and that could support development are a concern for potentially incompatible uses. West of Langley AFB, vacant parcels impacted by Langley's safety zones are located in the City of Hampton. The main concentration of parcels is in APZ I generally along the runway's centerline. Table 3-2 details the number of acres for each type of existing land use within the three western safety zones. Red shading indicates land uses incompatible with the safety zone while yellow shading indicates potentially incompatible uses.

Table 3-2. Existing Land Use in Langley AFB Western Safety Zones

Land Use	Hampton Planning Data		Hampton Assessor Data	
	Acres	Percent of Total	Acres	Percent of Total
Clear Zone				
Agriculture				
Commercial/Office			7	3.4%
Light Industrial	23	11.0%	12	5.7%
Low Density Residential			1	0.3%
Medium Density Residential			12	5.9%
High Density Residential				
Rural Residential				
Military	145	70.2%	148	71.5%
Open Space	11	5.4%		
Public/Semi-Public				
Undesignated	12	5.7%	12	5.7%
Vacant	16	7.5%	16	7.5%
Total	**207**		**207**	
Accidental Potential Zone I				
Agriculture			33	9.5%
Commercial/Office	4	1.3%	55	15.9%
Light Industrial	186	54.2%	61	17.6%

	Hampton Planning Data		Hampton Assessor Data	
Land Use	Acres	Percent of Total	Acres	Percent of Total
Low Density Residential			3	0.9%
Medium Density Residential				
High Density Residential				
Rural Residential				
Military	3	0.8%	4	1.0%
Open Space				
Public / Semi-Public	42	12.2%	78	22.5%
Undesignated	16	4.6%	20	5.7%
Vacant	93	27.0%	93	27.0%
Total	**344**		**344**	
Accident Potential Zone II				
Agriculture				
Commercial / Office	11	2.3%	38	7.8%
Light Industrial	51	10.5%		
Low Density Residential	20	4.3%	21	4.3%
Medium Density Residential			1	0.3%
High Density Residential	1	0.3%		
Rural Residential	6	1.3%		
Military				
Open Space				
Public / Semi-Public	261	54.2%	274	56.9%
Undesignated	63	13.1%	81	16.8%
Vacant	68	14.0%	68	14.0%
Total	**482**		**482**	

Note: Compatibility derived from Langley AFB AICUZ Update, July 2007, Table 3-74 "Land Use Compatibility, Noise Exposure, and Accident Potential"

Source: Hampton Planning Data provided by the City of Hampton GIS Department, September 29, 2009; Hampton Assessor Data obtained from www.hampton.gov/sol/propertysearch/

Future Land Use

Table 3-3 identifies the future land uses within the three western safety zones as indicated by the Hampton GIS Department. Each safety zone has incompatible and / or potentially incompatible land uses. The Hampton Assessor's Office does not maintain parcel data for future land uses. Red shading in the table indicates land uses incompatible with the safety zone while yellow shading indicates potentially incompatible uses. Figure 3-11 shows future land uses as provided by the city's GIS department. Land use compatibility within the western safety zones is depicted on Figure 3-12.

Table 3-3. Future Land Use in Langley AFB Western Safety Zones

	Hampton Planning Data	
Land Use	**Acres**	**Percent of Total**
Clear Zone		
Commercial/Office	**1**	**0.6%**
Light Industrial	**37**	**18.0%**
Low Density Residential	0	0.0%
High Density Residential	0	0.0%
Rural Residential	0	0.0%
Military	145	70.2%
Open Space	11	5.4%
Public/Semi-Public	0	0.0%
Undesignated	12	5.7%
Total	**207**	
Accident Potential Zone I		
Commercial/Office	6	1.8%
Light Industrial	277	80.6%
Low Density Residential	0	0.0%
High Density Residential	0	0.0%
Rural Residential	0	0.0%
Military	3	0.8%
Open Space	0	0.0%
Public/Semi-Public	42	12.2%
Undesignated	16	4.6%
Total	**344**	
Accident Potential Zone II		
Commercial/Office	11	2.3%
Light Industrial	51	10.5%
Low Density Residential	**21**	**4.3%**
High Density Residential	**1**	**0.3%**
Rural Residential	61	12.6%
Military	0	0.0%
Open Space	0	0.0%
Public/Semi-Public	274	56.9%
Undesignated	63	13.1%
Total	**482**	

Note: Compatibility derived from Langley AFB AICUZ Update, July 2007, Table 3-74 "Land Use Compatibility, Noise Exposure, and Accident Potential"
City of Hampton Assessor's Office does not have future land use data.

Source: Hampton Planning Data provided by the City of Hampton GIS Department, September 29, 2009

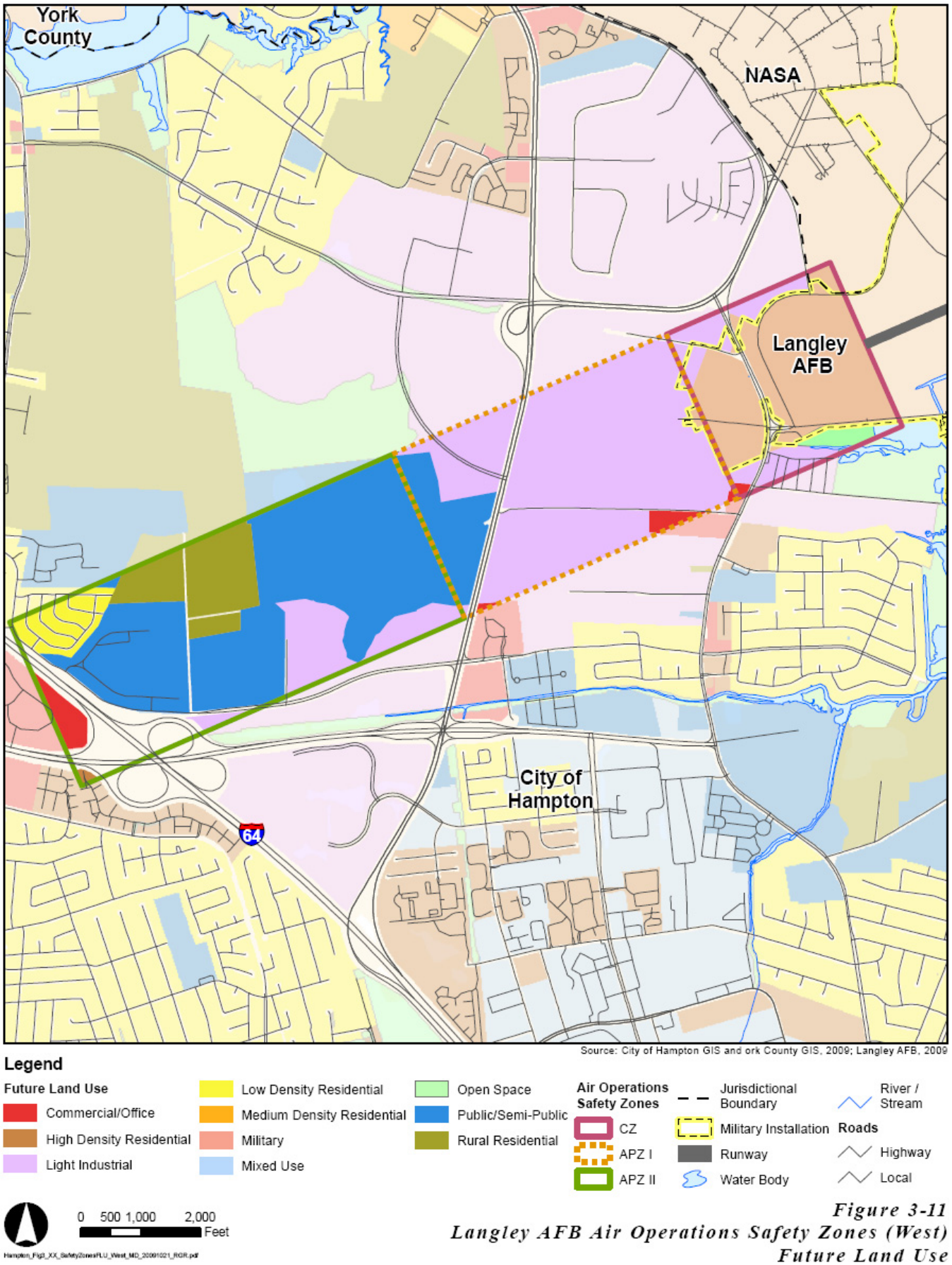
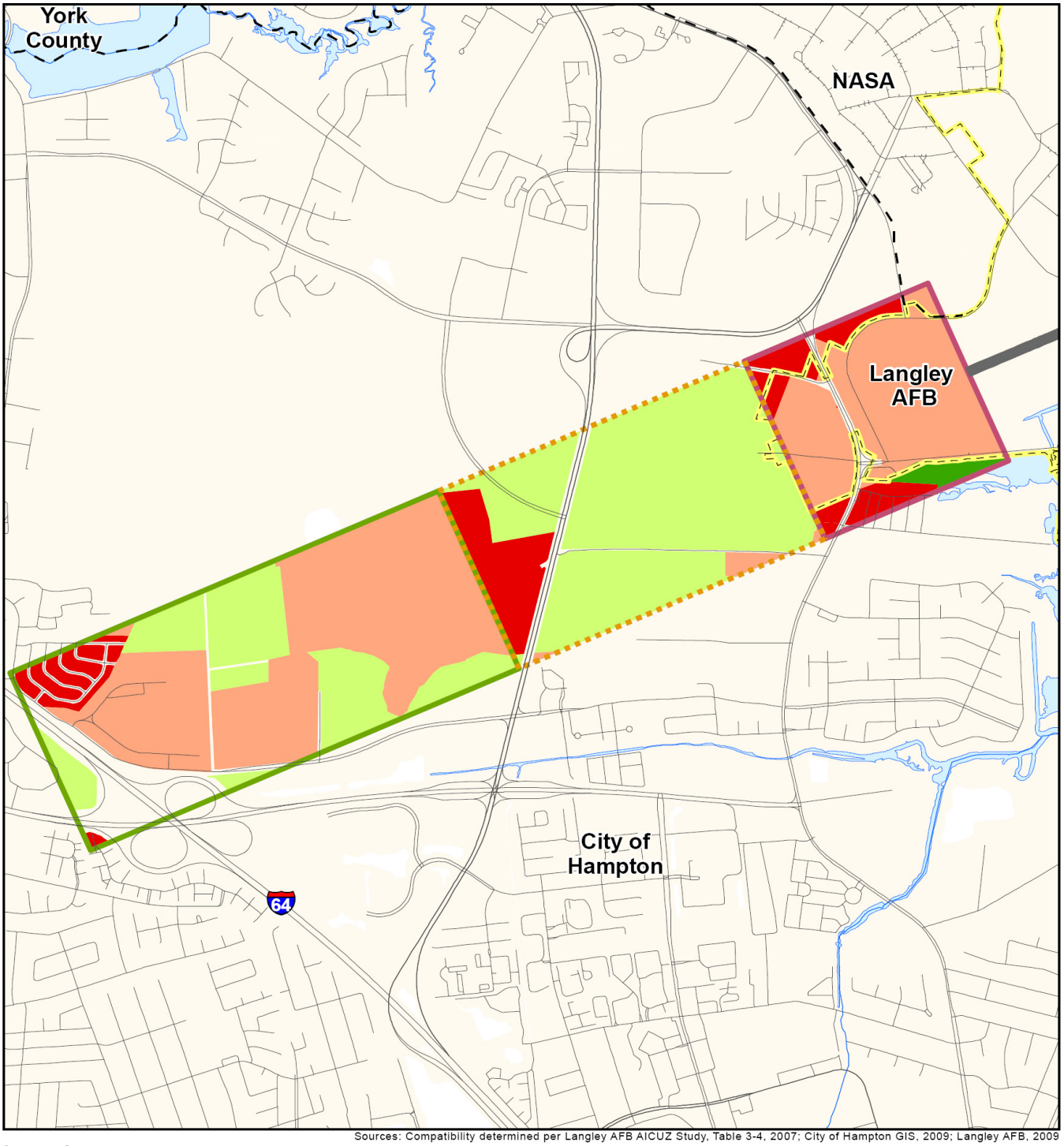


Figure 3-11
Langley AFB Air Operations Safety Zones (West)
Future Land Use



Sources: Compatibility determined per Langley AFB AICUZ Study, Table 3-4, 2007; City of Hampton GIS, 2009; Langley AFB, 2009

Legend

Compatibility
- Yes
- Yes with Restrictions
- No with Exceptions
- No

Air Operations Safety Zones
- CZ
- APZ I
- APZ II

- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Roads
- Highway
- Local

0 500 1,000 2,000 Feet

Hampton Fig3 XX SafetyZonesFLU West Compat 20091021 RGR.pdf

Figure 3-12
Langley AFB Air Operations Safety Zones (West)
Future Land Use Compatibility

Zoning

Analysis of zoning within the safety zones provides additional information as to the types of development that exists or could exist in the zones. All of the land located within the three safety zones is part of the City of Hampton and under its zoning regulations. Figure 3-13 identifies zoning for parcels located within the base's safety zones as identified by the City of Hampton Assessor's Office. Figure 3-14 shows zoning as provided by the city's GIS department. Compatibility of zoning within the safety zones with Langley AFB air operations is depicted on Figure 3-15. Figures 3-16 through 3-18 illustrate the same data as in Figures 3-13 through 3-15 but specifically for the western safety zones.

Portions of Langley AFB that are within the CZ are zoned by Hampton as single family residential and Langley Flight Approach – Manufacturing, Distribution, and Warehousing. These parcels, however, are not developed in accordance with those classifications since they are part of Langley AFB. The primary zoning concern in the western CZ are the 133 acres zoned for commercial, industrial, and residential uses as provided by the City of Hampton GIS Department. These uses are not compatible with Langley's western CZ. There are incompatible and potentially incompatible uses also located in the APZs; however, the acreage is much less than in the CZ. Table 3-4 shows the breakdown of the number of acres for each zoning category within the three western safety zones. Red shading in the table indicates land uses incompatible with the safety zone while yellow shading indicates potentially incompatible uses.

Table 3-4. Zoning in Langley AFB Western Safety Zones

	Hampton Planning Data		Hampton Assessor Data	
Zoning category	Acres	Percent of Total	Acres	Percent of Total
Clear Zone				
Langley Flight Approach District	73	35.5%	61	29.6%
Low Intensity Commercial	8	4.1%	11	5.5%
High Intensity Commercial	6	2.7%	5	2.6%
Low Intensity Industrial	14	6.6%	13	6.1%
Low Density Residential				
Medium Density Residential	105	51.0%	104	50.5%
Overlay Zoning Districts				
Office Park				
Undesignated			12	5.7%
Total	**207**		**207**	
Accident Potential Zone I				
Langley Flight Approach District	344	99.7%	291	84.4%
Low Intensity Commercial				
High Intensity Commercial				

Zoning category	Hampton Planning Data		Hampton Assessor Data	
	Acres	Percent of Total	Acres	Percent of Total
Low Intensity Industrial				
Low Density Residential			1	0.2%
Medium Density Residential	< 1	0.0%	9	2.7%
Overlay Zoning Districts				
Office Park			24	7.1%
Undesignated			20	5.7%
Total	**344**		**344**	
Accident Potential Zone II				
Langley Flight Approach District	476	98.7%	401	83.2%
Low Intensity Commercial			11	2.3%
High Intensity Commercial				
Low Intensity Industrial				
Low Density Residential				
Medium Density Residential	5	1.1%	6	1.3%
Overlay Zoning Districts	1	0.1%	< 1	0.1%
Office Park				
Undesignated			63	13.1%
Total	**482**		**482**	

Note: Compatibility derived from Langley AFB AICUZ Update, July 2007, Table 3-74 "Land Use Compatibility, Noise Exposure, and Accident Potential"

Source: Hampton Planning Data provided by the City of Hampton GIS Department, September 29, 2009; Hampton Assessor Data obtained from www.hampton.gov/sol/propertysearch/

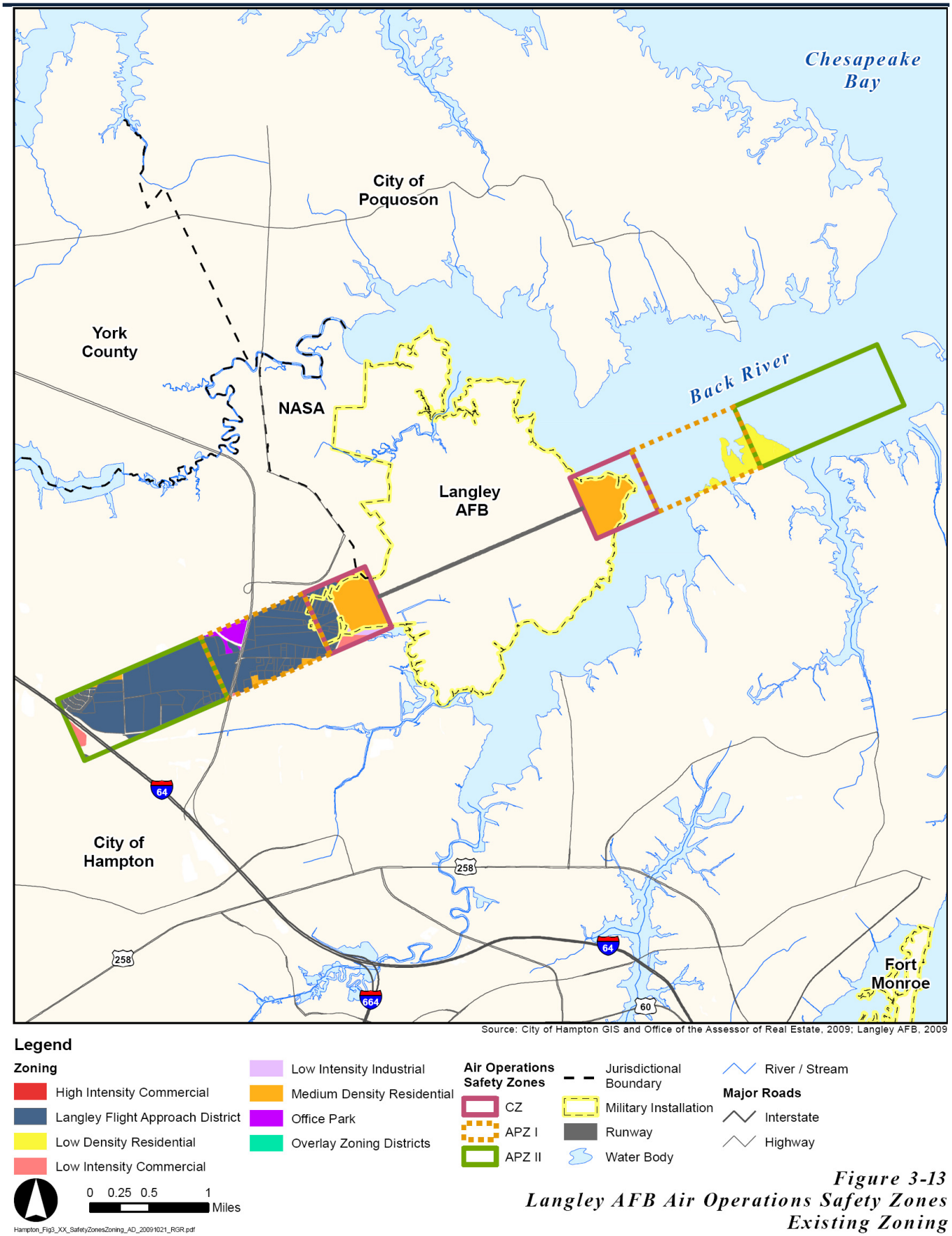


Figure 3-13
Langley AFB Air Operations Safety Zones
Existing Zoning

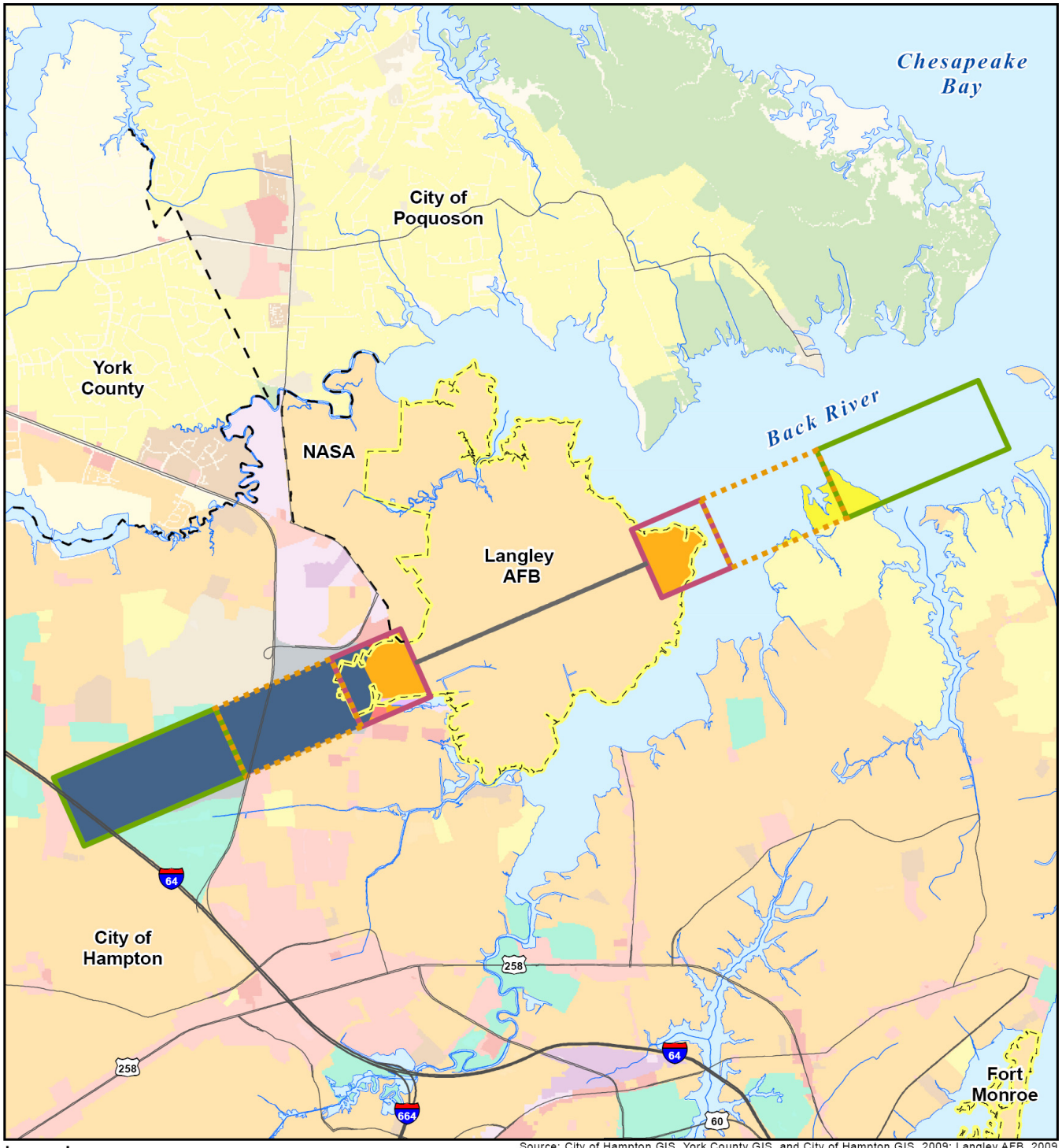
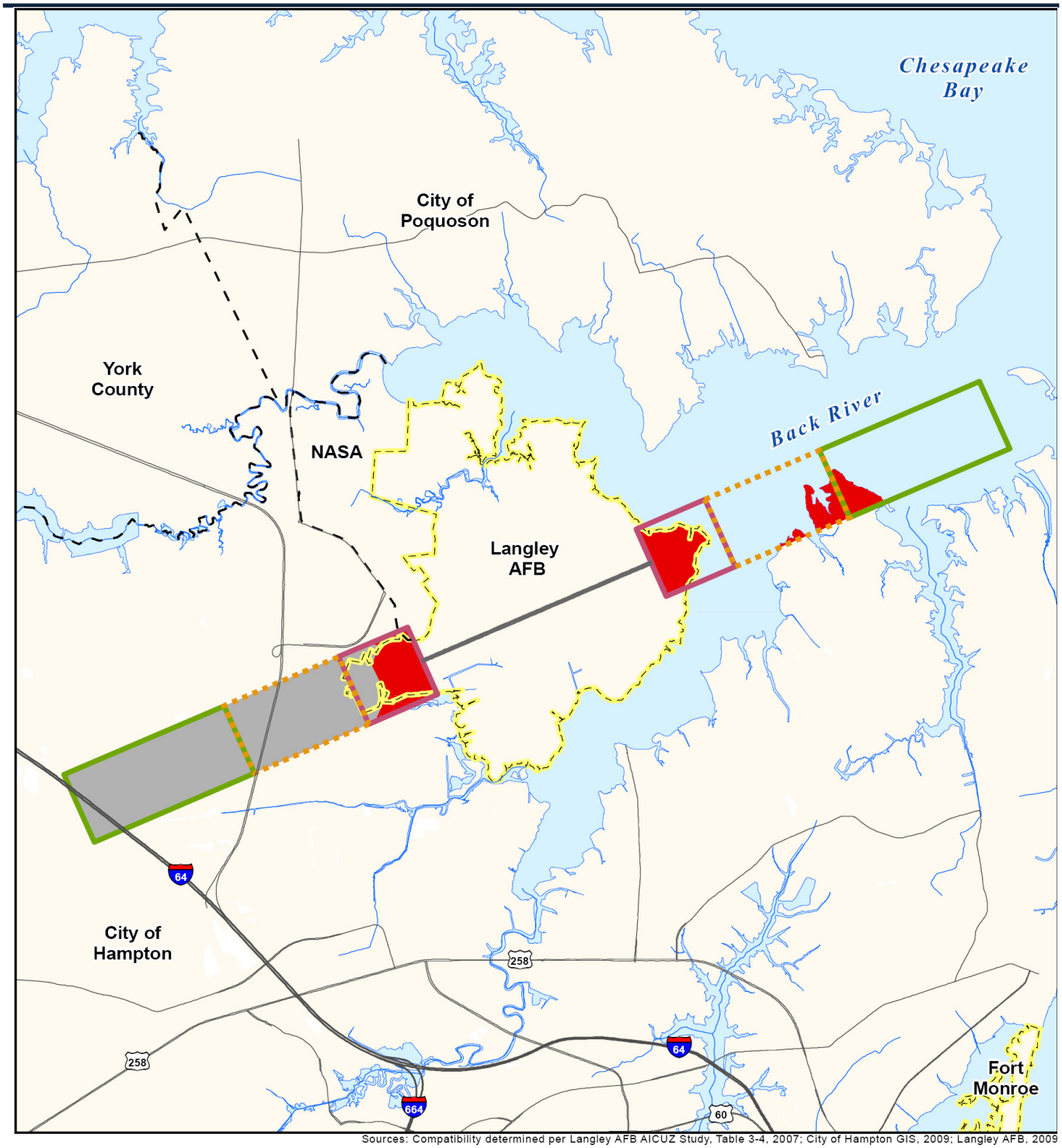


Figure 3-14
Langley AFB Air Operations Safety Zones
Existing Zoning



Sources: Compatibility determined per Langley AFB AICUZ Study, Table 3-4, 2007; City of Hampton GIS, 2009; Langley AFB, 2009

Legend

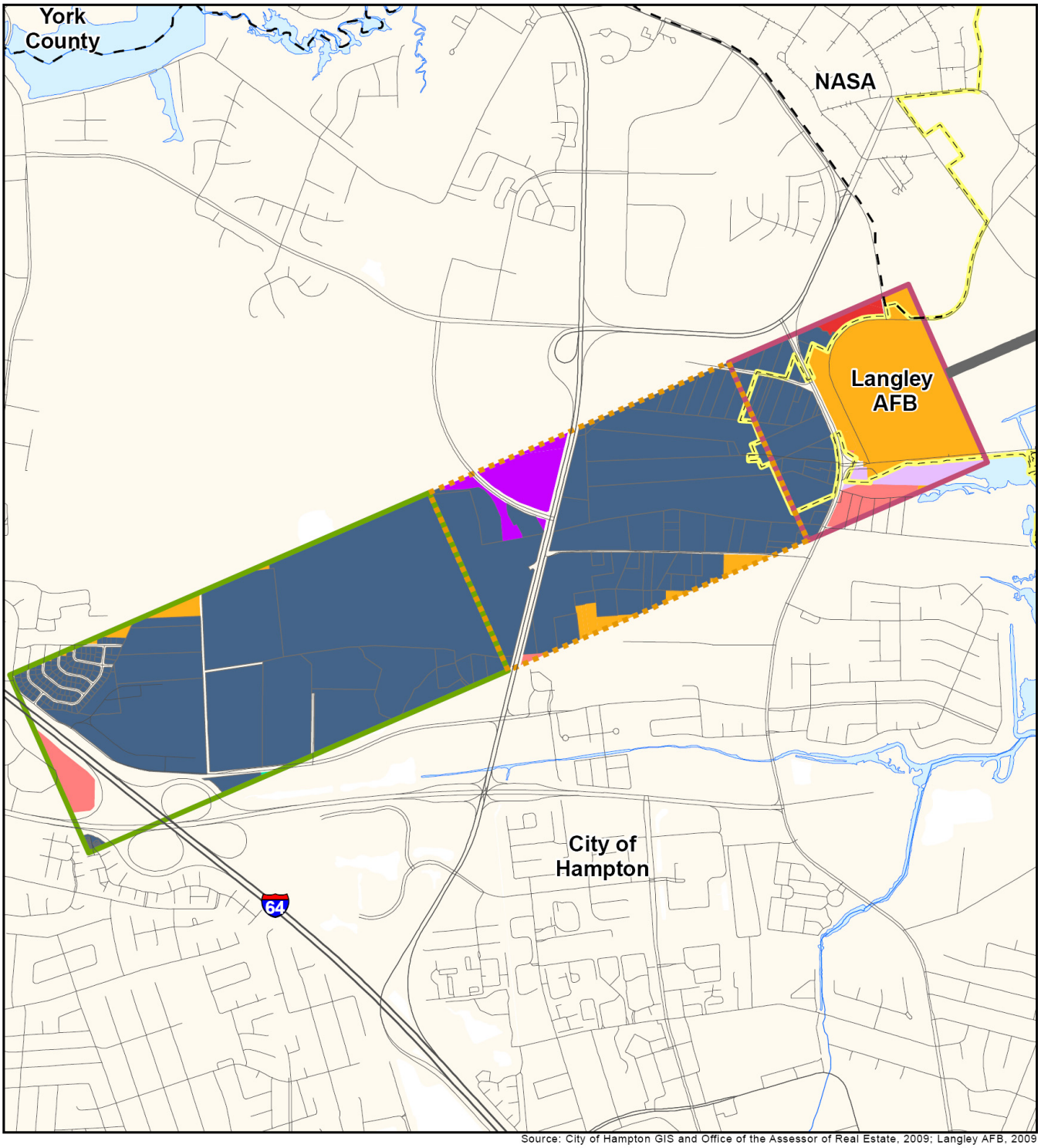
Compatibility
- Yes with Restrictions
- Dependent Upon Use
- No with Exceptions
- No
- Langley Flight Approach District

Air Operations Safety Zones
- CZ
- APZ I
- APZ II
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Major Roads
- Interstate
- Highway

0 0.25 0.5 1 Miles

Figure 3-15
Langley AFB Air Operations Safety Zones
Existing Zoning Compatibility



Source: City of Hampton GIS and Office of the Assessor of Real Estate, 2009; Langley AFB, 2009

Legend

Zoning
- High Intensity Commercial
- Langley Flight Approach District
- Low Density Residential
- Low Intensity Commercial
- Low Intensity Industrial
- Medium Density Residential
- Office Park
- Overlay Zoning Districts

Air Operations Safety Zones
- CZ
- APZ I
- APZ II
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Roads
- Interstate
- Highway
- Local

0 500 1,000 2,000 Feet

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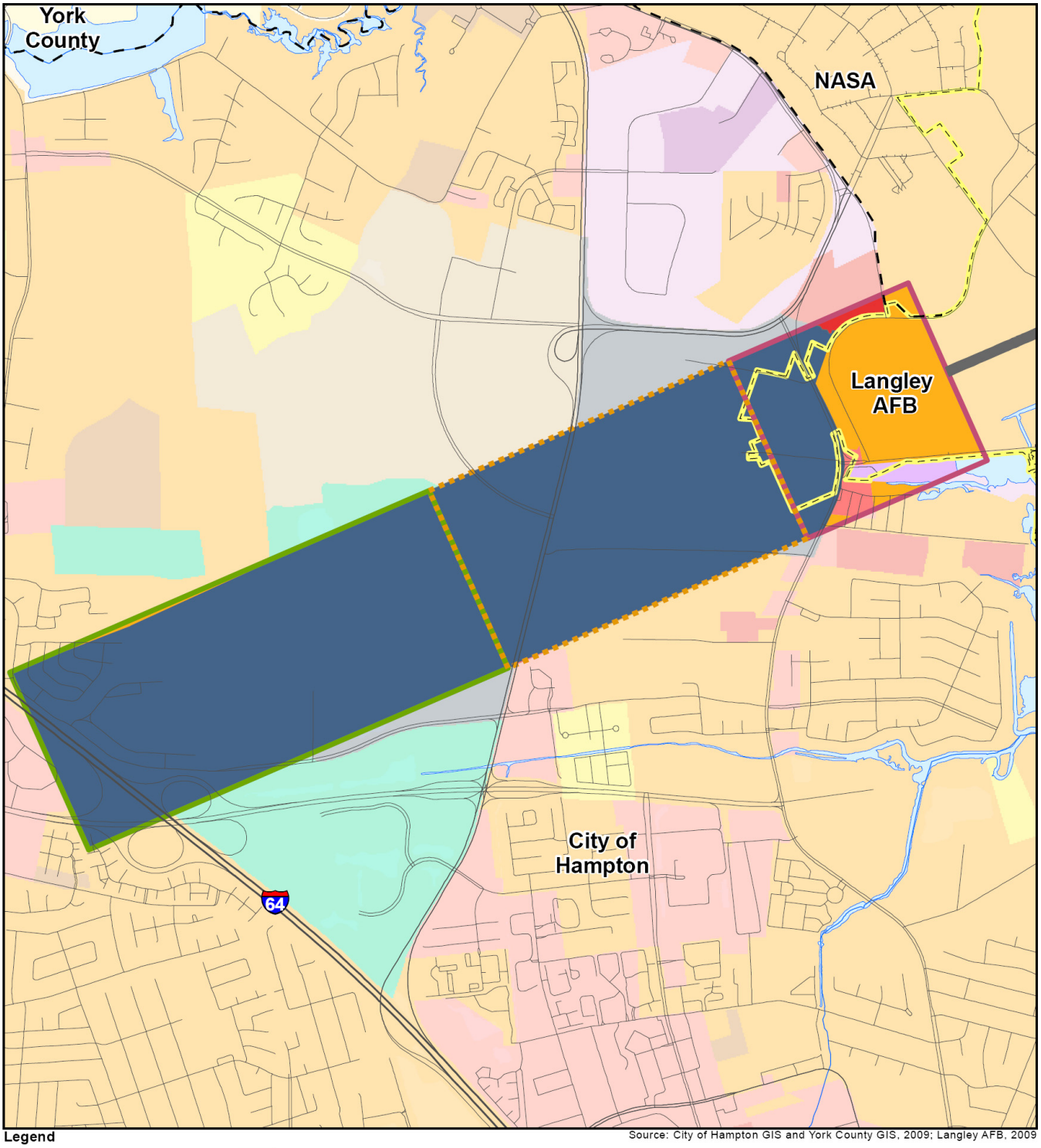
Figure 3-16
Langley AFB Air Operations Safety Zones (West)
Existing Zoning



Source: City of Hampton GIS and York County GIS, 2009; Langley AFB, 2009

Legend

Zoning
- High Density Residential
- High Intensity Commercial
- High Intensity Industrial
- Langley Flight Approach District
- Low Density Residential
- Low Intensity Commercial
- Low Intensity Industrial
- Medium Density Residential
- Office/Research and Development
- Overlay Zoning Districts
- Very Low Density Residential

Air Operations Safety Zones
- CZ
- APZ I
- APZ II

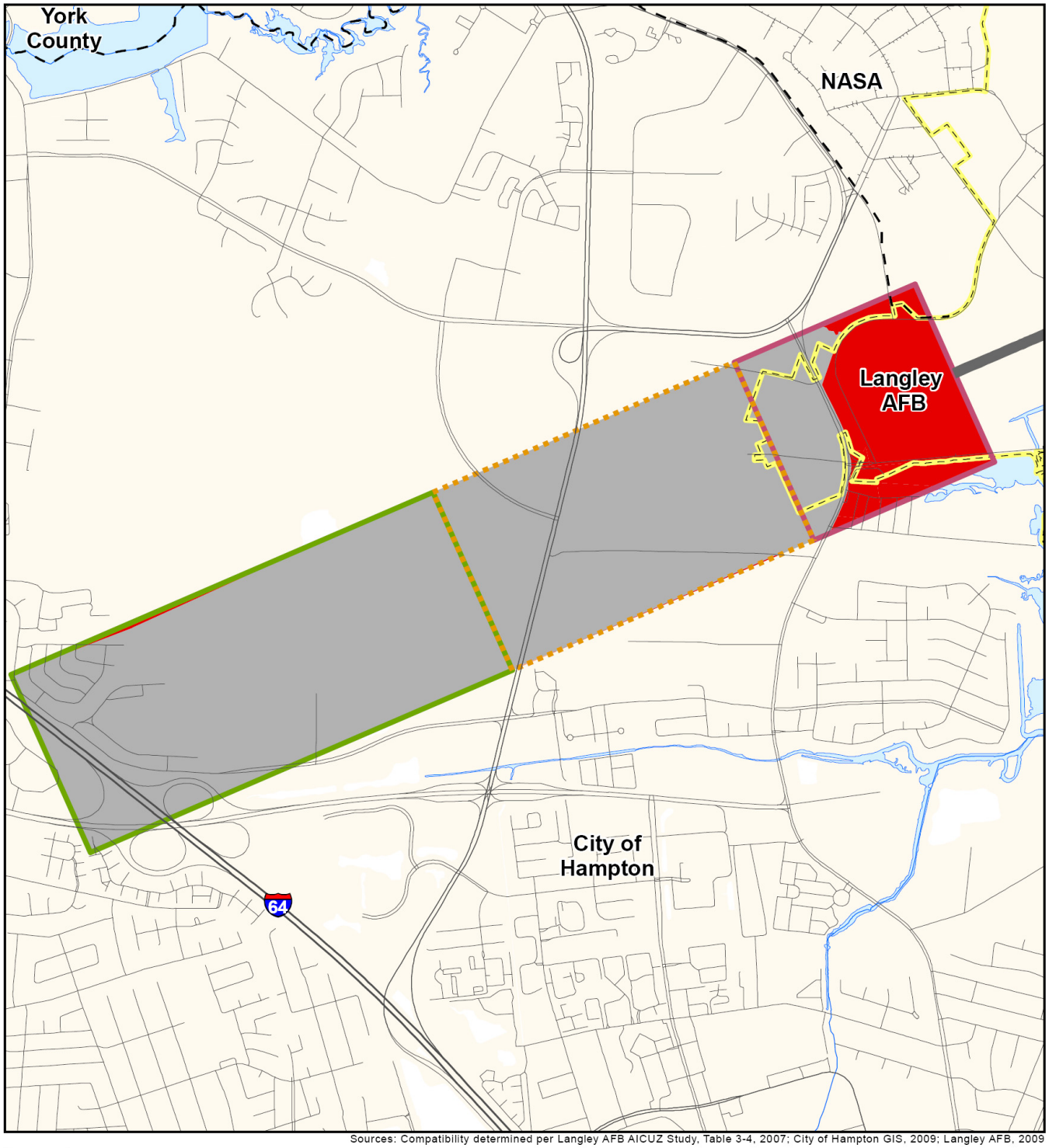
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Roads
- Interstate
- Highway
- Local

0 500 1,000 2,000 Feet

Hampton_Fig3_XX_SafetyZonesZoning_West_MD_20091022_RGR.pdf

Figure 3-17
Langley AFB Air Operations Safety Zones (West)
Existing Zoning



Sources: Compatibility determined per Langley AFB AICUZ Study, Table 3-4, 2007; City of Hampton GIS, 2009; Langley AFB, 2009

Legend

Compatibility
- Yes with Restrictions
- Dependent Upon Use
- No with Exceptions
- No
- Langley Flight Approach District

Air Operations Safety Zones
- CZ
- APZ I
- APZ II

- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Roads
- Interstate
- Highway
- Local

0 500 1,000 2,000 Feet

Figure 3-18
Langley AFB Air Operations Safety Zones (West)
Existing Zoning Compatibility

Analysis of the zoning of vacant land within the safety zones is important in that it can provide an idea of what type of land use is allowed on a certain parcel. There are 16 acres of vacant land in the Langley AFB western CZ. The USAF recommends only agricultural uses that do not involve buildings or livestock, as well as limited recreation uses within the CZ; however, none of the vacant land is zoned for these uses. Table 3-5 shows the breakdown of vacant acres by zoning category for the three western safety zones. Red shading in the table indicates uses incompatible with the safety.

Table 3-5. Zoning on Vacant Land in Langley AFB Western Safety Zones

	Hampton Planning Data		Hampton Assessor Data	
Zoning category	Acres	Percent of Total	Acres	Percent of Total
Clear Zone				
Langley Flight Approach District	15	95.9%	15	95.9%
Low Intensity Commercial	< 1	0.6%		
Medium Density Residential				
High Intensity Commercial	1	3.5%	1	4.1%
Overlay Zoning Districts				
Total	**16**		**16**	
Accident Potential Zone I				
Langley Flight Approach District	92	99.5%	88	95.2%
Low Intensity Commercial				
Medium Density Residential	< 1	0.5%	5	4.8%
High Intensity Commercial				
Overlay Zoning Districts				
Total	**93**		**93**	
Accident Potential Zone II				
Langley Flight Approach District	65	95.8%	63	93.7%
Low Intensity Commercial				
Medium Density Residential	3	4.2%	4	6.3%
High Intensity Commercial				
Overlay Zoning Districts				
Total	**68**			

Note: Compatibility derived from Langley AFB AICUZ Update, July 2007, Table 3-74 "Land Use Compatibility, Noise Exposure, and Accident Potential"
Source: Hampton Planning Data provided by the City of Hampton GIS Department, September 29, 2009; Hampton Assessor Data obtained from www.hampton.gov/sol/propertysearch/

Eastern Safety Zones

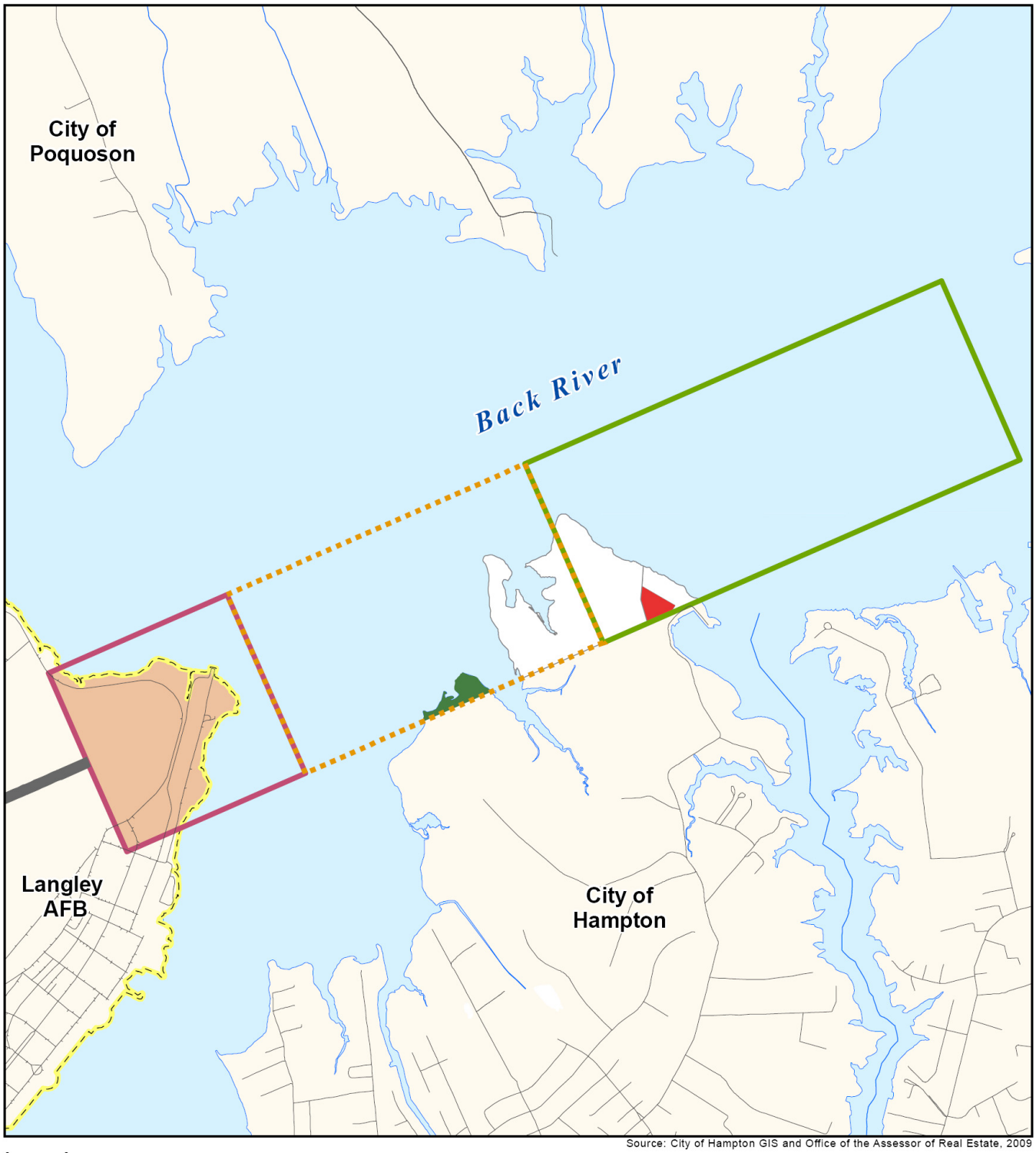
Existing Land Use

The majority of the eastern air operations safety zones are located over the Back River, where development is not a concern (see Figures 3-19 and 3-20). The first map (Figure 3-21) identifies existing land uses within the eastern safety zones as identified by the City of Hampton Assessor's Office, while Figure 3-20 shows land uses based on the city's GIS department. Compatibility within the eastern safety zones is illustrated in Figure 3-21.

The only land that lies under the CZ is part of Langley AFB and is controlled by the base. Thus, it can be regulated appropriately without concern of incompatible land uses. The City of Hampton owns 92 acres of land within eastern APZ I and APZ II. This area has the only vacant parcels east of the Installation. The only current development in APZ II is a marina, which is a land use compatible with Langley's air operations. The issue for the land located in eastern APZ I and APZ II is that there is a potential for future development that is incompatible with air operations safety zones. For this reason, it is important that the City of Hampton ensure proposed land uses are compatible with the safety zones when reviewing site proposal plans. Table 3-6 provides the breakdown of existing land uses within the three eastern safety zones. Currently, the majority of the land in APZ I and APZ II is undesignated and vacant, which, depending on the specific use of each parcel, may or may not be compatible with the safety zone. Red shading in the table indicates land uses incompatible with the safety zone while yellow shading indicates potentially incompatible uses.

Table 3-6. Existing Land Use within Langley AFB's Eastern Safety Zones

Land Use	Hampton Planning Data		Hampton Assessor Data	
	Acres	Percent of Total	Acres	Percent of Total
Clear Zone				
Agriculture				
Commercial / Office				
Rural Residential				
Military	116	55.9%	114	55.1%
Open Space			1	
Undesignated	91	44.1%	93	44.9%
Vacant				
Total	**207**		**207**	
Accident Potential Zone I				
Agriculture			6	1.7%
Commercial / Office				
Rural Residential	6	1.7%		
Military				
Open Space				
Undesignated	294	85.4%	294	85.5%
Vacant	44	12.9%	44	12.9%
Total	**344**		**344**	



Source: City of Hampton GIS and Office of the Assessor of Real Estate, 2009

Legend

Existing Land Use
- Agriculture
- Commercial/Office
- Military
- Vacant

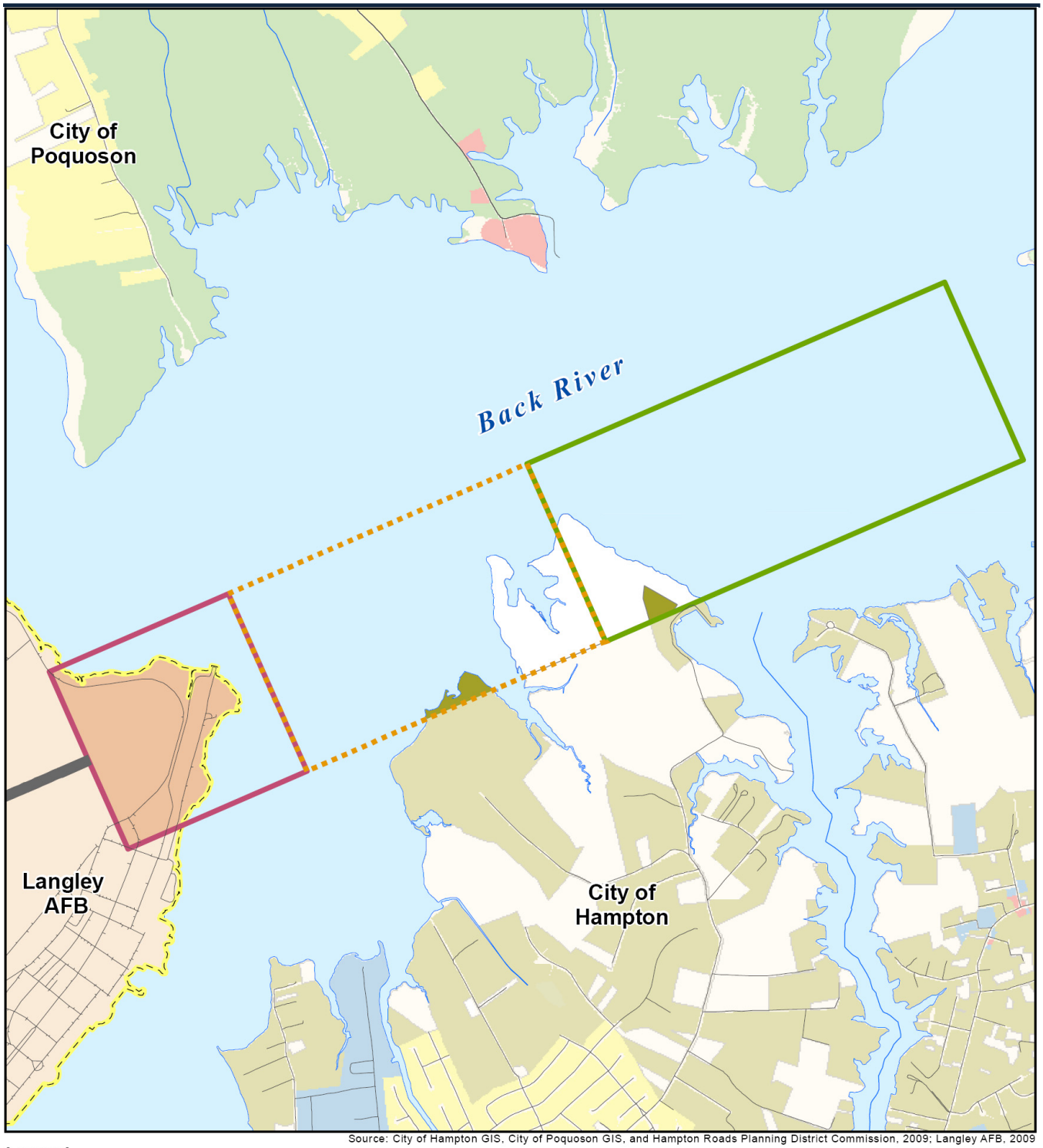
Safety Zones
- CZ
- APZ I
- APZ II

- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Roads
- Highway
- Local

0 500 1,000 2,000 Feet

Figure 3-19
Langley AFB Air Operations Safety Zones (East) - Existing Land Use



Source: City of Hampton GIS, City of Poquoson GIS, and Hampton Roads Planning District Commission, 2009; Langley AFB, 2009

Legend

Existing Land Use
- Commercial/Office
- Conservation
- Low Density Residential
- Military
- Open Space
- Public/Semi-Public
- Rural Residential
- Vacant

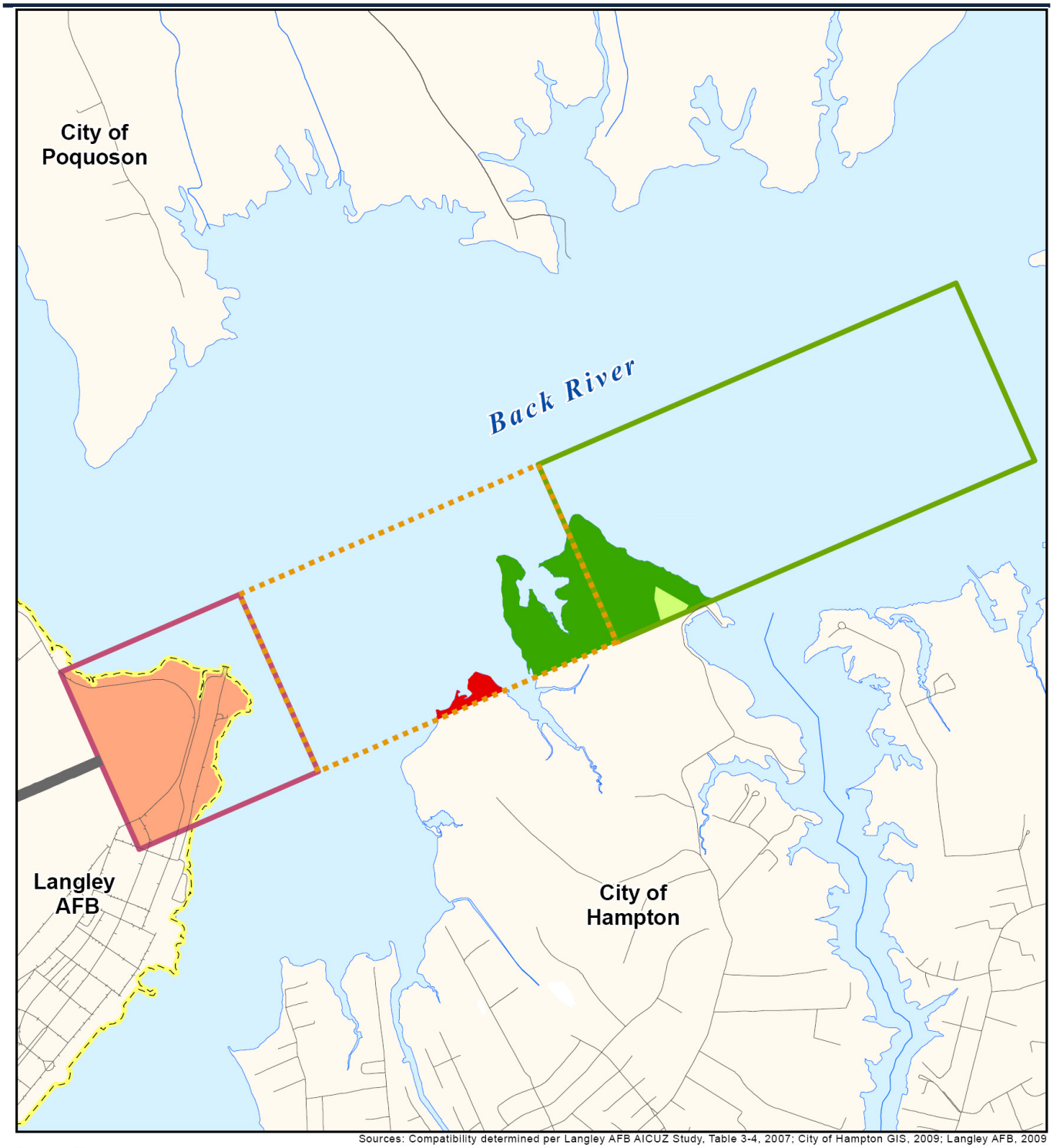
Air Operations Safety Zones
- CZ
- APZ I
- APZ II
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Roads
- Highway
- Local

0 500 1,000 2,000 Feet

Hampton_Fig3_XX_SafetyZonesELU_East_MD_20091021_RGR.pdf

Figure 3-20
Langley AFB Air Operations Safety Zones (East)
Existing Land Use



Sources: Compatibility determined per Langley AFB AICUZ Study, Table 3-4, 2007; City of Hampton GIS, 2009; Langley AFB, 2009

Legend

Compatibility
- Yes
- Yes with Restrictions
- No with Exceptions
- No

Air Operations Safety Zones
- CZ
- APZ I
- APZ II

- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Roads
- Highway
- Local

0 500 1,000 2,000 Feet

Hampton_Fig3_XX_SafetyZonesELU_East_Compat_20091021_RGR.pdf

Figure 3-21
Langley AFB Air Operations Safety Zones (East)
Existing Land Use Compatibility

Table 3-6. Existing Land Use within Langley AFB's Eastern Safety Zones (contd)

Land Use	Hampton Planning Data		Hampton Assessor Data	
	Acres	Percent of Total	Acres	Percent of Total
Accident Potential Zone II				
Agriculture				
Commercial / Office			4	0.8%
Rural Residential	4	0.8%		
Military				
Open Space				
Undesignated	440	91.3%	440	91.3%
Vacant	38	7.9%	38	7.9%
Total	**482**		**482**	

Note: Compatibility derived from Langley AFB AICUZ Update, July 2007, Table 3-74 "Land Use Compatibility, Noise Exposure, and Accident Potential"

Source: Hampton Planning Data provided by the City of Hampton GIS Department, September 29, 2009; Hampton Assessor Data obtained from www.hampton.gov/sol/propertysearch/

Future Land Use

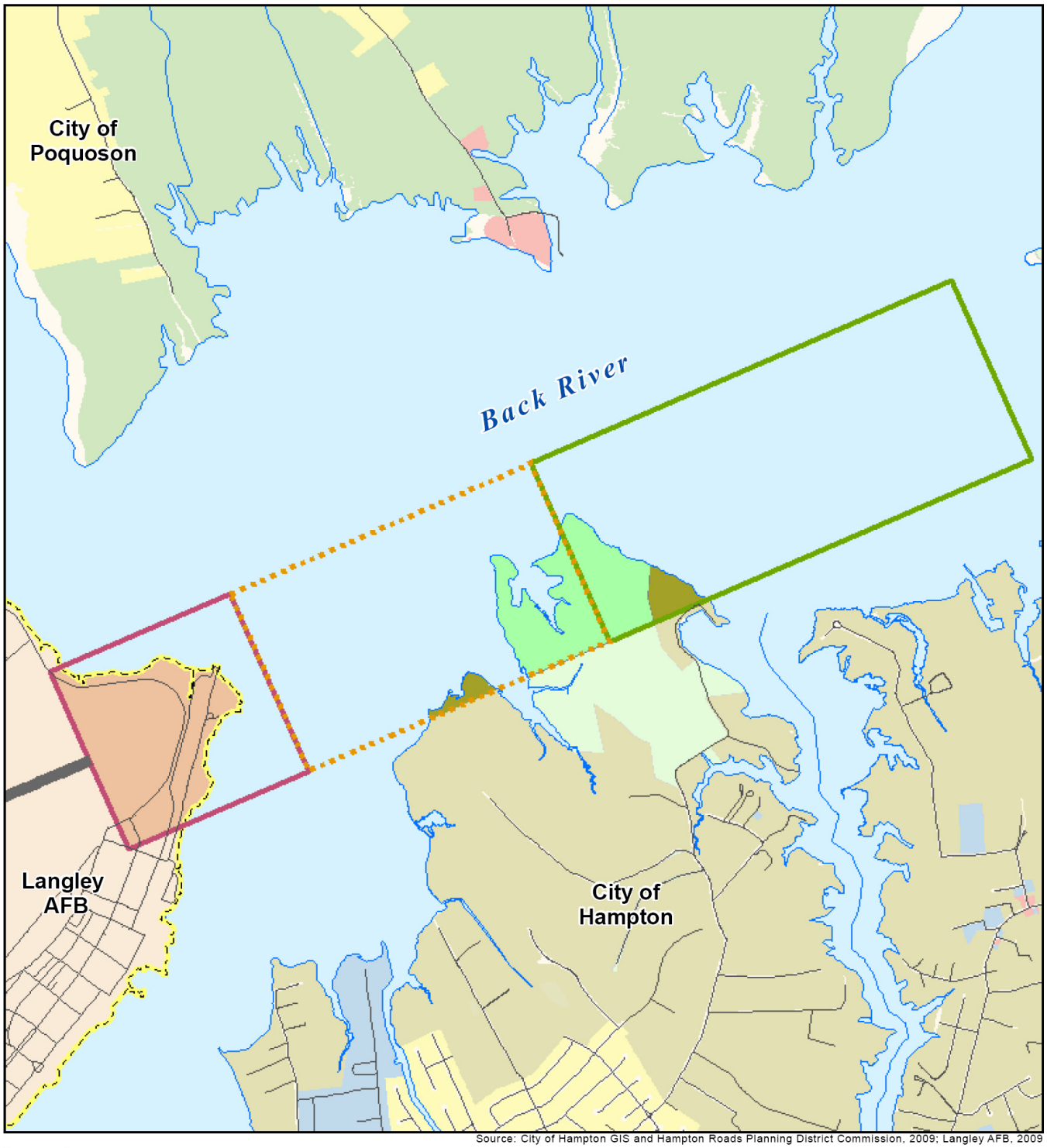
Table 3-7 identifies the future land uses within the three eastern safety zones as indicated by the Hampton GIS Department. Just under half of the land within the eastern CZ is undesignated; however, this area is water. APZs I and II have over 85 percent and 91 percent, respectively, as undesignated, which are also comprised of water. Figure 3-22 shows future land uses as provided by the city's GIS department. Land use compatibility within the eastern safety zones is depicted on Figure 3-23.

Table 3-7. Future Land Use within Langley AFB's Eastern Safety Zones

Land Use	Hampton Planning Data	
	Acres	Percent of Total
Clear Zone		
Rural Residential		
Military	116	55.9%
Open Space		
Undesignated	91	44.1%
	207	
Accident Potential Zone 1		
Rural Residential	6	1.7%
Military		
Open Space	44	12.9%
Undesignated	294	85.5%
	344	
Accident Potential Zone II		
Rural Residential	10	2.0%
Military		
Open Space	32	6.7%
Undesignated	440	91.3%
	482	

Note: Compatibility derived from Langley AFB AICUZ Update, July 2007, Table 3-74 "Land Use Compatibility, Noise Exposure, and Accident Potential." City of Hampton Assessor's Office does not have future land use data.

Source: Hampton Planning Data provided by the City of Hampton GIS Department, September 29, 2009



Source: City of Hampton GIS and Hampton Roads Planning District Commission, 2009; Langley AFB, 2009

Legend

Future Land Use
- Commercial/Office
- Low Density Residential
- Military
- Open Space
- Public/Semi-Public
- Rural Residential

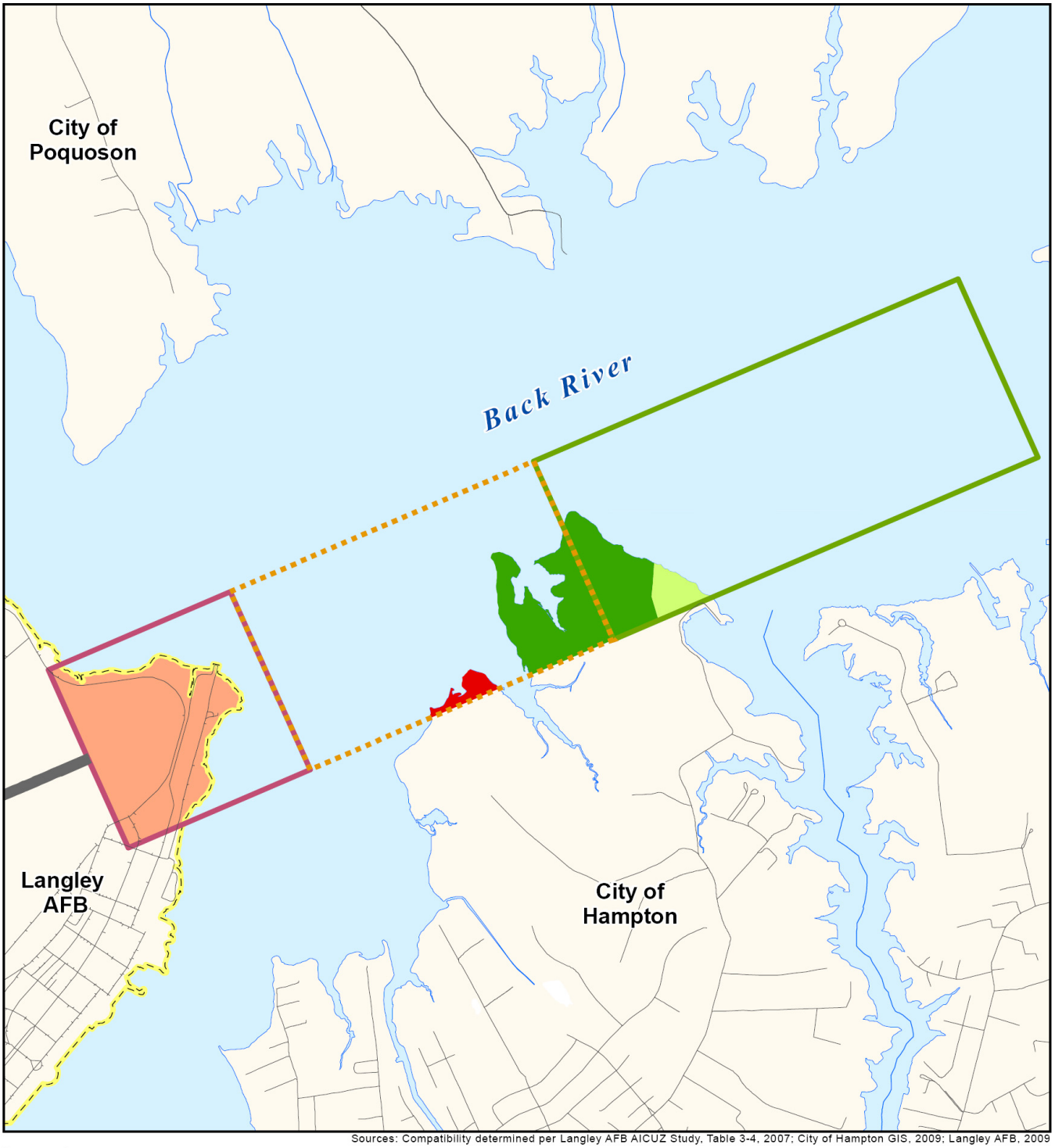
Air Operations Safety Zones
- CZ
- APZ I
- APZ II
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Roads
- Highway
- Local

0 500 1,000 2,000 Feet

Hampton_Fig3_XX_SafetyZonesFLU_East_MD_20091021_RGR.pdf

Figure 3-22
Langley AFB Air Operations Safety Zones (East)
Future Land Use



Sources: Compatibility determined per Langley AFB AICUZ Study, Table 3-4, 2007; City of Hampton GIS, 2009; Langley AFB, 2009

Legend

Compatibility
- Yes
- Yes with Restrictions
- No with Exceptions
- No

Air Operations Safety Zones
- CZ
- APZ I
- APZ II

- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Roads
- Highway
- Local

0 500 1,000 2,000 Feet

Hampton_Fig3_XX_SafetyZonesFLU_East_Compat_20091021_RGR.pdf

Figure 3-23
Langley AFB Air Operations Safety Zones (East)
Future Land Use Compatibility

Zoning

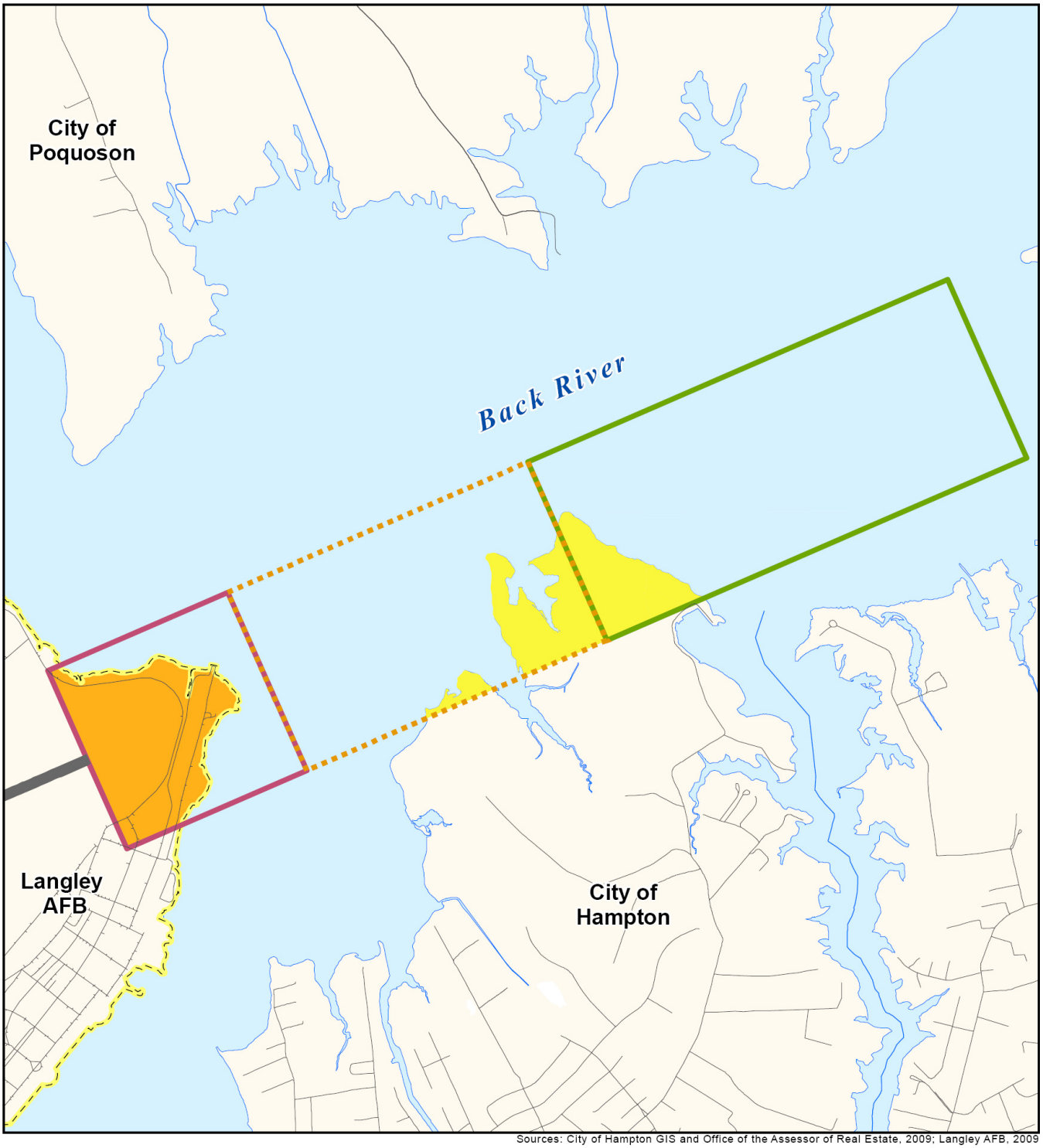
All of the land within the eastern APZ I and APZ II (excluding water) is zoned as low density residential. According to the Air Force, residential uses are not compatible with APZ I; consequently, the land within this zone is currently incompatibly zoned. The City of Hampton identifies low density residential as 3.5 to 9 dwelling units per acre, which is not compatible with APZ II recommended uses. Air Force compatibility guidelines for APZ II allow only rural residential at a density of less than 2 dwelling units per acre, and this allowance has restrictions. Therefore, the residential zoning in the eastern APZs are incompatible uses. Figure 3-24 identifies zoning for parcels located within the base's safety zones as identified by the City of Hampton Assessor's Office. Figure 3-25 shows zoning as provided by the city's GIS department. Compatibility of zoning within the safety zones with Langley AFB air operations is depicted on Figure 3-26.

Although some of the land can be rezoned, it is often a timely and costly effort. The majority of the land within the two APZs is vacant and is also zoned as single family residential. Table 3-8 shows the current breakdown of all land by zoning category. Red shading in the table indicates uses incompatible with the safety zone while yellow shading indicates potentially incompatible uses. Of the figures in the table, the only vacant parcels in the eastern safety zones are 44 acres in APZ I and 38 acres in APZ II, all of which are zoned Low Density Residential. Vacant parcel zoning data from the Hampton Assessor's Office also indicates 44 acres in APZ I and 38 acres in APZ II of Low Density Residential. It should be noted that although all the land is zoned as residential, a commercial use currently exists. This indicates that if the land is developed, it will not necessarily be residential.

Table 3-8. Zoning in Langley AFB Eastern Safety Zones

Zoning Category	Hampton Planning Data		Hampton Assessor Data	
	Acres	Percent of Total	Acres	Percent of Total
Clear Zone				
Low Density Residential				
Medium Density Residential	116	55.9%	114	55.1%
Undesignated	91	44.1%	93	44.9%
Total	207		207	
Accident Potential Zone I				
Low Density Residential	50	14.5%	50	14.5%
Medium Density Residential				
Undesignated	294	85.5%	294	85.5%
Total	344		344	
Accident Potential Zone II				
Low Density Residential	42	8.7%	42	8.7%
Medium Density Residential				
Undesignated	440	91.3%	440	91.3%
Total	482		482	

Note: Compatibility derived from Langley AFB AICUZ Update, July 2007, Table 3-74 "Land Use Compatibility, Noise Exposure, and Accident Potential"
Source: Hampton Planning Data provided by the City of Hampton GIS Department, September 29, 2009; Hampton Assessor Data obtained from www.hampton.gov/sol/propertysearch/



Sources: City of Hampton GIS and Office of the Assessor of Real Estate, 2009; Langley AFB, 2009

Legend

Zoning
- Low Density Residential
- Medium Density Residential

Air Operations Safety Zones
- CZ
- APZ I
- APZ II

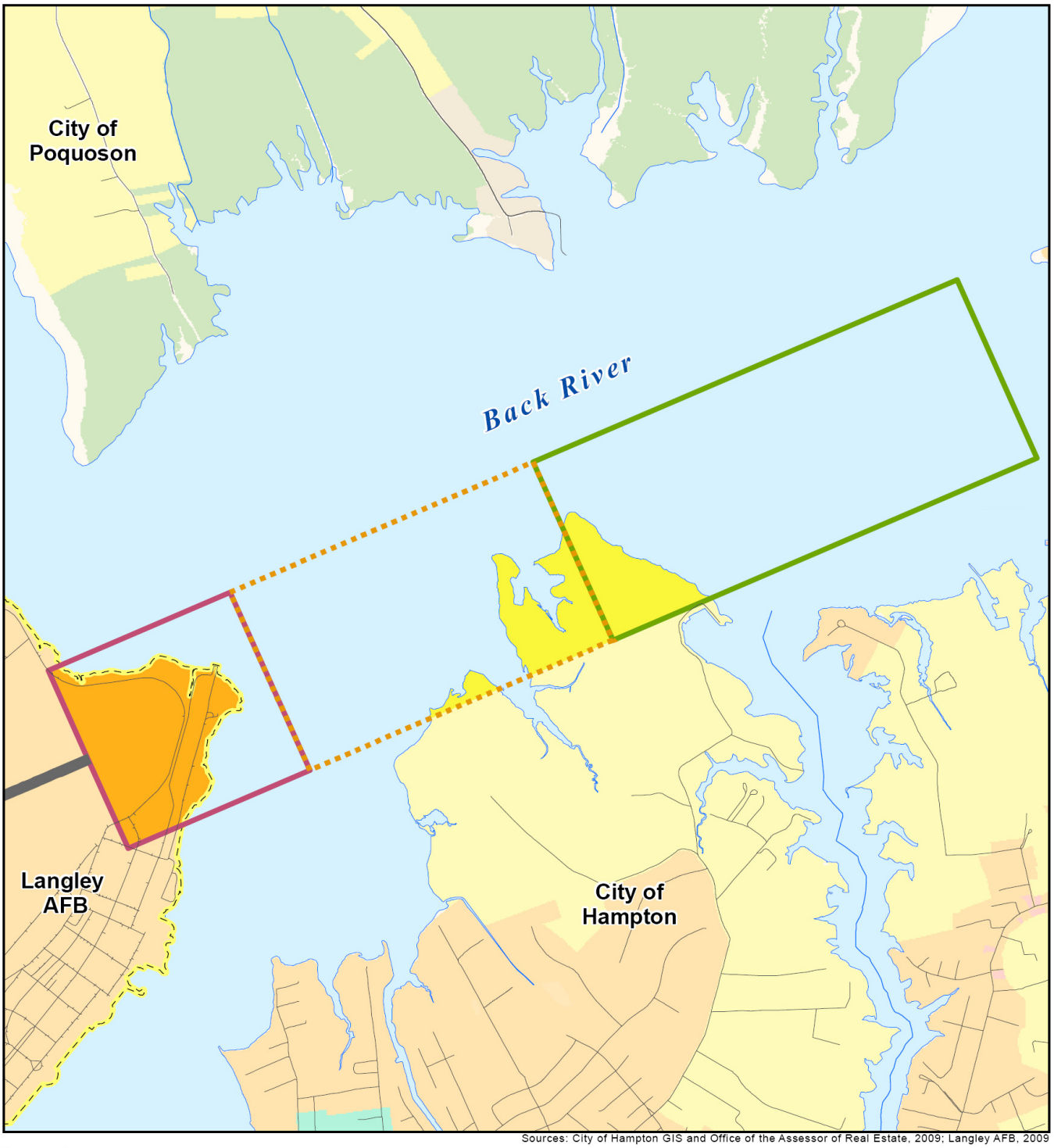
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Roads
- Highway
- Local

0 500 1,000 2,000 Feet

Hampton Fig3 XX SafetyZonesZoning East AD 20091021 RGR.pdf

Figure 3-24
Langley AFB Air Operations Safety Zones (East)
Existing Zoning



Sources: City of Hampton GIS and Office of the Assessor of Real Estate, 2009; Langley AFB, 2009

Legend

Zoning
- Low Density Residential
- Low Intensity Commercial
- Medium Density Residential
- Office/Research and Development
- Overlay Zoning Districts
- Parks/Conservation

Air Operations Safety Zones
- CZ
- APZ I
- APZ II

- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Roads
- Highway
- Local

0 500 1,000 2,000 Feet

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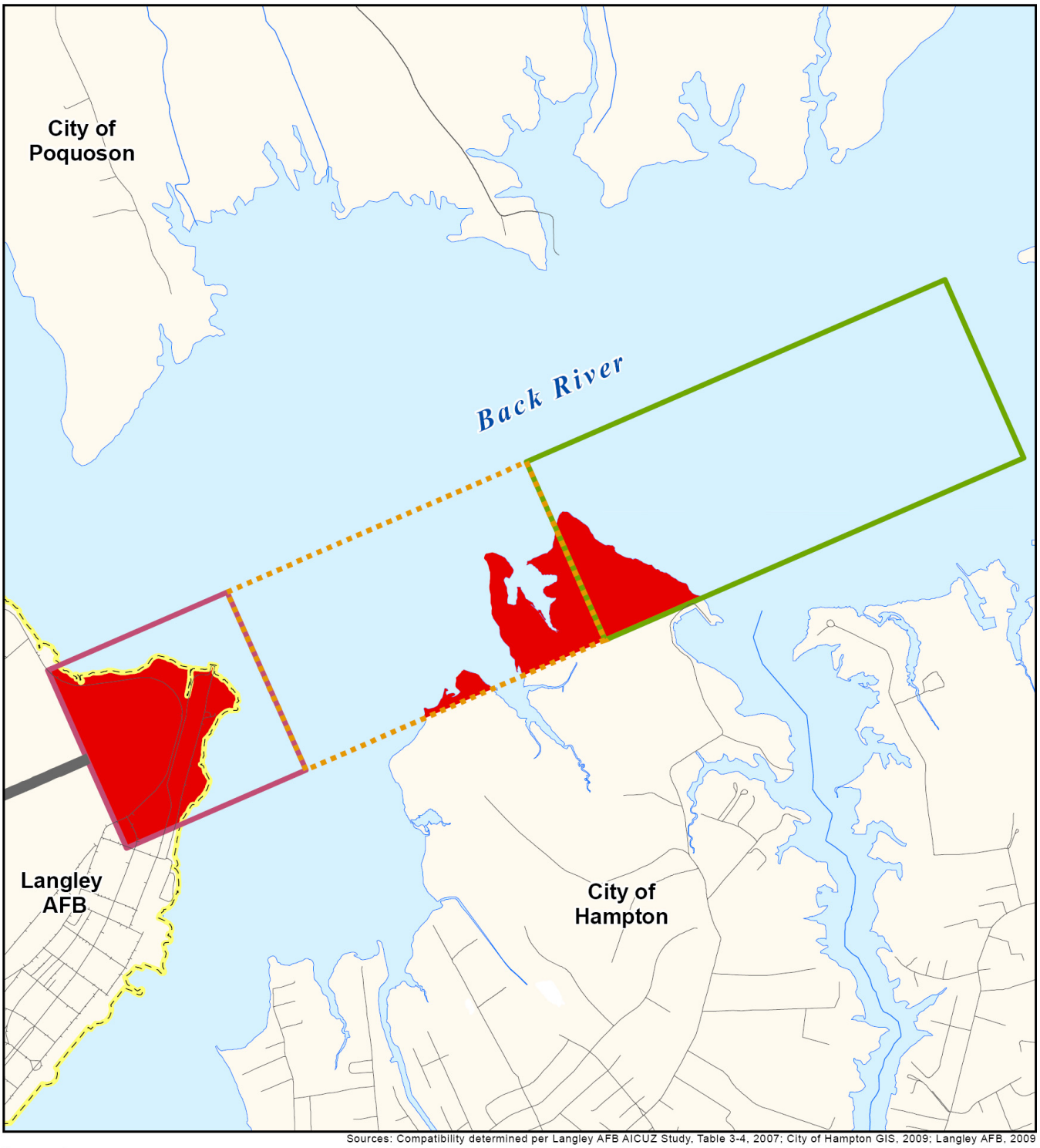
Figure 3-25
Langley AFB Air Operations Safety Zones (East)
Existing Zoning



Sources: Compatibility determined per Langley AFB AICUZ Study, Table 3-4, 2007; City of Hampton GIS, 2009; Langley AFB, 2009

Legend

Compatibility
- Yes with Restrictions
- Dependent Upon Use
- No with Exceptions
- No
- Langley Flight Approach District

Air Operations Safety Zones
- CZ
- APZ I
- APZ II
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Roads
- Highway
- Local

0 500 1,000 2,000 Feet

Figure 3-26
Langley AFB Air Operations Safety Zones (East)
Existing Zoning Compatibility

Bird Attraction Hazards

In-flight collisions with birds are dangerous for pilots, people on the ground, and aircraft operations in general. Incompatible land uses adjacent to the Installation and within approach and departure flight tracks can result in an increased hazard. Within the Hampton-Langley JLUS study area and in close proximity to Langley AFB, bird attractants exist that could impact aircraft operating at the airfield. These attractants include golf courses, wetlands, and agricultural land uses. Golf courses, junk yards, and other uses with large open areas near Langley AFB also have a potential to accumulate standing water during and after periods of rain. The standing water, temporary or permanent, can be significant bird attractants.

Bird strikes can cause significant damage to aircraft

A Bird / Wildlife Aircraft Strike Hazard Plan for Langley AFB was finalized on July 1, 2005. The plan stated that a significant BASH issue exists at Langley and its surrounding areas from both resident and migratory bird species. There are several locations in the vicinity of the Installation that attract birds, which could be hazardous to pilot safety. Many of these areas are natural communities and ecosystems, such as the Back River and undeveloped shoreline along the Chesapeake Bay. The base itself contains natural areas that draw bird species, including 300 acres of forested land, 450 acres of salt marsh, and 100 acres of other wetlands. Furthermore, Langley AFB is located within the Atlantic Flyway, within which millions of birds travel during spring and fall migration periods.

There are several other natural areas within five miles of the runway that attract birds. The 475-acre Grandview Natural Preserve is located along the coast of the Chesapeake Bay roughly four miles east of the runway. Part of the City of Hampton, the Preserve is open to the public and consists of salt marshes, tidal creeks, and beachfront that draw migratory birds. Grundland Creek Park is just west of Grandview Natural Preserve and is still being developed; therefore, it is not yet open to the public. It contains salt marshes, creeks, and shoreline that attract bird species. Plum Tree Island National Wildlife Refuge is situated approximately four miles northeast of Langley AFB. The area was previously owned by the DOD and was used as a bombing range. Due to safety concerns with unexploded ordnance, the public is prohibited from the majority of the Refuge. It covers 3,501 acres of salt marsh, shrub-scrub, and wooded habitat in the City of Poquoson. It sits roughly at the midpoint for the Atlantic Bird Flyway and draws a variety of migratory, as well as resident bird species. Harwood's Mill Reservoir is a 265-acre impoundment roughly seven miles northwest of Langley AFB that provides water to the City of Newport News water supply system. Its open water areas and surrounding woodlands attract birds. Big Bethel Reservoir in Newport News / York County is about three miles west of Langley and poses a concern for BASH issues as it attracts birds similarly to Harwood's Mill Reservoir. Lastly, undeveloped land east of the Harris River in the City of Hampton is known to attract birds that could pose safety concerns for pilots.

There are several man-made locations within five miles of Langley AFB that also attract birds and pose safety concerns. Active and inert landfills can pose compatibility issues to aircraft operations since these operations have the potential to attract wildlife, specifically birds. Bethel Landfill is roughly 3.5 miles west of the Langley runway and attracts large numbers of

gulls and other species. Between 2000 and 2005, eight bird strikes were reported to have occurred near the landfill. A community program was initiated to alert Langley personnel when a bird hazard is present. Golf courses are another major bird attractant. They generally are well landscaped and have water features, ponds, and lakes that are attractive to birds. The Eaglewood Golf Course on Langley AFB north of the runway has seven freshwater ponds that cover a total of ten acres. The course includes 320 acres of fairways and greens that entice migratory and resident Canadian geese. Other golf courses within the JLUS study area include the 232-acre Hamptons Golf Course, with three 9-hole courses located in the western APZ I and APZ II; the 108-acre Woodlands Golf Course, with 18 holes about four miles southeast of the runway, and the 253-acre Kiln Creek Golf Course, with 18 holes approximately eight miles northwest of the runway.

The Sentara Careplex Hospital was opened in December 2002, about two miles southwest of Langley AFB. The hospital includes 200 patient rooms and covers a large area of land. The building and associated pavement made the land impervious to water drainage and absorption during rain and flooding. To mitigate the issue of water buildup, several storm water ponds were built in conjunction with the hospital. These storm water ponds attract bird species such as Canadian geese, which pose a hazard to pilots. Amplifying this BASH concern is the site's location within Langley AFB flight paths.

There is an automobile salvage yard located in the western CZ and a junkyard located in the western APZ I. Both of these uses could attract birds searching for food or water if they are built up. Sandy Bottom Nature Park is a redevelopment area operated by the City of Hampton at the end of the western APZ II, along Interstate 64. This 456-acre park draws a variety of wildlife and bird species. Despite the fact that the area is incompatible with safety in regards to the BASH issue, it is an important feature to the city as it was reclaimed from being a garbage dump, which was also considered a bird attractant. Hampton operates the Bluebird Gap Farm 3.5 miles south of Langley AFB. This 60-acre farm has over 250 domestic and wild animals, including a wide variety of bird species. One of the main bird attractants at the farm are ponds and pastures. A total of 161 bird species have been identified at Bluebird Gap Farm, including waterfowl, shorebirds, vultures, Bald Eagles, hawks, gulls, and crows. All of the locations listed above, except for Woodlands Golf Course, are situated along or adjacent to flight paths that have been identified and are used by aircraft operating from Langley AFB. Figure 3-27 shows the location of BASH areas of concern within the Hampton-Langley JLUS study area.

According to the 2005 Langley BASH Plan, there are approximately two dozen nesting pairs of osprey within the vicinity of Langley AFB. Each pair of osprey typically raises two to four young annually. According to the Langley AFB Safety Office, osprey are one of the biggest BASH concerns due to behavior that predisposes them to aircraft strikes and their location in proximity to the base. A collision between an F-15C and an osprey in 2000 resulted in over $700,000 in damage to the aircraft's engine. This incident resulted in an Integrated Osprey Hazard Management Program at the base. This program monitors osprey nesting patterns and uses varying amounts of control to ensure osprey do not nest on or near the runway, including removing nests, nest exclusion, habitat modification, non-lethal harassment, and under extreme threat potentials, lethal removal. As noted in the 2005 Langley AFB BASH Plan, 76 nestling osprey were relocated to Ohio and Indiana since the program's inception.

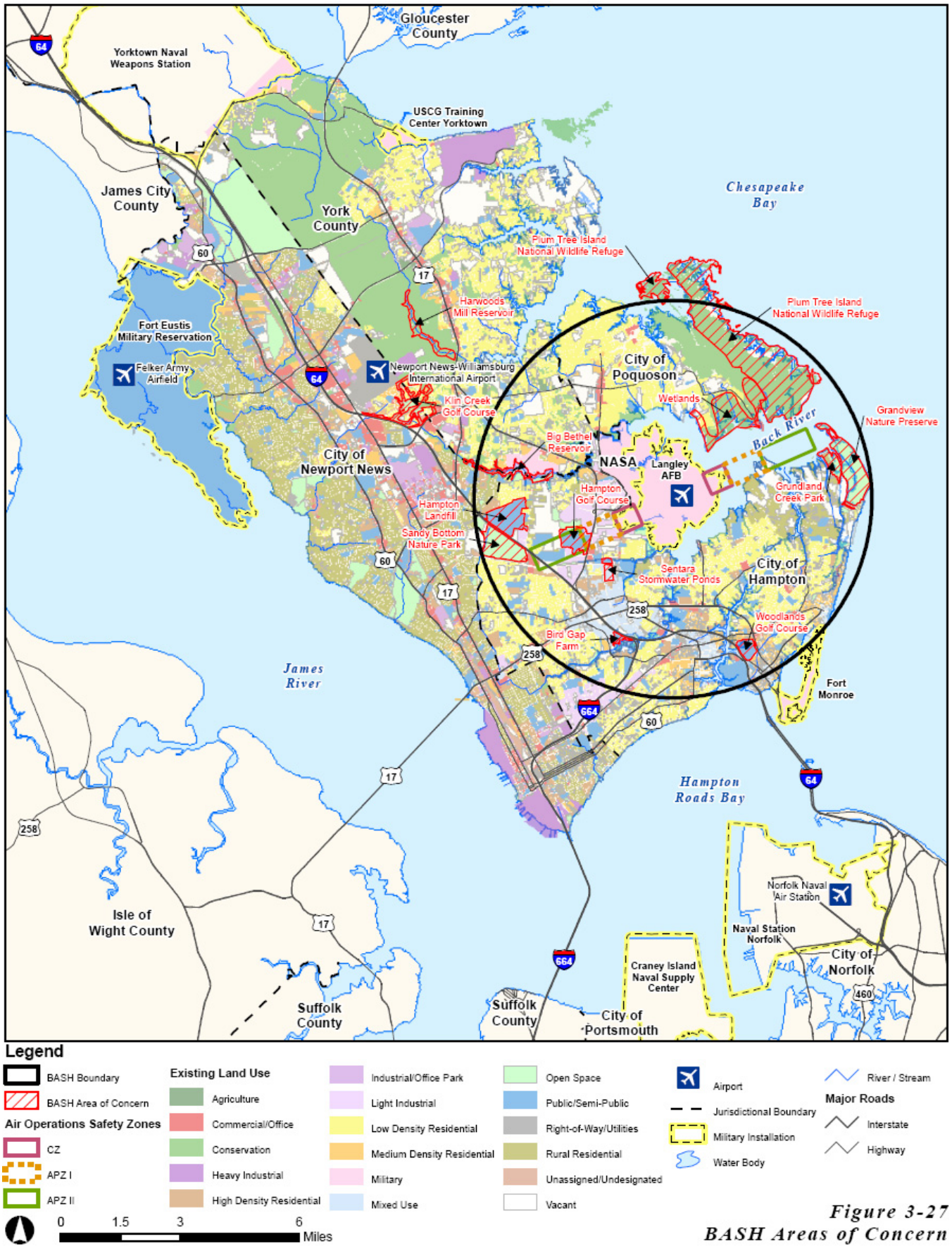


Figure 3-27
BASH Areas of Concern

3 Vertical Obstruction Issues

Definition:
Vertical obstructions are created by buildings, structures or other features that may encroach into the navigable airspace used by military operations (aircraft approach, transitional, inner horizontal, outer horizontal and conical areas, as well as military training routes), presenting a safety hazard to both the public and military personnel and potentially impacting military readiness.

The issues identified for this compatibility factor are:

- a large pile of rubble / construction debris;
- Bethel Landfill; and
- radio transmitter towers in the area

Evaluating Vertical Obstruction

Vertical obstruction in relation to flight operations from an airport (military or civilian) are addressed through compliance with Federal Regulation Title 14 Part 77, which establishes standards and notification requirements for objects affecting navigable airspace. Commonly referred to as FAA Part 77 or Part 77 compliance, this regulation provides details on how 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 in relation to the airfield in question. Figure 3-28 illustrates common terms used in the Part 77 regulation, and Figure 3-29 provides a graphic representation of the imaginary surfaces associated with Langley AFB. These are how structures and facilities are evaluated to determine if they pose a vertical obstruction in relation to the airspace around base. The various imaginary surfaces build upon one another and are designed to eliminate obstructions to air navigation and operations, either natural or man-made. These terms associated with imaginary surfaces and Part 77 are further described in the discussion that follows.

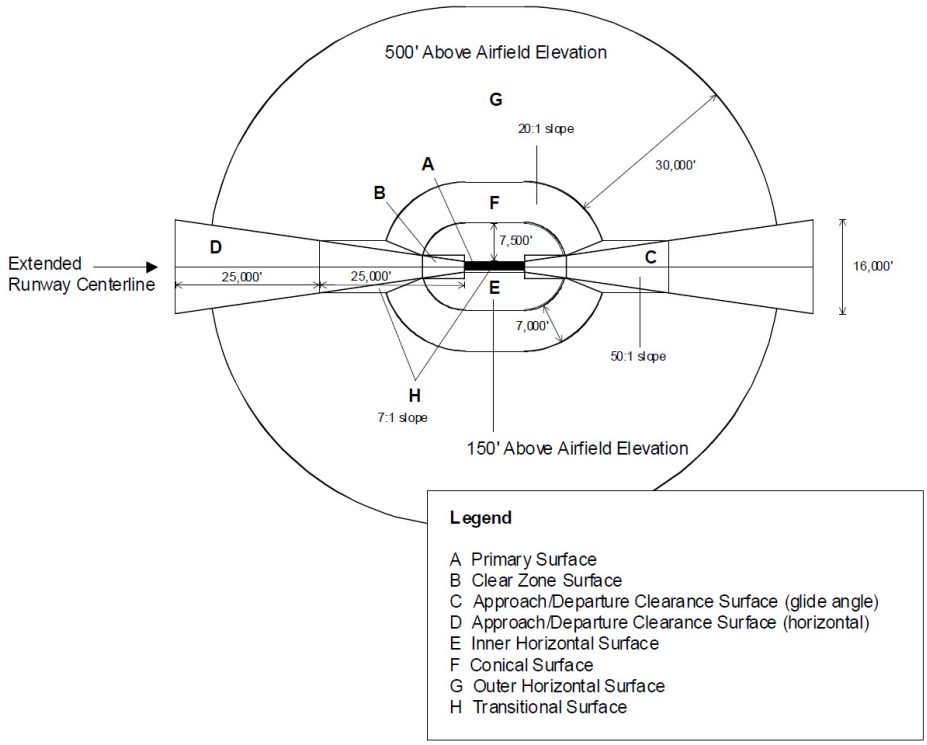
Primary Surface – This surface defines the limits of the obstruction clearance requirements in the immediate vicinity of the landing area. The primary surface comprises surfaces of the runway, runway shoulders, and lateral safety zones and extends 200 feet beyond the runway ends. The width of the primary surface for a single Class "B" runway, the class for Langley AFB's primary runway, is 2,000 feet, or 1,000 feet on each side of the runway centerline. Ideally, there should be no obstructions, fixed or mobile, within the primary surface area.

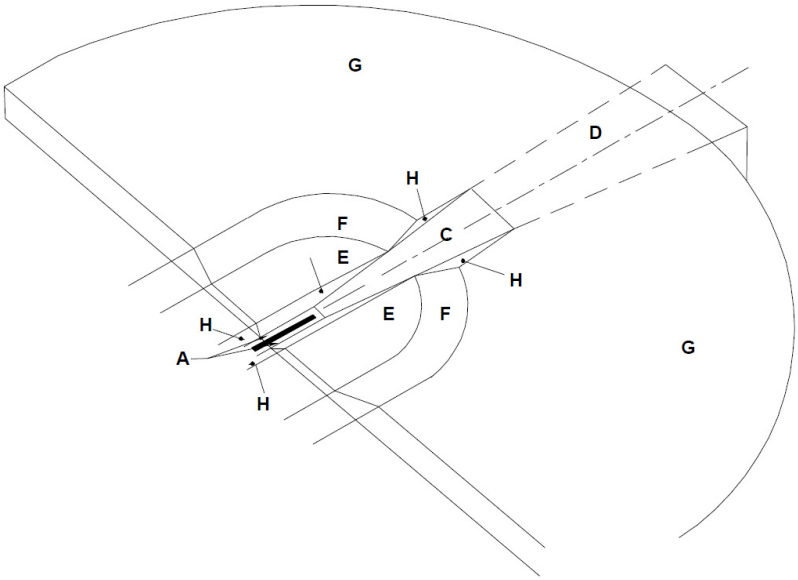
Clear Zone – This surface defines the limits of the obstruction clearance requirements in the vicinity contiguous to the end of the primary surface. The CZ surface length and width (for a single runway) is 3,000 feet by 3,000 feet. This area has the highest accident potential of all zones.

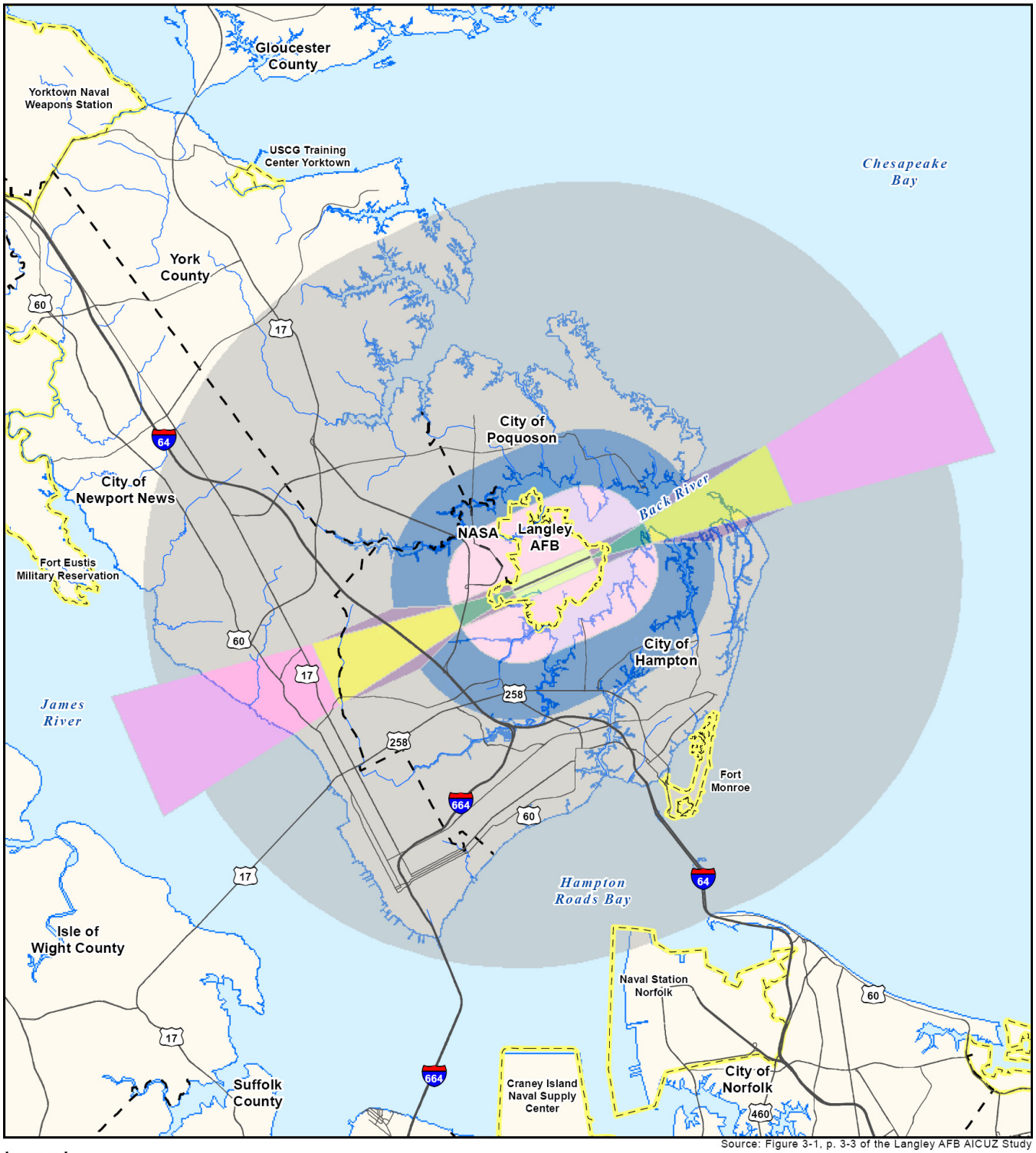
Approach-Departure Clearance Surface – This surface is symmetrical about the extended runway centerline, begins as an inclined plane (glide angle) at each end of the primary surface of the centerline elevation of the runway end, and extends for 50,000 feet. The slope of the approach-departure clearance surface is 50:1 along the extended runway (glide angle) centerline until it reaches an elevation of 500 feet above the established airfield elevation. It then continues horizontally at this elevation to a point 50,000 feet from the start of the glide angle. The width of this surface at the runway end is 2,000 feet; it flares uniformly, and the width at 50,000 feet is 16,000 feet.

Inner Horizontal Surface – This surface is a plane, oval in shape at a height of 150 feet above the established airfield elevation. It is constructed by scribing an arc with a radius of 7,500 feet above the centerline at the end of the runway and interconnecting these arcs with tangents.

Figure 3-28. Part 77 Terminology, Imaginary Surfaces







Source: Figure 3-1, p. 3-3 of the Langley AFB AICUZ Study

Legend

- Primary Surface
- Clear Zone Surface
- Approach/Departure Clearance Surface (glide angle)
- Approach/Departure Clearance Surface (horizontal)
- Inner Horizontal Surface
- Conical Surface
- Outer Horizontal Surface
- Transitional Surface
- Jurisdictional Boundary
- Military Installation
- Water Body
- Runway
- River / Stream

Major Roads

- Interstate
- Highway

0 1.5 3 6 Miles

Figure 3-29
Imaginary Surfaces - USAF Airspace Control

Conical Surface – This is an inclined surface extending outward and upward from the outer periphery of the inner horizontal surface for a horizontal distance of 7,000 feet to a height of 500 feet above the established airfield elevation. The slope of the conical surface is 20:1.

Outer Horizontal Surface – This surface is a plane located 500 feet above the established airfield elevation. It extends for a horizontal distance of 30,000 feet from the outer periphery of the conical surface.

Transitional Surfaces – These surfaces connect the primary surfaces, CZ surfaces, and approach-departure clearance surfaces to the outer horizontal surface, conical surface, other horizontal surface, or other transitional surfaces. The slope of the transitional surface is 7:1 outward and upward at right angles to the runway centerline. To determine the elevation for the beginning of the transitional surface slope at any point along the lateral boundary of the primary surface, including the clear zone, draw a line from this point to the runway centerline. This line will be at right angles to the runway axis. The elevation at the runway centerline is the elevation for the beginning of the 7:1 slope.

The land areas that fall within the surfaces recognized above should be regulated in order to prevent incompatible development or uses that might cause safety hazards to aircraft operations. The Langley AFB AICUZ Study also identifies the following uses that should be restricted and / or prohibited for pilot safety.

- Uses that release into the air any substance that would impair visibility or otherwise interfere with the operation of aircraft (i.e., steam, dust, or smoke).
- Uses that produce light emissions, either direct or indirect (reflective), that would interfere with pilot vision.
- Uses that produce 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, maintenance of feeding stations, or the growing of certain vegetation.
- Uses that include structures within ten feet of aircraft approach-departure and / or transitional surfaces.

To determine when proposed structures or facilities require the FAA to be notified, Part 77 (§ 77.13) states the following requirements.

§ 77.13 - Any person / organization who intends to sponsor any of the following construction or alterations must notify the Administrator of the FAA (paraphrased):

(1) Any construction or alteration of more than 200 feet in height above the ground level at its site.

(2) Any construction or alteration of greater height than an imaginary surface extending outward and upward at one of the following slopes:

- within 20,000 ft of a public use or military airport which exceeds a 100:1 surface from any point on the runway of each airport with at least one runway more than 3,200 ft.
- within 10,000 ft of a public use or military airport which exceeds a 50:1 surface from any point on the runway of each airport with its longest runway no more than 3,200 ft.
- within 5,000 ft of a public use heliport which exceeds a 25:1 surface

- Any highway, railroad, or other traverse way whose prescribed adjusted height would exceed that above noted standards
- When requested by the FAA
- Any construction or alteration located on a public use airport or heliport regardless of height or location

Further, Part 77 identifies the height at which an object may be considered an obstruction at a designated distance. An excerpt from Section 77.23 follows:

§ 77.23 – Standards for determining obstructions

(a) An existing object, including a mobile object, is, and a future object would be, an obstruction to air navigation if it is of greater height than any of the following heights or surfaces:

(1) A height of 500 feet above ground level (AGL) at the site of the object.

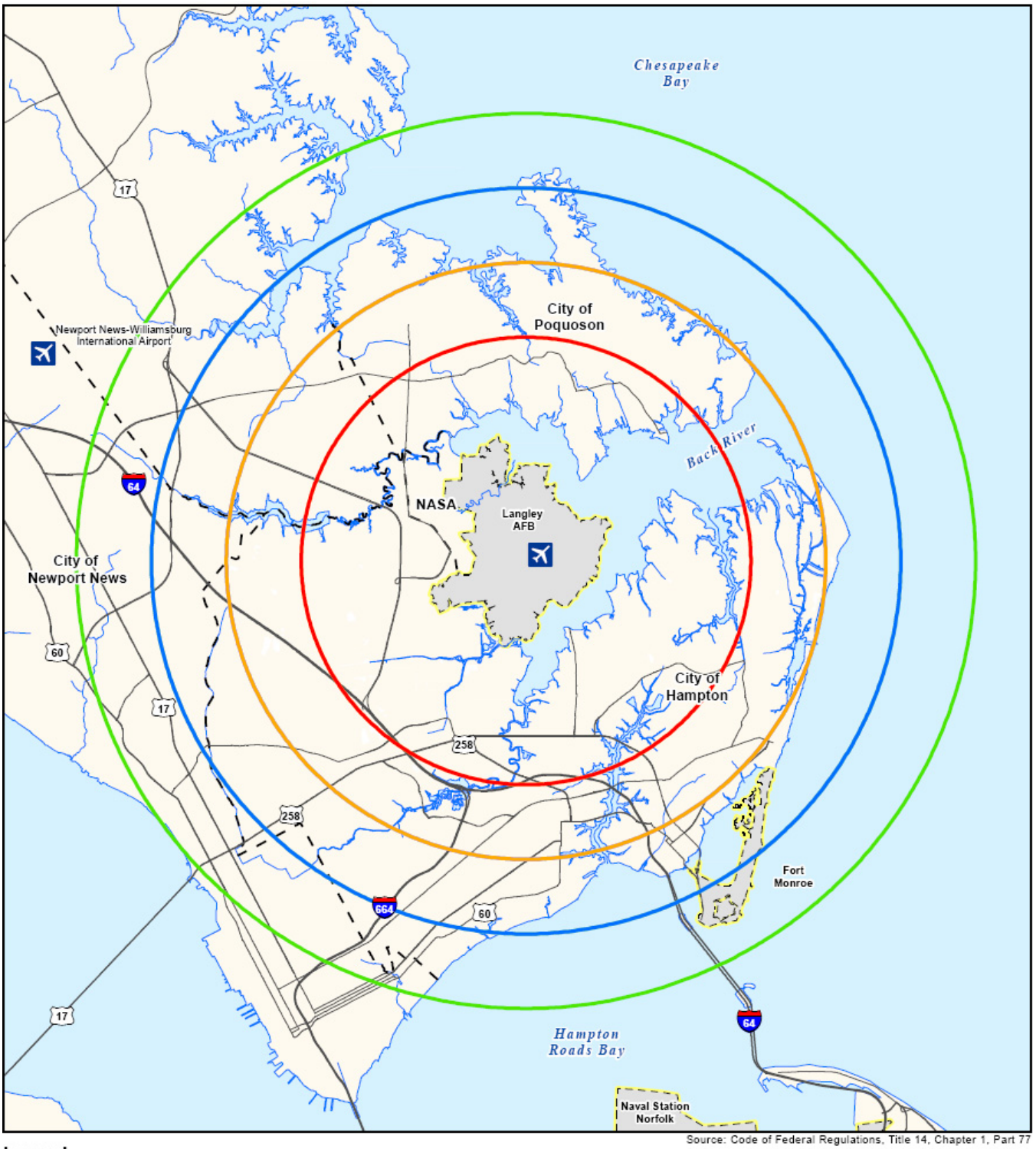
(2) A height that is 200 feet above ground level or above the established airport elevation, whichever is higher, within three nautical miles of the established reference point of an airport, excluding heliports, with its longest runway more than 3,200 feet in actual length, and that height increases in the proportion of 100 feet for each additional nautical mile of distance from the airport up to a maximum of 500 feet.

Figure 3-30 depicts how Part 77 requirements impact allowable vertical structures over distance from Langley AFB.

The airfield at Langley AFB sits at an elevation of 11 feet MSL. Based on this, the outer horizontal surface has an elevation of 511 feet MSL, which equates to 500 feet AGL. Incompatible developments within this area above a certain height could impact operations and mission capabilities at the base. Not only would they pose safety hazards to pilots, but they could also impede the use of instrument approach corridors. This could in-turn force pilots to approach at too high of an altitude and / or have to divert to alternate airfields during certain conditions such as inclement weather.

There were few existing locations identified during the JLUS process that currently pose vertical obstruction issues. There is a large pile of construction debris located in the southern corner of the western CZ adjacent to Langley AFB's West Gate and approximately one-quarter of a mile from the west end of the base's runway. This use is not compatible with air operations and the Air Force recommended uses in the CZ. The Bethel Landfill to the west of Bethel Road was also identified as a vertical obstruction concern due to its attraction of birds. The landfill's height increases as new waste is added. This results in increased heights at which birds fly above it. As the column of birds soars higher over the landfill, there is a greater risk of a BASH accident with aircraft departing or arriving to or from Langley AFB. A group of radio transmitter towers is located in the vicinity of the Buckroe Beach area of Hampton, approximately 4.5 miles southeast of the Langley AFB runway. These towers extend above the 511-foot MSL (500-foot AGL) elevation of the outer horizontal surface.

It should be noted that vertical structures that may be below the imaginary surfaces may still impact Terminal Instrument Procedures (TERPS). For this reason, in addition to evaluating structures based on imaginary surfaces, the local TERPS office may need to be contacted to ensure proposed structures will not impact aircraft operations at the Installation.



Source: Code of Federal Regulations, Title 14, Chapter 1, Part 77

Legend

Structure Height
- >200 Feet
- >300 Feet
- >400 Feet
- >500 Feet

- Airport
- Jurisdictional Boundary
- Military Installation
- Water Body
- River / Stream

Major Roads
- Interstate
- Highway

0 1 2 4 Miles

Figure 3-30
Vertical Obstruction Compliance - FAA Part 77

Other than those listed above, no other issues were identified for vertical obstructions within the flight paths associated with Langley aircraft operations; however, low-level flight that is often a part of ingress and egress into the base is a general concern. Structures built above FAA-regulated heights and under flight paths could pose hazards to pilots and people on the ground. It is important to note that in addition to the review of obstacles Langley AFB has a large network of flight paths including arrival, departure, and closed pattern. These flight paths are illustrated on Figures 3-31, 3-32, and 3-33.

4 Local Housing Availability Issues

Definition:
Local housing availability addresses the supply and demand for housing in the region, the competition for housing that may result from changes in the number of military personnel and the supply of military family housing provided by the base.

Given personal choice and the availability of installation housing, military personnel assigned to Langley AFB often seek housing in nearby communities. In reviewing local housing availability, no specific areas or concerns were identified. Similar to many installations across the nation, Langley AFB recently underwent privatization of its military housing areas. Congressionally authorized since 1996, the Military Housing Privatization Initiative allows the military to work with the private sector to design, construct and / or renovate, operate, manage, and maintain family housing assets located on Installation property, both on and off of the primary Installation (i.e., remote housing locations).

Langley AFB's privatization project is a public-private venture with the firm Pinnacle-Hunt and is designed to revitalize the Installation's existing housing stock. Under this partnership agreement, Pinnacle Hunt will demolish a large number of Langley AFB's existing units, renovate many of the remaining units, and construct new houses as it moves towards the end-state of 1,431 units (including 244 historic units) by September 2014.

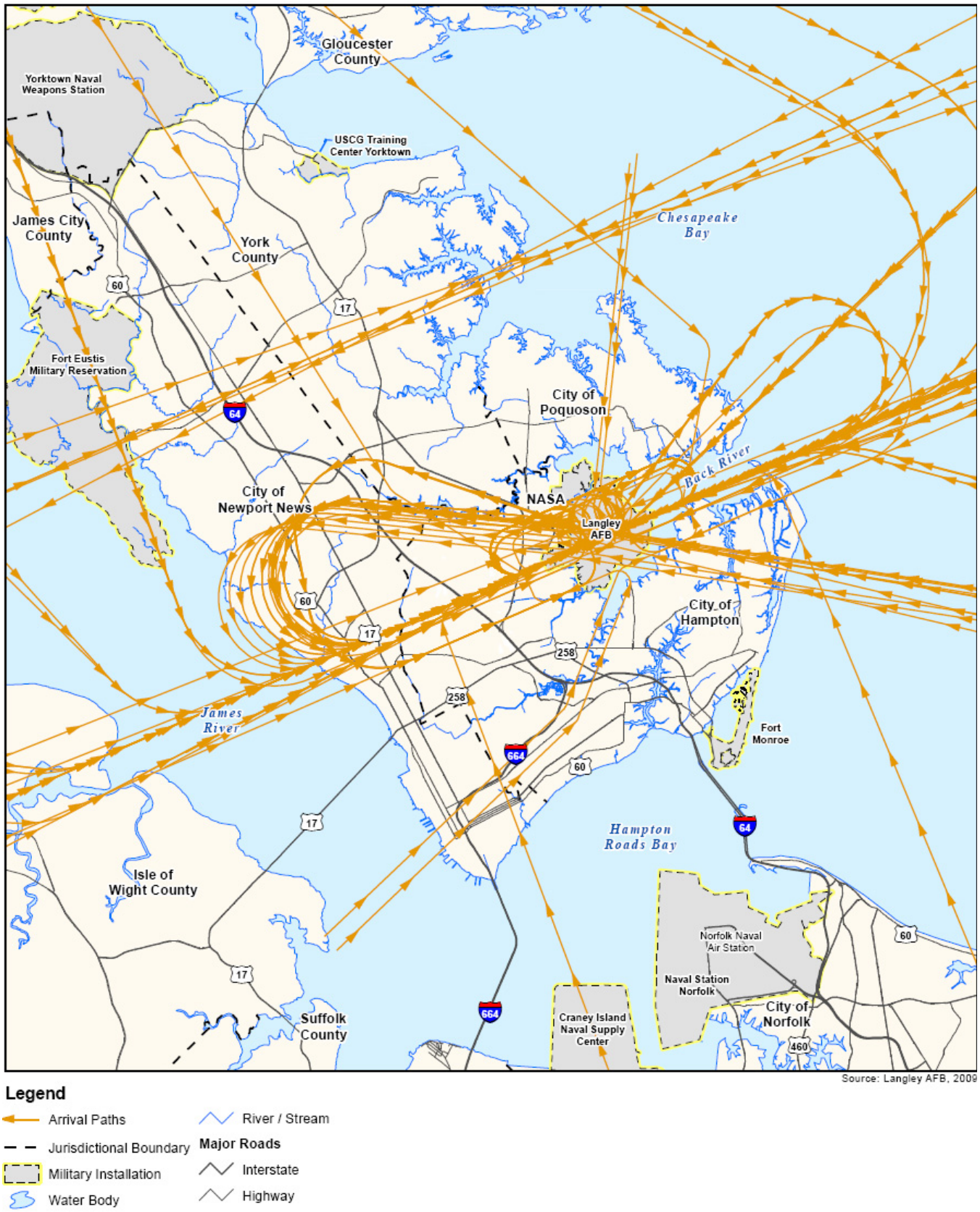
Military families are not required to live in family housing and can obtain housing anywhere within the local communities. Changes in missions at the Installation could increase or decrease the number of personnel assigned to Langley AFB, which could translate into a requirement for more or less housing to support the Installation's families. In the case of an increase in personnel, the increased demand beyond the available on-base housing stock would likely be handled by the local communities, at least in a short-term situation. Depending on the magnitude of the increase, this could impact housing supply in the local region.

5 Infrastructure Extensions Issues

Definition:
This factor covers the extension or provision of infrastructure (i.e., roads, sewer, water, etc.).

Infrastructure plays an interesting role in compatibility planning. Historical development has shown that the old adage "if you build it, they will come" is particularly true when it comes to infrastructure extensions. Infrastructure can positively impact and enhance the operations of the installation by providing needed services, such as transportation systems. It can also be a compatibility concern if enhanced infrastructure encourages growth into areas near the installation where it would not be compatible with current or future missions.

Utility extensions or expansion of infrastructure in proximity to military installations, promotes the desirability of the area for growth increasing the potential for incompatible development.



Source: Langley AFB, 2009

Legend

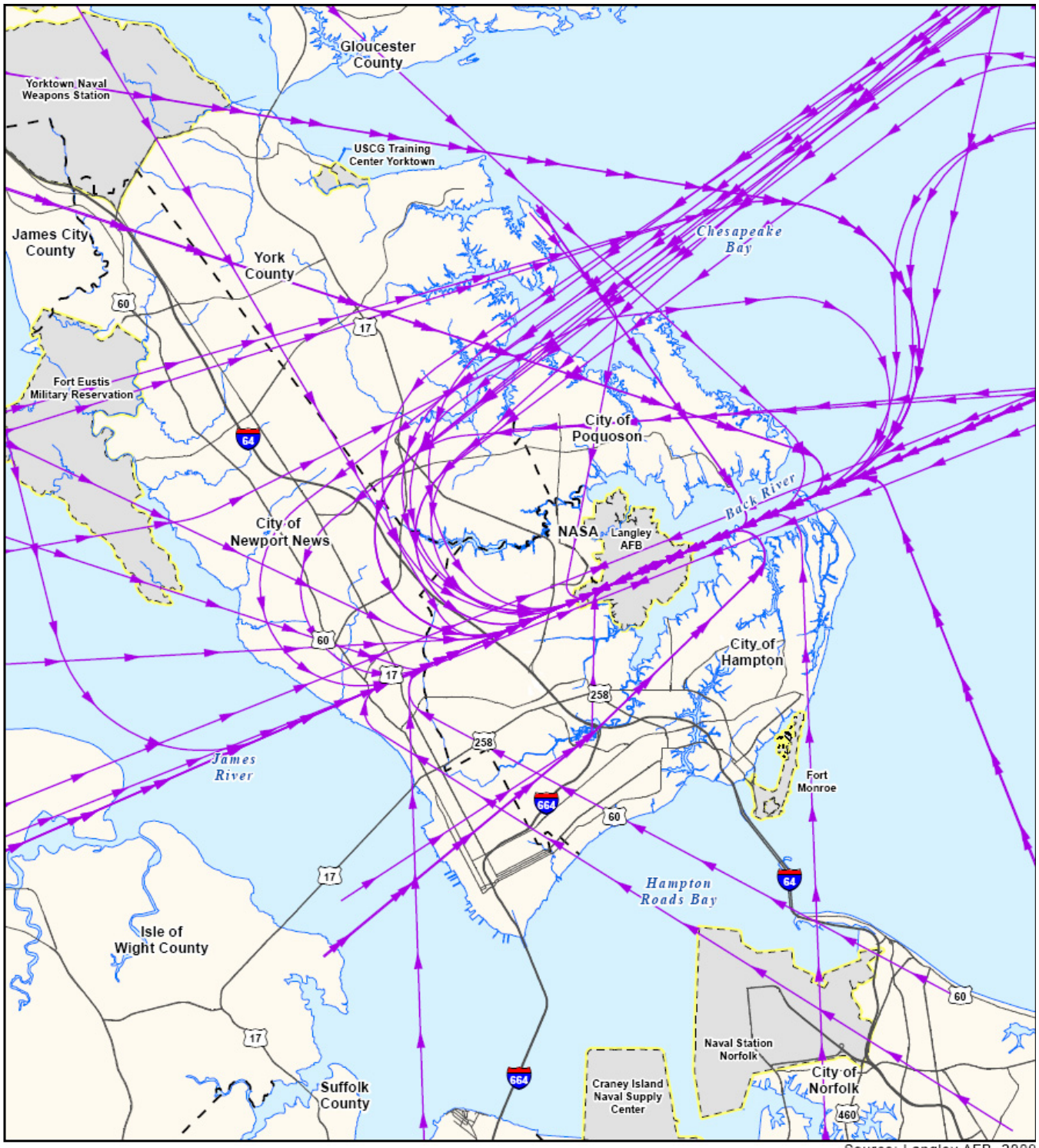
- Arrival Paths
- Jurisdictional Boundary
- Military Installation
- Water Body
- River / Stream

Major Roads

- Interstate
- Highway

0 1.5 3 6 Miles

Figure 3-31
Langley AFB Flight Arrival Paths



Source: Langley AFB, 2009

Legend

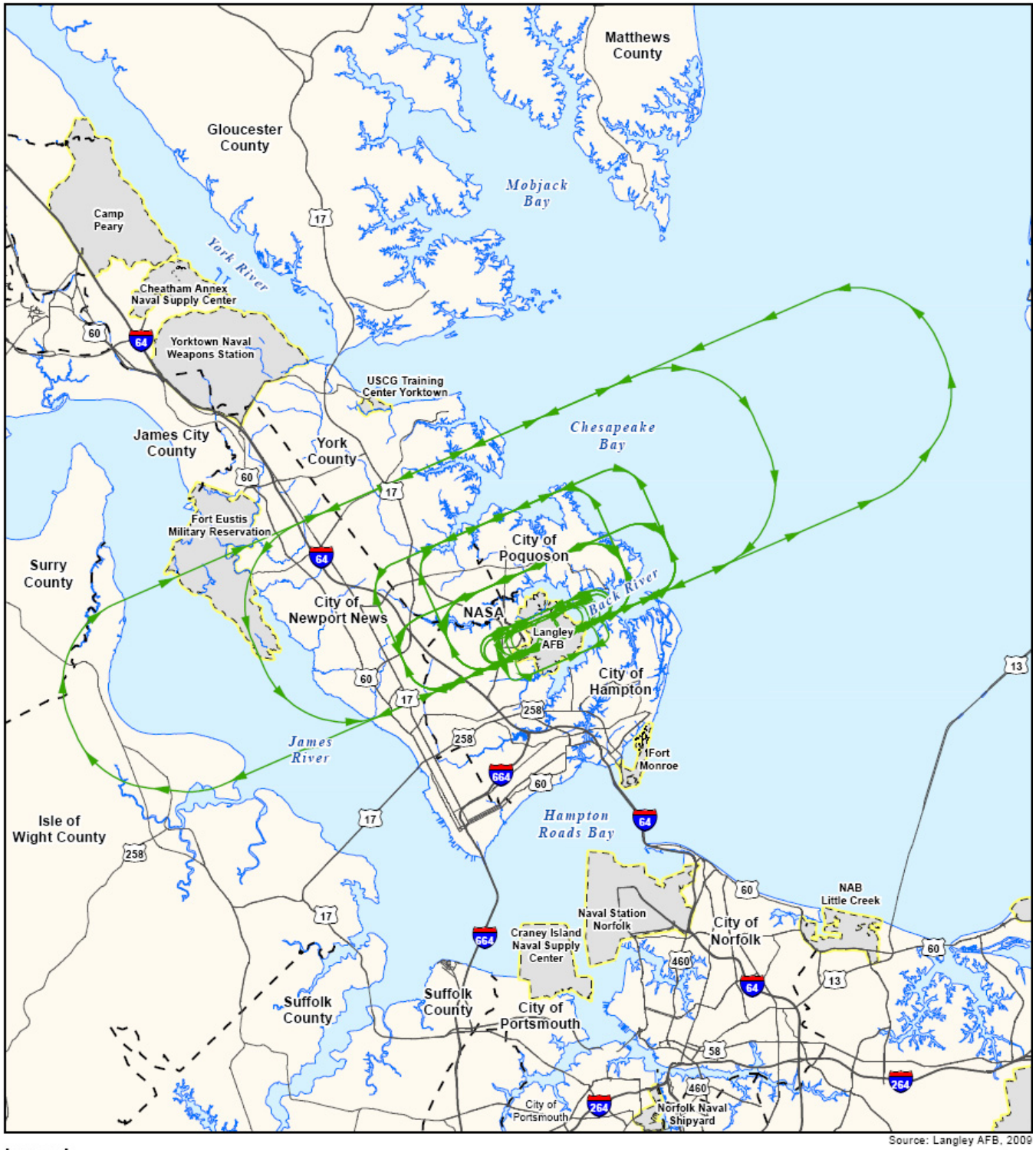
- Departure Paths
- Jurisdictional Boundary
- Military Installation
- Water Body
- River / Stream

Major Roads

- Interstate
- Highway

0 1.5 3 6 Miles

Figure 3-32
Langley AFB Flight Departure Paths



Legend

- Closed Pattern
- Jurisdictional Boundary
- Military Installation
- Water Body
- River / Stream
- Major Roads
- Interstate
- Highway

0 2.5 5 10 Miles

Figure 3-33
Langley AFB Flight Closed Pattern Paths

Through careful planning, the extension of infrastructure can serve as a means to guide development into appropriate areas while providing the community opportunities for new development potential.

As the majority of land in proximity to Langley AFB is developed already, no specific issues for this factor were identified.

6 Anti-terrorism / Force Protection Issues

Definition:
Anti-terrorism / Force Protection (AT/FP) relates to the safety of personnel, facilities, and information on an installation from outside threats.

The factors identified for this compatibility factor are:

- an automobile salvage yard;
- a large pile of rubble / construction debris; and
- a mobile home park located adjacent to the Langley AFB fence line.

Like any military installation, there are security concerns at Langley AFB. Further anti-terrorism and security measures have been initiated since the September 11, 2001 terrorist attacks on the US. Three specific issues were identified that pose AT/FP concerns due to their location adjacent to Langley's fence line. The automobile salvage yard in the western CZ, poses a threat because it contains large amounts of scrap metal stacked close to the base's southwest boundary and is in line with the runway centerline. A person could potentially climb the stack, which would provide a view into the base. Another concern could be the interference with aircraft operations arriving or departing from the west end of the runway. The large pile of construction debris is located in the southern corner of the western CZ. Like the automobile salvage yard, the debris pile could afford a pedestrian the opportunity to view base personnel and activities, as well as the Langley West Gate from a significant height. The debris pile could also potentially conceal a person's movement on the Installation. The mobile home park is also partially located in the western CZ, and is identified under the Safety and Vertical Obstructions compatibility factors. The mobile home park poses similar concerns because it is close to the base boundary. Additionally, people can climb on top of the trailers and view into the base.

7 Noise Issues

Definition:
Defining noise from a technical perspective, sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. More simply stated, sound is what we hear. As sounds reach unwanted levels, this is referred to as noise.

The issues identified for this compatibility factor are in regards to noise-sensitive land uses located within the noise contours established by operations at Langley AFB. These include:

- high density residential;
- low density residential;
- the Peninsula Higher Education Center;
- Thomas Nelson Community College;
- development sites within safety zones and noise contours throughout the study area; and
- the potential for future incompatible development in the noise zones.

Understanding Noise

Due to the technical nature of this resource topic and its importance to the JLUS process, this section provides a discussion of the characteristics of sound and the modeling process used to evaluate noise impacts.

The following key terms are used to describe noise.

- **Ambient Noise.** The total noise associated with an existing environment and usually comprising sounds from many sources, both near and far.
- **Attenuation.** Reduction in the level of sound resulting from absorption by the surrounding topography, the atmosphere, distance from the source, barriers, construction techniques and materials, and other factors.
- **A-weighted decibel (dBA).** A unit of measurement for noise having a logarithmic scale and measured using the A-weighted sensory network on a noise-measuring device. An increase or decrease of 10 decibels corresponds to a tenfold increase or decrease in sound energy. A doubling or halving of sound energy corresponds to a 3-dBA increase or decrease.
- **Day-Night Average Sound Level (DNL)**. DNL represents 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 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.
- **Noise Contours.** Connecting points of equal noise exposure. Typically expressed in 5 dBA increments (60, 65, 70, 75, etc.).
- **Sensitive Receptors.** Sensitive receptors are defined as locations and uses typically more sensitive to noise, including residential areas, hospitals, convalescent homes and facilities, schools, and other similar land uses.

<u>Characteristics of Sound</u>

Sound is characterized by oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). The sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level. The decibel scale is used to quantify sound intensity. Because sound pressure can vary by over one trillion times within the range of human hearing, a logarithmic loudness scale (i.e., dB scale) is used to present sound intensity levels in a convenient format.

Since the human ear is not equally sensitive to all frequencies within the entire spectrum, noise measurements are weighted more heavily within those frequencies of maximum human sensitivity in a process called "A-weighting" written as dBA. The human ear can detect changes in sound levels of approximately 3 dBA under normal conditions. Changes of 1 to 3 dBA are typically noticeable under controlled conditions, while changes of less than 1 dBA are only discernable under controlled, extremely quiet conditions. A change of 5 dBA is typically noticeable to the general public in an outdoor environment. Typical A-weighted sound levels for a range of indoor and outdoor activities are summarized in Figure 3-34.

Environmental noise fluctuates over time. While some noise fluctuations are minor, others can be substantial. These fluctuations include regular and random patterns, how fast the noise fluctuates, and the amount of variation. When describing noise impacts, it is common to look at the average noise over an average day.

Characteristics of Noise Modeling

The Air Force adopted the NOISEMAP computer model to analyze and describe noise impacts created by aircraft operations. NOISEMAP is one of two Environmental Protection Agency (EPA) approved models. The other is the Integrated Noise Model (INM), which is used by the FAA for civilian airports.

In 1974, EPA designated the noise descriptor Ldn, or DNL, as the standard measurement for noise impacts. Ldn is an average sound level exposure, measured in decibels, over a 24-hour period (see the definition earlier in this section for details). On a national level, Ldn measurements are projected down to 65 decibels.

Aircraft Noise

For noise sources attributable to Langley AFB, aircraft noise is the primary concern relative to compatibility planning. Over the years, several studies have been developed regarding noise levels associated with aircraft operations at Langley AFB. The analysis of airborne noise varies based on the type of aircraft modeled of this JLUS, flight operations, training activities, flight frequency, and other aircraft using the airspace.

As described in Chapter 4, Langley AFB published an updated AICUZ Study in July 2007, which revised the previous AICUZ Study from 1997. One major difference between the 1997 and 2007 AICUZ Studies is the identified noise zones. The 2007 update and subsequent noise zone changes were the result of:

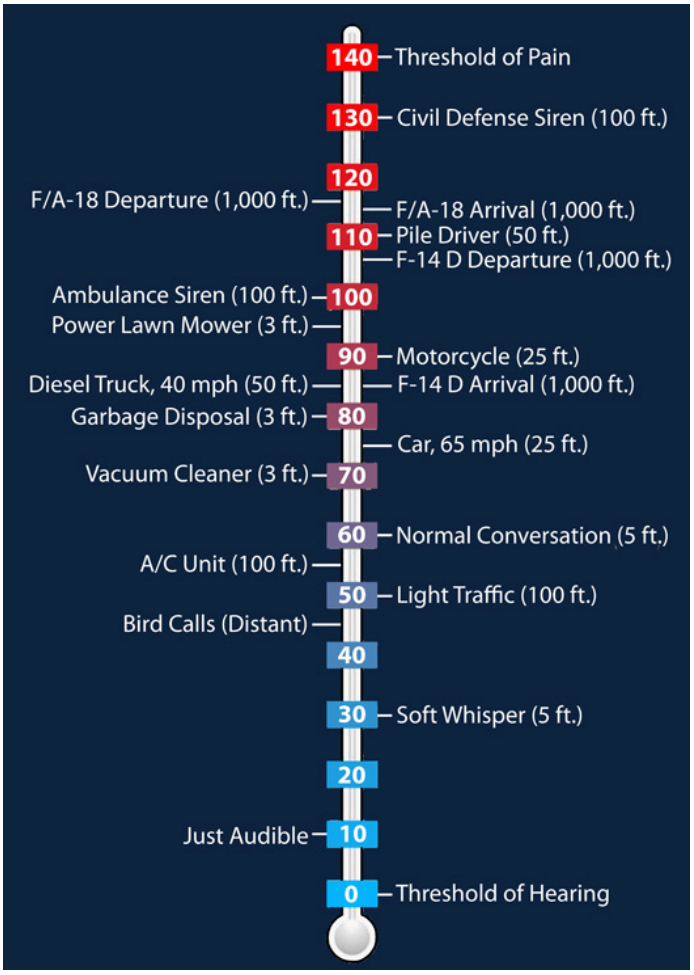


Figure 3-34. Sound Levels Comparison (in dB)

- Changes in flight operations and the addition, elimination, or alteration of flight tracks for mission and training purposes;
- The integration of the Air National Guard into the Air Force's active duty program has resulted in more frequent operations on weekends;
- Post September 11, 2001, aircraft operations tempo supporting wartime mission and homeland security requirements;
- Technical improvements to NOISEMAP, a computer program for modeling noise levels that determines noise zones (NZ) based on aircraft activity; and

- Changes in aircraft type, such as the addition of the F-22 Raptor located at Langley AFB.

The 2007 Langley AICUZ provided detailed noise modeling of current aircraft operations at the Installation. Aircraft operations at Langley AFB have the most noticable noise effect in the surrounding area to residential and commercial uses.

The Langley AICUZ looks at noise for a typical or average day over a given year. On any given day, noise levels on a specific property will be higher or lower depending on a number of factors, including the number of flights, aircraft mix, the actual flight tracks taken, flight elevations, and so forth. Other changes at the base could result in changes to the noise contours. As such, the noise contours should be used as guidance in making future land use decisions, not absolute constraints.

The AICUZ noise contours show areas where noise compatibility factors are likely to occur with more sensitive land uses. Outside of these contours are additional areas where overflight will occur and new development will notice noise from flight operations. The overall shape and size of the study area reflects locations that experience periodic low level overflight, and therefore, may be exposed to occasional noise.

Four different noise contours were established in the Langley AICUZ using NOISEMAP ranging from 65 dB to 80+ dB in five-dB increments. The Langley AFB noise contours are illustrated in Figure 3-35. The 80+ dB contour extends just beyond the base boundaries and partially covers an automobile salvage yard and the northernmost portion of a mobile home park. Both of these uses are incompatible with Langley's aircraft operations. The 65 dB contour extends to the east along the runway centerline for approximately 7.5 miles and to the west of the runway centerline for about 5.5 miles. The contour also extends north of the runway for about 1.9 miles and to the south roughly 1.5 miles. Table 3-9 displays land use types and corresponding Air Force recommendations within the four noise contours.

Table 3-9. AICUZ Safety Zones Generalized Land Use Criteria

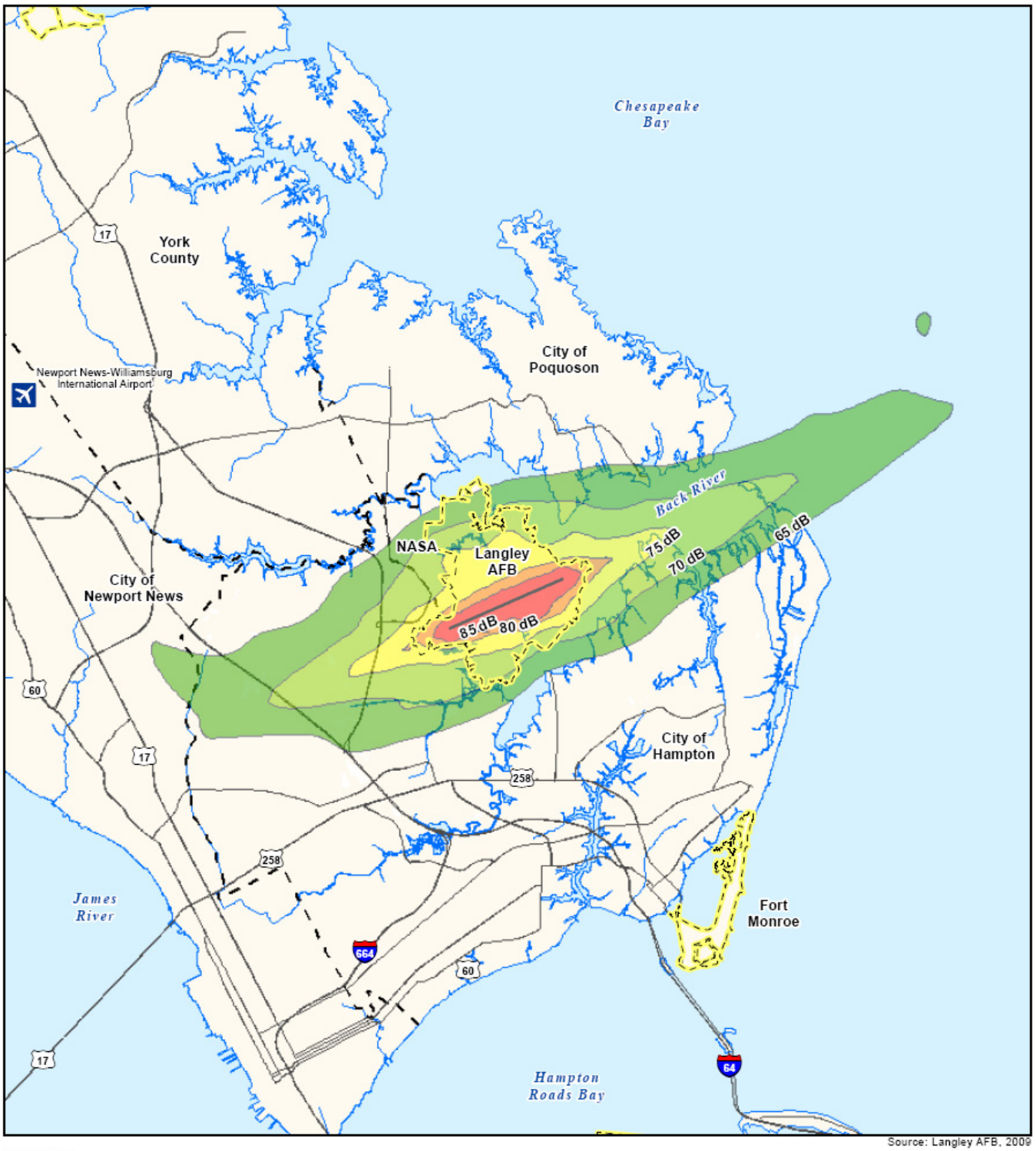
General Land Use	DNL Noise Contours (dB)			
	65-69	70-74	75-79	80+
Residential	No[1]	No[1]	No	No
Manufacturing	Yes	Yes	Yes	Yes
Transportation, Communications and Utilities	Yes	Yes	Yes	No
Trade, Business, and Offices	Yes	Yes	Yes	No
Shopping Districts	Yes	Yes	Yes	No
Public and Quasi-Public Service	Yes	No[1]	No[1]	No
Recreation	Yes	Yes	No	No
Public Assembly	Yes	No	No	No
Agriculture and Mining	Yes	Yes	Yes	Yes

Notes:

** This chart is for general information. Refer to Langley AFB 2007 AICUZ Study, Volume I, Table 3-4 for specific land use guidelines.*

1. Unless sound attenuation materials are installed.

Source: Langley AFB 2007 AICUZ Citizen's Brochure



Source: Langley AFB, 2009

Legend

Aircraft Noise Contours
- 65-70 dB
- 70-75 dB
- 75-80 dB
- 80-85 dB
- 85+ dB

- Airport
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Major Roads
- Interstate
- Highway

0 1 2 4 Miles

Figure 3-35
Langley AFB Aircraft Noise Contours

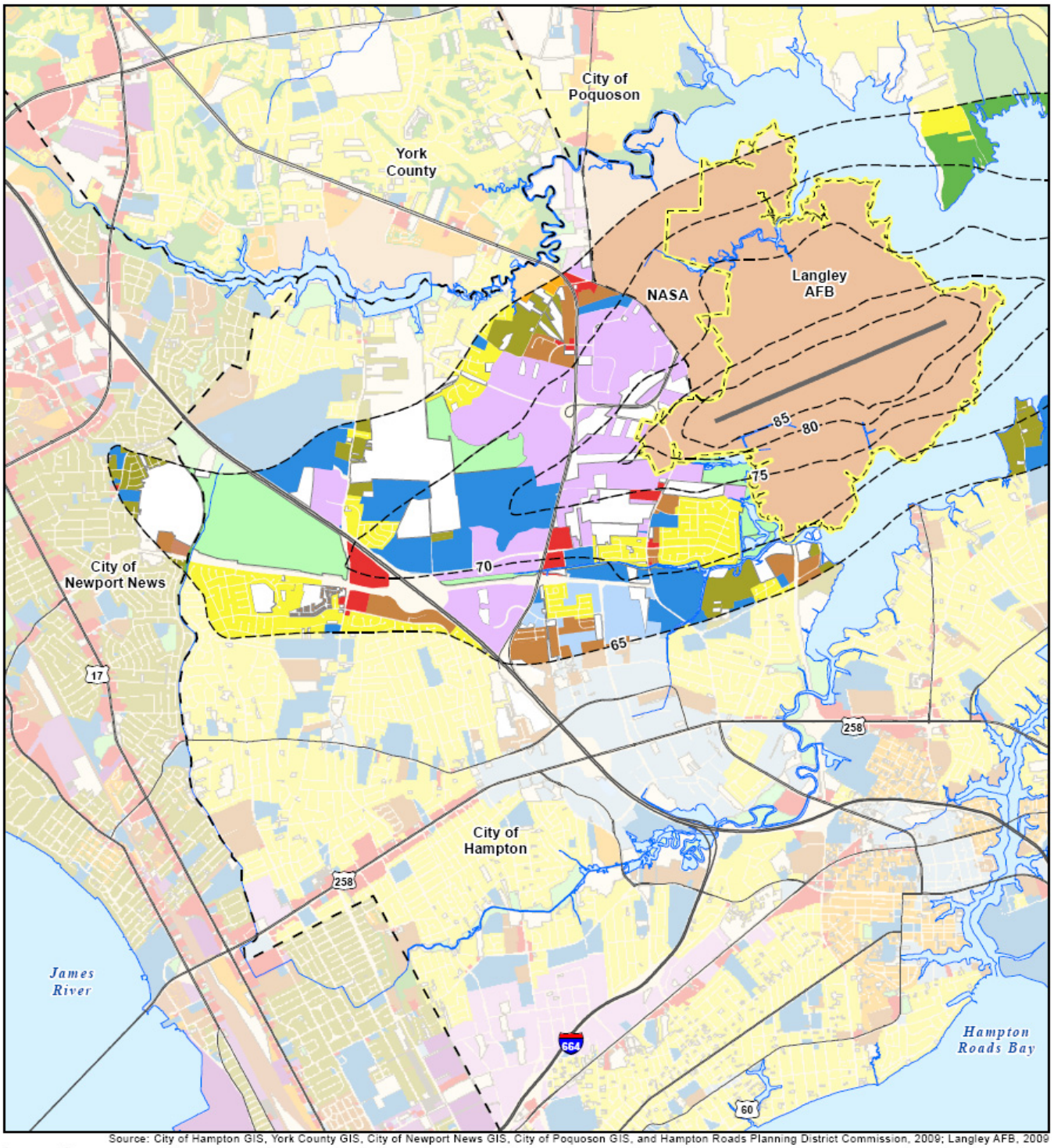
The majority of the compatibility issues in the study area related to aircraft noise stems from existing residential developments. According to the 2007 AICUZ, residential uses are discouraged within areas impacted by 65 dB or higher without some type of noise level reduction techniques (sound attenuation) in the building construction. Several areas were identified during the JLUS process that fall within Langley's noise contours and are incompatible with aircraft operations noise levels. One of the locations is a low density residential / agricultural property located in the western APZ I and under the 70-74 and 75-79 dB noise contours.

Studies have shown that environments with excess amounts of noise (i.e., insufficient / improper sound attenuation) can negatively impact both quality of life and health of people or animals. There is a mobile home park located within the western CZ and in the 75-79 dB noise contour. Mobile home parks are not recommended in any of the listed noise contours due to the structures' construction and increased susceptibility to noise. The Peninsula Higher Education Center and Thomas Nelson Community College are both located in the western APZ II in line with the Langley AFB runway. These locations are within the 70-74 dB noise contour.

As noted in the discussion of Compatibility Issue 1, Land Use, vacant parcels throughout the JLUS study area that are within Langley's noise contours and that could support development are a concern for potentially incompatible uses. East of Langley AFB, the primary concentrations of vacant parcels within the Installation's noise contours are located in the City of Hampton along the Back River. A small number of vacant parcels are also located adjacent to the Back River, but these are in the City of Poquoson. West of Langley AFB, vacant parcels impacted by Langley's noise contours are located in Hampton. One concentration of parcels is immediately adjacent to the base's western boundary generally along the runway's centerline. Another concentration of vacant parcels is located approximately 1.5 miles west of the base and north of the runway centerline.

Another location identified during the JLUS process as a compatibility issue is a high density residential development along Interstate 64 west of the runway. This development is within the 65-69 dB contour. Some of the land in the 65-69 and 70-74 dB contours to the east of Langley AFB is currently vacant and could potentially be developed for residential or other noise sensitive uses in the future. There are other locations throughout the study area that lie under Langley's noise contours and include residential uses, but those issues listed above were identified as posing the biggest concerns at this time. Figures 3-36 through 3-41 illustrate the existing land use, future land use, and zoning designations, respectively, as well as corresponding compatibility for land west of Langley AFB and within the Installation's noise contours. Similarly, Figures 3-42 through 3-47 illustrate these topics for areas east of Langley AFB.

Using 2007 Environmental Systems Research Institute (ESRI) data, the numbers of people living within each of the five noise contours for Langley AFB aircraft operations was estimated. The numbers were estimated by intersecting the noise contours with 2000 census block GIS data, calculating the area of the resulting figure, and multiplying that area by the 2007 estimated population density. Using this process, it was determined that a total of 28,569 people were estimated to reside within Langley's noise contours. Of that number, an estimated 1,546 people live in the 85+ dB contour; 1,211 people are in the 80-84 dB contour; 3,233 people reside in the 75-79 dB contour; 7,488 people live in the 70-74 dB contour; and 15,091 people were estimated to reside in the 65-69 dB contour. These numbers should generate a level of concern for the amount of people already living within the various noise contour zones for Langley AFB.



Source: City of Hampton GIS, York County GIS, City of Newport News GIS, City of Poquoson GIS, and Hampton Roads Planning District Commission, 2009; Langley AFB, 2009

Legend

Existing Land Use

- Agriculture
- Commercial/Office
- Conservation
- Heavy Industrial
- High Density Residential
- Industrial/Office Park
- Light Industrial
- Low Density Residential
- Medium Density Residential
- Military
- Mixed Use
- Open Space
- Public/Semi-Public
- Right-of-Way/Utilities
- Rural Residential
- Unassigned/Undesignated
- Vacant
- Aircraft Noise Contours
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

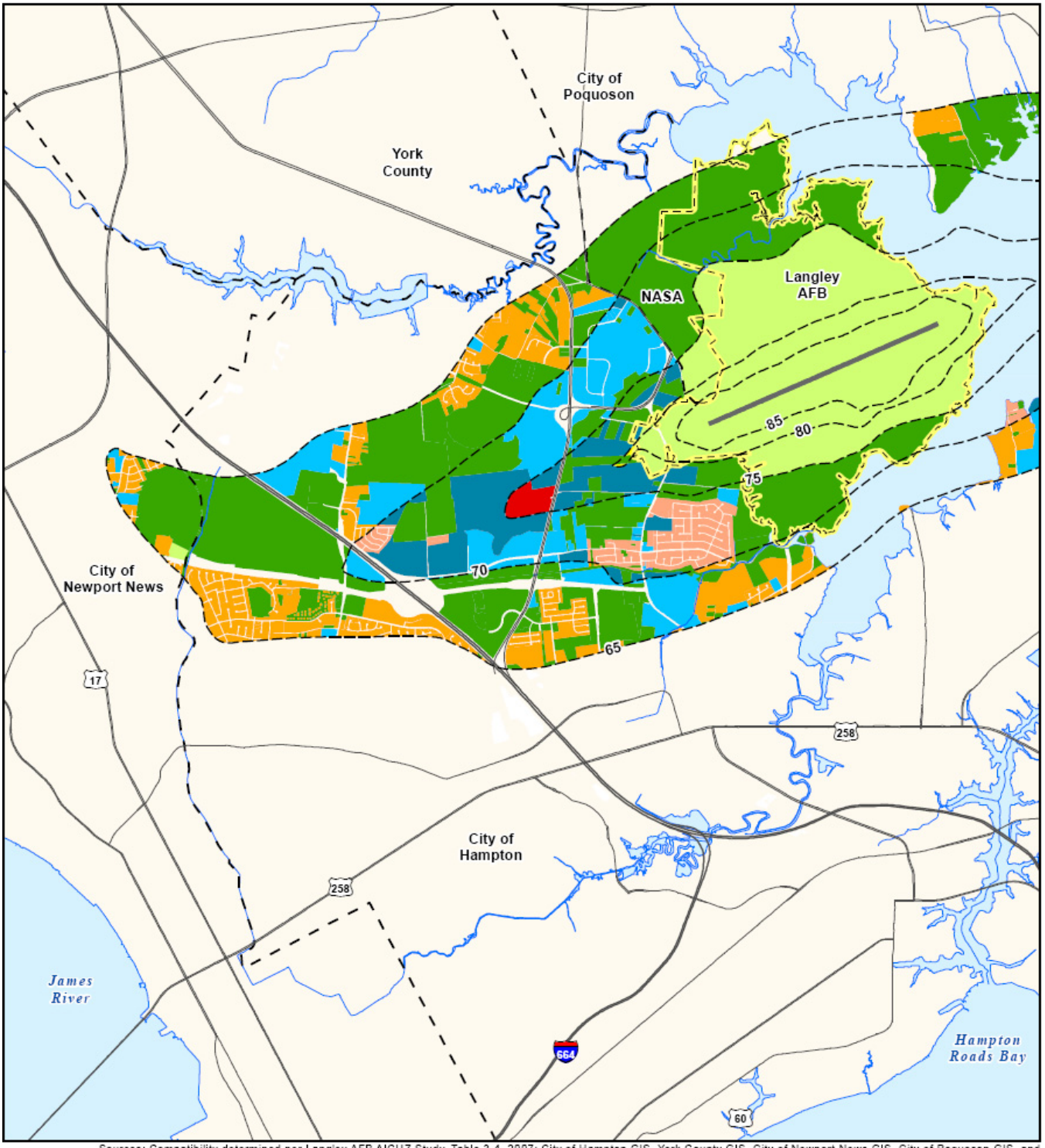
Major Roads

- Interstate
- Highway

0 0.25 0.5 1 Miles

Hampton_Fig3_XX_NoiseELU_West_20091020_RGR.pdf

Figure 3-36
Langley AFB Aircraft Noise Contours (West)
Existing Land Use



Sources: Compatibility determined per Langley AFB AICUZ Study, Table 3-4, 2007; City of Hampton GIS, York County GIS, City of Newport News GIS, City of Poquoson GIS, and Hampton Roads Planning District Commission, 2009; Langley AFB, 2009

Legend

Compatibility

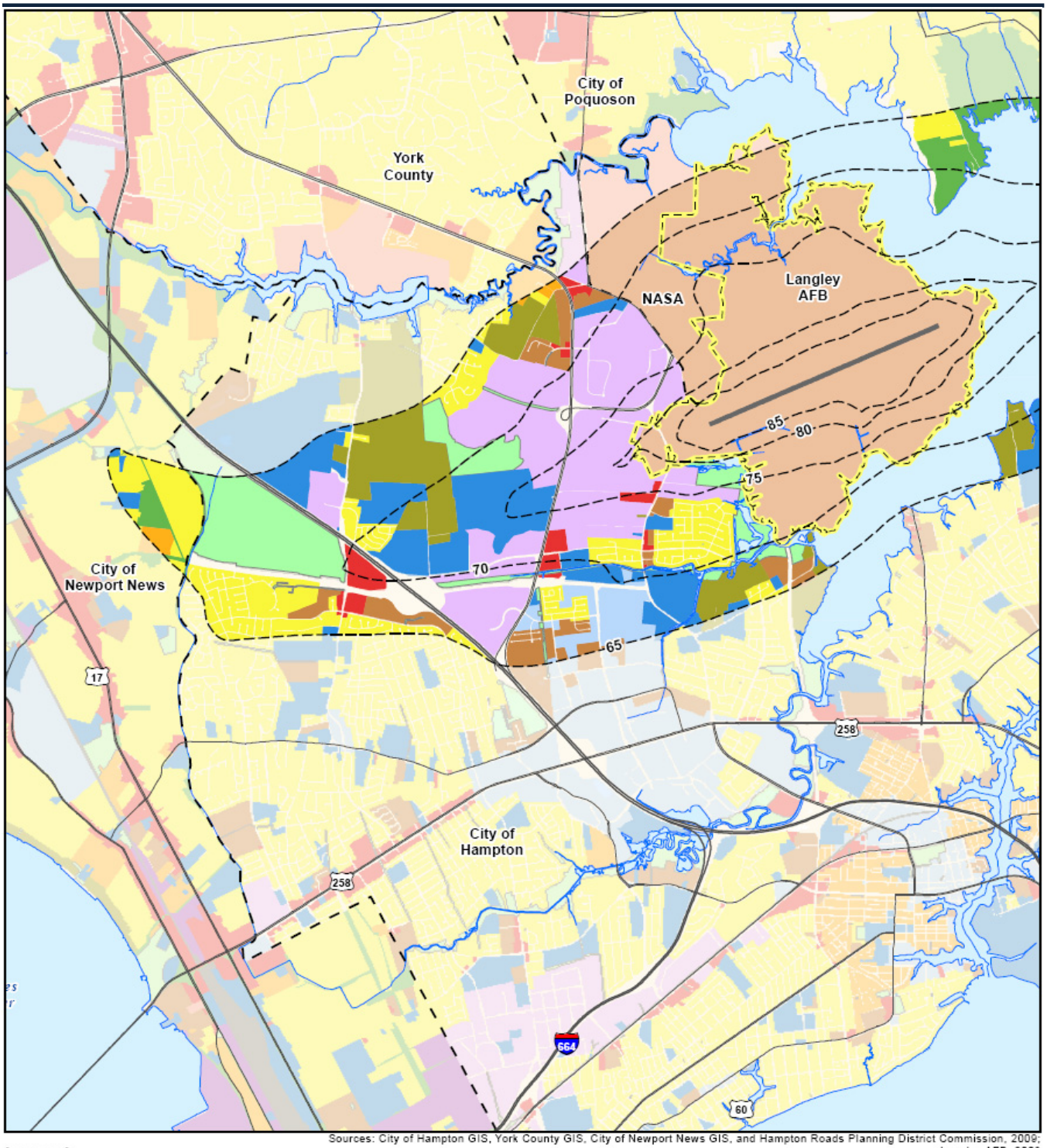
- Yes
- Dependent Upon Land Use, Noise Level Reduction may Apply
- Generally Compatible with Noise Level Reduction of (25 dB)
- Generally Compatible with Noise Level Reduction of (30 dB)
- Generally Compatible with Noise Level Reduction of (35 dB)
- Discouraged; Generally Compatible with Noise Level Reduction of (25 dB)
- Strongly Discouraged; Generally Compatible with Noise Level Reduction of (30 dB)
- No
- Aircraft Noise Contours
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Major Roads

- Interstate
- Highway

0 0.25 0.5 1 Miles

Figure 3-37
Langley AFB Aircraft Noise Contours (West) - Existing Land Use Compatibility



Sources: City of Hampton GIS, York County GIS, City of Newport News GIS, and Hampton Roads Planning District Commission, 2009; Langley AFB, 2009

Legend

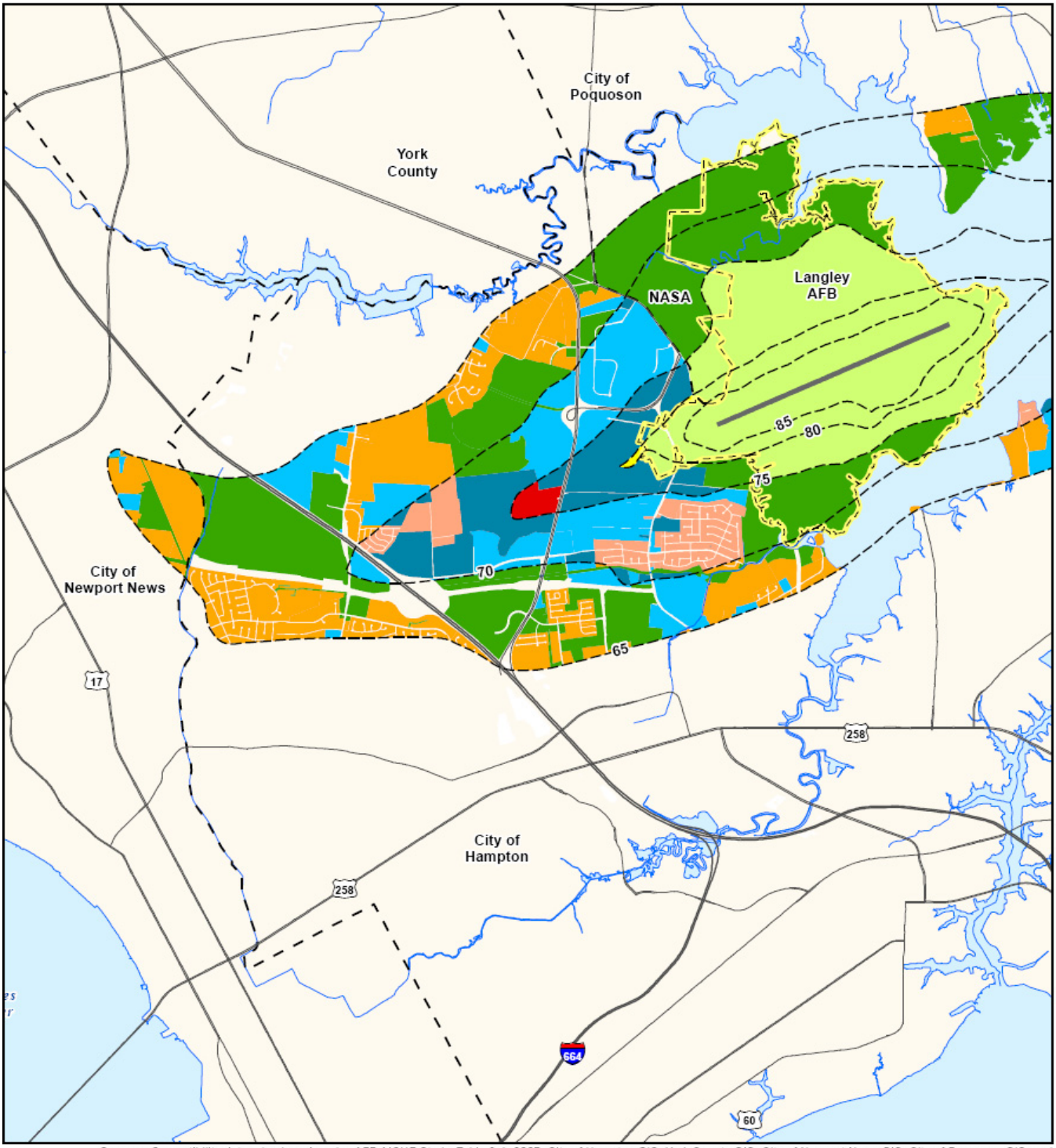
Future Land Use
- Commercial/Office
- Conservation
- Heavy Industrial
- High Density Residential
- Industrial/Office Park
- Light Industrial
- Low Density Residential
- Medium Density Residential
- Military
- Mixed Use
- Open Space
- Public/Semi-Public
- Right-of-Way/Utilities
- Rural Residential
- Aircraft Noise Contours
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Major Roads
- Interstate
- Highway

0 0.25 0.5 1 Miles

Hampton_Fig3_38_NoisePLU_West_20091027_RGR.pdf

Figure 3-38
Langley AFB Aircraft Noise Contours (West)
Future Land Use



Sources: Compatibility determined per Langley AFB AICUZ Study, Table 3-4, 2007; City of Hampton GIS, York County GIS, City of Newport News GIS, City of Poquoson GIS, and Hampton Roads Planning District Commission, 2009; Langley AFB, 2009

Legend

Compatibility

- Yes
- Dependent Upon Land Use, Noise Level Reduction may Apply
- Generally Compatible with Noise Level Reduction of (25 dB)
- Generally Compatible with Noise Level Reduction of (30 dB)
- Generally Compatible with Noise Level Reduction of (35 dB)
- Discouraged; Generally Compatible with Noise Level Reduction of (25 dB)
- Strongly Discouraged; Generally Compatible with Noise Level Reduction of (30 dB)
- No
- Aircraft Noise Contours
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

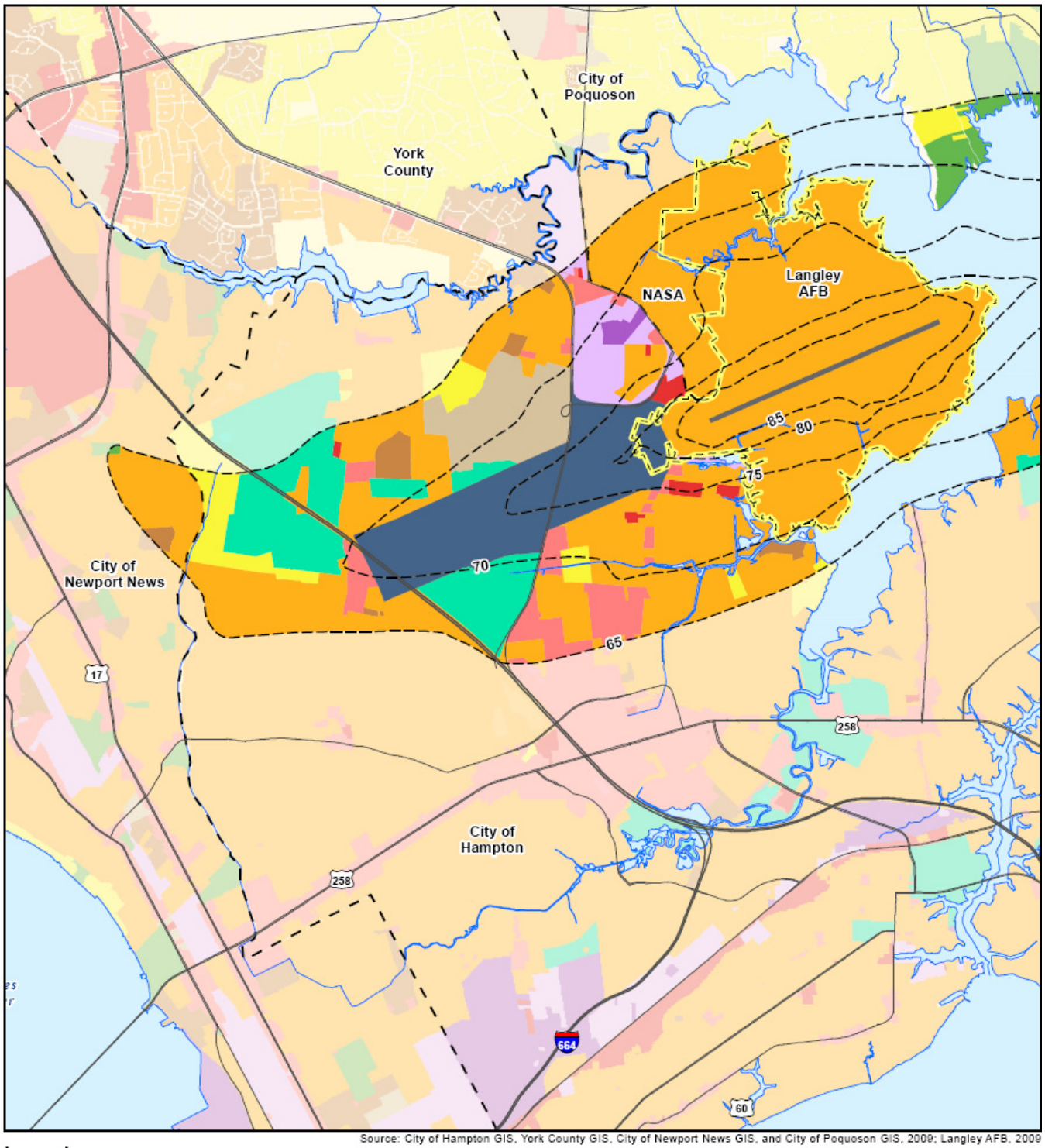
Major Roads

- Interstate
- Highway

0 0.25 0.5 1 Miles

Hampton_Fig3_39_NoiseFLU_West_Compat_20091027_RGR.pdf

Figure 3-39
Langley AFB Aircraft Noise Contours (West)
Future Land Use Compatibility



Source: City of Hampton GIS, York County GIS, City of Newport News GIS, and City of Poquoson GIS, 2009; Langley AFB, 2009

Legend

Zoning

- High Density Residential
- High Intensity Commercial
- High Intensity Industrial
- Langley Flight Approach District
- Low Density Residential
- Low Intensity Commercial
- Low Intensity Industrial
- Medium Density Residential
- Office/Research and Development
- Overlay Zoning Districts
- Parks/Conservation
- Unassigned
- Very Low Density Residential
- Aircraft Noise Contours
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

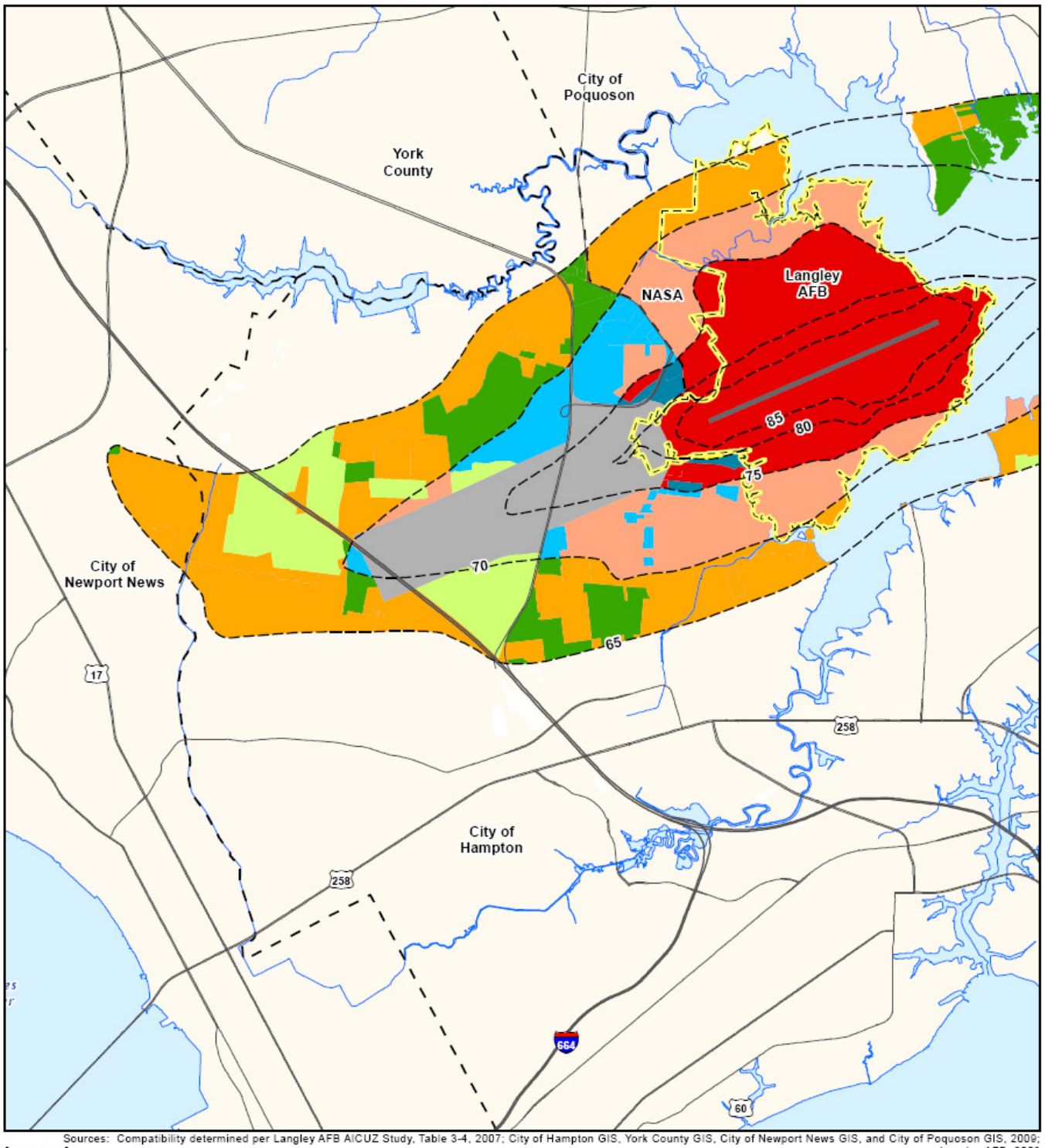
Major Roads

- Interstate
- Highway

0 0.25 0.5 1 Miles

Hampton_Fig3_40_NoiseZoning_West_20091027_RGR.pdf

Figure 3-40
Langley AFB Aircraft Noise Contours (West)
Existing Zoning



Sources: Compatibility determined per Langley AFB AICUZ Study, Table 3-4, 2007; City of Hampton GIS, York County GIS, City of Newport News GIS, and City of Poquoson GIS, 2009; Langley AFB, 2009

Legend

Compatibility

- Yes
- Dependent Upon Land Use, Noise Level Reduction may Apply
- Generally Compatible with Noise Level Reduction of (25 dB)
- Generally Compatible with Noise Level Reduction of (30 dB)
- Generally Compatible with Noise Level Reduction of (35 dB)
- Discouraged; Generally Compatible with Noise Level Reduction of (25 dB)
- Strongly Discouraged; Generally Compatible with Noise Level Reduction of (30 dB)
- No
- Langley Flight Approach District
- Aircraft Noise Contours
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

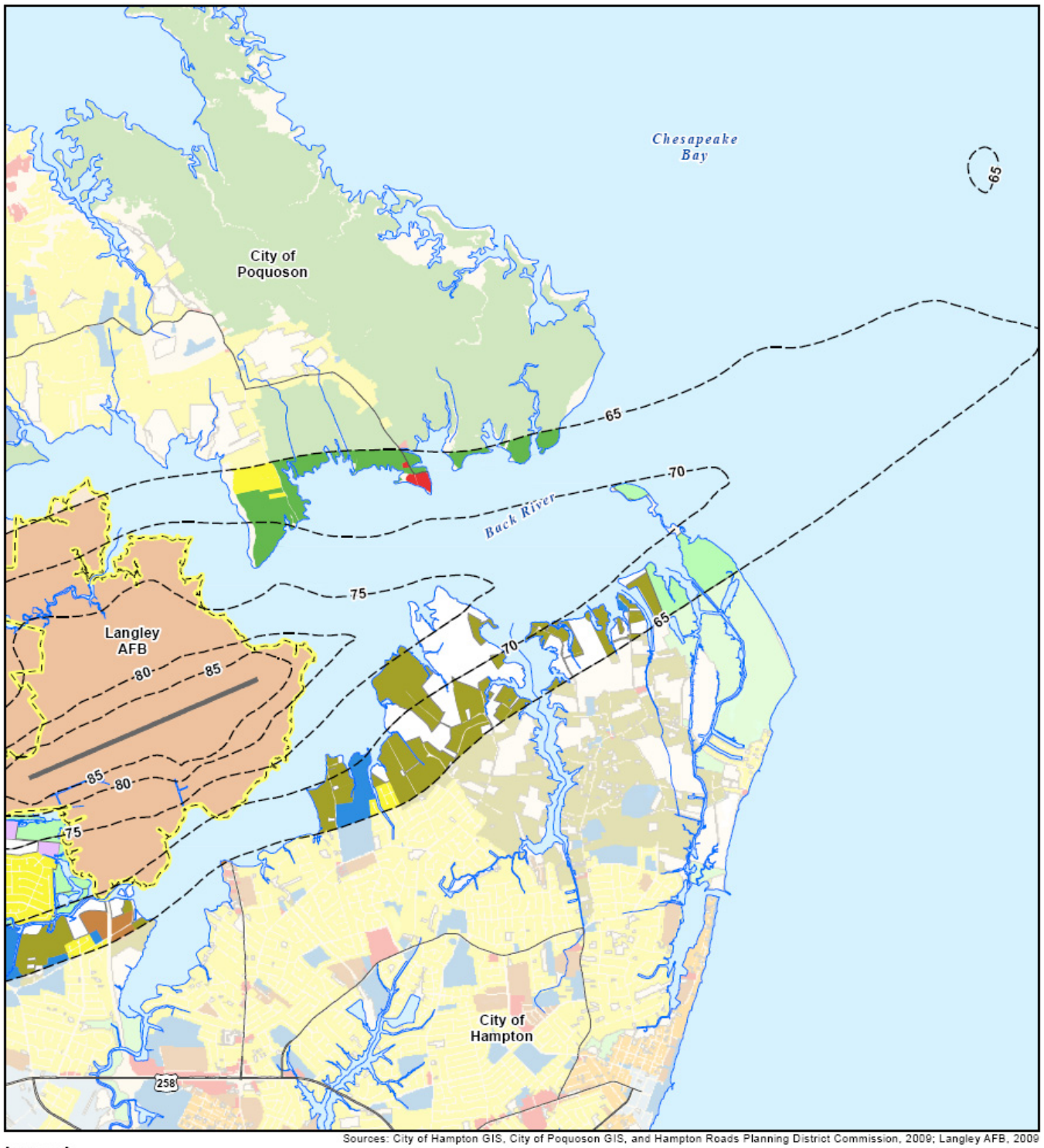
Major Roads

- Interstate
- Highway

0 0.25 0.5 1 Miles

Hampton_Fig3_41_NoiseZoning_West_Compat_20091027_RGR.pdf

Figure 3-41
Langley AFB Aircraft Noise Contours (West)
Existing Zoning Compatibility



Sources: City of Hampton GIS, City of Poquoson GIS, and Hampton Roads Planning District Commission, 2009; Langley AFB, 2009

Legend

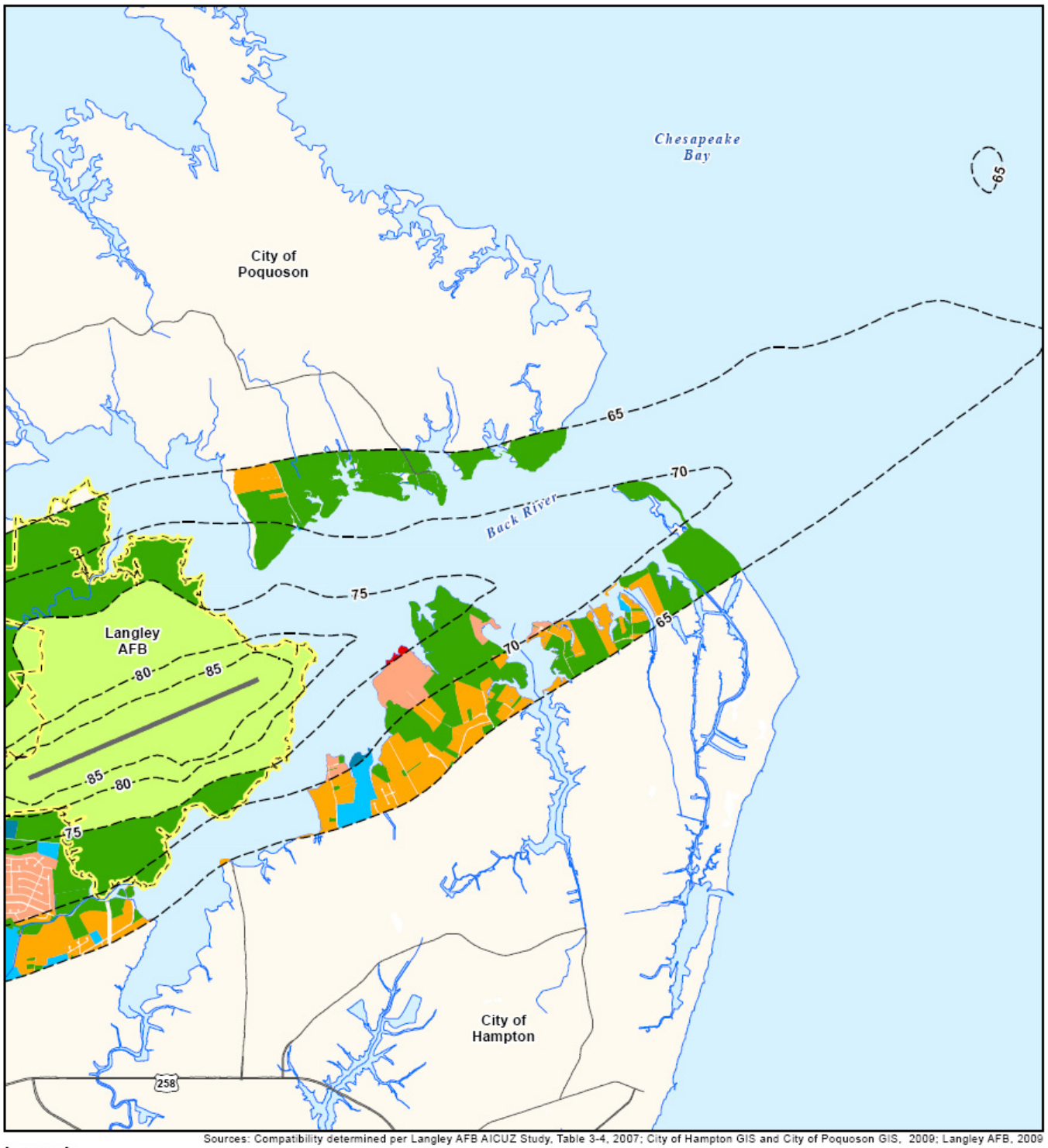
Existing Land Use

- Commercial/Office
- Conservation
- High Density Residential
- Light Industrial
- Low Density Residential
- Military
- Open Space
- Public/Semi-Public
- Rural Residential
- Vacant
- Aircraft Noise Contours
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream
- Highway

0 0.25 0.5 1 Miles

Hampton_Fig3_XX_NoiseELU_East_20091020_RGR.pdf

Figure 3-42
Langley AFB Aircraft Noise Contours (East)
Existing Land Use



Sources: Compatibility determined per Langley AFB AICUZ Study, Table 3-4, 2007; City of Hampton GIS and City of Poquoson GIS, 2009; Langley AFB, 2009

Legend

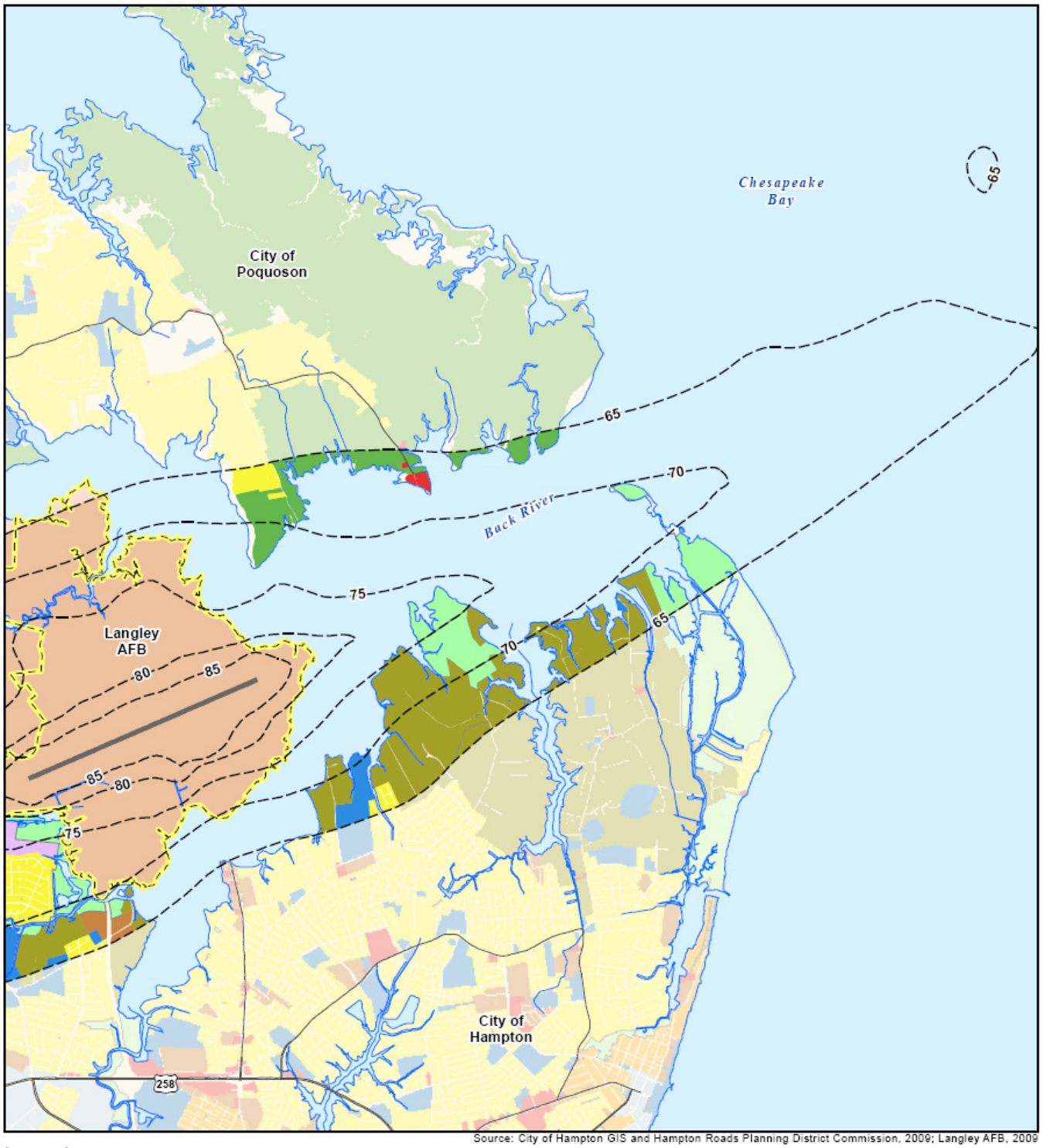
Compatibility

- Yes
- Dependent Upon Land Use, Noise Level Reduction may Apply
- Generally Compatible with Noise Level Reduction of (25 dB)
- Generally Compatible with Noise Level Reduction of (30 dB)
- Generally Compatible with Noise Level Reduction of (35 dB)
- Discouraged; Generally Compatible with Noise Level Reduction of (25 dB)
- Strongly Discouraged; Generally Compatible with Noise Level Reduction of (30 dB)
- No
- Aircraft Noise Contours
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream
- Highway

0 0.25 0.5 1 Miles

Hampton_Fig3_XX_NoiseELU_East_Compat_20091021_RGR.pdf

Figure 3-43
Langley AFB Aircraft Noise Contours (East)
Existing Land Use Compatibility



Source: City of Hampton GIS and Hampton Roads Planning District Commission, 2009; Langley AFB, 2009

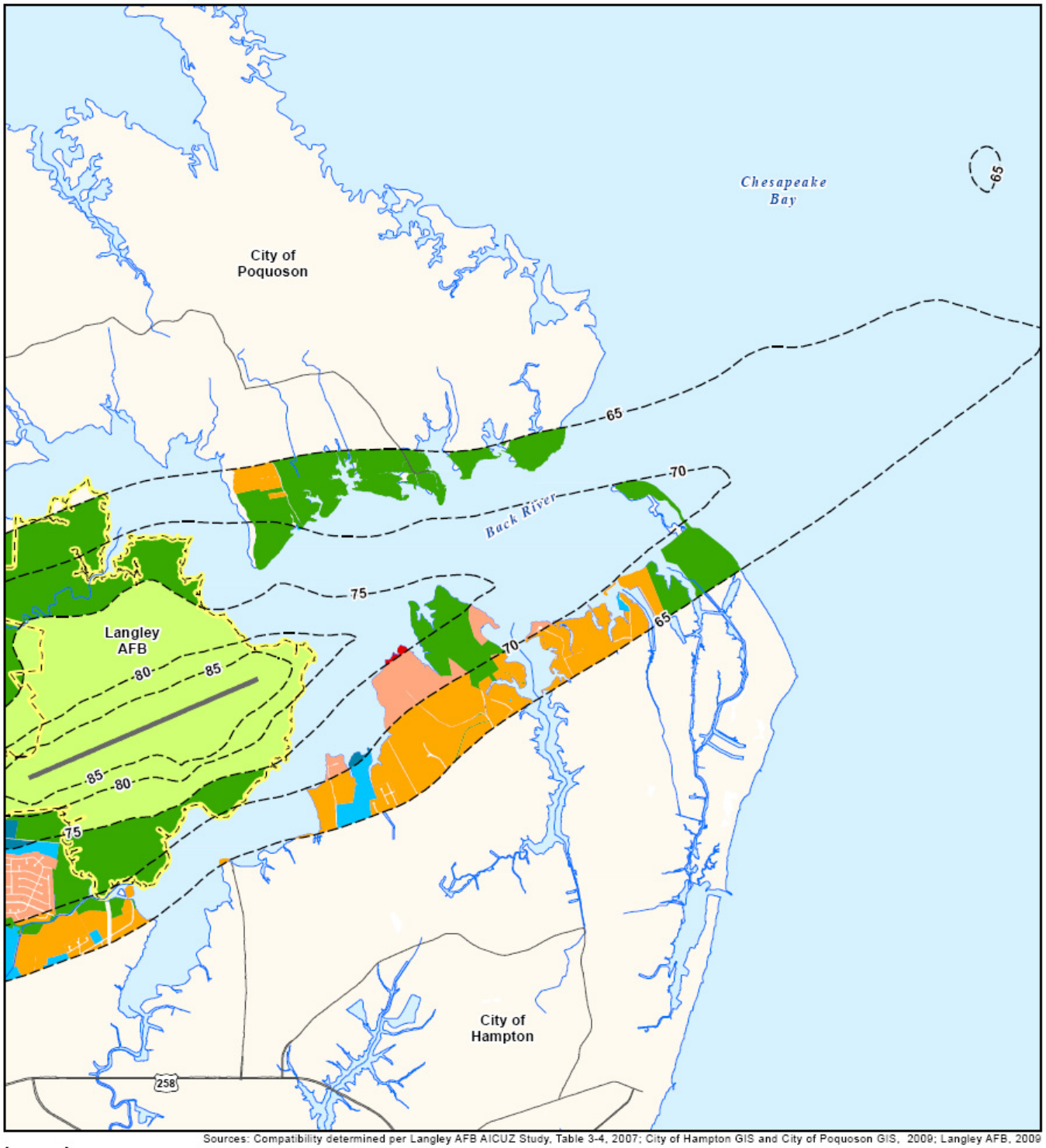
Legend

Future Land Use

- Commercial/Office
- Conservation
- High Density Residential
- Light Industrial
- Low Density Residential
- Medium Density Residential
- Military
- Mixed Use
- Open Space
- Public/Semi-Public
- Rural Residential
- Aircraft Noise Contours
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream
- Highway

0 0.25 0.5 1 Miles

Figure 3-44
Langley AFB Aircraft Noise Contours (East)
Future Land Use



Sources: Compatibility determined per Langley AFB AICUZ Study, Table 3-4, 2007; City of Hampton GIS and City of Poquoson GIS, 2009; Langley AFB, 2009

Legend

Compatibility

- Yes
- Dependent Upon Land Use, Noise Level Reduction may Apply
- Generally Compatible with Noise Level Reduction of (25 dB)
- Generally Compatible with Noise Level Reduction of (30 dB)
- Generally Compatible with Noise Level Reduction of (35 dB)
- Discouraged; Generally Compatible with Noise Level Reduction of (25 dB)
- Strongly Discouraged; Generally Compatible with Noise Level Reduction of (30 dB)
- No
- Aircraft Noise Contours
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream
- Highway

0 0.25 0.5 1 Miles

Hampton_Fig3_XX_NoiseFLU_East_Compat_20091021_RGR.pdf

Figure 3-45
Langley AFB Aircraft Noise Contours (East)
Future Land Use Compatibility

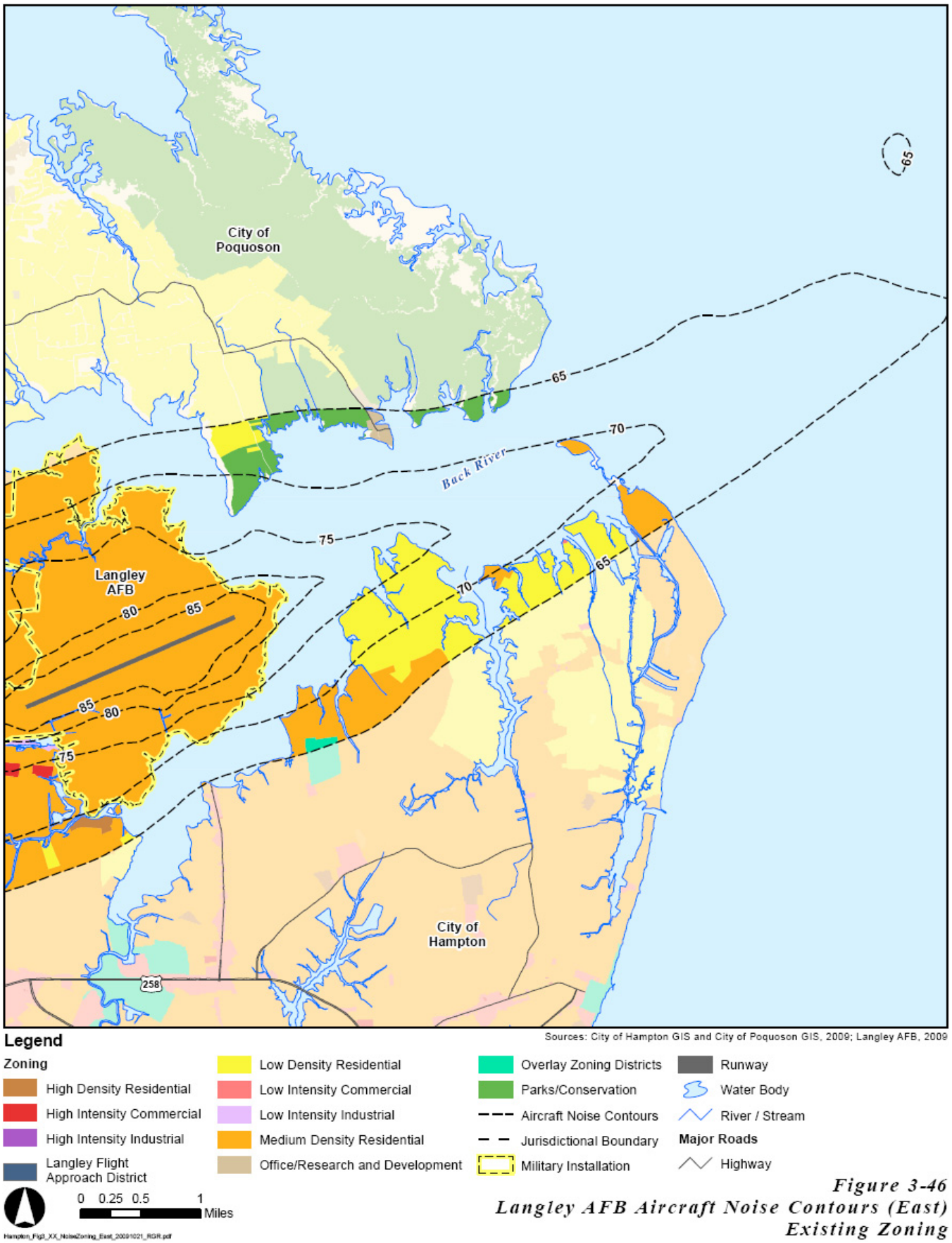
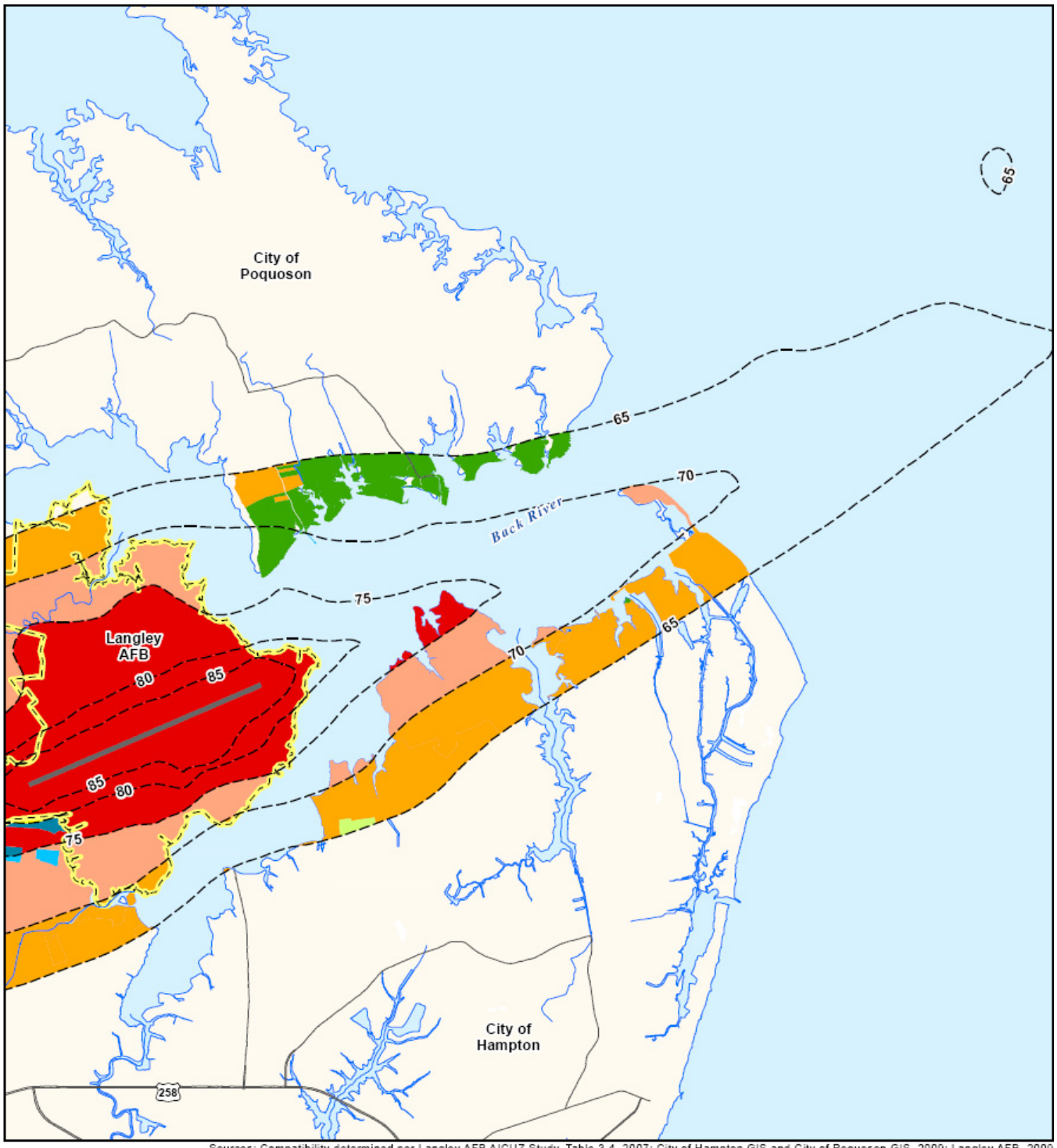


Figure 3-46
Langley AFB Aircraft Noise Contours (East)
Existing Zoning



Sources: Compatibility determined per Langley AFB AICUZ Study, Table 3-4, 2007; City of Hampton GIS and City of Poquoson GIS, 2009; Langley AFB, 2009

Legend

Compatibility

- Yes
- Dependent Upon Land Use, Noise Level Reduction may Apply
- Generally Compatible with Noise Level Reduction of (25 dB)
- Generally Compatible with Noise Level Reduction of (30 dB)
- Generally Compatible with Noise Level Reduction of (35 dB)
- Discouraged; Generally Compatible with Noise Level Reduction of (25 dB)
- Strongly Discouraged; Generally Compatible with Noise Level Reduction of (30 dB)
- No
- Langley Flight Approach District
- Aircraft Noise Contours
- Jurisdictional Boundary
- Military Installation
- Runway
- Water Body
- River / Stream

Major Roads

- Highway

0 0.25 0.5 1 Miles

Hampton_Fig3_XX_NoiseZoning_East_Compat_20091020_RGR.pdf

Figure 3-47
Langley AFB Aircraft Noise Contours (East)
Existing Zoning Compatibility

8 Vibration Issues

Definition:
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.

The issue identified for vibration is: residential development in close proximity to Langley AFB.

Although vibration is not an issue associated with operations at Langley AFB, it was identified as a potential problem during the JLUS process. The operation of jet engines produces a certain amount of vibration that could affect certain land uses if they were located close to the Installation. Based on Langley's current assigned aircraft, missions, and locations of development around the base, no concerns were noted. However, future development near the base or mission changes could result in vibration becoming an issue.

9 Dust / Smoke / Steam Issues

Definition:
Dust is the common term used to describe the suspension of particulate matter in the air. Dust, smoke, and steam can be created by fire (controlled burns, agricultural burning), ground disturbance (agricultural operations, grading), industrial activities, or other similar processes. Dust, smoke, and steam become a compatibility issue if sufficient in quantity to impact flight operations (such as reduced visibility or equipment damage).

Civilian and military activities can produce dust, smoke, and steam from grading, agriculture, industrial practices, vehicle movement, or weapons training. Suspended particulate matter becomes a compatibility factor if sufficient in quantity to impact flight operations (such as reduced visibility or equipment damage) or substantially impacting the quality of life of local residents. Sources of dust, smoke, and steam in the vicinity of the airfield could obstruct the pilot's vision during takeoff, landing, or other periods of low altitude flight. No specific issues were identified for this factor.

10 Light and Glare Issues

Definition:
This compatibility factor refers to man-made lighting (street lights, airfield lighting, building lights) and glare (direct or reflected light that is harsh and disrupts normal vision). Light sources from commercial, industrial and residential uses at night can cause excessive glare and illumination, which impacts the use of military night vision devices and air 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 factors identified for this compatibility factor are:

- development sites within safety zones and noise contours throughout the study area; and
- the potential for new development along flight paths to include uses that would create glare or light that could affect pilot visibility

Langley AFB is located in the middle of an urban area, which means that there is always night glow caused by lighting from urban uses such as residential and commercial. Although some night operations may take place at Langley AFB, they are not the focus of the base's mission; consequently, light pollution is not a significant problem with Langley's aircraft operations. It is important to note, however, that light pollution

could impact future missions at Langley AFB depending on the requirements of that mission.

Two issues were identified during the JLUS process that pose concerns for light and glare. Much of the land along the Back River, east of the base is undeveloped. Development sites the north and south shorelines in Hampton and Poquoson could have a variety of land uses developed on them. It is important to keep in mind that these areas are in the Installation's flight path, and uses that produce excess glare could negatively impact pilot visibility and overall safety.

11 Alternative Energy Development Issues

Definition:
Alternative energy refers to sources such as solar, wind or biofuels that can be used to replace or supplement traditional fossil-fuel sources, such as coal, oil and natural gas. Alternative energy development could pose compatibility issues related to glare (solar energy) or vertical obstruction (wind generation). Other alternative energy developments, such as biofuels, have no typical compatibility issues and would be judged for compatibility on a case-by-case basis.

There were no issues identified for alternative energy uses within the study area that would cause incompatible use with operations at Langley AFB.

12 Air Quality Issues

Definition:
Air quality is defined by a number of components that are regulated at the federal and state level. For compatibility, the primary concerns are pollutants that limit visibility, such as particulates, ozone and potential non-attainment of air quality standards that may limit future changes in operations at the installation.

There were no issues identified for air quality within the study area that would cause incompatible use with operations at Langley AFB.

13 Frequency Spectrum Impedance and Interference Issues

Definition:
Frequency spectrum impedance and interference refers to the interruption of aircraft related electronic signals by a structure (impedance) or the inability to distribute / receive a particular frequency because of similar frequency competition (interference).

In the performance of typical operations, the military relies on a range of frequencies for communications and support systems. Similarly, public and private uses rely on a range of frequencies to support daily life. The potential for increased background radio frequency interference / electromagnetic interference is developing as a mission impact to the US military's high-tech combat forces. Frequency interference can result from a number of factors, including:

- New transmissions using a frequency that is near an existing frequency used by the military;
- Reducing the distance between two antennae transmitting similar frequencies;
- Increasing the power of a similar transmission signal;
- Using poorly adjusted transmission devices that transmit outside their assigned frequency;
- Production of an electromagnetic signal that interferes with a signal transmission;
- Explosion of consumer electronic sources and uses from portable systems to whole communities utilizing Wi-Fi broadband systems and industrial sources that produce electronic noise by-products.

As the use of the frequency spectrum increases (such as the rapid increase in cellular phone technology over the last decade) and as development expands near military installations and operations, the potential for frequency spectrum interference and competition increases.

The final item of concern is frequency impedance. Key issues to consider relative to frequency spectrum impedance include the construction of buildings or other facilities that block or impede the transmission of signals from antennae, satellite dishes, or other transmission / reception devices affected by line-of-sight requirements. No specific compatibility issues were identified for this JLUS; however, as development continues in and around Langley AFB and the surrounding communities, care must be taken to avoid impendence by construction outside the Installation.

14 Public Trespassing Issues

Definition:
This factor addresses public trespassing, either purposeful or unintentional, onto Langley AFB. This issue is related to Compatibility Factor 6, AT/FP.

There were no issues identified for public trespassing within the study area that would cause incompatible use with operations at Langley AFB.

15 Cultural Sites Issues

Definition:
Cultural sites may prevent development on the base, apply development constraints or require special access by Native American tribal governments or other authorities.

Special considerations must be made for any development or expansion of military missions considered for areas with cultural significance. There were no issues identified for cultural sites within the study area that would cause incompatible use with operations at Langley AFB.

16 Legislative Initiatives Issues

Definition:
Legislative initiatives are federal, state or local laws and regulations that may have a direct or indirect effect on a military installation to conduct its current or future mission or a community's ability to direct growth.

There were no issues identified for legislative initiatives within the study area that would cause incompatible use with operations at Langley AFB.

17 Interagency Coordination Issues

Definition:
Interagency coordination relates to the level of interaction on compatibility issues between military installations, jurisdictions, land and resource management agencies, and conservation authorities.

The development of proactive partnerships between the Air Force, other governmental agencies, and local jurisdictions is required to ensure continued sustainability of Langley AFB and local economies. Local jurisdictions and agencies are generally considerate of operations at Langley AFB when planning new development and work closely with the military to ensure that they are aware of what is occurring in the surrounding communities. There were no issues identified for this compatibility factor.

3.3 NATURAL RESOURCE COMPATIBILITY FACTORS

In addition to man-made compatibility factors, natural resource compatibility factors are also potential sources of conflict with military readiness activities. Factor 19, Threatened and Endangered Species was the only natural resource compatibility factor identified during the JLUS process to currently present compatibility issues.

Figure 3-48 illustrates the location of the natural resource compatibility issues identified by the JLUS committees, the public, and the consulting team during preparation of this JLUS. The strategies presented in Chapter 5 are designed to address the significant compatibility issues identified in this section.

18 Water Quality / Quantity Issues

Definition:
Water quality / quantity concerns include ensuring adequate water supplies of good quality for use by installations and surrounding communities as the area develops.

The long term availability of water at sufficient quality and quantity within the study area is vital to sustaining local communities and Langley AFB. There were no issues identified for water quality / quantity within the study area that would cause incompatible use with operations at Langley AFB.

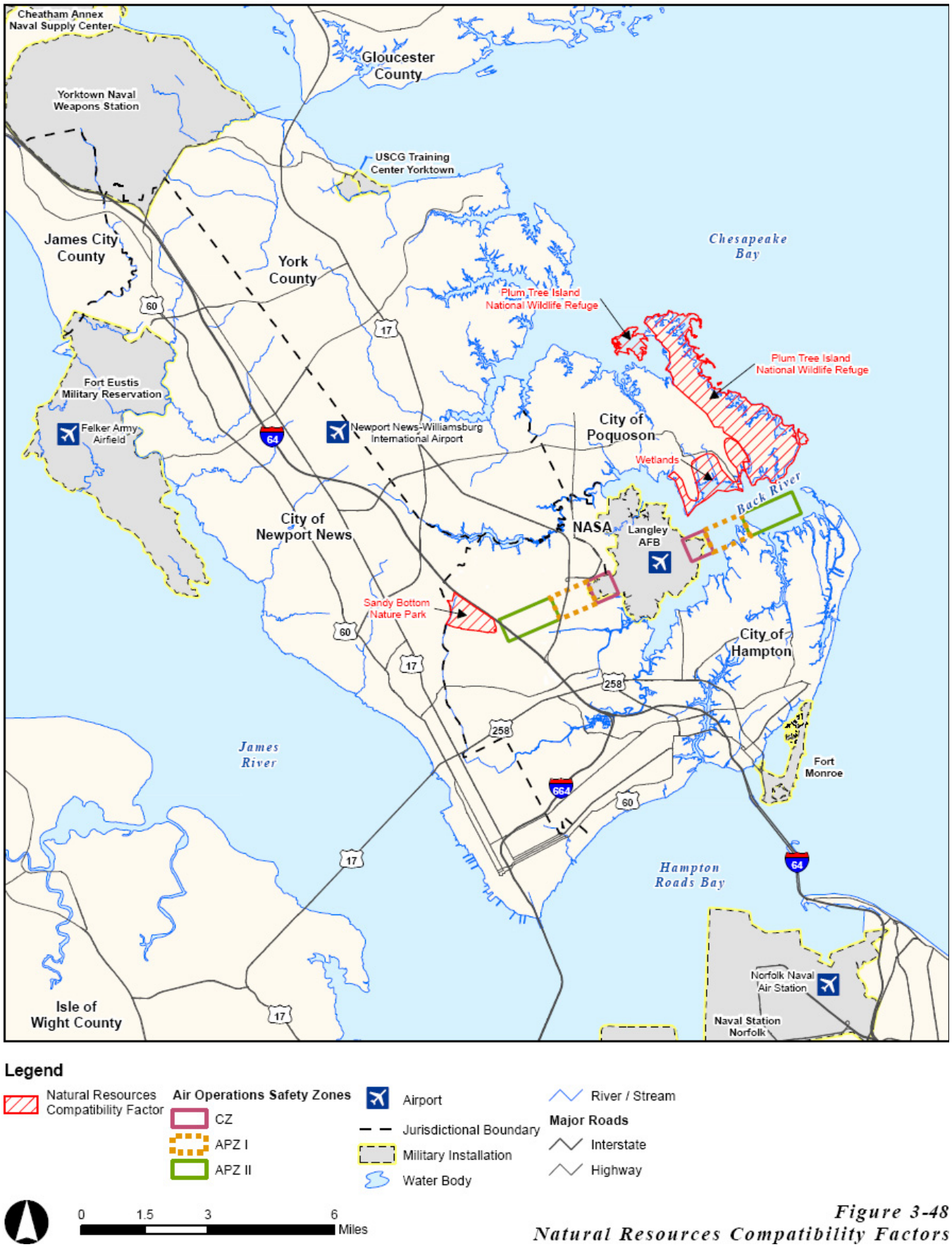


Figure 3-48
Natural Resources Compatibility Factors

19 Threatened & Endangered Species Issues

Definition:
*A **threatened** species is one that may become extinct if measures are not taken to protect it. An **endangered** species is one that has a very small population and is at greater risk of becoming extinct. Many species that become extinct never make it to the endangered species list. The presence of threatened and endangered species may require special development considerations, could halt development and could impact performance of military missions.*

The issues identified for this compatibility factor are:

- Plum Tree Island National Wildlife Refuge;
- Grandview Nature Preserve;
- Sandy Bottom Nature Park; and
- Wetlands throughout the study area.

The maintenance and enhancement of biodiversity is an important component to Langley AFB's land management stewardship responsibilities. Natural resource management on Langley AFB is influenced by federal legislation and Department of Defense policies, including the Federal Endangered Species Act of 1973, Department of Defense Directive 4700.4, Air Force Instruction 32-7064, and the Department of Defense Ecosystem Management Principles. Based on the need to adhere to the aforementioned policies, habitat management for the Installation is guided by its 2006 Integrated Natural Resources Management Plan (INRMP).

Although there have been no threatened or endangered species (federal or state-listed) identified as permanently residing or nesting on land within Langley AFB, there are several federally-listed species with the potential to occur within five miles of the base. There are two threatened turtle species, the green sea turtle and the loggerhead sea turtle, as well as two endangered turtle species, Kemp's Ridley sea turtle and the leatherback sea turtle. Although these are primarily sea-dwelling creatures, they do come on land during breeding season to lay their eggs in the sand. Additional species with the potential to occur within five miles of the Installation include the endangered red-cockaded woodpecker, the threatened piping plover, the federally threatened northeastern beach tiger beetle, and the recently de-listed bald eagle.

There have been three state-listed endangered species with the potential to occur within five miles of Langley AFB, which include Harpers Fimbristylis (a plant species), the canebrake rattlesnake, and the eastern tiger salamander. The six state-listed threatened species identified are the barking tree frog and Mabee's salamander, as well as the bird species of the peregrine falcon, the upland sandpiper, the gull-billed tern, and the loggerhead shrike.

None of the species mentioned above currently pose issues for mission operations; however should their habitats be altered / destroyed or some other natural or man-made occurrence cause them to relocate onto portions of Langley AFB, the base would then be subject to federal regulations that could restrict operations. The base includes a large amount of undeveloped area that could provide safe haven for certain species. As a federal institution, the base has a responsibility to protect threatened and endangered species if they occur within the boundaries of the base. Other military installations across the country have faced restrictions and reductions in mission and training capabilities due to the presence of federally protected species.

The last concern for threatened and endangered species in the study area is the potential for Bird / Wildlife Aircraft Strike Hazard occurrences. The Grandview Nature Preserve, Plum Tree Island

National Wildlife Refuge, Sandy Bottom Nature Park, and the various wetlands in the region all provide habitat for a variety of wildlife, which could include threatened or endangered bird species. These areas are located within flight tracks used by aircraft at Langley AFB. Not only does a BASH incident pose safety concerns, but there is further concern if it was to involve a threatened or endangered specie.

20 Marine Environment Issues

Definition:
Regulatory or permit requirements protecting marine and ocean resources can cumulatively affect the military's ability to conduct operations, training exercises, or testing in the marine environment.

There were no issues identified for marine environments within the study area that would cause incompatible use with operations at Langley AFB.

3.4 COMPETITION FOR SCARCE RESOURCES

Competition for scarce resources can cause compatibility factors due to competition between local and federal government agencies, other agencies, private development concerns, and the military when demand exceeds the supply of the desired attribute. The following is a description of the key resources that could be in high demand.

Figure 3-49 illustrates the location of the compatibility issues related to competition for scarce resources as identified by the JLUS committees, the public, and the consulting team during preparation of this JLUS. In general, these issues were not determined to be a major concern in the JLUS study area. There were only a few issues identified related to Compatibility Factor 22, Land, Air, and Sea Spaces.

21 Scarce Natural Resources Issues

Definition:
Pressure to gain access to valuable natural resources (such as oil, gas, minerals, and water resources) located on military installations, within military training areas, or on public lands historically used for military operations can impact resource utilization and military operations.

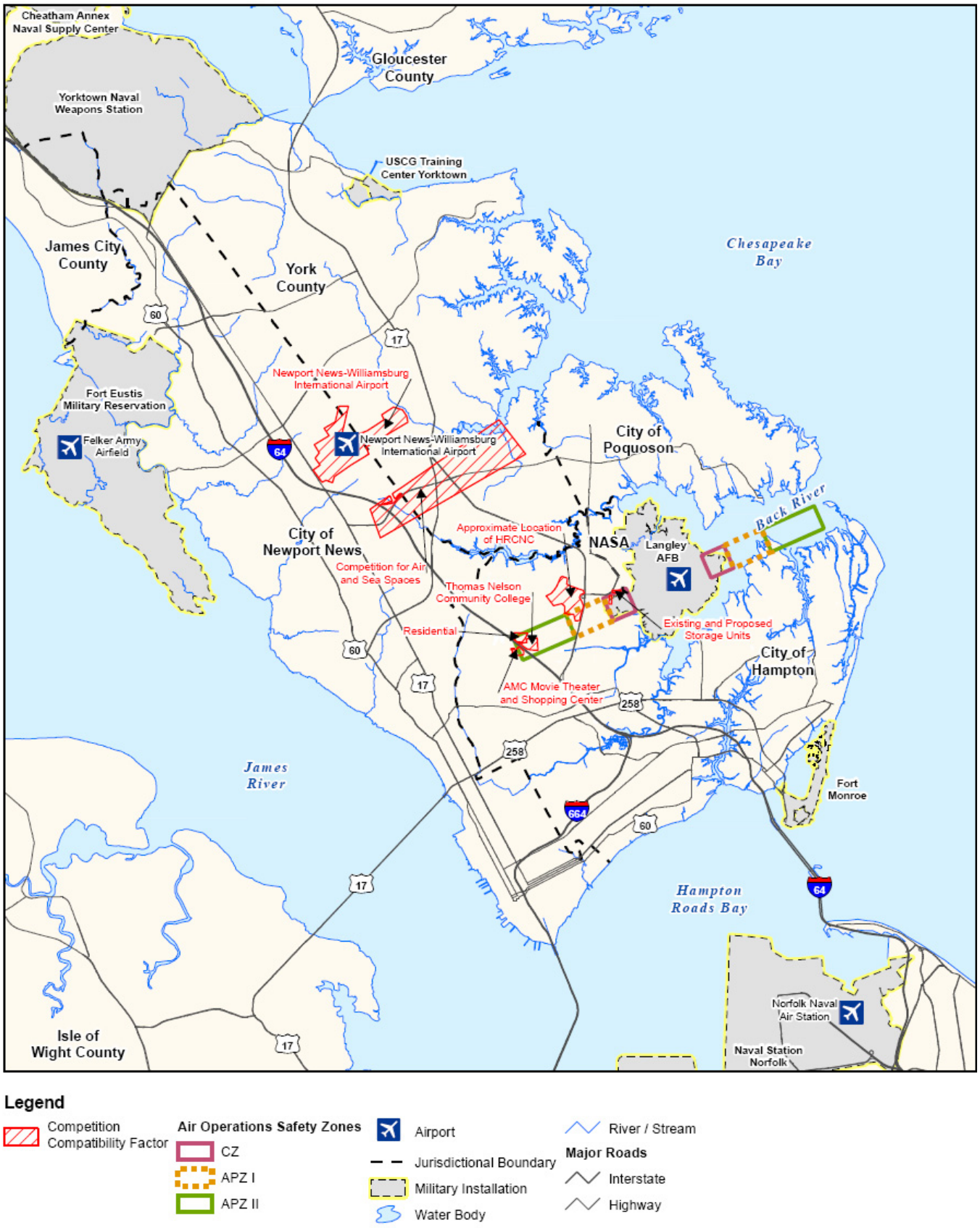
There were no issues identified for scarce natural resources within the study area that would cause incompatible use with operations at Langley AFB.

22 Land, Air, and Sea Spaces Issues

Definition:
Land, Air, and Sea Spaces with regard to other airports in the proximity of the military installations can cause competition for limited resources.

The issue identified for this compatibility factor is competition for airspace with the Newport News-Williamsburg International Airport.

To help controllers and pilots deal with varying traffic conditions in the sky, US airspace has been divided into six different classes (A, B, C, D, E, and G; Class G Airspace is uncontrolled). These various classes have different requirements for entry into the airspace, pilot qualifications, radio and transponder equipment, and Visual Flight Rules (VFR) weather minimums. VFR consists of published routes that use visual references such as railroads, highways, waterways, etc. Weather must also exceed certain minimum requirement, including visibility must be at least three miles and the pilot must be able to remain clear of clouds by at least 500 feet. The other type of route, Instrument Flight Ules (IFR), requires that pilots are trained and certified in navigational



Legend

- Competition Compatibility Factor
- **Air Operations Safety Zones**
  - CZ
  - APZ I
  - APZ II
- Airport
- Jurisdictional Boundary
- Military Installation
- Water Body
- River / Stream
- **Major Roads**
  - Interstate
  - Highway

0 1.5 3 6 Miles

Figure 3-49
Competition Compatibility Factors

methodologies and must adhere to air traffic control clearances containing specific flight route and altitude directions.

The airspace around Langley AFB is classified as Class D airspace. This airspace extends outward from Langley's airfield approximately five miles and upward to 2,500 feet MSL. By requiring two-way communication between pilots and air traffic control, Class D airspace allows air traffic control to provide separation service to participating aircraft that operate under VFR and IFR. This permits operations to occur during periods that have less than favorable weather.

Airspace resources around Langley AFB must be available and of sufficient size, cohesiveness, and quality to accommodate effective training for existing and future missions. Airspace near Langley AFB is a high-demand resource. Increases in demand for flights from the Newport News-Williamsburg International Airport (NNWIA), which is approximately eight miles northwest of Langley AFB, or the other five airports in the nearby region may impact existing and future aircraft operations at Langley AFB (i.e., approach and departure tracks, closed pattern flight tracks, etc.). If flight demand increases either for Langley AFB, Newport News-Williamsburg International Airport, or other nearby airports, constraints on flight activity will result for the other entities with regards to the amount and type of aircraft operations that can occur.

Class D airspace also surrounds Newport News-Williamsburg International Airport for a five-mile radius upward to 2,500 feet MSL and, therefore, has similar communications regulations as Langley AFB. Current facilities at Newport News-Williamsburg International Airport include two runways. According to statistics dated March 31, 2007, there was an average of 313 aircraft operations per day. It is important for the local public and private airports to keep in contact with Langley AFB and for all air traffic controllers to be aware of the types and times of military operations and public operations to avoid hazards.

23 Frequency Spectrum Capacity Issues

Definition:
Frequency spectrum capacity is critical for maintaining existing and future missions at Langley AFB. This also needs to be addressed from the standpoint of consumer electronics.

There were no issues identified for frequency spectrum capacity within the study area that would cause incompatible use with operations at Langley AFB.

24 Ground Transportation Capacity Issues

Definition:
Ground transportation capacity relates to the ability of existing freeways, highways, arterials, and other local roads to provide adequate mobility and access between military installations and their surrounding communities.

Vehicular transportation within the Hampton-Langley JLUS study area is problematic given its location on the Virginia Peninsula. The peninsula is connected to South Hampton Roads by two bridge-tunnels – the Hampton Roads Bridge-Tunnel (HRBT) and the Monitor-Merrimac Memorial Bridge-Tunnel (MMMBT). The third and last major connection between the Virginia Peninsula and land to the south is the James River Bridge. The primary vehicular transportation route north off of the peninsula is Interstate 64, which has numerous capacity issues resulting in traffic congestion and delays. There are several transportation projects identified by the Hampton Roads Transportation Authority aimed at improving vehicular transportation on and off of the peninsula; therefore, no issues were identified

related to this aspect of the study area's transportation capacity. There were, however, issues identified for ground transportation in close proximity to Langley AFB. This issue called out the inadequate vehicular transportation capacity of the roadways between the City of Poquoson and NASA LaRC / the west side of Langley AFB. The sole high speed roadway supporting north-south movement is State Highway 172. This highway intersects the State Highway 171 corridor, which provides east-west movement into Poquoson and York County. These roadways have been deemed inadequate to support the study area's current and future demand. Should a mission change or increase result in additional personnel at the base, the limited capacity of these roadways would be stressed even further.