

Real Property Master Plan
**Long Range
Component**

Fort Belvoir, Virginia

December 2009



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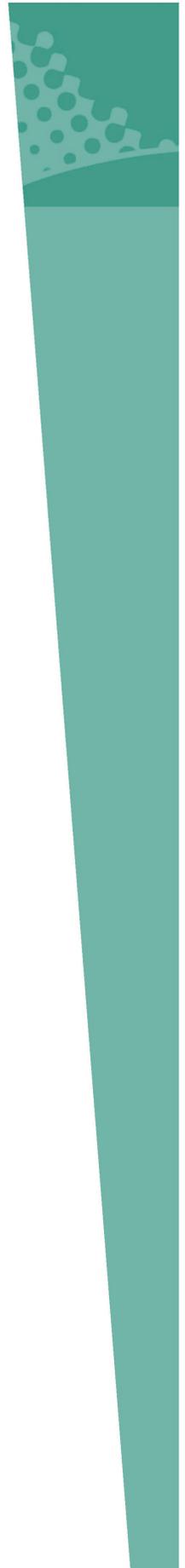
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Introduction

1 CHAPTER



View of Fort Belvoir from Route 1 toward Potomac River

Purpose

According to Army Regulation (AR) 210-20, the Long Range Component (LRC) of the Real Property Master Plan (RPMP) establishes “the environmental baseline, basic framework, and specific options for developing and managing real property on the Post”. It provides development options in accordance with the installation’s mission and the Real Property Vision, Goals and Objectives. Including the LRC, there are five components in the RPMP. The LRC serves as the planning baseline for the other four components:

- Real Property Master Plan Digest
- Installation Design Guide
- Capital Investment Strategy
- Short Range Component

Fort Belvoir is undergoing significant near-term growth and has numerous missions and programs to accommodate. This master plan provides the planning framework that ensures Fort Belvoir will remain a world-class installation over the next century, while setting a new standard of excellence and sustainability for federal urban design and development.



Figure 1.1 - Fort Belvoir Main Post and Fort Belvoir North Area (FBNA)



View across Belvoir looking Northwest

Scope

This master plan addresses approximately 8,500 acres including both the Main Post (7,700 acres) and Fort Belvoir North Area (FBNA) (800 acres) (see Figure 1.1). FBNA was formerly known as the Engineer Proving Ground (EPG). This plan does not include the adjacent property of the Humphreys Engineer Center (HEC) which is operated by the Army Corps of Engineers and considered as a separate entity for land planning purposes. Also, this plan does not include Rivanna Station, a remotely located portion of Fort Belvoir.

The following assumptions, developed by the master planning team and Fort Belvoir provide the point of departure for development of this master plan.

- Within a few years due to Base Realignment and Closure Commission (BRAC), the population and intensity of activity at Fort Belvoir will nearly double. This phenomenal growth will occur in one of the most congested areas of the country. Belvoir currently has 23,000 personnel working on Post. Current planning (BRAC and non-BRAC) envisions an additional 19,300 new people working at Fort Belvoir by 2015. Minimal continued growth will add another 3,000, by 2030. The total projected employee population for 2030 is 48,000.
- Fort Belvoir will provide more regional services in support of the National Capital Region (NCR). Examples of these expanding services include administrative support, regional outdoor recreation, logistical support, and expanded support to the retiree population.
- Fort Belvoir family housing assets are now transferred to private ownership under a 50-year lease. The Fort Belvoir Residential Communities Limited Liability Corporation (FBRC LLC) is the entity that oversees the leases. The master plan is a key tool in ensuring that the Post's housing requirement is accommodated, while still allowing development opportunities for other important missions at Fort Belvoir. While housing neighborhoods are being redeveloped, the number of housing units provided (2,070) is projected to remain constant for the planning period of this master plan.
- The Museum of the United States Army is planned to be constructed on Belvoir.
- Fort Belvoir is expected to continue its current mission of regional support for office and housing. Therefore, all planning will be aimed at supporting this mission..

These current planning assumptions, along with the mission and vision of Fort Belvoir, set the direction of its growth to the year 2030, while providing a long-range flexible plan that can accommodate its existing, currently planned, and future needs and requirements

Mission

Fort Belvoir is the Army's premier installation in the National Capital Region (NCR). It provides a secure, safe operating environment for numerous missions and functions, including:

- Administrative, logistics, and operations support for regional and worldwide military missions
- A creative learning environment for Army and DoD school students
- Military support for a variety of NCR contingency missions
- Regional housing for active duty military families
- Quality of life support for the military community that includes health and recreation
- Environmental and cultural resources stewardship in concert with mission support



Vision

The collective vision of the future Fort Belvoir aspires to create:

- An outstanding place to work, train and live
- A federal urban center that provides the workforce with safe, secure, premium support
- A culture that welcomes change and challenges while simultaneously achieving harmony with surrounding communities and the natural environment
- A continuing legacy of a "Beautiful to See" installation



Guiding Principles

The Master Plan Guiding Principles were developed in consultation with the garrison staff. They provide a planning road map that will shape the future development of Fort Belvoir. These principles are:

- Transform Fort Belvoir: Create a world-class installation
 - Support Fort Belvoir’s mission.
 - Become a model within the community, the region and among other military installations.
 - Support and incorporate anti-terrorism/force protection standards to provide a safe and secure environment for installation residents and customers.
 - Improve the quality of life across the Post.
 - Promote diverse and high quality neighborhoods.
 - Develop new facilities and public spaces.
- Achieve a diversity of use and activities: Enrich the program
 - Create new places of work that reinforce the spirit of community and collaboration.
 - Integrate new places for education and training.
 - Continue to support areas for recreation.
 - Encourage the creation of mixed-use activity centers.
 - Provide National Capital Soldiers with quality, cost effective military training capabilities.
- Achieve environmental brilliance: A sustainable approach in everything
 - Create energy efficiency through technology and by maximizing site potential.
 - Explore ability to maximize day-lighting in building design.
 - Optimize the use of recycled building materials.
 - Incorporate new technologies and best practices.
 - Explore alternative modes of transportation.
- Strengthen the natural habitat: Enhance creeks, wetlands and wildlife habitats and ensure all development is in concert with the natural environment
 - Preserve natural systems and their functions.
 - Protect and enhance natural habitats.
 - Recognize and preserve existing biodiversity.
 - Enable connections between the regional and on-post conservation areas.
 - Incorporate ‘watershed planning’ principles into site planning.
- Build compact neighborhoods: Strengthen the sense of community and place
 - Extend transit lines.
 - Guide projected growth around transit opportunities.
 - Optimize developable land.
 - Preserve large land areas for potential future missions.
 - Preserve open space.
 - Align accessibility and transit initiatives.
 - Recognize that land is a valuable and diminishing resource.
 - Implement land use planning that reinforces redevelopment and strengthens exiting neighborhoods.
- Improve connectivity: Consider strategies that allow people to “park once”
 - Create convenient access to transit.
 - Strengthen circulation connections between North and South Post.
 - Investigate alternative modes of transit.
 - Integrate potential shuttle connections or a “circulator” between Army neighborhoods, parking facilities and regional transit.
 - Encourage the development of pedestrian and bicycle trails that connect residential neighborhoods to each other.

- Emphasize the public realm: Create walkable neighborhoods
 - Create new and exciting places for people.
 - Concentrate uses and activities that enable a walkable community.
 - Provide active and public uses at the ground floor.
 - Ensure accessibility.
 - Repair existing landscapes including streets, parklands, creeks, and streams.
 - Expand the “Town Center” to serve as a central focus for South Post development.



- Respect the history of Fort Belvoir: Continue its legacy for future generations
 - Explore the innovative reuse of older facilities.
 - Continue legacy of the landscape and natural setting.
 - Continue to uphold Fort Belvoir’s mission and responsibilities within the region.
 - Provide a clear development strategy for a long-term, sustainable development plan.
 - Recognize Fort Belvoir’s advantageous location near our nation’s capital.
 - Emphasize design standards that are respectful of the historic nature of Fort Belvoir and the surrounding region.
 - Protect Fort Belvoir’s cultural resources.



- Provide Community Benefits: Strengthen existing Army and surrounding neighborhoods
 - Identify roadway investments for continued growth of the region.
 - Explore shared amenities, such as parks and community-based facilities (for example, the hospital and Museum of the U.S. Army).
 - Align possible synergies with surrounding community development initiatives, such as the redevelopment of downtown Springfield and the U.S. Route 1 corridor.
 - Optimize the potential of existing infrastructure and shared benefits from continued investment in regional transportation.



These principles aim at creating a plan that: efficiently uses land, maximizes the use of previously developed areas, minimizes the impact on the environment, and ultimately creates a sustainable world-class installation.

Process

Producing the LRC is a three-part process. Part I, the Existing Conditions Assessment, involves extensive mapping of what is currently “on the ground.” Part II, Land Development Patterning, marks the entry into true “planning”. Part III, Future Development Planning, is the in-depth analysis that produces the long-term plans. (See Figure 1.2.)

Existing Conditions Assessment

The Existing Conditions Assessment is an assessment of existing baseline information that allows the determination of which areas on the installation are most appropriate for future development. This assessment provides an analysis of both on and off-post information including: regional planning and demographics, history, facilities, land use, transportation, infrastructure/utilities, airfields, and environmental resources (natural, cultural and operational). The assessment concludes with a summary of the opportunities and constraints for future development on the Post. This assessment is provided in Chapter 2, Existing Conditions Assessment.

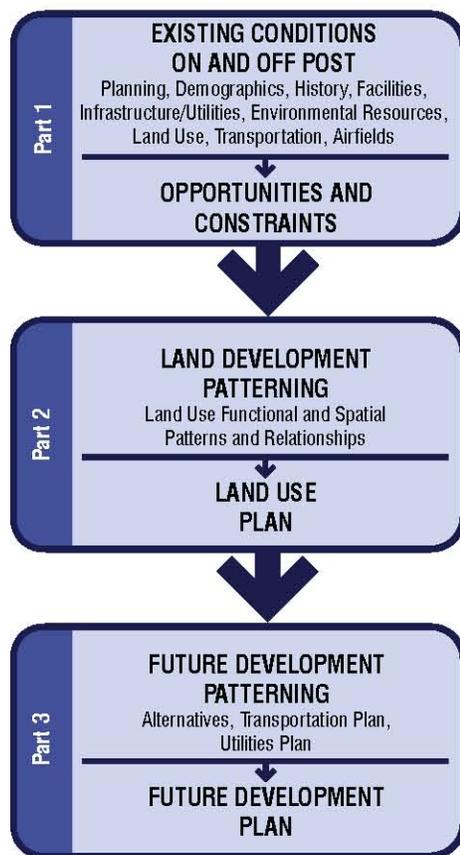


Figure 1.2 - Three primary parts of the LRC

Land Development Patterning

Land Development Patterning is the examination of land use functional and spatial patterns and relationships. It leads to the optimal organization of real property, which helps the installation operate more efficiently. Specifically, it helps the installation use fewer resources to satisfy greater demand, as well as institute effective means to support and sustain Army readiness. It results in the installation’s Land Use Plan. In this report, land development patterning is provided in Chapter 3, Land Development Patterning.

Future Development Planning

Derived from the Land Use Plan, the Future Development Plan integrates the known with the unknown, and represents a consensus on the direction and location of future installation development. Supplemental products include individual plans for Transportation and Utilities. In this report, these plans are provided in Chapter 4, Future Development Planning.

Siting of projects occurs regularly and on a somewhat frequent basis. Sites selected must be compatible with the approved RPMP. However, before any course of action can be undertaken, all siting impacts must be considered. Area Development Plans were developed concurrently with this Master Plan, which support and guide the future siting of projects.

Approval

As specified in AR 210-20, the senior mission commander endorses the RPMP and sends it to the Installation Management Command Region Office for review and approval by the region director.

Recent Master Planning Studies

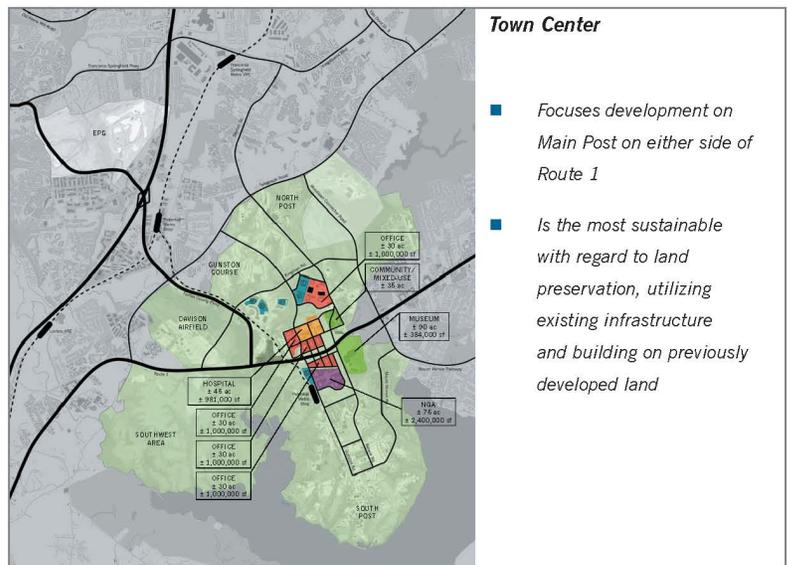
This section discusses the relevant planning studies that directly contributed to this Master Plan.

The last official master plan of Fort Belvoir was completed in 1993. A Master Plan Update was started in 2002, which included three capacity studies. The first benchmark analyzed was 600,000 SF of facilities and 3000 new workers; the second was 3,000,000 SF of facilities and 15,000 new workers; the third was 6,000,000 SF of facilities and 30,000 new workers. This master plan (Figure 1.3) was nearly complete, and then curtailed due to the new impacts of BRAC 2005 on the Post.



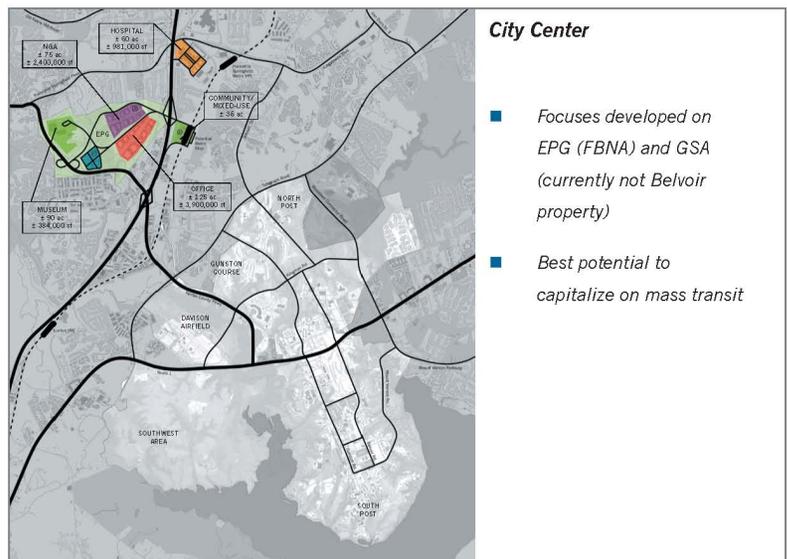
Figure 1.3 - 2005 Master Plan: Development Alternative for South Post

These previously developed capacity studies from the unpublished master plan provided a good starting point for the BRAC Siting Analysis that started in February 2006 and was completed in June 2006. This report presented alternative BRAC development strategies along with a thoughtful, comprehensive assessment of each option. Three alternatives were presented in the report Town Center, City Center, and Satellite Campuses (See Figure 1.4) Town Center focused development on North and South Post on either side of the Route 1 Corridor. City Center focused development on EPG (know referred to as FBNA) and a nearby GSA site (currently not Belvoir property). The Satellite Campuses option spread development between Main Post, EPG (FBNA) and the Airfield.



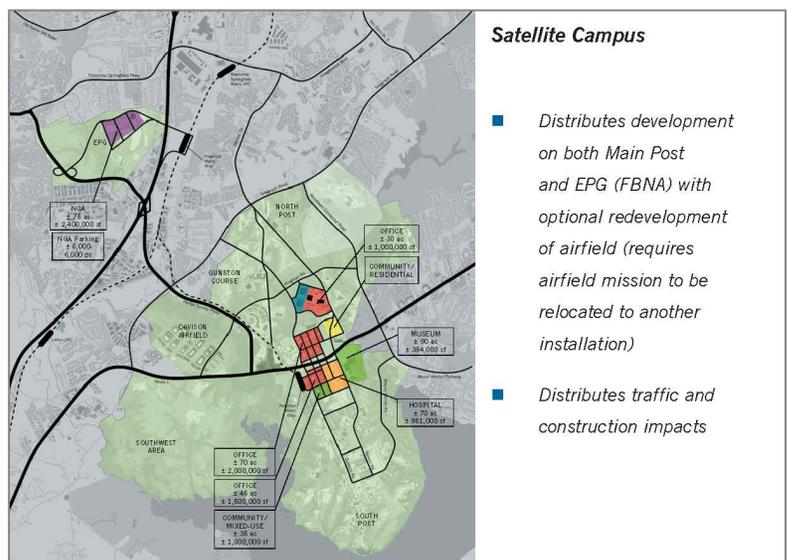
Town Center

- Focuses development on Main Post on either side of Route 1
- Is the most sustainable with regard to land preservation, utilizing existing infrastructure and building on previously developed land



City Center

- Focuses developed on EPG (FBNA) and GSA (currently not Belvoir property)
- Best potential to capitalize on mass transit



Satellite Campus

- Distributes development on both Main Post and EPG (FBNA) with optional redevelopment of airfield (requires airfield mission to be relocated to another installation)
- Distributes traffic and construction impacts

Figure 1.4 - Three Development Alternatives Presented in the BRAC Siting Analysis, June 2006

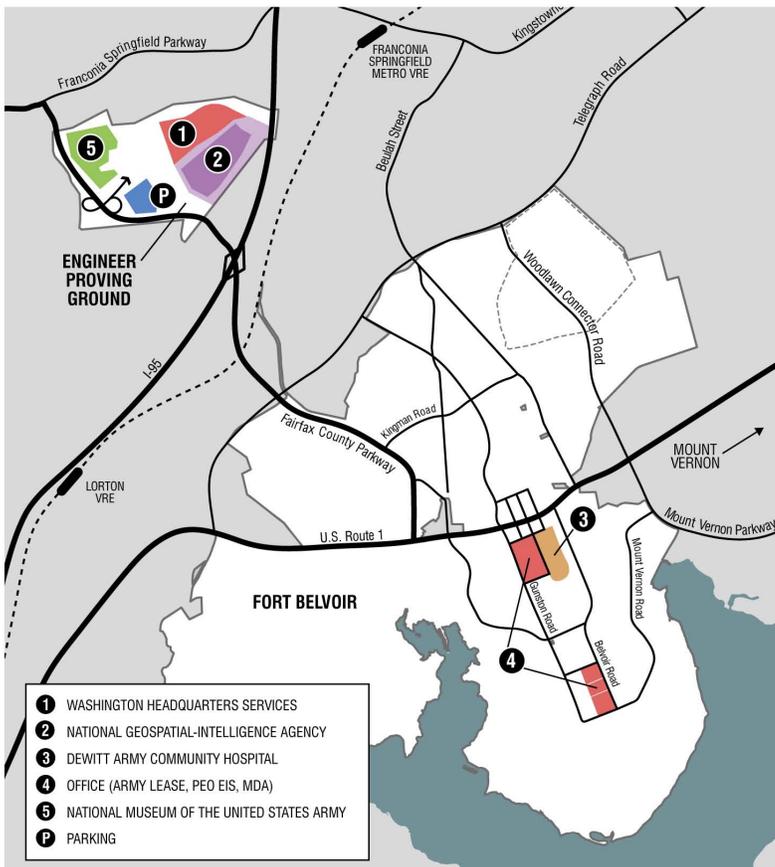


Figure 1.5 - Preferred Alternative (July 2006)

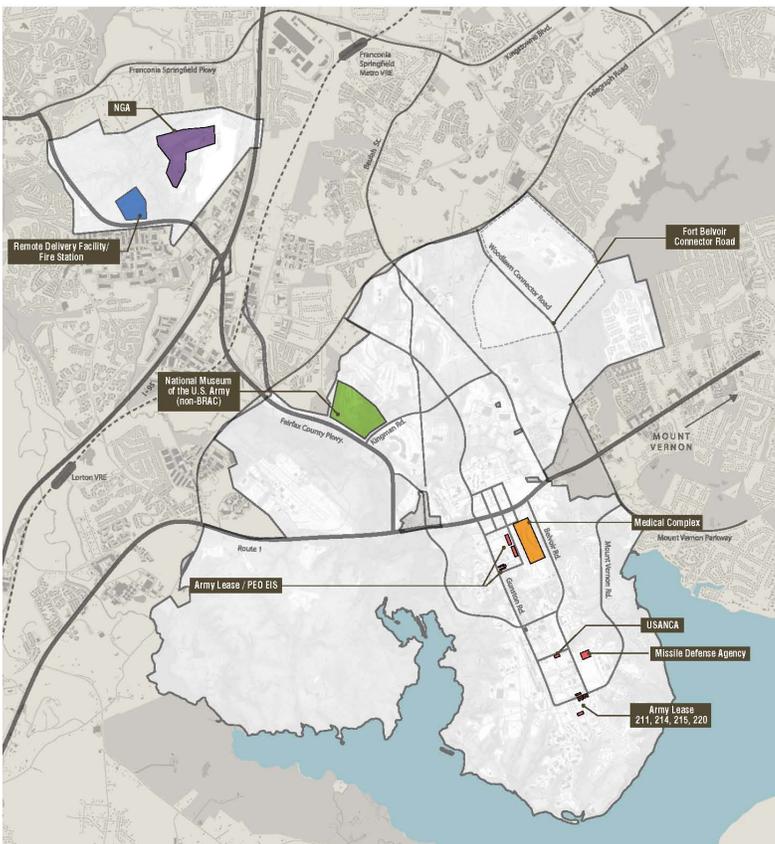


Figure 1.6 - Preferred Site Strategy as approved by ROD September 2007

After extensive meetings between the Army, the community, and elected officials, the Army selected a preferred siting strategy that incorporates elements of several plans (Figure 1.5). The preferred strategy would place 18,000 of the new jobs at EPG (FBNA), and the remaining 4,000 at Fort Belvoir's South Post. The development strategy chosen by the Army was the starting point for this Master Plan Update.

However, as the master planning and National Environmental Protection Act (NEPA) processes moved forward, a number of changes occurred in the population and program requirements. The total population number for the BRAC action dropped from 22,000 to 19,300 and in July 2007, a letter of understanding between the Army, Federal Highway Administration and the Commonwealth of Virginia committed to cap the population at EPG (FBNA) to 8,500. This population cap was achieved by removing Washington Headquarters Services (WHS) program from consideration at EPG (FBNA) and deferring its final siting there until further study.

These two major changes among other smaller program changes altered the June 2006 preferred alternative. The final recommendations in this Master Plan reflect the plan approved in the September 2007 Record of Decision (ROD) (Figure 1.6) and includes:

- National Geospatial-Intelligence Agency (NGA) on EPG (FBNA)
- Army Lease units, agencies, and activities on South Post at sites along Gunston Road and Belvoir Road
- U.S. Army Medical Command (MEDCOM) facilities and a new Army community hospital on the South Post golf course
- Program Executive Office, Enterprise Information Systems (PEO EIS) and Missile Defense Agency (MDA) on South Post at sites along Gunston Road and Belvoir Road
- Relocation of the present Troop area on North Post to an area west of Gunston Road on South Post
- Deferment of the decision to site WHS on EPG (FBNA), pending further study

Existing Conditions Assessment

Overview

This section discusses both broad regional influences and specific installation conditions. It analyzes these factors and summarizes both the opportunities and constraints they pose to development on Fort Belvoir.

Geographic Location

Fort Belvoir is located along the Potomac River in Fairfax County, Virginia (Figure 2.1). It is situated 16 miles southwest of Washington, D.C. and eight miles southwest of the City of Alexandria. Fort Belvoir is located near Interstate 95, which serves the East Coast as a primary north-south transportation corridor.



Figure 2.1 - Location Map

History

Fort Belvoir, the land it occupies, and the surrounding region have a long and well-documented history. There are many excellent sources that describe this history, including the Fort Belvoir web site - (<http://www.belvoir.army.mil>). The following is provided as a general overview of this history. From a master planning viewpoint, history is important because the activities, artifacts, and past development all affect how we plan and build at Fort Belvoir today. Cultural resources such as archaeological sites and historic structures provide both constraints and opportunities for planners. Constraints include development restrictions such as those related to archaeological resources, while opportunities include the adaptive reuse of historic buildings and site reorganization. Some of this history is even found in place names such as Dogue Creek, Potomac River, and the name of the Post itself.

Prehistoric Antecedents

Archeologists know that the earliest Americans wandered throughout Virginia, including present-day Fairfax County. The Fort Belvoir region was first settled perhaps 11,500 years ago. Indian projectile points found in Fairfax County represent over 8,000 years of prehistoric occupation in the region.

After approximately 2750 B.C., the climate of the Northern Virginia area stabilized close to what it is today. Prehistoric peoples tended to gravitate toward the region's rivers and streams and to adopt a less nomadic existence. They settled in larger base camps and made seasonal food gathering trips to the interior. The Native Americans who greeted the first European visitors to this region engaged in agriculture. The maize, beans, and other products grown by these Indians would become the commodities that ensured the survival of Virginia's early European settlements. The three main Indian tribes along this section of the Potomac River were the Dogue, the Patawomeke, and the Piscataway. All three tribes were members of the larger Algonquin Nation.

Belvoir in the Seventeenth Century

With the establishment of the Virginia colony, European settlers began arriving to claim large tracts of land for agrarian use. The Fairfax family administered the Northern Neck Proprietary, which was originally established by the exiled future king, Charles II, in 1649. Through marriage, inheritance, and land holdings, the Fairfax family gained political and financial prominence in Colonial America. This period of history marked the beginning of great plantations. The first land grant in what is now Fairfax County was issued in 1651 for property on the peninsula or "neck" immediately south of Fort Belvoir. To encourage population growth,

the colonial assembly in Jamestown adopted a system known as the "headright," which enabled a resident colonist to claim fifty acres for every new settler whose passage he paid from England to Virginia. By 1690, all waterfront property that today is included within Fort Belvoir had been patented and subdivided.

The Eighteenth Century: Fairfax County's "Golden Age"

Five major property grants comprised most of the area that today forms Fort Belvoir. Over the years, the land was owned by numerous families, and eventually sub-divided into smaller lots. During the 1730s, Colonel William Fairfax became the land agent for his cousin, Nicholas, 6th Lord Fairfax. He purchased the original 2,200 acres, and built the Belvoir Mansion plantation between 1737-41, much of which is now considered Fort Belvoir.

By 1750, navigable rivers like the Potomac were the main commercial arteries of the Virginia colony. These eighteenth century highways carried the commodities that established and maintained the great colonial fortunes: tobacco, grain, and slaves. They also wove together the social and political fabric of the colony, for those who lived along and traveled the rivers generally held positions of power.



Woodlawn

At this time four large homes were located in the area: George Mason's Gunston Hall, Colonel Dennis McCarty's Cedar Grove, William Fairfax's Belvoir Manor, and Lawrence Washington's Mount Vernon. Two of these homes, Cedar Grove and Belvoir, were located within the present boundaries of Fort Belvoir and both remain as archeological sites. The Woodlawn Plantation would eventually be built between 1800 and 1805, after 2,000 acres were gifted to Major Lawrence Custis by George Washington. Much of this land would become the grounds of the Commissary, Lewis Village, and Fort Belvoir Elementary School.

Belvoir in the Antebellum Period

George William Fairfax, eldest son of Colonel William Fairfax and a friend of George Washington, left Belvoir in 1773 to return to England to reclaim ancestral lands. Without a household to maintain the plantation, it fell into gradual decline, and was never re-occupied. After the last of the Fairfax family members died in 1820, ownership of Belvoir land changed hands many times.

All of the great eighteenth century plantations in the Fort Belvoir area changed considerably in the years before the Civil War. Soil exhaustion and inheritance prompted the sale and sub-division of these formerly massive tracts of land. As a new generation of landowners took up residence in southeastern Fairfax County, patterns of land use and ownership were altered.

Belvoir Enters the Twentieth Century

By the 1840s, entrepreneurs from Northern states saw the potential for the depleted lands in Virginia, and began purchasing land for speculative ventures. Many who resettled in the area were the Society of Friends (Quakers), and by 1850 had created a thriving community in the Accotink/Woodlawn area. The Quaker congregation is still active in the area today. During this time, the main agricultural effort changed from tobacco to subsistence crop farming. As the demographics changed, a more diverse community evolved and many trades became established. Even traditional farming saw an evolution to mechanized growing techniques. With the social and commercial changes occurring, the economy no longer relied on the massive efforts of slavery. Slaves who weren't sold or relocated to the deeper south were freed, and those who stayed in the area often prospered as hired help at local farms and businesses.

1917-1918: Establishment of Camp A. A. Humphreys

In 1915, the Engineer School began conducting summer training exercises on a government-owned parcel in Virginia, located approximately 15 miles south of Washington along the Potomac River. The federal government had acquired the 1,500-acre tract on the Belvoir peninsula in 1910 from the Otterback family for development of a children's reformatory. However, local community groups and patriotic organizations, such as the Daughters of the American Revolution, opposed the establishment of a reformatory on grounds so closely associated with George Washington and the other "founding fathers" of the country. Therefore, the reformatory never materialized. In 1912, Congress transferred the Otterback property to the War Department, following an Army request to use the land as a training site. This site was chosen by the Engineer School for its adequate water supply and challenging terrain.

America's entry into World War I in April 1917 led to the first wave of military construction at the Virginia training site. Construction of the temporary cantonment, known as Camp A.A. Humphreys, began in January 1918. Through purchase or condemnation, the Army acquired additional acreage during 1917 and 1918. Fourteen farms on the peninsula between Accotink and Pohick Creeks were transformed into target ranges; two large parcels along Dogue Creek were taken through government condemnation proceedings; and a 3,300-acre parcel that today comprises most of the North Post and Davison Army Airfield was purchased by 1918.

Transportation systems and utilities also were improved. Previously, the most direct access to the Belvoir Peninsula had been by boat down the Potomac River from Washington, District of Columbia (D.C.) The unpaved Washington-Richmond Highway (U.S. Route 1) was surfaced with concrete in 1918, and a plank road was constructed that linked the camp to the Washington-Richmond Highway. Standard gauge and narrow gauge railways followed.

To accommodate the 20,000 men anticipated at the camp, plans called for the construction of 790 temporary wood-frame buildings. Within only four months of the start of construction, Camp A.A. Humphreys was in full swing. Several schools operated here during World War I, including the Army Gas School and the School of Military Mining. At war's end in November 1918, the Camp became a demobilization center where troops were prepared for their return to civilian life.

Inter-War Period: 1919-1939

Unlike many other temporary Army installations established during World War I and that closed following the war, Camp A.A. Humphreys remained active and continued to expand. By 1919, the camp had grown from its original 1,500 acres to approximately 6,000 acres. The Army's commitment to the installation was demonstrated by the official relocation of the Engineer School from the Washington Barracks to the Camp in 1919.

Camp A.A. Humphreys was designated a permanent post in 1922 and renamed Fort Humphreys. The new designation acknowledged the Fort as an important installation that served as a prominent teaching facility. Throughout the inter-war years, the Engineer School trained new engineer officers and enlisted soldiers in the technical requirements of their duties. Programs offered included forestry, road and railroad construction, camouflage, mining, surveying, pontoon construction, photography, printing, and cooking.

In 1926, the Army initiated an ambitious, nation-wide building program designed to address growing concerns over the deplorable living conditions reported at the nation's military posts. The program, financed through the sale of 43 military posts, aimed to

replace World War I temporary wooden buildings with permanent structures. During this period, the Army spent approximately \$2.5 million on re-constructing the Fort with permanent facilities. Many of Fort Belvoir's most important buildings were constructed as a result of this nationwide rebuilding program. Most of the temporary wood-frame World War I buildings were demolished; in their place, new permanent masonry construction buildings were erected. At Fort Belvoir, the new buildings included officer and NCO housing, barracks, administrative buildings, and a hospital – all designed in a Colonial Revival style.

The landscape plan adopted for the Post also exemplified Army efforts to improve the quality of life for its personnel and the aesthetic beauty of its posts. George B. Ford, planning adviser to the War Department during the 1920s, encouraged posts to turn away from more formal, traditional planning practices, particularly the use of straight lines and rigid geometric patterns. He advocated creating useful and aesthetically pleasing environments that took advantage of natural vistas and used irregular lines. Quartermaster Corps officer, First Lieutenant Howard B. Nurse, also influenced Army planning at this time. Like Ford, he advocated the integration of natural topography in the design and layout of streets, especially in residential areas. The results of Nurse's and Ford's philosophies are most apparent in the configuration of the Fort Belvoir's historic officers' housing.

The elaborate new layout for Fort Humphreys called for separate functional areas united in a formal plan. Administrative and instructional buildings were arranged along one side of the parade ground, with the barracks, theater, gymnasium, Post Exchange (PX), and post office in two squares on the opposite side of the parade ground. Non-commissioned officer (NCO) housing was arranged in two blocks behind the barracks area, while the officers' housing was placed along a picturesque, curving road in a park-like setting. Warehouses and support buildings were located at the edge of the new Post in this plan. This plan still exists today.



Housing in Belvoir Village - Built in 1934-35

In 1935, the name of the installation was changed from Fort Humphreys to Fort Belvoir. It is said that the name change occurred after President Franklin D. Roosevelt's visit to the neighboring Gunston Hall. Louis Hertle, the owner of Gunston Hall, spoke of the vibrant history of the area, which inspired the President to initiate the new name of the Post.

World War II Period: 1940-1945

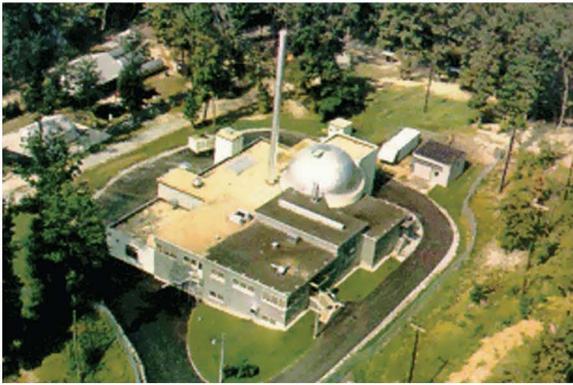
During World War II, Fort Belvoir expanded to accommodate the influx of draftees. After 1940, an additional 3,000 acres north of U.S. Route 1 were acquired to make room for the new Engineer Replacement Training Center (ERTC). At the height of World War II, the ERTC turned out 5,000 trained engineer soldiers per month. The massive influx of inductees at Fort Belvoir prompted another wave of temporary construction at the Post during World War II. Housing was constructed for approximately 24,000 enlisted men and officers. Like the temporary structures built during World War I, the World War II-era, wood-frame buildings were designed to be simple and inexpensive to construct. Unlike the World War I facilities however, these newer structures incorporated such improvements as indoor plumbing, central heating, and electricity.

Post-World War II: 1946 - Present

After World War II, Fort Belvoir served as a training facility and as a Research, Development and Testing site. Perhaps no structure on the Post illustrates more graphically Fort Belvoir's research and development phase than the SM-1 (Stationary, Medium Power, First Prototype) nuclear power plant. This facility was developed to generate electricity for commercial use, and as a prototype of a facility type that could be deployed to areas where use of fossil fuels was logistically difficult. The SM-1 Plant, which represented the first national nuclear training facility for military personnel, became operational in 1957 and remained in operation until its decommissioning in 1973.



The Original Fort Humphrey's Plan Still Exists



SM-1 Plant

The innovative initiatives pursued at Fort Belvoir during the post-war period were also illustrated in its residential architecture. In 1948, the well-known architectural firm of Albert Kahn & Associates designed and oversaw construction of the Thermo-Con House. This full-scale prototype was to exemplify a methodology for low-cost, mass-produced housing. Prospective Army residents, however, rejected the design concept, and no additional structures were built.



Thermo-Con House

Fort Belvoir's mission expanded in other directions between 1950 and 1980, when the Post began playing host to a variety of organizations. These included the DeWitt Hospital, the Defense Systems Management College, and the Defense Mapping School (DMS).

The approximately 800 acres that now constitute the Fort Belvoir North Area (FBNA) were ceded to the United States by Act of the Virginia General Assembly, approved 1 April 1940, and the deed of cession was executed by the Virginia governor on 6 November 1942. This area was first called the Engineer Board (E.B.) Test Area. The Engineer Board, predecessor of the Belvoir Research, Development and Engineering Center, was originally founded in 1870 to develop and test specialized engineering equipment. The Engineer Board moved to Fort Humphreys in 1924.

Over time, the E.B. Test Area came to be called Eebee Field, because it also contained a facility and landing strip for the testing of aircraft. The area served as a test bed for landmine warfare, mobility and counter-mobility operations, and other engineer vehicles and equipment. In July 1950, a board of officers recommended the change of title to the Engineer Proving Ground (EPG). This name remained in effect until 1963 when, through General Orders of the Engineer School and Center, the name again changed to the Fort Belvoir North Area (FBNA). This official name remains in effect.

Due to a shortage of land for training at Fort Belvoir, the Engineer School relocated in 1988 to Fort Leonard Wood in Missouri. Testing and training operations at the FBNA ended. In the early 1990s, a plan to develop the FBNA for large-scale, multi-capability, civilian/military use did not come to fruition. Thereafter, the area fell into disrepair and became overgrown.

Fort Belvoir continues to fulfill an important and valuable role within the Army today. The Post's present mission is to provide essential administrative and basic operations support to its tenant organizations. The 8,500-acre Post is one of the larger installations in the Military District of Washington, which also includes Fort Hamilton, Fort McNair, Fort Myer, Fort Meade, and Fort Ritchie. In 2003 the Post came under the supervision of the Installation Management Command (IMCOM), an organization which is tasked with standardizing and administering garrisons throughout the entire Army.

Today, Fort Belvoir houses tenants from all armed forces, as well as such DoD agencies as the Defense Acquisition University, Defense Logistics Agency, and the National Geospatial-Intelligence College. To carry out this mission effectively, Fort Belvoir has evolved from a traditional military post to a more broadly based community. In many ways, it currently functions like a small city with its own ordinances, land use plan, building codes, utilities, public parks, and academic institutions. This master plan integrates and respects this great history as the Post looks forward to the future.



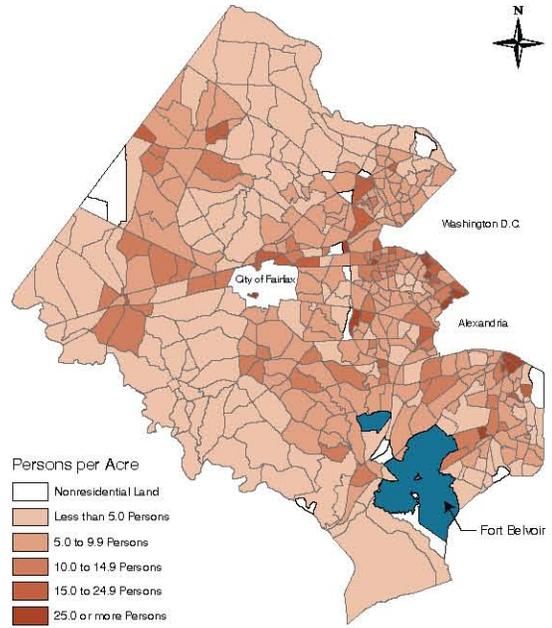
Defense Logistics Agency

Regional Community

Population

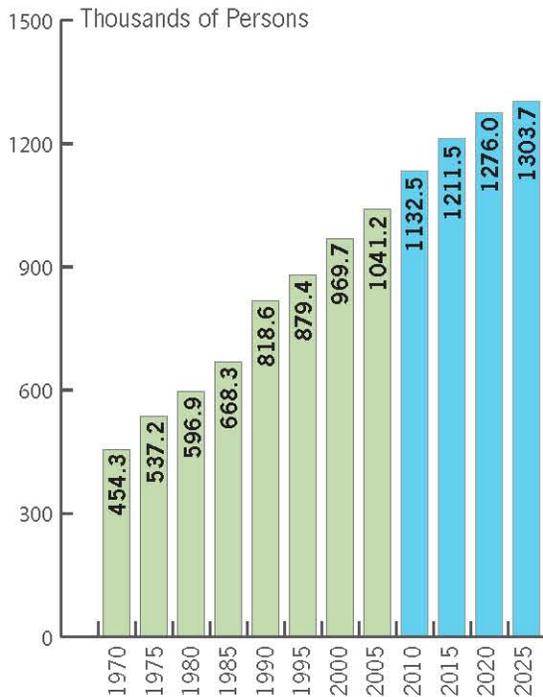
In 1742, the Virginia Assembly created Fairfax County from the northern part of Prince William County. Named after an English nobleman, it originally included Loudoun County, Arlington County, and the cities of Alexandria and Falls Church. At that time, it was then home to approximately 4,000 people. Today, Fairfax County is the most populated jurisdiction in the Washington Metropolitan Area and Virginia. Its two fastest growing segments are seniors (65 years and older) and persons under age 20. By 2025, estimates predict a burgeoning population of 1.2 million people. (See Figure 2.2.)

Denser areas of Fairfax County are located near the City of Alexandria and Washington, D.C. (Figure 2.3). However, much of the new population growth is projected to be closer to Fort Belvoir, along the I-95 corridor, U.S. Route 1, and in the Mason Neck area (Figure 2.4).



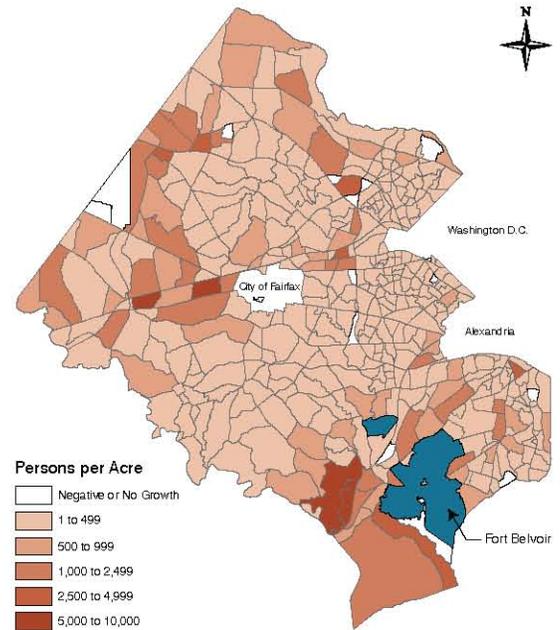
Source: Fairfax County Department of Systems Management for Human Services, January 2005

Figure 2.3 - 2004 Fairfax County Population Density by Subcensus Tract



Source: Fairfax County Department of Systems Management for Human Services (population estimates), Metropolitan Washington (DC) Council of Governments (population projections).

Figure 2.2 - Fairfax County Population Estimates and Projections



Source: Fairfax County Department of Systems Management for Human Services, January 2005

Figure 2.4 - 2004 Fairfax County Forecasted Population Growth by Subcensus Tract for 2025

Economy

Currently, Fairfax County enjoys one of the strongest economies in the United States. Major economic drivers include government and defense technologies as well as a large and growing presence in commercial information technology, financial, software, communications, and technology management service providers.

The proximity to the nation's capital directly impacts the economic condition of Fairfax County. Washington D.C. is one of the most important institutional, commercial and financial centers in the United States and the world. Among foreign investors, it is ranked as the #1 national and #2 international investment market. However, the federal government and tourism are the two major economic drivers generating revenue for the entire region. In addition, every core economic segment – office, retail, residential, education, hospitality/tourism, and media/communications – is experiencing robust new development. As a result, the Gross Regional Product is estimated at \$313 billion.

In the past five years, the Greater Washington economy grew by 19.6% (adjusted for inflation), compared with a national growth rate of 14.5%. In April 2007, the unemployment rate for Fairfax County was 2.9%; the Washington Metropolitan Area, 2.9%; and nationally, 4.5%. In 2004, the unemployment rate in the metropolitan area was about 3.6%.

Major Industries and Employers

Greater Washington Area has been recognized as a “hub for business, science and technological innovation, and is the prime location for firms seeking to provide goods and services to the federal government.”

(Source: http://www.greaterwashington.org/regional/market_position/index.htm)

The presence of major government agencies – DoD, National Institutes of Health, and the Food and Drug Administration to name a few – promote area business development in terms of federal contractors, non-profit organizations, law firms, lobbying firms, caterers, administrative services, and consulting companies. This presence also attracts defense contractors, including General Dynamics, Computer Sciences Corporation, Science Applications International Corporation, and Lockheed Martin. Thirty-one Fortune 500 companies are headquartered in Fairfax County. Seven of these are considered some of the largest corporations in the United States: General Dynamics (Falls Church), Sprint Nextel Communications (Reston), Capital One Financial (McLean), Gannett Corporation (McLean), Sallie Mae (Reston), Freddie Mac (McLean), and NVR (McLean). In addition, there are 358 foreign-owned firms in Fairfax County. (Source: <http://www.fairfaxcountyeda.org>)

Another major industry within the greater Washington area is communications media, with America Online, MCI Communications, XM Satellite Radio, Public Broadcasting Service, and Discovery Communications as leading employers.

(Source: <http://www.greaterwashington.org/business/companies/index.htm>)

By annual revenue, many of the largest employers in the Washington Metropolitan Area include companies that are based in Fairfax County.

Local Real Estate Market

The Richmond Highway, Springfield/Franconia, and Newington/Lorton sub-markets are flourishing as demand for commercial space spreads southward from the Arlington/Alexandria area. (For the mid-year 2005 office statistics see Table 2.1.)

	Office Inventory	Direct Vacancy	Gross*	Absorption**	Under Construction
Richmond Highway	1,038,644	13.60%	36,851	141,229	0
Springfield/Franconia	3,928,143	5.14%	115,478	201,727	326,485
Newington/Lorton	508,206	3.52%	8,210	17,864	43,103
Total	5,474,993	22.26%	160,539	360,820	369,588

* Gross is the amount of vacant space leased in a given time

**Absorption is the amount of space the market can absorb without causing market saturation and price distortions

There are some notable developments currently under construction or are in the planning stages near Fort Belvoir (Figure 2.5).

- 1 Metro Park includes six office buildings – five of which are complete, four of which are leased, and one of which is being marketed to large tenants.
- 2 Kingstone Center is a four-building, mixed-use development with a 2.0 million SF capacity for office space, along with 6,300 residences and associated retail.
- 3 Franconia Two, LP (aka Vornado) has plans to redevelop the Springfield Mall complex and add a hotel, residential units, and office space. The proposed new development on this 79-acre site located off of I-95 will be referred to as Springfield Town Center. The initial phase of the project, approximately 1.9 million GSF, is primarily retail. The developers are pursuing county approval to develop another phase of 5.8 million GSF including a hotel, residential units and office space.

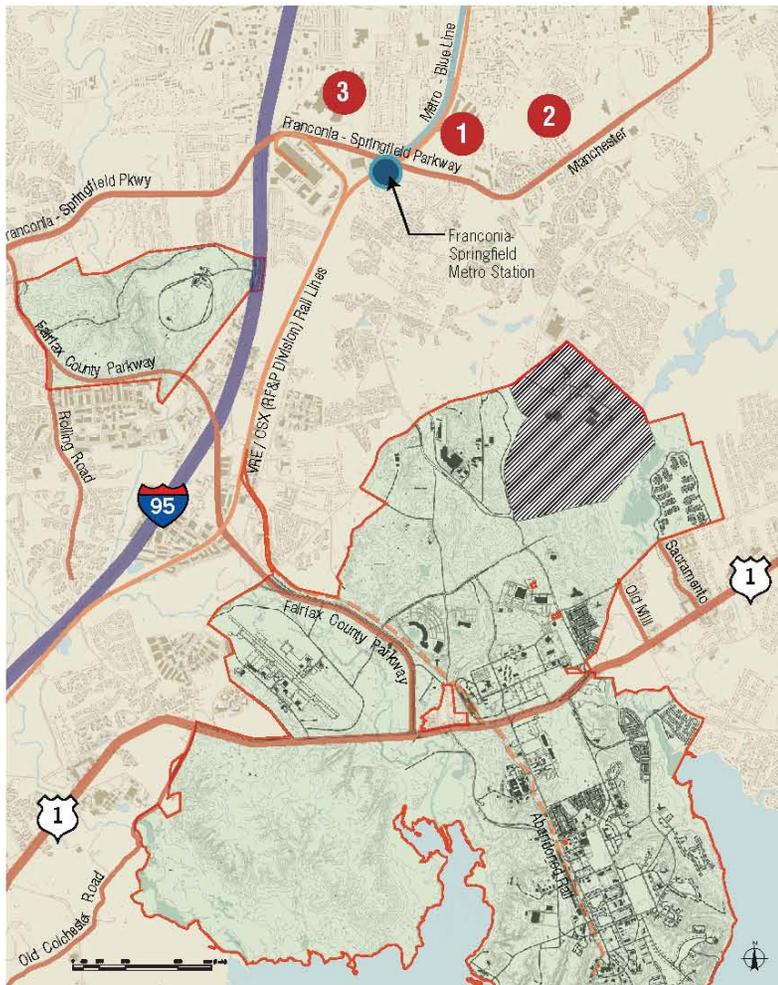


Figure 2.5 - Notable New Developments near Fort Belvoir

These projects fall within the Springfield Revitalization Area (Figure 2.6), which is one of the seven commercial revitalization areas identified by Fairfax County. In these areas, Fairfax County encourages and facilitates the renewal of older commercial and residential areas.

Discussions with the Fairfax Economic Development Authority and several other developers indicate that while these developments will add significant inventory, they will not seriously compete with any development located closer to Fort Belvoir.



Figure 2.6 - Aerial view of Springfield Revitalization District.

Source: http://www.revite.net/springfield/aerial_photo.htm



The proposed Springfield Mall project transforms the mall into a mixed-use development.

(Source: <http://www.divaris.com/rereview/springfield06.html>)

Parks and Recreation Areas

An extensive system of parks and refuges surround Fort Belvoir creating a defined network of green ways (Figure 2.7). These are important resources for natural habitat of plant and animal species.

In February 2004, the Park Authority Board was presented with a 10-year Capital Improvements Plan (CIP) that identified and prioritized near, intermediate and long-term park improvements needed through 2013. The foundation for the plan was a needs assessment process that took the pulse of Fairfax County residents. A few main points from the study are included below:

- The park system is extensively used -- eight of every 10 households visited a Fairfax County park in the year prior to the study.
- County residents devote more than one- million days annually to participation in the 17 activities included on the needs assessment survey. Table 2.2 shows activities with the highest participation rates.
- The parks and recreational needs of the community are extensive -- amounting to \$376 million over the next 10 years for new facilities, renovation of existing parks, and land acquisition and preservation.

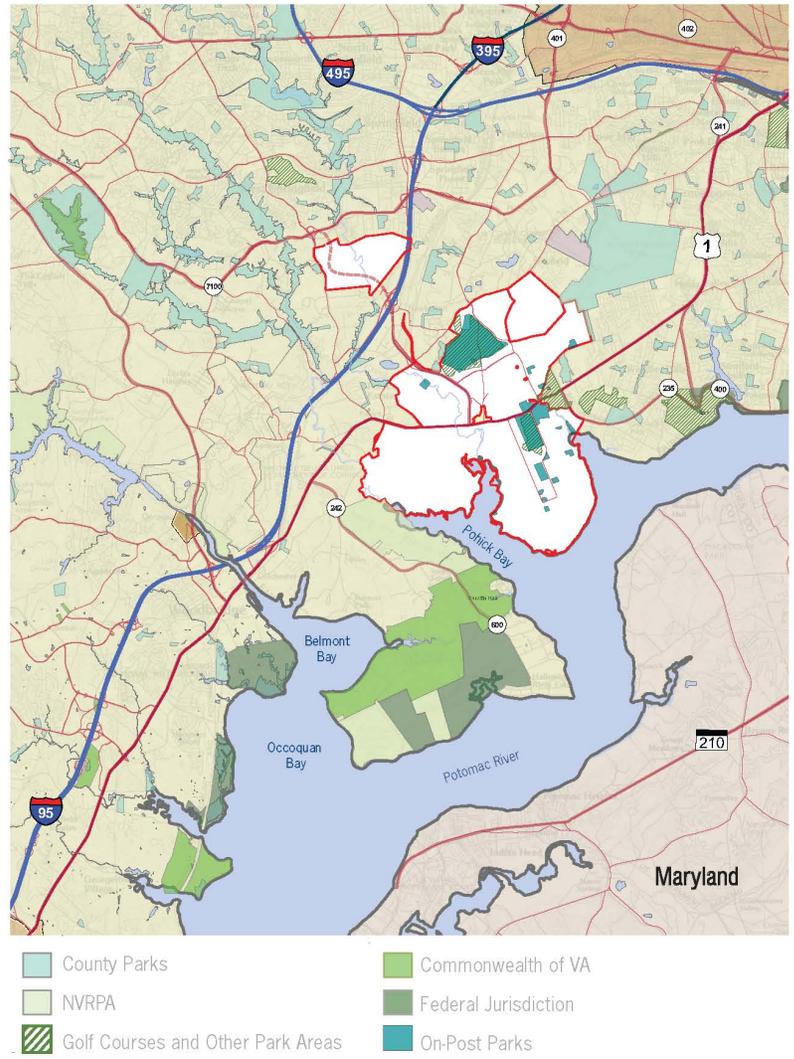
Table 2.2 - Activities with Highest Participation Rates

Activity	Population Participating
Hiking/Walking on Trails	45%
Visiting Historic Sites	38%
Picnicking	36%
Biking Paved Surfaces	33%
Swimming / Recreational	32%
Visiting Nature Centers	29%
Fitness-Cardio Equipment Use	27%
Gardening	27%
Walking / Exercising Dog	26%
Fitness Weight Training	24%
Visit Horticultural Centers	23%
Playing at Playgrounds	22%

Source: Needs Assessment, Fairfax County Park Authority, February 2004

Fort Belvoir contributes to the park and green way system with its many preservation areas and wildlife refuges. Future development should adhere to preserving and enhancing natural resources on the post as they are strongly interconnected with the regional habitat and park system.

Figure 2.7 - Sub-Regional Parks Map



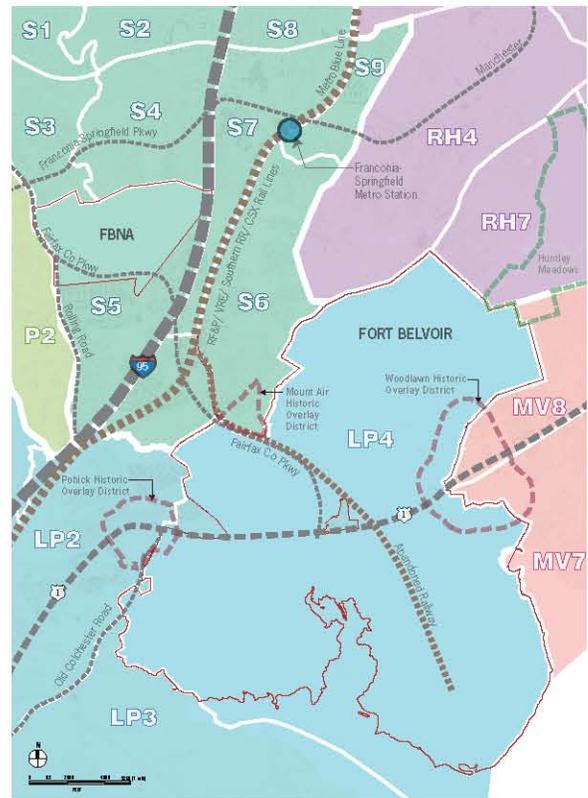
Regional Comprehensive Plans

Fairfax County Comprehensive Plan

This section summarizes parts from the *Fairfax County Comprehensive Plan, 2007 Edition*, that impact Fort Belvoir. Fairfax County regional planning guidance is available in the 2003 Fairfax County Comprehensive Plan, 2007 Edition. The Plan provides regional goals and guidance for achieving a balance between environmental protection and orderly development and redevelopment.

Fairfax County is subdivided into planning districts, as illustrated in Figure 2.8. Most of Fort Belvoir falls within the Lower Potomac (LP) Planning District. Fort Belvoir North Area (FBNA) falls within the Springfield Planning District (S). Planning districts are then further subdivided into community planning sectors. The Fort Belvoir Community Planning Sector (LP4) is largely comprised of the Main Post. Despite FBNA being within the Belvoir Community Planning Sector (S5) (Figure 2.9), all of its recommendations are found in the overlay Planning Area known as Franconia-Springfield Area Suburban Center (Figure 2.8).

Figure 2.9 - Planning Districts and Sectors Adjacent to Fort Belvoir



- Springfield Planning District
- Lower Potomac Planning District
- Rose Hill Planning District
- Mount Vernon Planning District
- Pohick Planning District

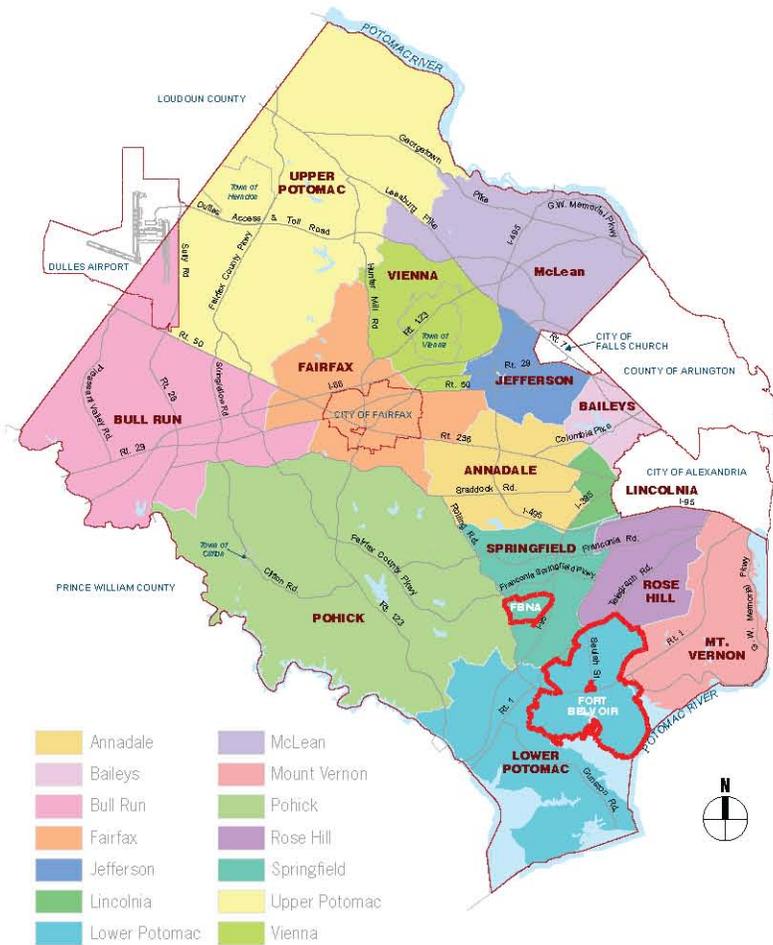


Figure 2.8 - Fairfax County Planning Districts

The Lower Potomac Planning District

The Lower Potomac Planning District consists of moderate-density residential areas and commercial uses along U.S. Route 1. Beyond this are low density residential areas almost rural in character. Regional access is via three major transportation corridors – Interstate 95 (I-95), U.S. Route 1, and the Richmond, Fredricksburg, & Potomac Railroad (RF&P).

Population in the Lower Potomac planning district decreased between 1970 and 1980. Since that time, it has increased steadily, due to the construction of new housing in the Lorton-South Route 1 area and the redevelopment that has occurred near the former prison and Lorton Station.

As stated in the *Fairfax County Comprehensive Plan, 2007 Edition, Lower Potomac Planning District, Amended through 12-4-2006*, the planning objectives in the Lower Potomac Planning District include the following:

- Create a focal point of development or “Town Center”, which includes retail businesses, office uses, cultural facilities and community services and establishes a strong “sense of place” and positive image for the Lorton-South Route 1 area.
- Preserve stable residential areas through infill development of a character and intensity or density that is compatible with existing residential uses.
- Limit commercial encroachment into residential neighborhoods and establish a clearly defined “edge” between commercial and residential areas.
- Encourage pedestrian access to retail and mixed-use areas.
- Encourage the creation of additional parks, open space and recreation areas and acquisition of additional acreage in environmentally sensitive areas, as part of the Environmental Quality Corridor program.
- Preserve significant heritage resources.
- Provide adequate buffering and screening, and appropriate transitional land uses between residential areas and non-residential uses.

Lorton-South Route 1 Community Planning Sector (LP2). This planning sector is adjacent to the western border of Fort Belvoir. The area consists of several land use types, ranging from low density residential to heavy industrial. Gunston Plaza and other retail activities are found along U.S. Route 1. Industrial activities occur along the rail line at Lockport Place, located along U.S. Route 1 south of Gunston and Gunston Cove Roads.

Mason Neck Planning Sector (LP-3). The Mason Neck Planning Sector is a low density residential area with parkland and open space, located on the southwest boundary of Fort Belvoir. Housing types include townhouses, garden apartments and single-family detached homes.



Mason Neck West Park

Fort Belvoir Community Planning Sector (LP4). The Fort Belvoir Community Planning Sector includes Fort Belvoir and the Village of Accotink. Fort Belvoir is one of the largest employers in Fairfax County and is a major traffic generator within the Lower Potomac Planning District. The Village of Accotink includes single-family homes, garden apartments, as well as commercial and institutional uses. This planning sector contains numerous locally and nationally significant heritage resources. Major resources are maintained through the use of Historic Overlay Districts. Fort Belvoir abuts three Historic Overlay Districts (shown in Figure 2.9): Pohick Church, Mount Air, and Woodlawn. These districts exist to protect heritage resources. Within this planning sector, Fort Belvoir Elementary School, located on North Post, is on land leased to the Fairfax County School Board under a special agreement between Fort Belvoir and the County School Board. Nearby is the Main Post chapel, post exchange, commissary, gas station, and other retail and recreational facilities that support the Fort Belvoir community. Mutual aid agreements between the Post and Fairfax County provide for back-up police and fire support in times of emergency.

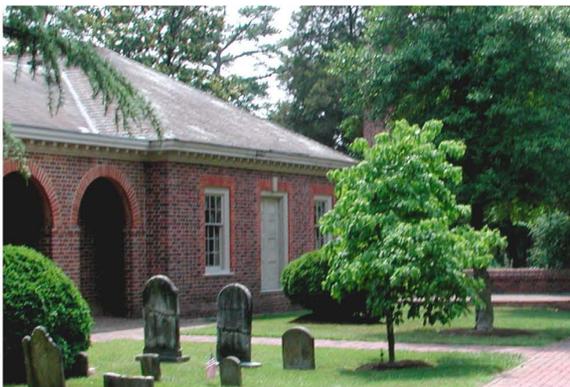
The *Fairfax County Comprehensive Plan, 2007 Edition, Lower Potomac Planning District, Amended through 12-4-2006*, lists several concepts for future development in Sector LP4 (Fort Belvoir). Key future development (LP4) concepts include:

- Proposed development or redevelopment on Fort Belvoir should be consistent with county goals and the Comprehensive Plan.
- Form a task force to comprehensively plan future uses and protect natural/cultural assets in the event of excess land.
- Consideration should be given to construction of well-designed, on-post housing for military families that is buffered and not sited along U.S. Route 1 frontage, to reduce competition for affordable housing in the county.



U.S. Route 1

- Develop elderly housing, a nursing care facility, and low-rise office buildings on a 107-acre parcel located west of Davison Army Airfield (DAA) and north of U.S. Route 1 with a substantial buffer utilizing existing tree cover along Richmond Highway and Telegraph Road.
- Maintain the current use and densities of the non-military area known as the Village of Accotink as guided in the Fairfax County Comprehensive Plan.
- Incorporate the access orientation, circulation plans, interchange impact areas and generalized locations of proposed transit facilities that are found in the recently updated 2006 Transportation Plan map.
- The remains of the Belvoir site, located in the southern region of Fort Belvoir near the Potomac River, reflects local heritage and should be protected.
- Protection of the historic resources that abut Fort Belvoir (the Pohick Church, Mount Air and Woodlawn Historic Districts) should be considered in redevelopment of the Fort Belvoir property.



Pohick Church

- Ensure protection of the Environmental Quality Corridor (EQC) and public access to Stream Valley parks through acquisition and/or donation/dedication of land or open space easements to the Fairfax County Park Authority.
- Complete development of countywide Stream Valley Trail.
- Protect the Accotink Bay shore line by developing the former float bridge training area as the Tompkins Basin National Capital Region Recreation Area.
- Develop the Fort Belvoir trail system in concert with the Fairfax County trail system.
- Develop urban design guidelines and objectives along U.S. Route 1 that include the following: establishing visual continuity along right-of-way and highway edges; providing user orientation within the corridor; establishing a clear corridor image; improving access and functional amenities for both pedestrian and vehicular traffic; and reducing impact on adjacent residential communities such as glare, noise, and incompatible building forms.

The Springfield Planning District

The Springfield Planning District contains several major transportation corridors including I-95, the Capital Beltway, the Franconia-Springfield Parkway, the Fairfax County Parkway, and the Norfolk Southern Railroad and CSX Transportation Railroad lines. The Blue Line of the Metrorail subway system terminates at the Franconia-Springfield station. VRE, Amtrak and Greyhound Bus also provide service to this station. Consequently, this planning district has large commercial areas, such as the Springfield Community Business Center (CBC) and Springfield Mall, a regional shopping center.

As stated in the *Fairfax County Comprehensive Plan, 2007 Edition, Springfield Planning District, Amended through 9-11-2006*, the primary development objectives in this planning district include:

- Encourage revitalization and redevelopment of the Springfield Community Business Center to create a more attractive, commercially viable, and functionally efficient business center and community focal point.
- Develop the Franconia-Springfield Transit Station Area given existing access and environmental constraints.
- Ensure that any future development of the FBNA does not result in adverse impacts on surrounding neighborhoods and transportation service.
- Establish land use and urban patterns in the Springfield Area that support mass transit and ridership.
- In the Springfield Area, incorporate and give priority to mass transit in the design of all major public and private projects.

- Develop trails and mass transit resources to provide access to the Van Dorn Metrorail Station and the Joseph Alexander Transportation Center.
- Improve circulation in and around the community by the management of existing transportation facilities and by promoting alternatives to single-occupant vehicle use.
- Protect stable residential neighborhoods from any adverse impacts associated with adjacent non-residential development.
- Protect wetlands and EQCs.
- Provide opportunities for affordable housing near mass transit facilities and transportation corridors in the vicinity of the Springfield CBC, the I-95 Corridor Industrial Area, the Franconia-Springfield Transit Station Area, and the FBNA, for persons with low and moderate incomes.

Franconia-Springfield Area Suburban Center Planning Area.

The overlay Planning Area known as Franconia-Springfield Area Suburban Center is centrally located in the Springfield Planning District, extending along I-95 from Commerce Street to the Newington interchange. It contains FBNA, along with the two established employment and retail centers – Franconia-Springfield Transit Station Area and Springfield CBC (Figure 2.10). described here:

- *Franconia-Springfield Transit Station Area.* The Franconia-Springfield Transit Station Area is located east of I-95 and south of Franconia Road. It includes Metrorail, Virginia Rail Express, Amtrak, commuter parking and bus service, both local and inter-city. It also includes Springfield Mall, one of the county's largest shopping centers. The Concept for Future Development identifies this as a Transit Station Area where mixed-use, transit-oriented development is encouraged.
- *Springfield Community Business Center (CBC).* The Springfield CBC is located west of I-95 and north and south of Old Keene Mill Road. It offers a variety of community-serving retail goods and services, housing, and the potential for additional mixed-use development. The CBC is envisioned as the future town center of the Franconia-Springfield Area.
- *Fort Belvoir North Area (FBNA).* This section summarizes parts from the Fairfax County Comprehensive Plan, 2007 Edition, that impact FBNA. FBNA is roughly an 800-acre military reservation located between I-95 and Rolling Road, south of Hooes Road. It is important to ensure that potential development of this property supports overall county goals and policies. This would expand the future employment and housing opportunities in the Franconia-Springfield Area.

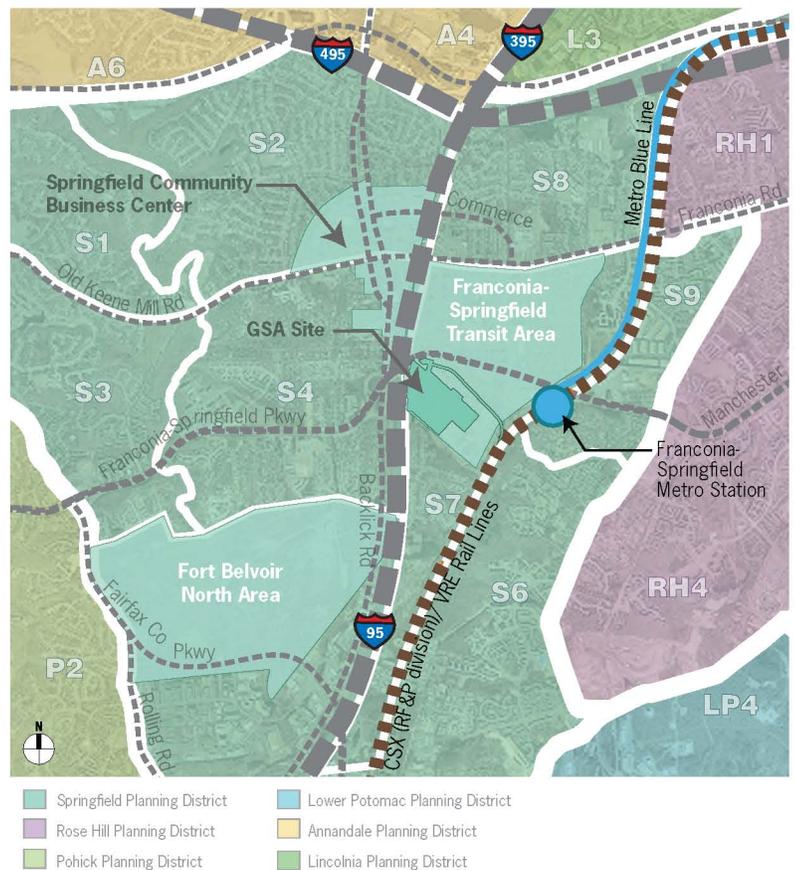


Capital Beltway



Springfield Community Business Center

Figure 2.10 - Franconia-Springfield Area Suburban Center



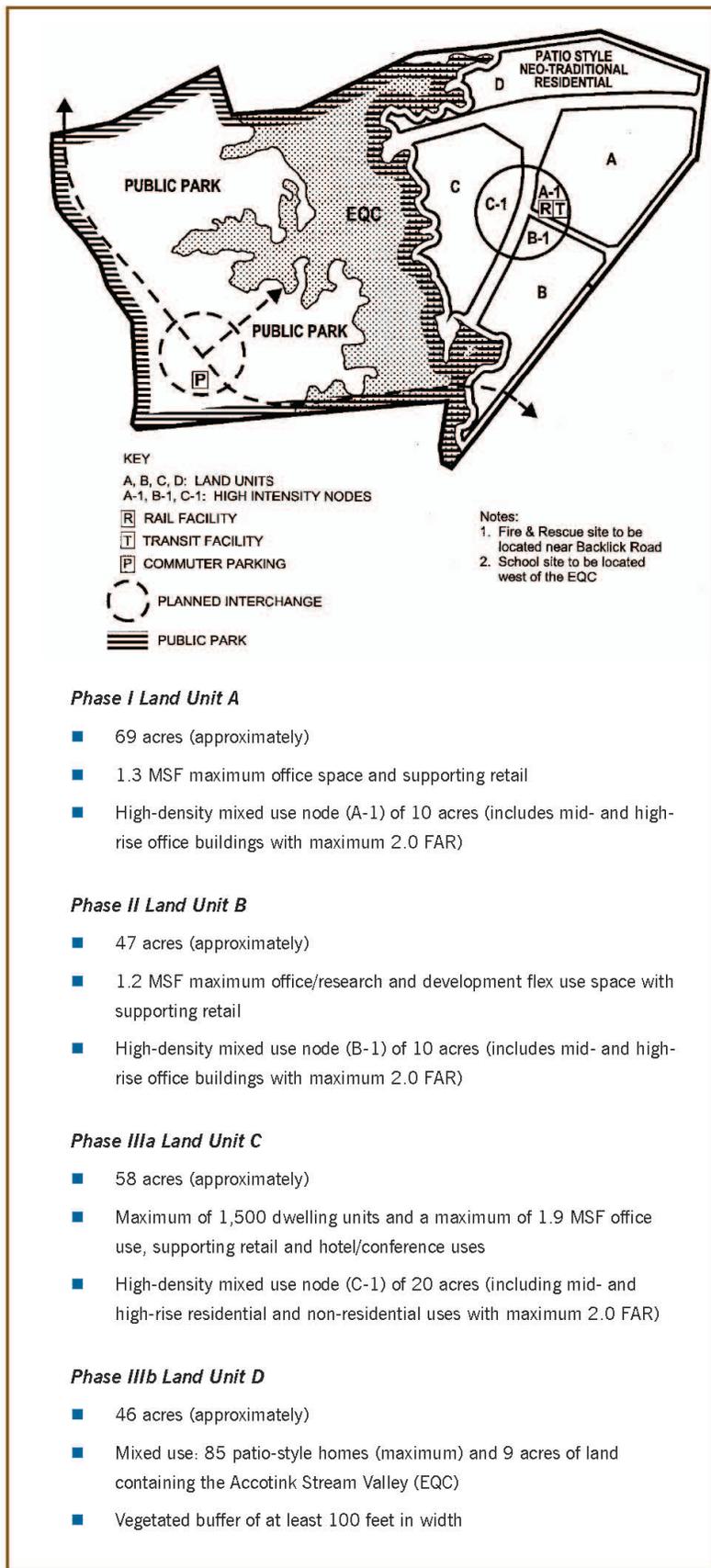


Figure 2.11 - Conceptual Development for FBNA as presented in the Fairfax County Comprehensive Plan

As stated in the *Fairfax County Comprehensive Plan, 2007 Edition, Franconia-Springfield Area, Amended through 9-11-2006*, the Major Planning Objectives for the Mixed-Use Development Concept at FBNA include:

- Provide an opportunity for employment and housing, while ensuring that development is adequately supported by transportation and public facilities improvements to offset any potentially negative impacts.
- Provide sites for a school, as well as a fire and rescue facility to serve the FBNA and surrounding community.
- Satisfy the demonstrated recreation needs deficiency in this portion of the county by acquiring parkland at the FBNA site and developing a complex of active recreation uses.
- Create development that incorporates high-quality architecture and landscape design and clusters development within nodes to encourage transit use and enhance open space.
- Provide transitions to residential neighborhoods to the north and west, and within the development from mixed-use nodes to surrounding lower density areas by tapering building heights, and incorporating effective buffering and screening.
- Provide an opportunity for the Springfield Community Business Center to expand its market potential by providing goods and services to the residents and employees of FBNA.
- Create a user-friendly pedestrian, non-motorized vehicle network of sidewalks and trails that provide ready access to employment, housing, parks and transit facilities.
- Achieve and maintain acceptable levels of roadway performance through a variety of mechanisms including roadway and/or transit improvements and implementation of an aggressive Transportation Demand Program to reduce single occupancy vehicle usage.
- Preserve the Accotink Stream Valley, the Environmental Quality Corridor, and other natural features, such as environmentally sensitive land and heritage resources, and provide a trail system linking the Stream Valley to the countywide and regional trails network.
- Develop a regional stormwater management plan in coordination with Fairfax County, to alleviate the adverse effects of development on stream water quality and quantity.

Figure 2.11 depicts the Development Concept for FBNA as portrayed in the *Fairfax County Comprehensive Plan, 2003 Edition (Amended through 5-23-2005)*. See later sections in this Master Plan for Army proposed developments of FBNA.

Adjacent Planning District: Mount Vernon

The Mount Vernon Planning District places commercial use along the U.S. Route 1 corridor. Most are retail shopping centers and strip commercial developments. Shopping centers are set back from the road with large parking areas fronting U.S. Route 1. The closest development to Fort Belvoir is the Woodlawn CBC, located on U.S. Route 1. It consists of three shopping centers to the west and several strip commercial developments to the east. Dogue Creek crosses U.S. Route 1 in this area.

In sharp contrast, the eastern border of this planning district is characterized by scenic parkland and riverfront. Historic, low density residential neighborhoods border Fort Belvoir in this area. Historic sites include Mount Vernon, George Washington's Grist Mill, Woodlawn Plantation, the Pope-Leighey House, Wellington, Sherwood Farm, and Gum Springs. The County's vision for this district is to achieve a balance between transportation, residential, and commercial growth, while capitalizing on its natural and cultural assets and economic potential along the U.S. Route 1 corridor. This would include substantial open space, recreation areas, and a pedestrian circulation network. The Dogue Creek floodplain would remain in its natural state.

Adjacent Planning District: Pohick

The Pohick Planning District is located in southwest Fairfax County, which is west of Springfield and northwest of the Lower Potomac planning districts. The district is suburban in character, comprised mostly of residential neighborhoods with supporting commercial and institutional uses.

The Fairfax County Parkway (Route 7100) bisects the planning district and serves as the major road through Pohick, with inter-county access to the north and south. VRE carries passengers between Manassas and Washington, D.C., via Alexandria. VRE operates along the Southern Railroad line, with commuter rail stations located in Burke Centre at Roberts Parkway, Burke Road (west of Rolling Road), and Backlick Road. One additional station may be added to serve the Fairfax Station-Clifton area.

An area in the western portion of the district is within the Occoquan Reservoir watershed. The Occoquan Reservoir is a major source of drinking water for the surrounding jurisdictions. It also provides recreation for the public and a habitat for wildlife. To preserve water quality, the western area of the planning district has been developed primarily with low density development, especially within the watershed area. The Comprehensive Plan maintains this planning strategy as a land use Best Management Practice (BMP) to work in conjunction with stormwater management facilities to preserve water quality.

Adjacent Planning District: Rose Hill

The Rose Hill Planning District is substantially developed with stable residential neighborhoods characterized by mostly single-family, detached homes at a density of two to four dwelling units per acre. The Kingstowne residential development includes a CBC and a variety of housing types at an overall density of three to four dwelling units per acre. This town center is a major employment center with a significant amount of office space. A transit station area is located near the South Van Dorn Street/I-95 interchange. Most of the planning district is recommended for development as Suburban Neighborhoods. This will protect existing stable neighborhoods, strive for a mix of housing types, and support commercial and institutional uses. A large part of the planning district is public parkland, including Huntley Meadows, which is to be preserved and managed.



U.S. Route 1



Woodlawn Plantation



Kingstowne

Relevant Regional Planning Studies

Urban Land Institute (ULI) Study of the Richmond Highway Corridor

The Richmond Highway Corridor, located in the southeast area of Fairfax County, is one of seven commercial revitalization districts (CRDs) as defined by the Fairfax County Comprehensive Plan and Zoning Ordinance. The corridor is approximately 7.5 miles long, starting at the capital beltway and ending at the north boundary of Fort Belvoir (Figure 2.12). Typically, this corridor serves the commercial, business, and community sectors.

Development sponsored a “Technical Assistance Panel Report” entitled “Revitalizing the Richmond Highway Corridor to Attract Office Development,” which was completed by the Urban Land Institute (ULI) Washington, in October 2005. The intent of this study was to develop strategies that would revitalize the corridor and determine if the corridor had the potential to be further developed as a commercial office market. The following redevelopment issues served as the basis for the study:

- The planned increase of employees at Fort Belvoir and FBNA in the next six years will attract an influx of defense contractors, resulting in a demand for office development within the vicinity of the post.
- There is competition for office developers to find appropriate sites due to increased land values from the recent residential development along the corridor.
- There is not much recent office development and existing office uses are typically small.
- There is a lack of Class A office space. (Class A office space is defined as having excellent location and access, able to attract high quality tenants, and are professionally managed.)
- Planned professional office space utilized for BRAC related functions would require specific stand-off requirements for tenant security compliance. These requirements pose a problem for development along the corridor because of the narrow lot sizes that are currently designated.

The core strategy developed by the ULI was to “embrace and direct residential development growth along the corridor to encourage complementary office and retail development.” To achieve these goals of a revitalized Richmond Highway Corridor, the study determined development should be focused on community business centers (CBCs) and creating activity nodes, as well as improving the transportation system. General recommendations included:

- Make the corridor’s redevelopment a priority.
- There must be active involvement in the redevelopment process.
- Increase allowable densities.
- Redirect relevant programs to the corridor.
- Make funding available

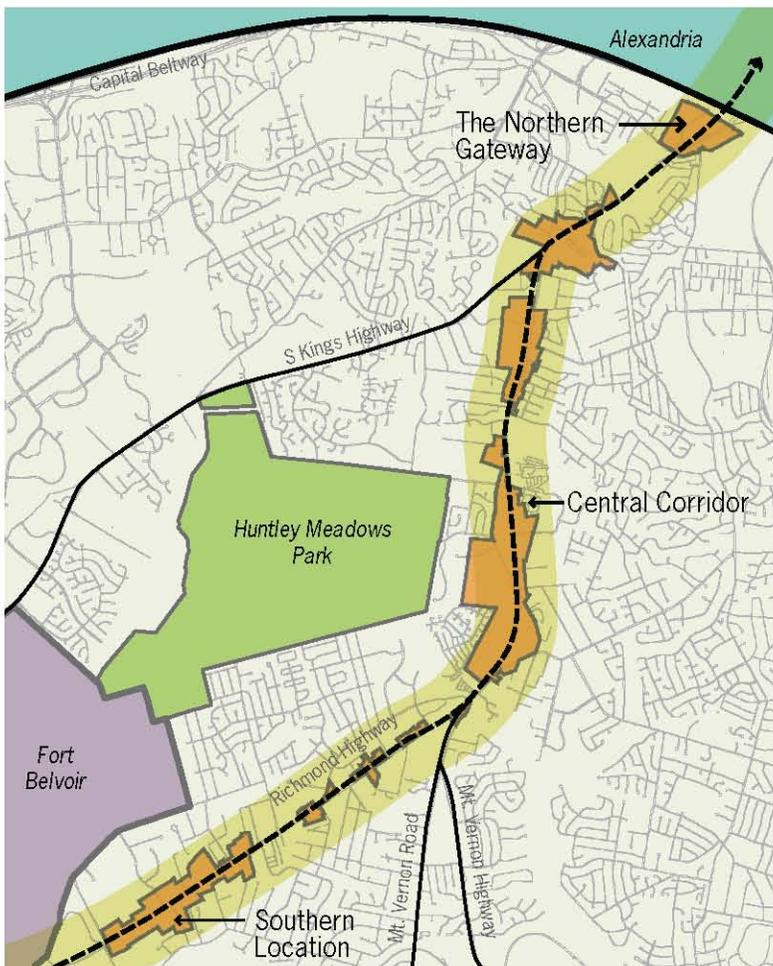


Figure 2.12 - ULI Richmond Highway Corridor Study Area

Springfield is a fragmented community, which is faced with many debilitating issues that include: freeway-oriented development, incomplete circulation, no boundaries, lack of architectural and spatial hierarchy, absence of civic places, and no historic identity. The area is characterized by aging properties, patchwork development, lack of public amenities, paved and hard surfaces, and discordant architectural character. . All this contributes to a perception of decreased market value, poor access, and chronic traffic congestion.

Despite its shortcomings, Springfield is strongly positioned for future growth due to its central location, which is attractive to many redevelopment markets. It has excellent local and regional access, serves as a transit node, is situated within a population growth corridor, and offers a citizenry that supports positive growth (all characteristics in high demand from developers). The ULI study projects a possible net increase of 18-million square-feet of growth. (See Table 2.3.) Major contributors to this growth potential come from the GSA and EPG (FBNA) sites that comprise sizable land holdings able to support large areas of contiguous development. However, these parcels are noted as “wild cards” in the report, as these are held in federal domain not bound by local planning initiatives. In other areas of Springfield, redevelopment will need to include considerable investment toward infrastructure improvements, particularly for roads. See Table 2.4. Specific recommendations include improving local transportation, adding a metro rail extension, adding regional express buses and local mass transit routes, and improving pedestrian and bicycle circulation.

Planning Recommendations. As previously mentioned, the ULI team determined that the Springfield Area did not have a clear identity and recommended focusing on specific development goals for each sub-area (Figure 2.14) to mitigate this specific issue. Some recommendations include:

- NW Quadrant
 - Create mixed-use market district
 - Utilize community green spaces
 - Encourage mixed-use retail/residential
 - Create a town center environment
 - Improve transportation circulation
- SW Quadrant
 - Implement traffic circulation improvements
 - Extend the town center corridor or
 - Create better parcels for commercial development
- NE Quadrant
 - Implement traffic circulation improvements
 - Define boundary markings
 - Integrate landscape and softening
- SE Quadrant
 - Use Vornado development as a catalyst
 - Create civic centers and parks
 - Define boundary marking
 - Integrate landscape and “softening”
 - Create connections to key uses
 - Encourage more community integration
- GSA/ Metro Site
 - Encourage development of residential, community, and/or a medical center
 - Implement traffic improvements, specifically access relationships
 - Explore site expansion
- EPG (FBNA) Site
 - Encourage development of residential, community, and/or a medical center
 - Explore parkway development

Table 2.3 - Net Addition Increase for Springfield

Tenant	Square Footage
NW	1,272,000
SE	4,580,000
GSA	6,000,000*
FBNA	6,113,000
Total	17,965,000

* Mixed-use - office, industrial, commercial retail; FAR 2.0

Table 2.4 - Level of Additional Infrastructure Capacity Required

Area	Need for Extra Capacity
NE	Low
SE	Moderate
NW	High
SW	High
GSA	High
FBNA	High

Source: ULI Study, Springfield, May 2006

To reinvent Springfield, ULI recommends that the area brand an identity that fosters a unique sense of place. To achieve this new image, recommendations include: creating places for people that include both intimate and civic locations for congregating; transforming the landscape with parks and green spaces by reducing the amount of hard surfaces and parking lots; establishing guidelines and controls to govern the design standards for signage, architecture, public amenities, and circulation; and effecting better coordination and guidance under a local governance structure that fosters public participation in the process and engages visionary developers.

A Fairfax County connectivity study is presently underway. The intent of the study is to assess the effects of the BRAC action on the Springfield area, and to evaluate how opportunities for redevelopment outlined in the previously developed ULI report could be implemented.

Prince William 2003 Comprehensive Plan

The Prince William 2003 Comprehensive Plan is currently being updated. The process of an incremental update of the 2003 Comprehensive Plan was approved by the Planning Commission at the Feb. 7, 2007 public hearing. It designated the first three updates as the: Technical Update, Transportation and Mass Transit Update, and Land Use and Housing Update. The date presented within this report is the latest available from the 2003 Comprehensive Plan.

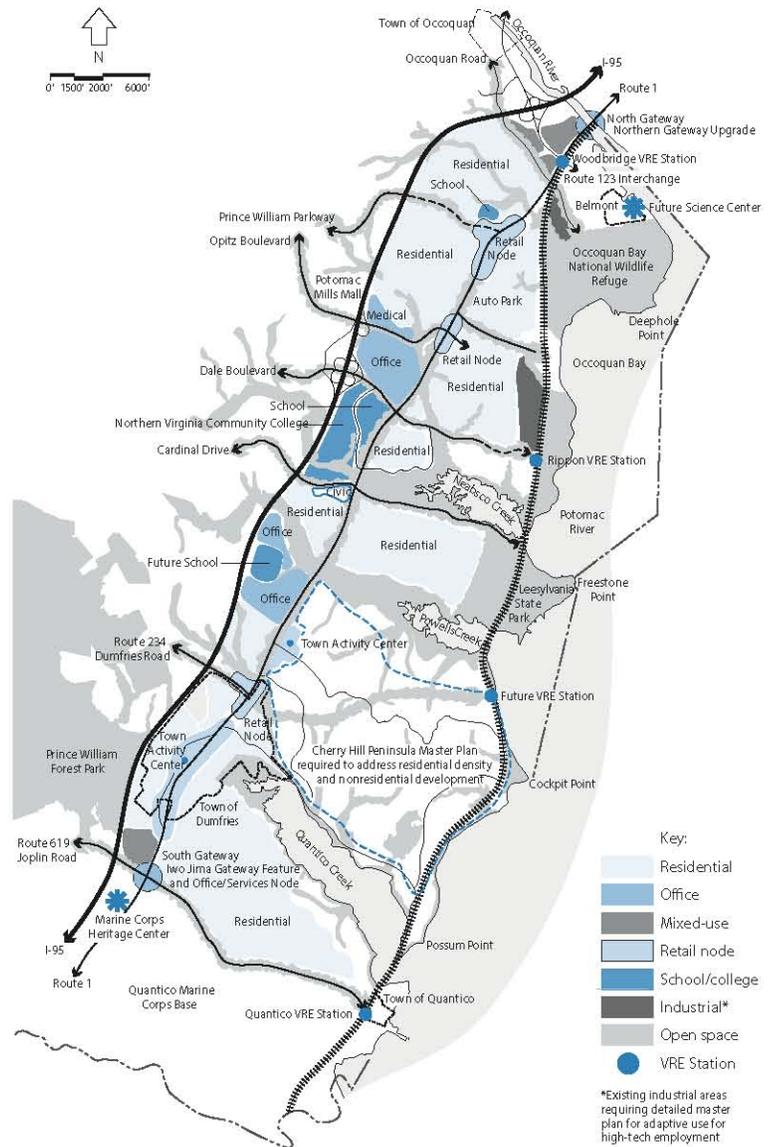
Fort Belvoir is located only eight miles from the northern border of Prince William County. Fort Belvoir's BRAC development actions will affect Prince William County, particularly the U.S. Route 1 and I-95 corridors.

In 2002, Prince William County contracted the Urban Land Institute (ULI) to provide planning recommendations for the U.S. Route 1 corridor. These recommendations, which were fine-tuned and adopted by the County, are significant in light of BRAC 2005. The revitalization of the U.S. Route 1 corridor affects all land between I-95 and the Potomac River, including land within Prince William County from the Occoquan River in the north to Quantico Marine Corps Base. (See Figure 2.15.) Major objectives of this project include:

- Building communities.
- Reversing the job/housing imbalance.
- Creating jobs, as well as providing housing choices and diversity.
- Enhancing the environment.

The North Woodbridge Study Area – the area closest to Fort Belvoir – consists of approximately 200 acres. High density residential, office, and recreational facilities that include mid- and high-rise structures are slowly replacing the blight encountered when exiting I-95 onto U.S. Route 1.

A newly completed marina community is adjacent to the newly renovated Woodbridge VRE Station and existing neighborhoods, located east of U.S. Route 1 and north of Dawson Beach Road. The plan calls for urban residential medium density communities to replace existing commercial structures along the southern side of Occoquan Road. It also intends to retain the area zoned General Commercial on the northwestern corner of U.S. Route 1 and Occoquan Road. The neighborhood commercial area, located at the intersection of Occoquan and Horner Roads, will help blend commercial areas with existing neighborhoods further west of Horner Road.



An Advisory Services Panel Report: Potomac Communities Prince William County, Virginia, Urban Land Institute, 2002.

Figure 2.15 - ULI Recommendations for U.S. Route 1 Corridor in Prince William County



U.S. Route 1 in Prince William County



U.S. Route 1 in Prince William County

The Neabsco Mills Study Area is located immediately south of the North Woodbridge Study Area. Here, the goal is to strengthen commercial nodes and capitalize on numerous civic facilities to integrate commercial and residential areas. This goal can be achieved by creating an urban mixed-use node north of Opitz Boulevard and Reddy Road that includes offices, high density residential, recreation, and retail, but at a lower overall intensity than that planned for the North Woodbridge area. Potomac Center, a 95-acre track proposed for development east of I-95 at Opitz Boulevard (near the Potomac Mills outlet mall), calls for 650,000 SF of retail space, 200,000 SF of office space, and 433 residential units, including loft units above shops and amid trees.

The existing general commercial node south of Opitz Boulevard is to be retained, as will office use located in the northeastern corner of I-95 and Dale Boulevard. In addition, this Office use area is to extend east to U.S. Route 1, and south towards property held by the Northern Virginia Community College (which is expected to expand east to Neabsco Road). The southern end of the study area will continue to be anchored by the Government Center and a neighborhood commercial node between Neabsco and Blackburn Roads. Finally, Urban Residential Medium and Urban Residential High density development is recommended for the mid-section of the Neabsco Mills Study Area east of U.S. Route 1, taking advantage of access to both I-95 and the Rippon VRE Station.

The Triangle Study Area is farthest south, reaching Quantico Marine Corps Base. The widening of U.S. Route 1 in this area, from four to six lanes of traffic with a center median wide enough to include a future transit corridor (bus rapid transit or light/heavy rail), leaves little land for redevelopment. Office development is being encouraged immediately south of the Town of Dumfries along both sides of U.S. Route 1 and on the west side of U.S. Route 1 south of Anderson Road. Areas zoned as urban residential medium density are planned along I-95 south of Dumfries, as well as west of U.S. Route 1 south of C Street and in the area north and south of Brady's Hill Road. Areas zoned as urban residential low density are planned west of U.S. Route 1 between Inn Street and Creek Road. Village Mixed Use is planned south of C Street. Neighborhood commercial is planned along Inn Street and the proposed extension of Anderson Road.

Fort Belvoir: The Site

Fort Belvoir stretches north and west from the banks of the Potomac River. Fort Belvoir - Main Post and FBNA - consists of approximately 8,500 acres of land. Humphreys Engineer Center (HEC) is not included in this study. U.S. Route 1 traverses the Post, dividing it between North Post and South Post. (Figure 2.16)



Figure 2.16 - Fort Belvoir: Main Post and Fort Belvoir North Area (FBNA)

The installation is further divided into eight sub-areas (Figure 2.17). The following is a discussion of the functions and characteristics of each of these areas. The population numbers identified within each area are estimates based on available information and discussions with Fort Belvoir Directorate of Public Works (DPW).

South Post is an approximately 2,550-acre peninsula located south of U.S. Route 1. Access is via Tulley Gate and Pence Gate from this route, and via Walker Gate from the Mount Vernon Parkway. South Post was the first functional area to be used and developed by the Army. It houses the majority of development on Post, which includes clusters devoted to Post administration and support, medical services, education, family housing, research and development, and community/recreational facilities. South Post has approximately 11,000 employees and 6,200 residents.

South Post Core represents approximately 100 acres of the total South Post acreage. It is the focal point and center of the Fort Belvoir Historic District. It contains the installation's principal administrative/educational buildings, a main parade ground, and officers/non-commissioned officers housing areas.

Lower North Post is comprised of approximately 320 acres along the northern edge of U.S. Route 1, and is accessible via South Post or Upper North Post. Additional direct access from this route can be provided via Woodlawn Gate and Lieber Gate, but both are currently closed. The development density and character on Lower North Post is similar to South Post, but these functional areas are only connected by Gunston Road. Lower North Post contains unaccompanied enlisted housing (McRee Barracks), family housing (Lewis Village), classrooms, and reserve training activities. It houses about 850 employees and 760 residents.

Upper North Post is approximately 1,930 acres located to the east of Fairfax County Parkway, between U.S. Route 1 and Interstate 95. It is accessed by the Kingman Gate on Kingman Road and by Telegraph Gate on Telegraph Road. Major tenant organizations in this functional area include: the Defense Logistics Agency (DLA), Defense Threat Reduction Agency (DTRA), Defense Communications Electronics Evaluation Testing Agency (DCEETA), and the U.S. Army Intelligence and Security Command (INSCOM). It also houses the Fort Belvoir North Post Golf Course, Post support facilities, Fort Belvoir Elementary School, as well as the community center comprised of the Post Exchange, Commissary, class VI store, convenience store, gas station, bank, and Main Post chapel. There are about 9,000 employees in this area. Woodlawn Village is a discrete residential area that is part of Upper North Post. It has its own gate and houses about 1,500 residents.

Southwest Area is roughly a 2,100-acre tract of land located to the south of U.S. Route 1 and west of South Post. Two unmanned gates allow access to this area. It encompasses most of the 1,400-acre Accotink Bay Wildlife Refuge (ABWR), as well as undeveloped wooded areas with closed and operational ranges for engineer/troop training.

Davison Army Airfield (DAA) is an 800-acre area located west of Fairfax County Parkway and between U.S. Route 1 and Interstate 95. It is accessed by Farrar Gate from the Parkway. DAA provides training and support facilities for fixed/rotary wing aircraft and houses the U.S. Army Operational Support Airlift Command (OSA COM). About 875 employees work in this area.

Fort Belvoir North Area (FBNA) is an approximately 800-acre area located about two miles northwest of the Main Post to the west of Interstate 95. It is remote from the Main Post, and accessible via an unmanned gate on Backlick Road. The gate on the western edge is currently closed. FBNA was formerly a testing area. Operations ceased when the Engineer Training Center relocated to Fort Leonard Wood, Missouri.

Humphreys Engineer Center (HEC) is an independent, 600-acre Post adjacent to Fort Belvoir. Although a separate entity with its own master plan, the two Posts collaborate as a result of an inter-Post agreement. There are about 1,200 employees in this area. This parcel is not included in this study.

Figure 2.17 - Fort Belvoir Functional Areas

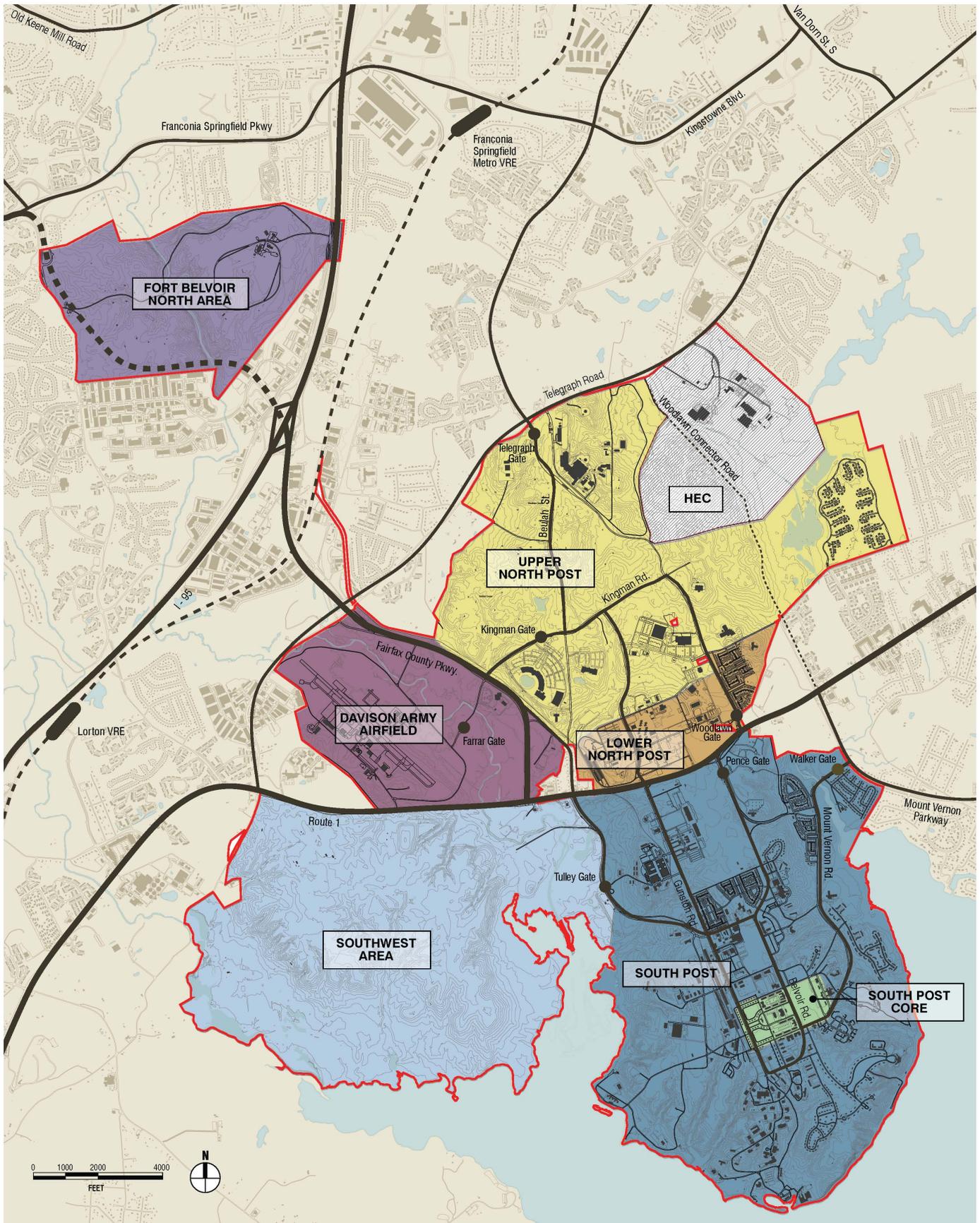
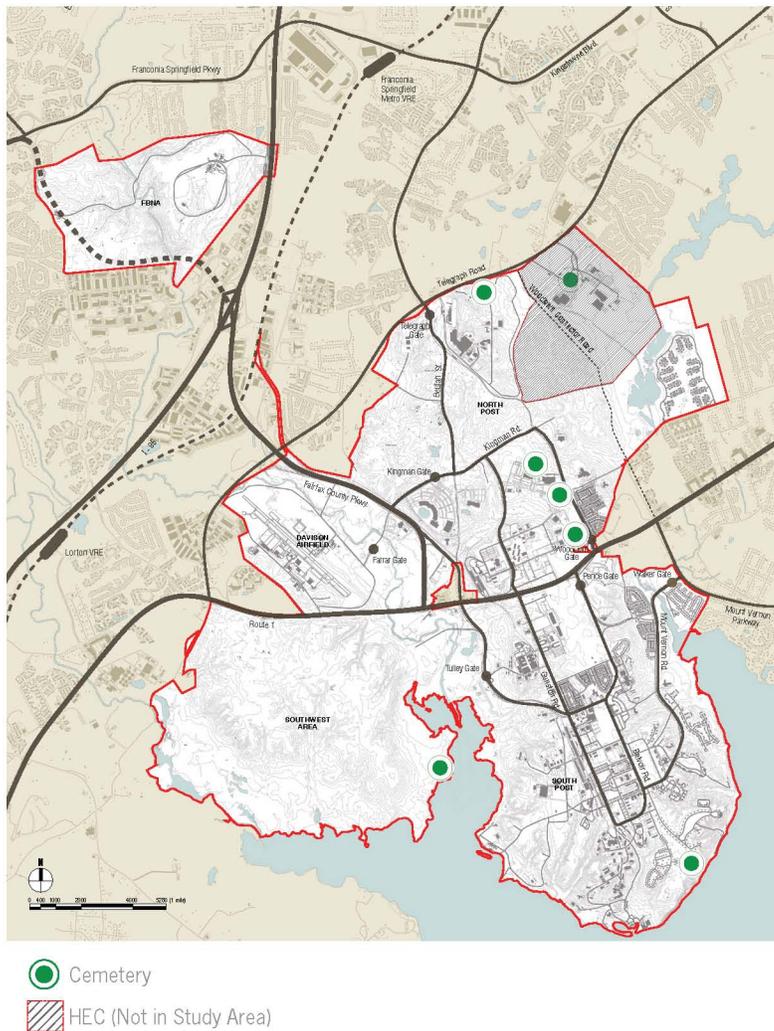


Figure 2.18 - Cemetery Locations on Fort Belvoir



Land Leases, Easements, and Outparcels

Fort Belvoir has 121 outgrants, comprising 600 acres, to accommodate various tenant activities and non-DoD organizations located at the Post. Outgrants include:

- Utility easements for power transmission lines, natural gas pipelines, communications lines, water, and sewage
- Road rights-of-way held by Virginia Department of Transportation (VDOT) along Backlick Road, Telegraph Road, Woodlawn Road, Beulah Street, U.S. Route 1, and the Fairfax County Parkway (Virginia Route 7100)
- Fort Belvoir Elementary School, built on land leased to the Fairfax County School Board by the Federal Government
- Eleanor U. Kennedy Shelter is located on Fort Belvoir property, housed in a historic building that was renovated in 1986 for use as a shelter, and is leased to Fairfax County. New Hope Housing operates the shelter under contract with the Department of Family Services. Many command units at Fort Belvoir continue to provide equipment, supplies, and volunteer services in support of the Kennedy Shelter.

In addition, approximately 577 acres are under a 50-year lease to Fort Belvoir Residential Communities – a partnership to improve existing housing and construct new military family housing. Electric utilities on Fort Belvoir were privatized in 2007 and service is now provided by Dominion Virginia. Gas service is currently provided by Washington Gas. An ongoing initiative aims to privatize water and sewer services in FY 2008. The Post also contains or surrounds seven cemeteries, with one located on HEC. (See Figure 2.18.)

Environmental

Protecting and preserving the environment at Fort Belvoir is of paramount importance. The installation has vast natural, cultural, and historic resources, as well as operational considerations, that limit the areas on Post that can be developed. Environmental issues on Fort Belvoir are addressed through established programs and guidelines, including the installation's Integrated Natural Resources Management Plan (INRMP), then coordinated through the Fort Belvoir Directorate of Public Works (DPW) and the Environmental and Natural Resources Division (ENRD).

This section begins with a discussion of Fort Belvoir's contribution to regional natural resources. It then provides details and assessments of development impacts on these environmental resources. Constraints include:

- **Natural Resources** - water resources, vegetation, habitat, topography/soil conditions, and air quality
- **Cultural Resources** - viewsheds and historic properties
- **Operational Constraints** - Solid Waste Management Units (SWMUs), Hazardous Waste Management Units (HWMUs), training ranges, and Petroleum Storage Areas (PSAs).

Regional Natural Resource Contributions

Fairfax County is the location of many bedroom communities for employment centers in the National Capital Region (NCR). Located in one of the most congested regions of the country, the County faces considerable environmental issues that stem from rapid growth in its residential, industrial, and commercial sectors. It continually balances these development pressures with environmental protection. Fort Belvoir finds it must also balance these pressures. It has taken the lead on many key environmental initiatives, including: ecosystem management, habitat connectivity and preservation, species migration, biodiversity, endangered species management, water quality preservation, and wetlands preservation. Despite continual pressures from surrounding development, approximately 70 percent of Fort Belvoir is undeveloped. Within the metropolitan Washington, D.C. area, Fort Belvoir represents a significant tract of native vegetation, in terms of size, diversity, and position relative to the location of off-post tracts of similar vegetation. A composite map of the natural resources of Fort Belvoir and the surrounding area is shown on Figure 2.19.

Fort Belvoir has recognized the ecological importance of on-post natural habitats. It has conserved two installation refuges (Accotink Bay Wildlife Refuge and Jackson Miles Abbott Wetland Refuge) that total approximately 1,500 acres, and designated a Forest and Wildlife Corridor of approximately 740 acres. These large areas of native vegetation align from the northeast to the southwest on its Main Post. This linear configuration creates a contiguous band of wildlife habitat through the installation. It also facilitates networking with off-post wildlife habitat areas, including Huntley Meadows Park to the northeast and Mason Neck State Park (part of the Potomac River National Wildlife Refuge Complex) to the southwest. Together these fragments represent the largest continuous and most diverse habitat area in eastern Fairfax County.

This geographic continuity is not only important to terrestrial wildlife but for bird species as well. The Atlantic Flyway, a major North American bird migration route, passes to the east along the Atlantic Coast. Natural areas along the Potomac River, including areas on Fort Belvoir and those north and south of the installation, are an important resource for migratory bird species in an area that is otherwise largely developed.

Fort Belvoir recognizes that the ecological function of this large habitat complex largely depends upon conservation of its own environmental resources. Preserving the size and continuity of these on-post natural habitats is the single most important management tool for maintaining native diversity both within Fort Belvoir and the broader eastern Fairfax County area.

Fort Belvoir also plays a major role on water quality, another significant environmental issue within the region. The Post is located on the Potomac River, approximately 75 miles upstream from the Chesapeake Bay. The Chesapeake Bay watershed area is experiencing significant development pressures, as the population here has more than doubled since 1950 – from 8.1 million to 16.6 million. By 2030, its total population is projected to be roughly 20 million people (Chesapeake Bay Program Office).

Since 1983, the Chesapeake Bay watershed has been the focus of an extensive restoration effort that involves the State of Maryland; the Commonwealths of Virginia and Pennsylvania; the District of Columbia; federal agencies, including the Department of Defense (DoD) and the Department of the Army (DA); universities; nonprofit organizations; and the general public.

Fort Belvoir itself has more than 12.25 miles of shoreline, three significant wetland areas (two of which are designated wildlife refuges), and three major tributaries (Accotink Creek, Dogue Creek, and Pohick Creek) that empty directly into the Potomac River. A breakdown of watershed sizes is found in Table 2.5.

Fort Belvoir has roughly 1,984 acres of Resource Protection Area (RPAs), covering about 23 percent of the installation (Fort Belvoir GIS, 2006). RPAs help filter storm water runoff and prevent nutrients, toxic substances, and sediments from entering streams, rivers, and, ultimately, the Chesapeake Bay. They also provide valuable wildlife and riparian habitat (INRMP, 2001). Further, undeveloped areas on Fort Belvoir are a component of southeastern Fairfax County's open space network, which contributes to the Chesapeake Bay Program's restoration efforts.

Fort Belvoir has completed its primary baseline natural resources surveys. These baseline surveys provide the foundation of the natural resources program. Consistent with the principles of ecosystem management, Fort Belvoir aims to preserve both the species and native diversity of natural communities. The installation does not emphasize single-species management, nor does it aim to increase the number of species or communities on Post. Fort Belvoir fully embraces biodiversity conservation, and has developed and implemented an ecosystem-based natural resources management program so that it can continue as a leader in environmental stewardship in the region.

The 2003 Fairfax County Comprehensive Plan discussed previously provides regional goals and guidance for achieving a balance between environmental protection and orderly development and redevelopment. Its Environmental Policy section requires protection of important natural resources including: air quality, water quality and watersheds, wildlife habitat, resource protection areas (RPAs), and flood zones. It also provides environmental protection measures and recommends developing management plans for each resource. For example, Fairfax County is developing comprehensive watershed management plans for its 30 watersheds, of which three overlap Fort Belvoir. The overall goal of each plan is to protect and restore streams, along with related natural resources.

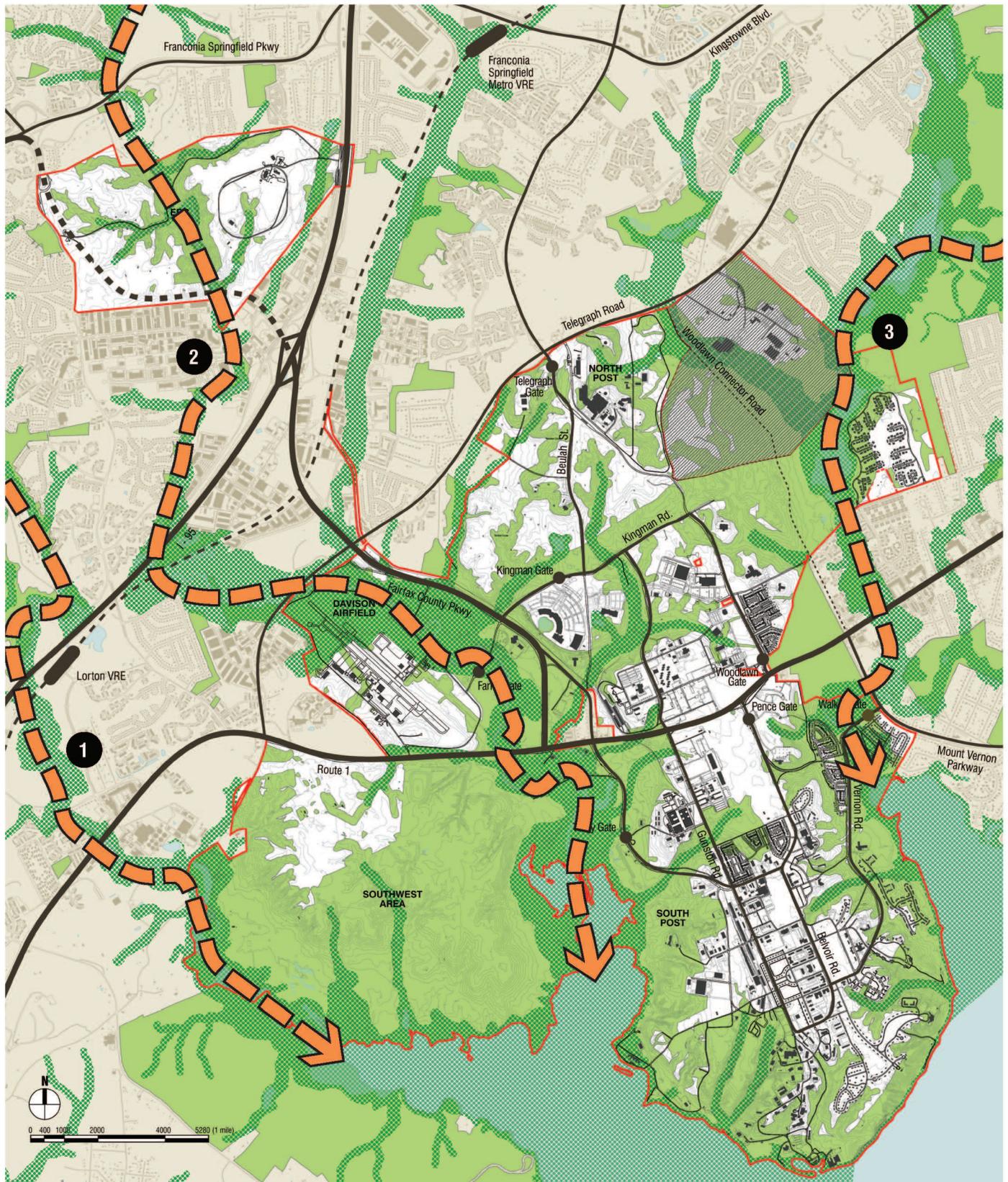
Fort Belvoir, through the Post's Integrated Natural Resources Management Plan (INRMP), follows the ecosystem-based approach previously discussed to manage conservation of fish and wildlife. The INRMP specifies the Post's goals, objectives, implementing actions, and management policy. This policy is to continue conservation of fish and wildlife resources, while providing opportunities for public access to Post wildlife (as long as this access is consistent with the military mission and resource conservation). Fort Belvoir will continue to make habitat and species conservation and enhancement a priority. Its management goals and objectives will continue to be as follows:

- Protect against the loss of native diversity of Fort Belvoir's fish and wildlife resources
- Emphasize for conservation those wildlife species that have been prioritized for conservation by federal or state statute or regulation, DoD or DA policy, DoD partnered programs (e.g., Chesapeake Bay Program, Partners in Flight Program), State Natural Heritage Program, or through recognized importance to the regional ecosystem function
- Conserve and enhance native wildlife habitat conditions to ensure habitat areas are sufficiently sized, sufficiently positioned, and possess the appropriate conditions to support healthy, self-sustaining native wildlife populations
- Conserve and enhance wildlife movement/migration routes within and through Fort Belvoir
- Protect the military mission and the public from wildlife hazards or disturbances
- Provide opportunities for public access for recreation and environmental education/study consistent, with resource conservation

Fort Belvoir complies with numerous federal environmental programs and regulations to aid in protecting the environment and natural and cultural resources. A summary of these regulations and orders are presented in Table 2.6. As a federal installation, Fort Belvoir is not required to abide by local government regulations (aside for a few exceptions), but does consider all local regulations during its planning processes.

Fort Belvoir watershed	Total watershed surface area (acres)	Percentage of total watershed area within Fort Belvoir	Surface Area within Fort Belvoir (acres)	Percent of Fort Belvoir land area	Number of subwatersheds within Fort Belvoir
Accotink Creek	33,156	14	4,040	48	20
Dogue Creek	10,883	21	1,713	20	15
Pohick Creek	22,755	3	638	8	2

Figure 2.19 - Regional Environmental Map



- | | |
|---|-------------------------|
|  Conservation Areas | 1 Pohick Creek |
|  Resource Protection Areas | 2 Ackotink Creek |
|  HEC (Not in Study Area) | 3 Dogue Creek |

Table 2.6 - Relevant Regional Regulations Applicable to Fort Belvoir

Environmental Programs and Regulations	Description	Fort Belvoir Status
Chesapeake Bay Program	Aims to protect and restore the waters and resources of the Chesapeake Bay system.	Department of Defense (DoD) and the Department of the Army are signatory partners, and Fort Belvoir is an active Partner in the Program. Resource Protection Areas (RPAs) must be considered during development.
Clean Water Act	Acts to prohibit discharges of pollutants into US navigable waters, except in compliance with a permit, and to achieve an interim goal of protecting water quality for biological and recreational reasons.	Fort Belvoir has Virginia Pollution Discharge Elimination System (VPDES) Phase II MS4 Stormwater Permit.
Executive Order 11988, Floodplain Management	Aims to reduce the risk of flood loss, minimize impacts of floods, and restore and preserve benefits of 100-year floodplains.	Fort Belvoir must avoid or mitigate any action occurring in a floodplain.
Coastal Zone Management Act	Aims to preserve, protect, develop, and where possible restore or enhance the resources of the coastal zone of the US.	Virginia's coastal zone includes all of Fort Belvoir and all proposed projects on Fort Belvoir must undergo a coastal zone consistency determination.
Endangered Species Act of 1973	Established the federal government's responsibility to take affirmative action for the protection and recovery of species considered to be in danger of extinction.	Fort Belvoir has one federal- and state-listed threatened fauna species (bald eagle), one federal- and state-listed flora species (small whorled pogonia), three state-listed threatened fauna species (bald eagle, wood turtle, peregrine falcon), and one federal 'species of concern' (Northern Virginia well amphipod).
Partners In Flight (PIF)	PIF is a consortium of hundreds of private, governmental, and non-profit organizations as well as individuals dedicated to maintaining healthy bird populations in the US.	Fort Belvoir has 61 PIF priority species.
Clean Air Act of 1970	Established National Ambient Air Quality Standards for six contaminants and requires steps to achieve and maintain attainment of standards. The six criteria pollutants are: carbon monoxide (CO), nitrogen dioxide (NO2), ozone (O3), particulate matter (PM10 and PM2.5), lead (Pb), and sulfur dioxide (SO2). Areas where a criteria pollutant level equals or exceeds the NAAQS are designated as being in "nonattainment" and steps must be taken to expeditiously achieve and maintain attainment of the NAAQS in those regions.	Fairfax County, including Fort Belvoir, is currently designated as a moderate non-attainment area for the 8-hour ozone standard and a nonattainment area for the PM2.5 standard. Fort Belvoir currently has a Title V stationary source operating permit from the Virginia Department of Environmental Quality (VDEQ). VDEQ has been delegated authority by the Environmental Protection Agency (EPA) to administer the Title V program.
National Historic Preservation Act (NHPA) and Archaeological Resources Protection Act (ARPA)	Delinates policy for managing cultural resources, including historic properties and archaeological resources. At the state level, the NHPA and ARPA are enforced by the State Historic Preservation Office (SHPO).	Fort Belvoir's historic resources include the National Register eligible Fort Belvoir Historic District with over 250 contributing structures; three individual National Register eligible structures; more than 175 National Register eligible or potentially eligible archaeological sites; and one National Register listed archaeological site.
The Resource Conservation and Recovery Act of 1976	Permits EPA and Virginia Department of Environmental Quality (VDEQ) to manage toxic or hazardous substances and waste streams.	The several hundred former or current petroleum storage areas (PSAs) on Fort Belvoir are managed under the VDEQ Petroleum Program. PSAs include above ground storage tanks (ASTs) and underground storage tanks (USTs). Currently there are 162 ASTs (nine of which are regulated) and 117 USTs (28 of which are regulated) on Fort Belvoir.
Toxic Substances Control Act	Allows EPA to track the 7,500 industrial chemicals currently produced and imported into the US.	Fort Belvoir has programs in place to comply with TSCA.
Comprehensive Environmental Response Compensation, and Liability Act of 1980	Permits EPA and VDEQ to manage toxic or hazardous substances and waste streams.	Fort Belvoir has a Solid Waste Management Unit (SMWU) program that manages 248 SMWUs on-post.
Military Munitions Response Program (MMRP)	Addresses defense sites – closed, transferring, and transferred military ranges -- with munitions and explosives of concern.	A MMRP Historical Records Review identified 400 acres of ranges on-post that are eligible for action.
National Environmental Policy Act (NEPA) of 1969	Requires the analysis and documentation of potential environmental effects associated with all major federal actions.	NEPA requires the analysis and documentation of potential environmental effects associated with all major federal actions. NEPA ensures that environmental factors are considered along with the technological and economic components of a decision and that the public is fully informed and appropriately involved in the environmental impacts analysis process. A NEPA document will be prepared to assess the impacts of various buildout scenarios identified in this Master Plan. An Environmental Impact Statement (EIS), completed in June 2007, analyzed the impacts of BRAC realignments at Fort Belvoir and a corresponding update of Fort Belvoir's land use plan. The master plan addresses development of the post from a broad perspective; further NEPA analysis and documentation must occur for specific proposals (e.g., the National Museum of the U.S. Army).
Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	Provides that each federal agency shall make achieving environmental justice part of its mission.	Analysis is being conducted as part of the various NEPA processes that are ongoing on Fort Belvoir.
Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management	Aimed to ensure that federal agencies conduct their environmental, transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner.	Fort Belvoir is currently working with relevant agencies to coordinate compliance with executive order.
DoD and Army Regulations	Fort Belvoir complies with the following: Department of Defense Instruction 4715.3 Environmental Conservation Program, Army Regulation 200-1 Environmental Protection and Enhancement, 32 CFR 651 Environmental Effects of Army Actions, AR 200-3 Natural Resources – Land, Forest, and Wildlife Management, AR 200-4 Cultural Resources Management, and Army policy for sustainable design and development.	

Natural Resources

Fort Belvoir's natural environment is a complex area where several ecological subregions converge, resulting in a diversity of environmental conditions, habitats, and climate. Approximately 70 percent of Fort Belvoir is undeveloped, with extensive, interior contiguous forests. This section discusses Fort Belvoir's natural resources (water resources, vegetation, habitat, topography and soils, and air quality) and their impacts on development.

Water Resources

Fort Belvoir has roughly 128 miles of streams in 59 watersheds. These watersheds drain into the lower reaches of one of three primary tributaries of the Potomac River – Accotink Creek, Dogue Creek, and Pohick Creek. Fort Belvoir contains approximately 2,625 acres of Resource Protection Areas (RPAs) along its perennial streams and 1,540 acres of 100-year flood zones (Figure 2.20) (Fort Belvoir GIS, 2006).

The installation's INRMP commits Fort Belvoir to follow a watershed approach to land management that acknowledges the relationship of land use and upstream areas with downstream resources. The Chesapeake Bay Program establishes far-reaching, natural resources protection policies, strategies, and actions to be undertaken by landholders throughout the Chesapeake Bay watershed.

Virginia's Erosion and Sediment Control Regulations (4VAC50-30-40.19) and Stormwater Management Regulations (4VAC3-20-81) require that "downstream channels and properties be protected from erosion and damage due to increases in volume, velocity, and peak flow rate." Because of this, site-specific Best Management Practices (BMPs) or mitigation measures will be required for each construction site within development areas.

Under Executive Order 11988, Floodplain Management (May 24, 1977), Fort Belvoir is required to evaluate any potential effects of any action occurring in a floodplain.

Mitigation. The following mitigation measures are examples of minimizing impacts to water resources from development on Fort Belvoir:

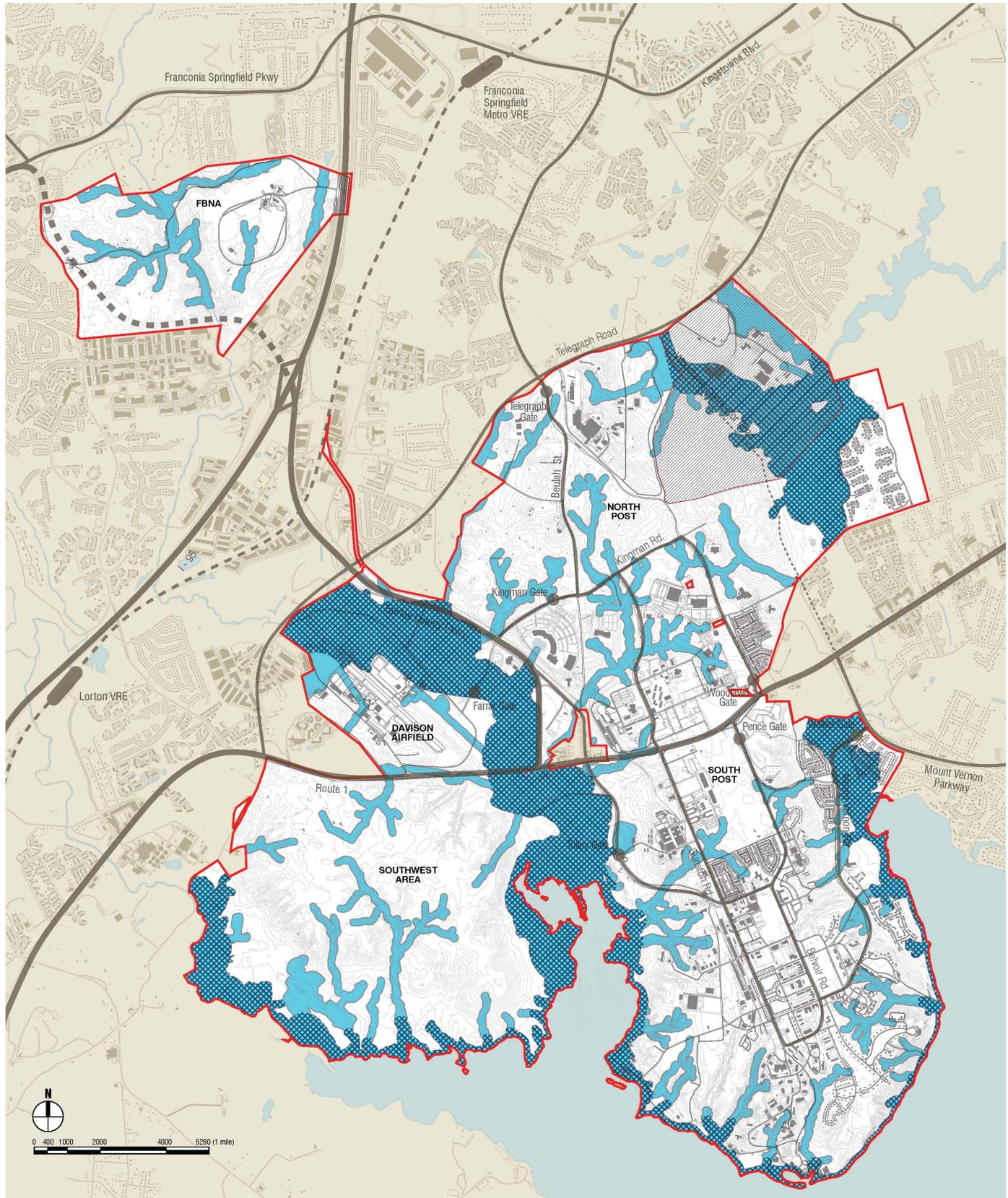
- Avoid habitable construction in RPAs. Construction of infrastructure improvements, recreational facilities, redevelopment "water dependent" activities, and water wells are permitted in the RPA (Fairfax County Comprehensive Plan, 2003).
- Avoid 100-year flood zones. A field delineation to determine the site-specific flood zone boundary should be conducted. Habitable structure development (i.e. office buildings, residences) is generally not permitted in flood zones.
- For new development and redevelopment, apply environmentally responsible site design and low-impact development (LID) techniques. Minimize amount of impervious surface created, encourage cluster development, and preserve wooded areas and adjacent steep slopes as much as possible.
- Construct detention or retention stormwater ponds, as required by Commonwealth law, to manage the increase in water runoff associated with development of impervious surfaces.
- Construct site-specific controls (such as linear sand filters or biofilters) for water quality management of impervious areas, (for example) parking facilities.

With proper planning, avoiding sensitive resources will not increase costs or impact construction scheduling. Incorporating LID techniques and stormwater management facilities into site design minimizes both expenses and project delays.



Accotink Creek

Figure 2.20 - Water Resources Map



-  Resource Protection Areas
-  HEC (Not in Study Area)
-  Flood Plains

Vegetation

Vegetation covers roughly 5,600 acres (62 percent) of Fort Belvoir and includes upland forests, riparian areas, and woody wetlands (See Figure 2.21) The upland forested areas, with the exception of wildlife corridors and refuges, are generally developable. Sensitive areas, including riparian areas (about 2,500 acres) and wetlands (about 1,200 acres), are discussed in detail below.

Riparian Areas. Riparian areas on Fort Belvoir must be considered when planning development (Directive No. 94-1 in the Chesapeake Bay Agreements, Riparian Forest Buffers). These are generally areas of land adjacent to a body of water – stream, river, marsh, or shoreline – that serve as transition zones between the aquatic and terrestrial environment. The riparian areas shown on Figure 2.21 are within 35 feet of an intermittent or perennial stream, alluvial soils, or soils with slopes greater than 15 percent. Riparian areas are usually vegetated. They act as buffers, reducing impacts of upland sources of pollution by trapping or filtering sediments, nutrients, and other chemicals from entering a waterbody. Benefits include water quality enhancement, stormwater/floodwater management, stream bank/shoreline stabilization, water temperature modification, wildlife habitat protection, pollutant absorption, and a high overall aesthetic appearance. New development has been and should continue to be minimized in riparian areas. Continuous riparian corridors should be maintained, particularly in ravines and along the shoreline.

Wetlands. Federal laws regulate activities in tidal and non-tidal wetlands. If development encroaches upon wetlands, a Section 404 permit (as referred to in the Clean Water Act) must be obtained from the U.S. Army Corps of Engineers (USACE) and coordinated with the VDEQ. Chapter 116 of the Fairfax County Code established a Wetlands Zoning Ordinance. Approval from the County's Wetlands Board is required for certain uses within tidal wetland areas.

Mitigation. The following mitigation measures are examples of minimizing impacts to sensitive vegetation areas from development on Fort Belvoir:

- Avoid development in riparian areas where possible. If unavoidable, incorporate LID practices (mentioned previously) into design to mimic riparian areas. With proper planning, avoiding sensitive resources will not significantly increase costs or impact construction scheduling. Incorporating LID techniques into site design minimizes both expenses and project delays.
- Wetland boundaries are determined during a jurisdictional delineation in the field by USACE. Construction in wetlands is possible but requires permits and mitigation such as wetland creation or banking, in which wetlands are created elsewhere on Post or wetland credits are purchased from wetland banks (such as the Cedar Run and Bull Run Banks in Fauquier and Prince William Counties, Virginia). Wetland credit approval takes several months and coordination with VDEQ and EPA.

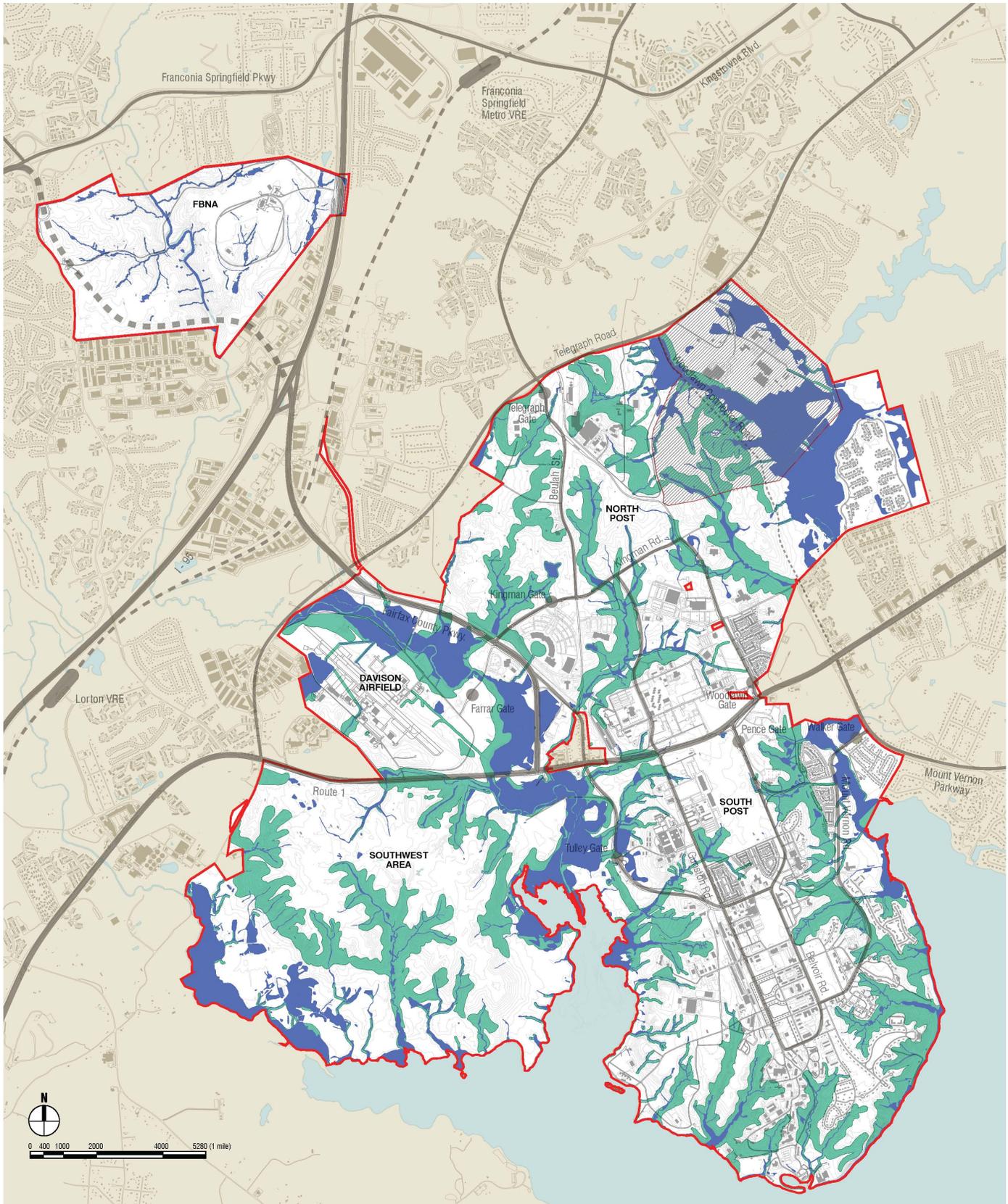


Shoreline



Wetland Area

Figure 2.21 - Vegetation Map



Habitat

Protected habitat on Fort Belvoir includes 2,300 acres of wildlife management areas (the federal Accotink Bay National Wildlife Refuge and Jackson Miles Abbott Wetland Refuge), the 730-acre Forest and Wildlife Corridor, and the 204-acre EQC on FBNA (See Figure 2.22.) Other conservation areas (identified in the INRMP) include grassland management areas and wetland conservation areas. Approximately 4,000 acres serve as buffers for flora (identified by USFWS/VDCR as special species or listed by state/federal governments as threatened/endangered) or as potential habitat for threatened/endangered fauna species known to occur on Fort Belvoir. In addition, there are approximately 3,700 acres of buffers for PIF bird sightings on Fort Belvoir.

Wildlife Management Areas. Two wildlife refuges and seven wildlife areas on the Main Post are designated as Wildlife Management Areas (WMAs). The Accotink Bay Wildlife Refuge (ABWR) was established by the U.S. Department of the Interior in 1979. It covers 1,360 acres of freshwater tidal marsh and climax hardwood forest adjacent to Accotink Bay. The Jackson Miles Abbott Wetland Refuge (JMAWR) was established in 1988. It covers 146 acres of sensitive wetlands along Dogue Creek on the eastern side of the North Post. The ABWR and JMAWR are habitat for several rare animals, plants, plant communities, and habitats, including the bald eagle, peregrine falcon, and wood turtle. It includes all RPAs along the main stem of Dogue Creek. The refuges also overlap other natural constraints, including some PIF priority bird species habitats and the RPAs. The ABWR is a federally designated National Wildlife Refuge. Therefore, development is not permitted. The JMAWR is not federally designated, but it contains many areas unsuitable for development, such as wetlands. Avoidance of these areas for development is, in some cases, recommended and, in other cases, required.

Forest and Wildlife Migration Corridor. This corridor is a tract of contiguous forested land where numerous fauna species migrate between habitats. It connects the biologically rich and diverse areas of the installation (east from Huntley Meadows Park to the Southwest Area). It provides habitat for migration of species, such as deer, to maintain genetic contact with other populations. The corridor was a mitigation measure in the BRAC 88 EIS and ROD to offset the siting of the DLA complex. It has six wildlife crossing structures: three cross beneath the Fairfax County Parkway, two cross U.S. Route 1, and one crosses Gunston Road. Outside the corridor, there are four additional crossings: two cross the Fairfax County Parkway and two cross U.S. Route 1. These structures consist of oversized box culverts with natural bottoms; some have daylighting. No facilities construction, except for wildlife habitat/movement enhancement, is authorized. Fort Belvoir has designated the corridor an environmentally sensitive area, protected from development to ensure ecological integrity.

Environmental Quality Corridor. The EQC on FBNA is an open space system designed to link and preserve natural resource areas and provide passive recreation. The EQC was set aside as open space in an agreement between Fort Belvoir and Fairfax County to protect and restore environmentally sensitive lands. This includes 100-year floodplains, steep slopes with gradients of 15 percent or greater, and riparian areas. The EQC is broader in area and extends further upstream than areas afforded protection under the County's floodplain and RPA regulations. EQC policy is not enforced by regulation. However, according to the Fairfax County Comprehensive Plan, FBNA development is to occur outside the EQC.

Other Conservation Areas. Fort Belvoir's ENRD has designated areas for conservation on Post. It includes 249 acres of grassland management areas, 2,500 acres of wetland conservation areas, and a habitat conservation area for the Northern Virginia well amphipod consisting of 210 acres in a ravine in the T-17 training area at the southwestern portion of South Post along the Potomac River. Grassland management areas are unimproved open fields or infrequently mowed areas. These old field grass communities occur in areas cleared for landfills, training, and farming. Wetland conservation areas were recommended by the VDCR-Natural Heritage Program to protect upstream areas from large wetland areas (Fort Belvoir INRMP, 2001).



Jackson M. Abbot Wildlife Refuge



FBNA Resource Protection Area



Small Whorled Pogonia
Source: <http://www.sas.usace.army.mil/ppogonia.htm>

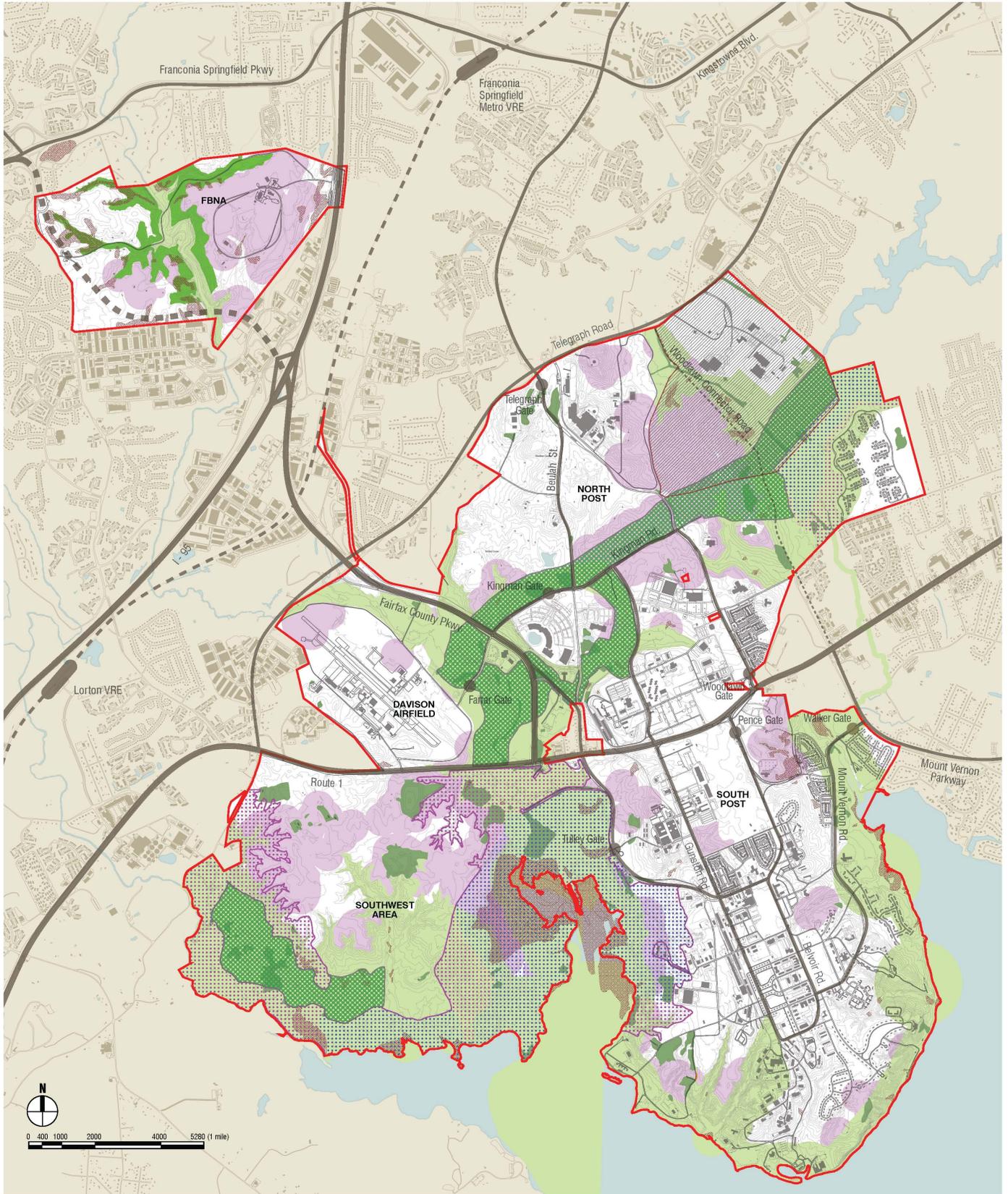
Threatened and Endangered Flora and Fauna Species Habitat.

The Endangered Species Act (ESA) affords legal protection to species listed as endangered or threatened, including their habitats. On Fort Belvoir, current or historical observations of several threatened/endangered species are recorded in designated areas of highly potential habitat. The ESA requires federal agencies to protect/restore populations of listed threatened/endangered species, and to prevent proposed and candidate species from being listed. Development is strictly prohibited in about 2,300 acres of nesting/foraging habitat designated for the bald eagle, and in about 450 acres that buffer threatened/endangered plant species. Fort Belvoir's Bald Eagle Management Plan prohibits training activities, hunting, and recreational activities within a 750-foot radius of a nest tree. It also prohibits land management activities within 1,320 feet from 15 November to 15 July. There are 2,100 acres along major streams on Fort Belvoir that are designated for the state-listed threatened wood turtle. However, there are only limited sightings of this species on Fort Belvoir. If alternative unconstrained land is locally unavailable, development in wood turtle habitat can be considered and evaluated in the EIS.

Mitigation. The following mitigation measures are examples of minimizing impacts to sensitive habitat from development on Fort Belvoir:

- Avoid development in habitat areas identified above. If unavoidable, identify contiguous habitat set-aside areas elsewhere on Post and present as required mitigation. Development in "Other Conservation Areas", PIF buffers, and fringe areas of sensitive species habitat may be permitted without significant mitigation.
- Construction of transportation corridors, stormwater management facilities, and open space recreational facilities (such as picnic tables) may be permitted in a few designated habitat areas.

Figure 2.22 - Habitat Map



- | | | | |
|--|--------------------------|--------------------------------|-------------------------|
| Wildlife Corridor | ESA - Flora | Environmental Quality Corridor | HEC (Not in Study Area) |
| Wildlife Management Area (refuge area) | ESA - Fauna | Grassland Management | |
| Wildlife Management Area (wildlife area) | Partners in Flight (PIF) | | |

Topography and Soil Conditions

The topography of Fort Belvoir is characterized by upland plateaus (40%), lowlands (40%), and steeply sloped terrain (20%) (Figure 2.23). Elevations range from approximately sea level along the Potomac River to roughly 300 feet above mean sea level (msl) on FBNA (Fort Belvoir INRMP, 2001).

Mitigation. Construction on steeply sloped terrain is reviewed on a case-by-case basis by analyzing individual building sites and appropriate engineering practices. In areas of highly erodible soils, the Commonwealth of Virginia mandates erosion/stormwater control techniques during and after construction. These techniques apply even if erodible soils are not present. Costs would be incorporated into design and construction costs.

Air Quality

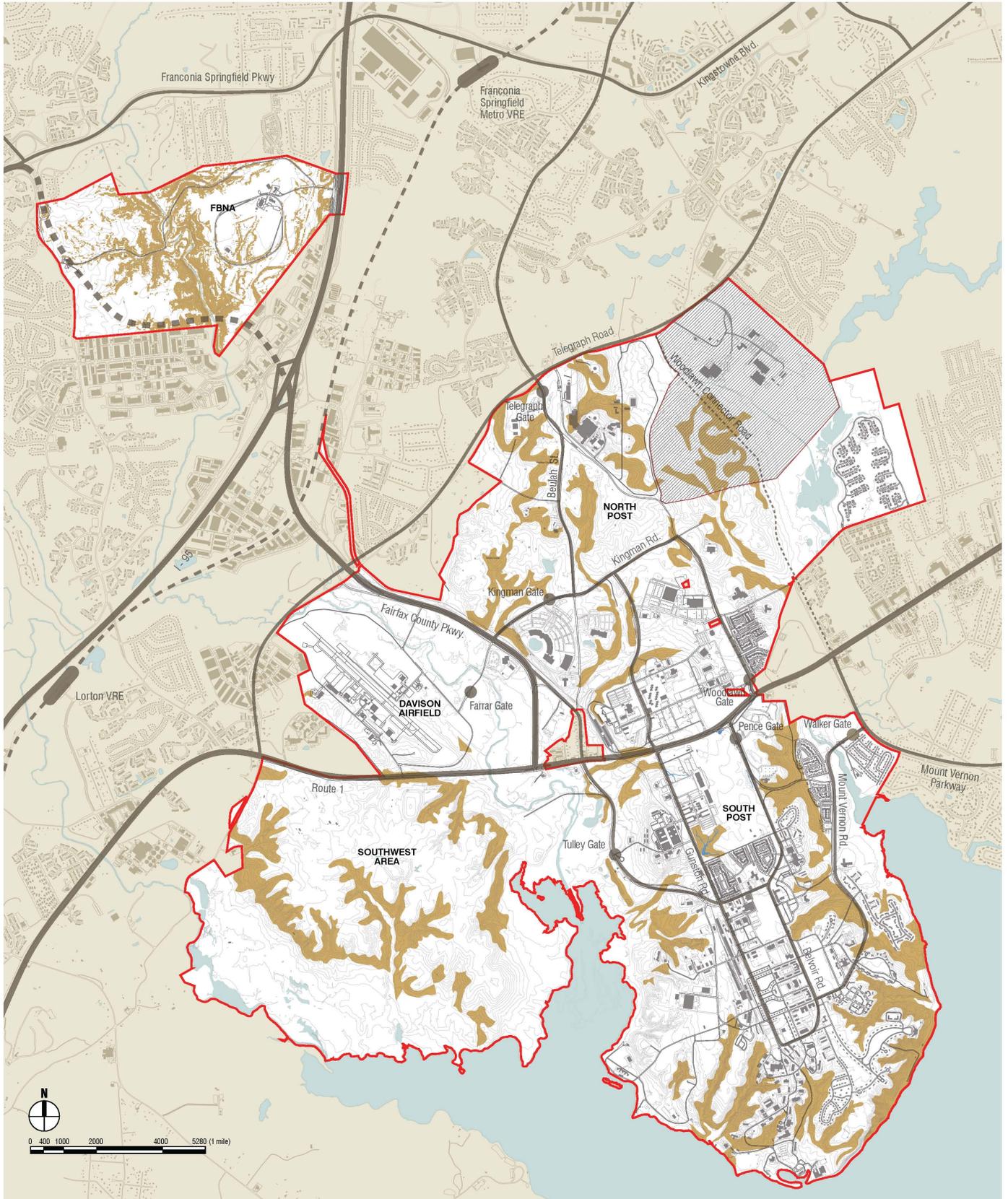
Fort Belvoir is designated as a major stationary source of air emissions, because of its potential to emit greater than 100 tons per year (tpy) of a criteria pollutant. In addition, Fort Belvoir is located within a nonattainment area for both ozone and very fine particles. (Note: The National Capital Interstate Air Quality Control Region (AQCR) is defined as the District of Columbia; Montgomery and Prince Georges Counties in MD; Arlington, Fairfax, Loudoun, and Prince William Counties in VA; and the cities of Alexandria, Fairfax, Falls Church in VA. The Washington, DC-MD-VA nonattainment area for ozone includes all the PM_{2.5} nonattainment area plus Calvert County, MD.)

Projects with potential emissions exceeding applicability thresholds for nonattainment pollutants and their precursors may trigger Nonattainment New Source Review (NSR). The purpose of Nonattainment NSR is to ensure that ambient air quality does not deteriorate any further in nonattainment areas. The Nonattainment NSR process includes obtaining emission offsets at a ratio of greater than 1 to 1 of all new emissions of applicable pollutants created during the project period. (Note: the 1.15 to 1 ratio only applies to moderate ozone nonattainment, not other ozone classifications or other nonattainment pollutants.) Offsets can be obtained internally (by reducing other emission sources at Fort Belvoir) or externally, but these must be from sources in the same nonattainment area or in the case of ozone precursors, from another nonattainment area if (i) the other area has an equal or higher nonattainment classification than the area in which the source is located and (ii) emissions from such other area contribute to a violation of the ambient air quality standard in the nonattainment area in which the source is located. When successful, the NSR process takes 18 to 24 months. However, available sources of emission offsets are very limited within the applicable nonattainment area.

Nonattainment NSR permits are issued by VDEQ. They are required for new major sources or existing major sources making a major modification in a nonattainment area. NSR permits are legal documents that specify what construction is allowed, what emission limits must be met, and how the source must operate. To assure compliance, permits also require monitoring, record keeping, and reporting.

Mitigation. All new air emissions contribute to an already existing regional air quality problem. New stationary source emissions that exceed Nonattainment NSR thresholds will trigger stringent regulatory requirements. Nonattainment NSR requires employing state-of-the-art emission controls on all new stationary sources using low-emission construction techniques, and/or obtaining emission offsets within the region. The Nonattainment NSR process could take up to two years. In addition, all future actions would be required to comply with the general conformity rule; a formal conformity determination will be necessary. Because the State Implementation Plans (SIPs) are currently under development for the region, strict emission controls and contemporaneous emission offsets may be required to ensure these guidelines are met.

Figure 2.23 - Topography Conditions Map



Steep Slopes (>15%)

HEC (Not in Study Area)

Summary of Natural Resources and Mitigations

The majority of land on Fort Belvoir is constrained by natural conditions that are either unfavorable to build upon or are being protected. Table 2.7 summarizes the list of natural resources that exist on Post. Although avoidance of these resources is desirable, mitigations are listed if development is necessary.

Table 2.7 - Summary of Natural Resources on Belvoir Main Post and FBNA		
Resource	Description	Mitigation
Natural Resources: Water Resources		
Water Quality	Water quality on Fort Belvoir's 128 miles of streams protected by Chesapeake Bay Program and Virginia sediment and erosion control regulations.	Implement state-required erosion control measures and recommended LID practices.
Resource Protection Areas (RPAs)	About 2,600 acres of RPAs on Fort Belvoir.	Avoid where possible. If avoidance is not possible, field review required to determine type of encroachment permitted.
Flood Zones	About 1,500 acres of 100-year flood zones on Fort Belvoir.	Avoid where possible. If avoidance is not possible, field review required to determine type of encroachment permitted (habitable structures not permitted).
Natural Resources: Vegetation		
Riparian Areas	About 2,600 acres of riparian areas on Fort Belvoir.	Avoid where possible. If avoidance is not possible, mitigation measures (such as LID) would be required.
Wetlands	About 1,200 acres of wetlands on Fort Belvoir.	Avoid where possible. If avoidance is not possible, wetland banking is possible.
Natural Resources: Habitat		
Wildlife Management Areas	About 2,300 acres of wildlife management areas on Fort Belvoir.	Avoid. Development not permitted in wildlife refuges.
Forest and Wildlife Migration Corridor	730-acre corridor bisecting the North Post.	Avoid where possible. If not possible, adequate contiguous set-aside areas would be considered as mitigation. Potential development limited to transportation corridors, stormwater management facilities, and open space recreation facilities.
Environmental Quality Corridor (EQC)	204-acre conservation area along Accotink Creek on FBNA.	Avoid where possible. If not possible, adequate contiguous set-aside areas would be considered as mitigation. Potential development limited to transportation corridors, stormwater management facilities, security setbacks, and open space recreation facilities.
Other Conservation Areas	About 2,800 acres of grassland management areas and wetland conservation areas.	Development may be permitted, however, similar areas elsewhere on Fort Belvoir should be set aside.
Partners in Flight (PIF)	About 3,700 acres of sighting buffers around 61 identified PIF species on the installation.	Development may be permitted, however, similar areas elsewhere on Fort Belvoir should be set aside.
Threatened and Endangered Flora and Fauna	About 4,000 acres of habitat for sensitive species on Fort Belvoir.	Avoid where possible. Development may be permitted in fringe habitat, however, similar areas elsewhere on Fort Belvoir should be set aside.
Natural Resources: Topography and Soil Conditions		
Topography and Soil Conditions	About 20 percent of Fort Belvoir has steep slopes.	Construction activities on severe or unstable slopes are generally prohibited. If unavoidable, appropriate engineering practices would be incorporated into site design.
Natural Resources: Air Quality		
Air Quality	Fort Belvoir is in a non-attainment area for ozone and fine particles.	All new air emissions contribute to an already existing regional air quality problem. New emissions from proposed actions may exceed air quality thresholds that trigger applicability of stringent regulatory programs, such as Nonattainment New Source Review. If new emissions were analyzed and expected to cause an exceedence of a National Ambient Air Quality Standard, the associated project would not be allowed to continue. A potential mitigation of regulatory requirements imposed on new emissions sources includes employing state-of-the-art emission controls on all new emission sources. An entire New Source Review process could take up to two years.

Cultural and Historic Resources

Regional Historic Sites and Viewsheds

Fairfax County has 340 sites listed in its historic sites inventory. Several historic sites near Fort Belvoir have protected viewsheds, with specific emphasis on scenic or historic value. (See Figure 2.24.) Projects that affect historic properties must be reviewed by the Virginia Department of Historic Resources. Development that has visual impact to viewsheds is permissible, pending National Historic Preservation Act (NHPA) - Section 106 and consultation with historic group representatives.

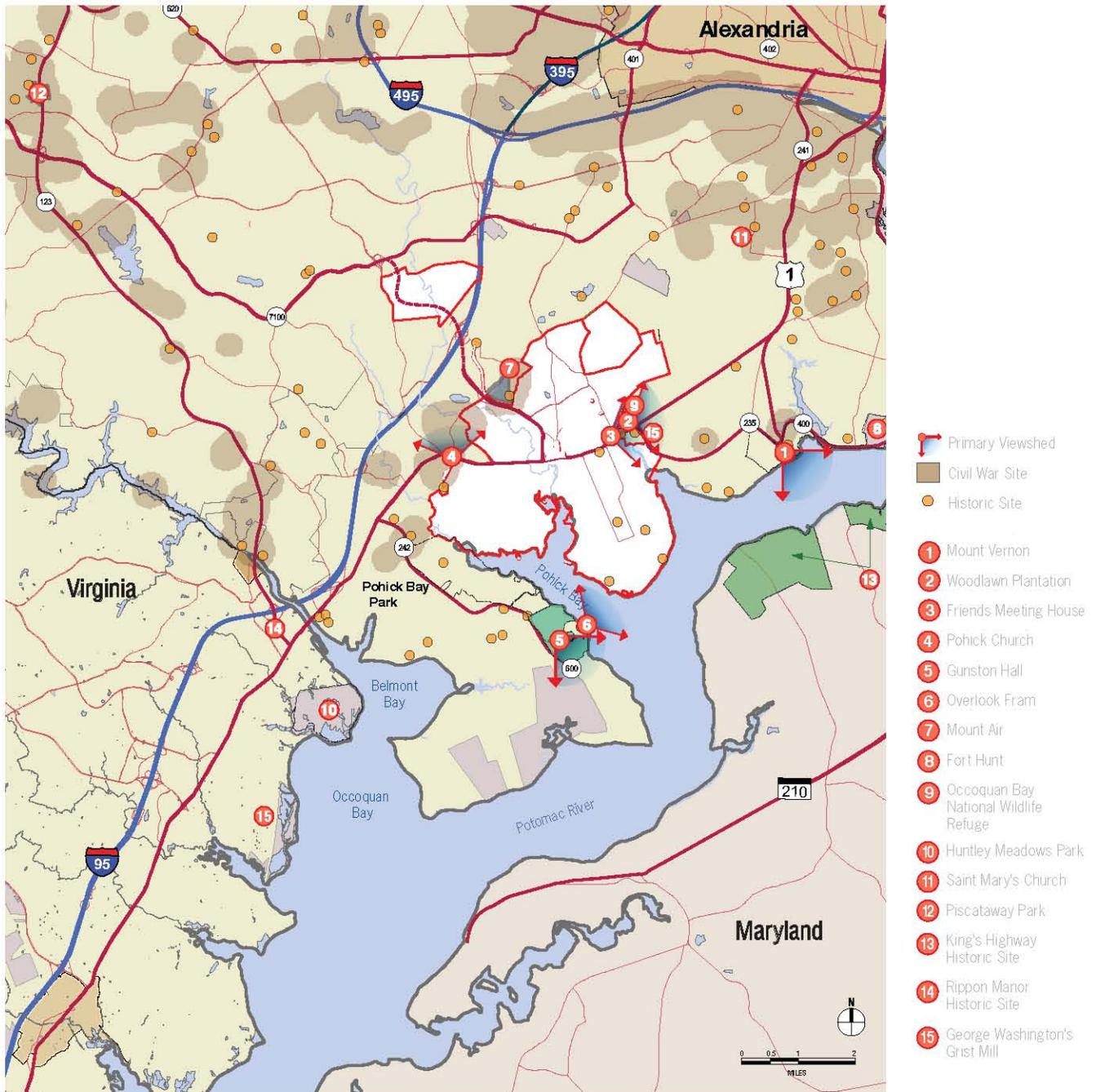


Figure 2.24 - Regional Cultural and Historical Sites Map

Viewsheds

Viewsheds from cultural resources on Fort Belvoir include the Main Post Historic District and adjacent off-post resources, such as Woodlawn Plantation, the Friends Meeting House, Pohick Church, and Mount Air. Fairfax County has delineated zoning overlay buffers of roughly ¼ mile around these off-post resources, with buffers extending on Post (Figure 2.24). In addition, any structures as tall or taller than the water towers on Post have the potential to impact the viewshed of historic properties such as Fort Washington in Maryland. Viewshed studies will need to be performed for any Fort Belvoir project located along the shoreline or that extends over 5 stories. Additionally, there is a Programmatic Agreement that restricts development on specific areas adjacent to Woodlawn Village and the Friends Meeting House.

Mitigation. Development within these buffers is permitted. Although Fort Belvoir is not legally required to employ mitigation measures when developing within buffers, measures should be considered. However, if a determination of adverse effect is reached then Fort Belvoir is legally required by the National Historic Preservation Act to minimize and mitigate the impact. Example measures include tree buffers, building height restrictions that conceal view of structure from resource, and development/design themes that match the historic resource. Consultation with representatives of historic resources (i.e. Woodlawn Plantation, Society of Friends) must occur as required by Section 106 of the NHPA, which can take several months.

Historic and Archaeological Resources

Cultural sites occur throughout Fort Belvoir and are protected under the NHPA. Sites of historic significance include the Main Post Historic District, Belvoir Ruins site, Thermo-Con House, Camp A. A. Humphreys Pump House Station and Filter Building, SM-1 Nuclear Power Plant Complex, and nearly 300 other historic structures, of which 191 are listed, eligible, or potentially-eligible archaeological sites, including seven cemeteries (Figure 2.25).

Mitigation. Development within on post viewsheds should respect and consider the design of protected resources. Development must avoid all NRHP that are listed as eligible archaeological sites, buildings, historic districts, and cemeteries. Historic buildings and cemeteries should generally be avoided. Should any proposed development encroach upon archaeological sites, they must be evaluated for eligibility. These surveys will need to be coordinated with the state and may take several months to complete. Ineligible archaeological sites can be developed.

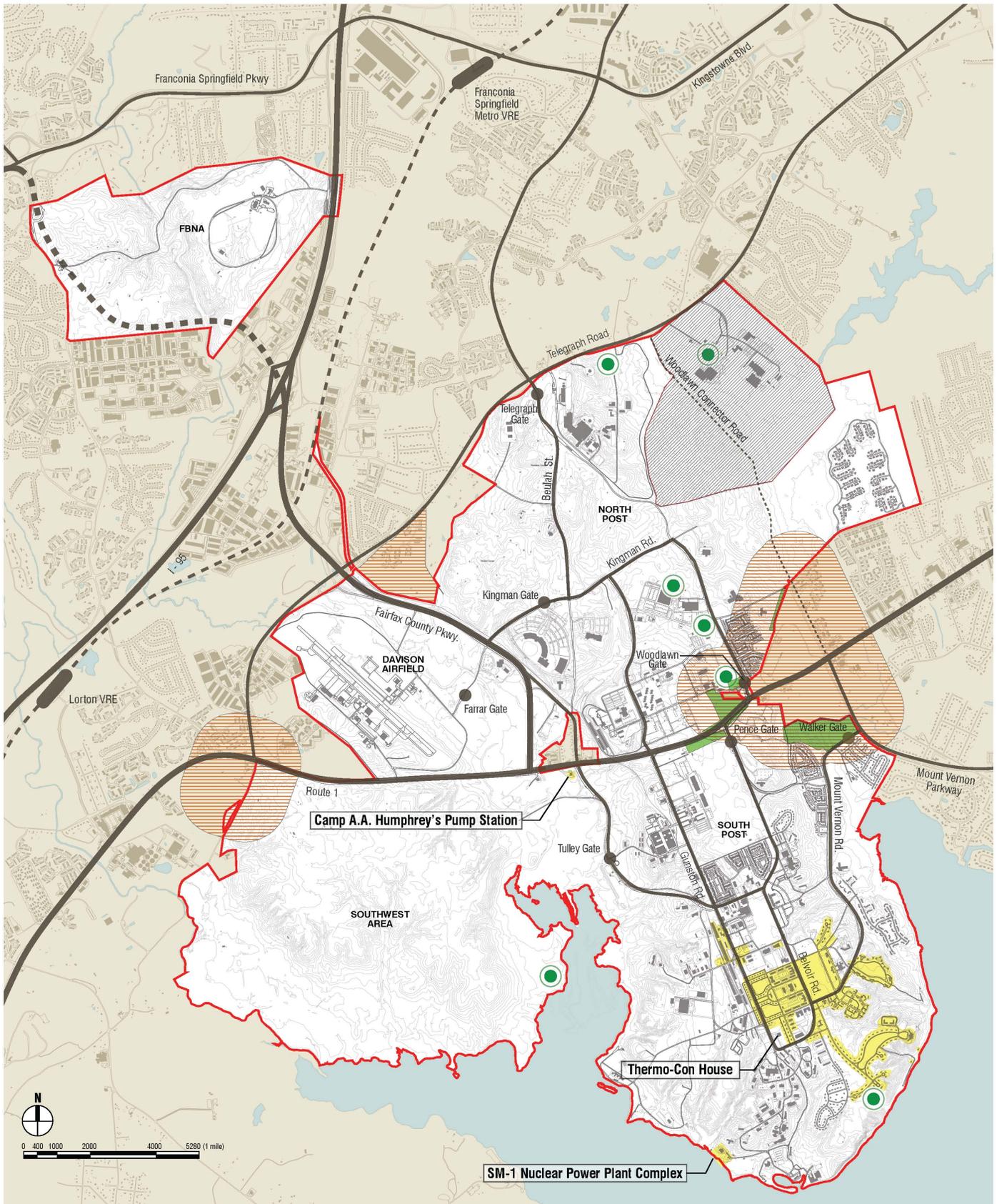
Summary of Cultural and Historic Resources and Mitigations

Table 2.8 summarizes both viewshed and historic property resources that will be encountered at Fort Belvoir. Development that occurs within these areas must adhere to specific mitigations that are also described in the table.

Table 2.8 - Summary of Cultural Resources on Belvoir Main Post and FBNA

Resource	Description	Mitigation
Cultural Resources		
Viewsheds	Fort Belvoir falls within the viewshed of a number of historic properties located outside the boundaries of the installation. Fort Belvoir has conducted a historic viewshed study for the Woodlawn Historic District and agreed to develop procedures to guide development on Fort Belvoir within the historic viewshed as defined by that study. Additionally, there is a Programmatic Agreement that restricts development on specific areas adjacent to Woodlawn Village and the Friends Meeting House.	Development within these viewsheds is permitted. However, if a proposed action on Fort Belvoir results in a determination of adverse effect to historic property due to the proposed actions effect on the historic properties viewshed the installation is required by the National Historic Preservation Act (NHPA) to minimize and/or mitigate the effect. Example measures include tree buffers, building height restrictions so that the structure cannot be seen from the resource, and development and design themes matching the theme of the historic property. Consultation with representatives of the historic property, interested parties and the State Historic Preservation Office must occur as required by Section 106 of the NHPA, which can take several months.
Historic Properties	Historic Properties on Fort Belvoir include the National Register of Historic Places (NR) eligible Fort Belvoir Historic District with over 200 contributing properties three of which are individually eligible for listing on the NR and more than 175 NR eligible and potentially eligible archaeological sites, including seven cemeteries.	Development of NR-eligible buildings or within the Fort Belvoir historic district should respect and consider the design and history of the resource being effected. Development should avoid encroachment upon NR-eligible archaeological sites. Should development encroach upon potentially eligible archaeological sites, site eligibility evaluations will have to be performed, which can take several months to complete. Ineligible archaeological sites can be developed. Any development that has the potential to effect historic properties must be coordinated with the State Historic Preservation Office, Tribal Historic Preservation Offices and other interested parties in accordance with Section 106 of the NHPA.

Figure 2.25- Cultural and Historical Resources Map



- Cemetery
- Historic Zoning Overlay Districts
- HEC (Not in Study Area)
- Historic District
- Historic Properties Buffer

Operational Resources

Fort Belvoir's environmental issues associated with operational activities are a result of decades of military training activities, a few of which are still ongoing. They include former training ranges, SWMUs, HWMUs, PSAs, Petroleum Release Sites (PRs), Areas of Potential Concern (AOPCs), and other operational constraints including easements, RCI leased areas, and noise zones. Several hundred individual sites are associated with these programs.

A primary difference between the operational issues mentioned above and environmental/cultural resources is the desire to remediate operational constraints (such as SWMUs) versus a desire to preserve environmental/cultural resources. Therefore, the primary concern associated with constraints resulting from some operational activities is cost and time related to mitigation. This does not apply to lands that are still active training areas, such as the Southwest Area.

Some corrective measures might take several years to achieve closure. Regulatory agency involvement in investigative/corrective actions is very high, and must be factored into the time it takes to achieve site closure. Coordination with regulatory agencies occurs while developing work plans, conducting site investigations, and preparing closure reports. The regulatory compliance requirements for each program and the amount of available information for individual sites are highly variable. For example, some sites were never studied while others are already closed. A brief description of each specific operational constraint is discussed below, including regulatory compliance and mitigation requirements.

Former Training Ranges

Since its inception as Camp Humphreys, Fort Belvoir has designated areas for weapons training. A consequence of this is that many former training ranges now contain Unexploded Ordnance (UXO). In addition to UXO, associated contamination is also addressed by the Military Munitions Response Program (MMRP) under Comprehensive Environmental Response, Compensation, and Liability Act CERCLA. To meet requirements, Fort Belvoir is currently developing a MMRP program with DoD as lead authority. Regulatory input will come from the VDEQ Federal Facilities Division and EPA Region III.

Former training ranges containing Ordnance and Explosives (OE), Unexploded Ordnance (UXO) Areas, and Munitions and Explosive Concerns (MEC) are located both on FBNA as well as the Main Post. Investigation, clearance, and closure of these former training ranges will be addressed in the MMRP. Since the MMRP is in its infancy (within the last two years), clean-up thresholds are still being developed. A unique and critical element of OE removal

is standoff distance requirements. For example, a 60mm mortar requires up to 1,013 feet standoff. If a road and occupied structures are within the standoff distance, the road will need to be closed and the building evacuated before rendering the OE item inert. Therefore, coordination and timing of OE clearance is critical to the proposed development phasing schedule.

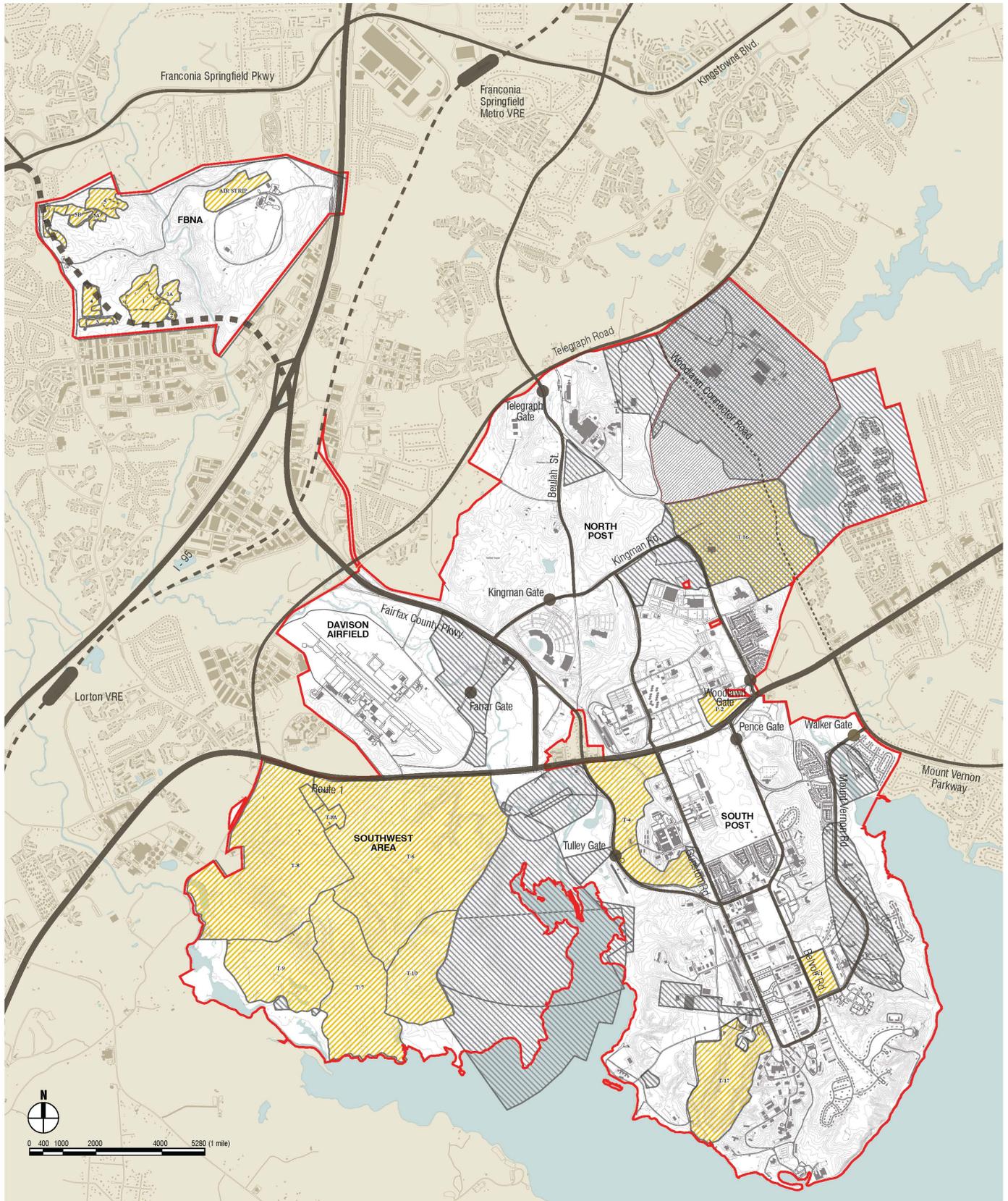
A key variable on the time it takes to achieve a "no further action" determination is contamination of soil or groundwater. In addition, in the absence of an established MMRP, clean-up level precedents are also not established, making it difficult to predict the level-of-effort required. Differences between DoD and federal/state regulators regarding clean-up levels might significantly affect the time and cost in addressing former training ranges at Fort Belvoir.

Several former FBNA training ranges were successfully cleared of OE in the Fall of 2003 through the Spring of 2005, in preparation for the proposed land transfer for the Fairfax County Parkway Right-of-Way (ROW). By working closely with federal and state regulatory agencies, Fort Belvoir successfully developed and executed environmental investigations for these ranges, and met all their requirements. It also demonstrated, in a timely manner, that former training ranges can be cleared and a regulatory concurrence of "no further action" determination be obtained. This project cleared 163 acres, including approximately 22 acres of former training ranges, for a cost of \$10 million. The project ran three OE crews on an accelerated 16-month schedule.

U. S. Army Environmental Center contracted EA Engineering, Science, and Technology, Inc. to prepare a Phase I Qualitative Assessment Report, under the Operational Range Assessment Program, of the operational ranges located at the Main Post of Fort Belvoir. This Phase I report indicates there are 15 ranges designated as operational (EA, 2006). Nine ranges are located in the Southwest Area and comprise about 1,290 acres. Four ranges at the Davison Army Airfield encompass 310 acres. The 24-acre Parade Grounds are centrally located next to Post Headquarters. Two maneuver and training areas, encompassing 248 acres, are located on the southwestern peninsula of the Main Post, just west of CMRL complex (EA, 2006). Two continuous former ranges located on the North Post are being addressed under the MMRP (EA, 2006).

The following discussions that follow define what is currently known with regard to the ranges at FBNA and Main Post. A considerable amount of remediation has been at FBNA.

Figure 2.26 - Ranges Map



- Training Areas
- HEC (Not in Study Area)
- Ranges

FBNA Ranges. There are 10 former training ranges at FBNA that are undergoing OE clearance and removal. FBNA is composed of approximately 807 acres and is bisected by Accotink Creek, creating areas on each side of the creek known as FBNA East and FBNA West. FBNA West is approximately 389 acres with nine ranges; FBNA East is 431 acres with one 18-acre range (Eebee Field). Given its historical use and concentration of ranges, all of FBNA is now being considered a range. The ROW for the proposed Fairfax County Parkway involves approximately 170 acres and extends through the southern portions of both sections of FBNA. Most of the remediation undertaken to date has occurred within the ROW. This work can serve as a guide to the regulatory requirements, procedures, costs, and timeframes for the remaining ranges. In support of the Fairfax County Parkway ROW property transfer, the Army undertook OE clearance and removal actions. About 20 acres (15 percent) of the ROW parcel encompasses former training ranges. OE removal actions are complete at three ranges (Ranges 3, 4, and 5C) and incomplete at two others (Ranges 1 and 2). Figure 2.26 illustrates the locations of FBNA ranges. The Fairfax County Parkway ROW configuration is also illustrated

The OE removal and clearance on all ranges on FBNA began in the fall of 2006 and is ongoing.

Other FBNA Property Considerations. If the proposed Fairfax County Parkway is constructed at FBNA prior to its potential BRAC development, OE clearance and removal will become incrementally more difficult and costly. At that point it is likely that the detonation of OE at FBNA will require significant road closures, potential residential evacuations, and/or construction of blast walls for safety reasons. In addition, a continued OE presence represents a maintenance/security liability for the Army if encroached upon by a roadway. If FBNA West is developed, the most cost-effective time to do so is prior to roadway completion.

At one time the northern half of FBNA West was proposed for transfer to Fairfax County for eventual use as parkland. Its historical use as training areas makes it incompatible for future use as a public park. The Army could expect significant liability if any OE remains on the parkland parcel and it was converted to a public park. The proposed future land use of OE-contaminated areas must be carefully evaluated before any property transfers.

Former Training Ranges on Main Post. The MMRP HRR indicates ranges have existed on the Main Post of Fort Belvoir. In fact, 16 ranges were identified in the 2002 Phase 3 Range Inventory performed at Fort Belvoir (Malcolm Pirnie, 2006). 12 additional ranges were identified at the Main Post during the Historic Records Review (HRR) preparation. By and large these former training ranges on the Main Post are not located within the proposed building envelopes of this program. However, three former training ranges are located within the proposed building envelopes on the Main Post. "T-15 Range" and "Gas Area" are located in the vicinity of currently existing Kingman Road and Woodlawn Road on the North Post. "Mounted Pistol Range" is located the southern end of what is now Davison Army Airfield (Malcolm Pimie, 2006). The locations of these ranges are illustrated in Figure 2.26.

To date, no significant OE removal actions have been performed in any of these areas. The Gas Area will not likely require intrusive activities to clear the area of UXO. T-15 Range and Mounted Pistol Range will likely not require UXO removal and clearance. A site investigation including soil and groundwater sampling can be anticipated at all three ranges. Based on the results of the site investigation, additional corrective action(s) may also be required.

Mitigation: Securing access to the areas containing UXO is the first step. UXO is then cleared and removed by performing magnetometer assisted surface clearance (MASC) to clear any UXO on the surface. Once the MASC is complete, surveyors survey the range areas in grids measuring 100 by 100 feet. Once the grids are surveyed, a geophysical survey is performed to identify subsurface anomalies. The anomalies are then interpreted into targets to clear and remove. Most UXO intrusive work is accomplished by hand digging so significant labor is required. If UXO is identified, the technicians determine whether the item can be moved or if it requires to be blown in place (BIP). Once all targets within a grid have been recovered, the quality assurance representative, typically the USACE representative, performs a final clearance to confirm all targets were removed. If approved, then a Form 948 is signed indicating the grid is cleared of UXO. The Army approval of an Explosive Safety Submission (ESS) is required to perform all the activities described herein. Approval of this submission can take several months; so much planning is required to rapidly address UXO. Even if the areas are cleared of all known OE, the Army will also require UXO avoidance and identification technicians on all construction projects in the area. The OE avoidance ensures that any OE item discovered during construction is appropriately addressed. UXO clearance and removal actions may be performed in the range areas concurrent to site preparation activities, as long as standoff distances are respected.

Solid Waste Management Units

Numerous studies at Fort Belvoir identify up to 248 SWMUs on the installation. However, these studies were sporadically funded. Investigations and corrective action measures were intermittently conducted. The only SWMUs that were investigated, remediated, and then closed include roughly 50 sites located in areas intended for redevelopment. Fort Belvoir now manages an active SWMU Program that is funded with up to several million dollars annually to manage sites, perform corrective action, and close sites. Fort Belvoir's SWMU Program is jointly managed with EPA as the lead agency and VDEQ as a contributing agency. Table 2.9 provides a summary of the number of SWMUs by category. These categories are largely based on studies conducted in the late 1980s. Action plans for each SWMU were prepared in the 1990s. An updated inspection of all SWMUs was conducted in 2005.

SWMU Category	Description	# of SWMUs
A	Landfill or Surface Impoundment	29
B	Building Storage Unit	23
C	Wash Rack	12
D	Oil/Water Separator	11
E	Waste POL Storage Area	14
F	Aboveground Waste POL Tank	9
G	Underground Waste POL Tank	14
H	Spent Battery Storage Area	5
I	Battery Acid Neutralization Unit	5
J	Incinerator	6
K	Fire Control Training Area Unit	5
L	Miscellaneous Unit	47
M	Fort Belvoir North Area (FBNA) Unit	44
N	Units Identified by CH2M Hill in 1992	24
	Total	248

Like ranges, SWMUs can be separated into two categories – Main Post and FBNA. Main Post SWMUs fall under Fort Belvoir's RCRA Part B Permit issued in 2004. There are 204 known SWMUs on Main Post. FBNA no longer has an active RCRA Part B Permit. EPA issued a Unilateral Administrative Order (UAO) 3013 for FBNA to include investigation of SWMUs. Since the former FBNA Part B Permit did not include corrective action authority, the UAO also does not include corrective action authority.

FBNA SWMUs. There are 44 known SWMUs on FBNA in various stages of investigation and closure. In accordance with requirements of EPA Administrative Order 3013, dated September 2005, Fort Belvoir prepared a summary of current conditions. It categorized the 44 SWMUs into four categories: No Further Action (NFA), Administrative Closure (AC), Confirmatory Sampling (CS) to confirm absence/presence of contamination, and Site Investigations (SI) that includes soil/groundwater sampling. Of the 44 SWMUs, nine are deemed "NFA", 12 will undergo administrative closure for removal from the SWMU list, seven require confirmatory sampling/closure actions, and 16 require a site investigation. Figure 2.27 illustrates the location of the SWMUs on FBNA.

The EPA reviewed this summary report. It agreed with the categorization of SWMUs, and offered comments addressing SWMUs eligible for enrollment into MMRP. Fort Belvoir and EPA are currently in the process of resolving these discrepancies. Several SWMUs may change categories; however, these changes are not anticipated to be significant.

Mitigation. Investigation and clean-up is currently underway so that BRAC construction can occur.

Main Post SWMUs. There are 204 SWMUs on the Main Post in various stages of investigation and closure. The most recent RCRA Part B permit, issued in 2004, included the investigation and corrective actions for these SWMUs. The distribution of SWMU sites is as follows:

- North Post: 36 sites (17 percent)
- South Post: 148 sites (70 percent)
- Davison Army Airfield: 20 sites (10 percent)
- HEC: 6 sites (3 percent)

Fort Belvoir performed a visual site inspection (VSI) for each Main Post SWMU in the Fall of 2005. It also prepared a Summary VSI report for each SWMU, which included action recommendations to achieve its closure. These were based on the VSIs and review of available data. Currently, the summary is in review by Fort Belvoir's ENRD and is subject to revision. A conservative approach has been adopted for the purpose of this evaluation, and includes sites the EPA will likely find require investigations.

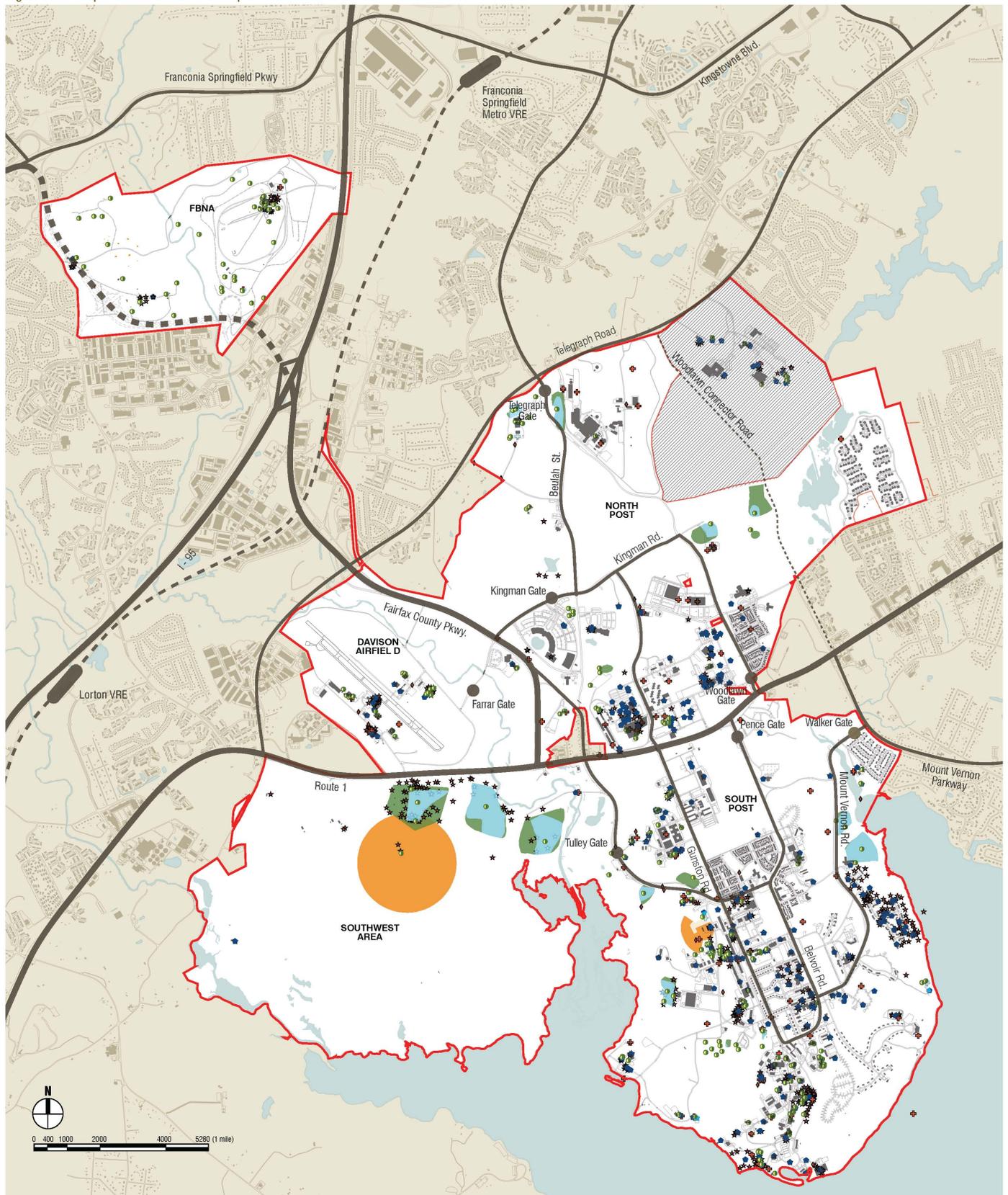
Mitigation. Specific remediation measures can only be determined following the detailed site investigations. Due to the variety of remediation among sites, costs for any SWMU are difficult to estimate at this time. Some corrective action may involve costly landfill caps and require 30-year monitoring programs. Other SWMUs may only require soil sampling to confirm contamination is not present. In an effort to capture generalized data for this evaluation, a worst-case scenario is used. This way, any future changes will likely lessen mitigation requirements and costs.

Hazardous Waste Management Units

Fort Belvoir entered into a Federal Facilities Compliance Agreement (FFCA) in 1992 with EPA that identified 27 SWMU sites as HWMUs. Fort Belvoir received funding and initiated corrective action at these HWMUs. Closure plans were developed. Sites were investigated, remediated, and closure reports prepared. VDEQ issued letters of concurrence with "no further action" determination for all 27 HWMU sites. However, 26 of these sites were closed using health-based risk assessments. Any disturbance to their subsurface soil could result in exposure to chemicals of concern, which would require reopening the case, developing a work plan, sampling, monitoring, and reporting of site conditions and waste generation. Construction programs that disturb areas around these HWMUs require appropriate federal Occupational Safety and Health Administration construction worker protection. Disturbing previously unidentified contamination also requires proper handling and disposal, as required by federal, state, local, and Army regulations. One of these HWMUs – the Open Burning/Open Detonation (OB/OD) Pit at T6A in the Southwest Area – required a land use restriction for closure. It limits future development near the site to commercial/industrial land use only. Figure 2.27 illustrates the locations of these HWMUs at Fort Belvoir.

Mitigation. Any disturbance to the subsurface soil at these sites could require reopening the case. Construction in these areas will require developing a work plan, sampling, monitoring, reporting of site conditions. Disturbance of HWMU sites can be mitigated by further characterizing the impacted area through sampling and analysis and employing a Health and Safety Program including qualified industrial hygienists and a Health and Safety Plan (HSP). Additional investigation could identify whether residual impacted soils exists and where they are located so that plans and cost estimates to excavate and remove the impacted soils can be developed. The cost estimates for this mitigation are not considered significant as the specifications of the construction project itself will likely require a HSP for the general construction. It is anticipated that this requirement can be incorporated into the construction program without addition of significant costs.

Figure 2.27 - Operational Resources Map



- | | | |
|----------------------------|------------------------|-------------------------|
| Quantity Distance Arcs | Pollution Source | Restoration Site |
| Areas of Potential Concern | Wells | SWMUs |
| Landfill | Spill Response Feature | HEC (Not in Study Area) |

Petroleum Storage Areas

For more than two decades, Fort Belvoir DPW-ENRD's multi-million dollar Petroleum Management Program has been addressing petroleum storage areas (PSAs) and petroleum release sites (PRSS). This program manages all aspects of PSAs and PRSS, including scheduling operation and maintenance, compliance monitoring, tank closure and removal, environmental investigations, remediation system design, management, and reporting. Nearly a thousand PSAs formerly existed or still exist at Fort Belvoir. PSAs include above-ground storage tanks (ASTs) and underground storage tanks (USTs) that store petroleum. PSAs range in size from a 275-gallon AST to a 50,000-gallon UST. For more than two decades, Fort Belvoir ENRD's Petroleum Management Program (PMP) has been addressing PSAs and PRSS.

Mitigation. PSAs located within a proposed building envelope could be aggressively addressed as part of the site preparations. Many of the open PSAs are unregulated, so a costly formal closure process can be avoided. A closure process involving administrative and decontamination processes will be required. Confirmation samples collected beneath USTs and potentially some AST will likely be required to demonstrate no release has occurred. On average, one in three USTs at Fort Belvoir has had a release. It can be expected that some USTs will have a release previously undiscovered. Site investigations at each release are approximately \$35,000 each and require approximately one month to complete. Mitigation measures could be integrated into the construction phase of the project in concert with the site preparation and earthwork features for minimal impact to the overall construction schedule.

Petroleum Release Sites

Of the more than 1,000 PSAs at Fort Belvoir, about 150 have released petroleum into the environment, resulting in designation of PRSS. Fort Belvoir is actively addressing these releases. Site investigations are performed to delineate the impacted areas of soil and groundwater. More than 10 sites have been actively remediated to the remedial endpoints with many of the sites of releases gaining acceptance of no further action by VDEQ. Fort Belvoir is actively managing their PRSS under the VDEQ Petroleum Program.

Mitigation. Any disturbance to the subsurface soil at these sites could require reopening the case, developing a work plan, sampling, monitoring, and reporting of site conditions and waste generation. PRSS located within a proposed building envelope could be aggressively addressed as part of the site preparations. Mitigation measures could be integrated into the construction phase of the project in concert with the site preparation and earthwork features for minimal impact to the overall construction schedule. Excavation and sampling of petroleum impacted soils areas will likely be the most timely and cost-effective manner to mitigate the PRSS.

Land Use Controls

At sites where environmental restoration activities have occurred, responsible parties sometimes need to limit exposure to hazardous substances or pollutants. When required, this is accomplished through Land Use Controls (LUCs). LUCs include any physical, legal, or administrative mechanism that place restrictions on the use of, or limits access to, real property to prevent exposure to chemicals above permissible levels. The intent of these controls is to protect the integrity of the selected remedy at the release site as well as human health and the environment by limiting the activities that may occur at a particular site.

From the planning to construction, all work planned or performed at Fort Belvoir is required to be compared to the areas of active LUCs. This is to aid project planning or limit construction in these areas until the selected remedy is complete and the LUC is no longer required. For parcels of land transferred from Army ownership, the Army recommends provisions such as limiting the disturbance of an area or limiting the use of groundwater in an area. The provisions are inserted into the deed and these restrictions are recorded at the appropriate courthouse or land record office. Enforcement depends on the jurisdiction, but typically this would be enforced under state law. Restrictions are enforced until the remedy is complete and are no longer required.

Once the impacted area of real property has been delineated, a Land Use Control Implementation Plan (LUCIP) is prepared. It serves as an internal management tool for Fort Belvoir that documents the extent of the area and explains the Land Use Controls (LUCs) that will be established. The LUCIP also defines the responsible parties for maintaining and managing LUCs. A summary of Fort Belvoir's current (October 2007) LUCIP is provided in Appendix A.

The Fort Belvoir LUC maintenance process employs three main elements: 1) documentation of controls through the installation's Geographic Information System (GIS) and in this Real Property Master Plan; 2) maintenance of controls through a siting approval process, demarcation of the area through physical markers or GIS, training, and inspections; and 3) tracking, modifying, and terminating the LUCs on the installation. Details about Fort Belvoir's LUC maintenance process can be found in Appendix A.

Areas of Potential Concern

During environmental investigations of SWMUs, it is also likely that additional, previously unidentified AOPCs, such as underground storage tanks, will be discovered. The size and extent of any AOPC investigation will be relatively small compared to the SWMU investigation. Therefore, it will probably not significantly impact investigation costs or schedules.

Other Operational Constraints

Other operational constraints, including septic tanks, wastewater disposal tanks, easements (i.e. utilities), RCI leased areas, and noise zones were also evaluated for this effort. None of these other existing conditions are expected to be encroached upon by the development options being presented.

Summary of Operational Constraints and Mitigations

The operational areas on Fort Belvoir represent the past and present mission that occurred on Post. Impacts to these areas are often desirable, as they may lead to the removal of hazardous materials. However, the ultimate improvement to the environment may involve costly and lengthy corrective measures. The types of operational resources that will be encountered are summarized on the following table. Impacts may also necessitate mitigation efforts which are also summarized on Table 2.10.

Table 2.10 - Summary of Operational Resources on Belvoir Main Post and FBNA		
Resource	Description	Mitigation
Operational Resources		
Former Training Ranges	About 400 acres on FBNA; additional ranges have been identified on Main Post.	Munitions and explosives of concern (MEC) is cleared and removed under an Army approved Explosive Safety Submission (ESS). While removal is costly, MEC clearance and removal can be accomplished concurrently with other site preparations as long as standoff distances are respected.
Solid Waste Management Units (SWMUs)	248 SWMUs in Fort Belvoir's SWMU Program.	Specific corrective action measures would need to be determined following detailed site investigations.
Hazardous Waste Management Units (HWMUs)	27 HWMUs on Fort Belvoir; all have been closed.	Any disturbance to the subsurface soil at these sites could require reopening the case. Construction through the areas will require developing a work plan, sampling, monitoring, reporting of site conditions, and waste generation. Disturbance of HWMU sites can be mitigated by further characterizing the impacted area through sample and analysis and employing a Health and Safety Program. Additional investigation could identify whether residual impacted soils exists and where they are located so that plans and cost estimates to excavate and remove the impacted soils can be developed.
Petroleum Storage Areas (PSAs)	Several hundred PSAs formerly existed or currently exist at Fort Belvoir.	PSAs located within a proposed building envelope could be aggressively addressed as part of the site preparations. A closure process involving administrative and decontamination processes will be required. Confirmation samples collected beneath USTs and potentially some ASTs will likely be required to demonstrate no release has occurred. On average, one in three underground storage tanks (USTs) at Fort Belvoir is an old single-walled steel UST. While these tanks meet current regulatory requirements for spill, overflow prevention and corrosion protection; it can be expected that some USTs will have had a release previously undiscovered. Site investigations at each release are approximately \$35,000 each and require approximately one month to complete. Mitigation measures could be integrated into the construction phase of the project in concert with the site preparation and earthwork features for minimal impact to the overall construction schedule.
Petroleum Release Sites (PRS)	Over 1,200 sites have been identified and a majority have been cleaned up.	Any disturbance to the subsurface soil at these sites could require reopening the case. PRSs located within a proposed building envelope could be aggressively addressed as part of the site preparations. Mitigation measures could be integrated into the construction phase of the project in concert with the site preparation and earthwork features for minimal impact to the overall construction schedule. Excavation and sampling of petroleum impacted soils areas will likely be the most effective manner to address these PRSs within the required time frame.
Areas of Potential Concern (AOPC)	Additional previously unidentified AOPCs could be found during environmental remediation of contaminated sites.	The size and extent of newly identified AOPCs would be expected to be relatively small compared to previously identified sites and therefore should not significantly impact the investigation costs or schedules.
Other Operational Constraints	Easements (i.e. utilities), Residential Communities Initiative (RCI) leased areas, noise zones, environmental justice.	Easements and RCI leased areas should be avoided. Zone III noise areas should be avoided; Zone II noise areas are not recommended for typical habitable structures. For environmental justice, if minority or low income communities were to bear a disproportionate share of the environmental consequences resulting from the proposed action, the action may require reevaluation.

Environmental Constraints Composite

Protecting and preserving the environment at Fort Belvoir is of paramount importance. The installation has vast natural, cultural, and historic resources, as well as operational considerations that limit the areas on Post that can be developed.

Identifying environmental constraints makes the developable areas on Fort Belvoir apparent. ENRD provided environmental GIS data, in which 25 constraints were identified. The constraints were related to primary natural/cultural resources and operational activities on Fort Belvoir (Table 2.11). These constraints were used to generate a constraints map (Figure 2.28). The map shows that constraints cover more than 65 percent of the Main Post

Table 2.11 - Level of Environmental Constraint

Limited Development

Natural Resources

Resource Protection Areas (RPAs)

100-year Flood Zones

Riparian Areas

Wetlands

Wildlife Management Areas

Forest and Wildlife Corridor

FBNA Environmental Quality Corridor (EQC)

Sensitive Flora Species

Sensitive Fauna Species

Cultural Resources

Archaeological Sites

Cemeteries

Historic Properties Buffer

Restricted Development

Natural Resources

Grassland Management Areas

Wetland Conservation Areas

Partners in Flight (PIF) Breeding Bird Buffers

Steep Slopes

Other Conservation Areas

Cultural Resources

Historic Zoning Overlay Districts

Historic Structures

Historic Districts

Operational Resources

Ranges*

Solid Waste Management Units (SWMUs)**

Hazardous Waste Management Units (HWMUs)**

Petroleum Storage Areas (PSAs)**

Petroleum Release Sites (PRSs)**

Easements

Notes: * Require OE clearance or removal
 ** Require investigation and remediation

and FBNA. At first glance, it appears that Fort Belvoir cannot be developed without significant impacts to the environment. However, some constraining factors are more easily mitigated than others. Additionally, certain operational constraints might actually benefit from development, due to the environmental clean-up efforts required for making the area suitable for construction.

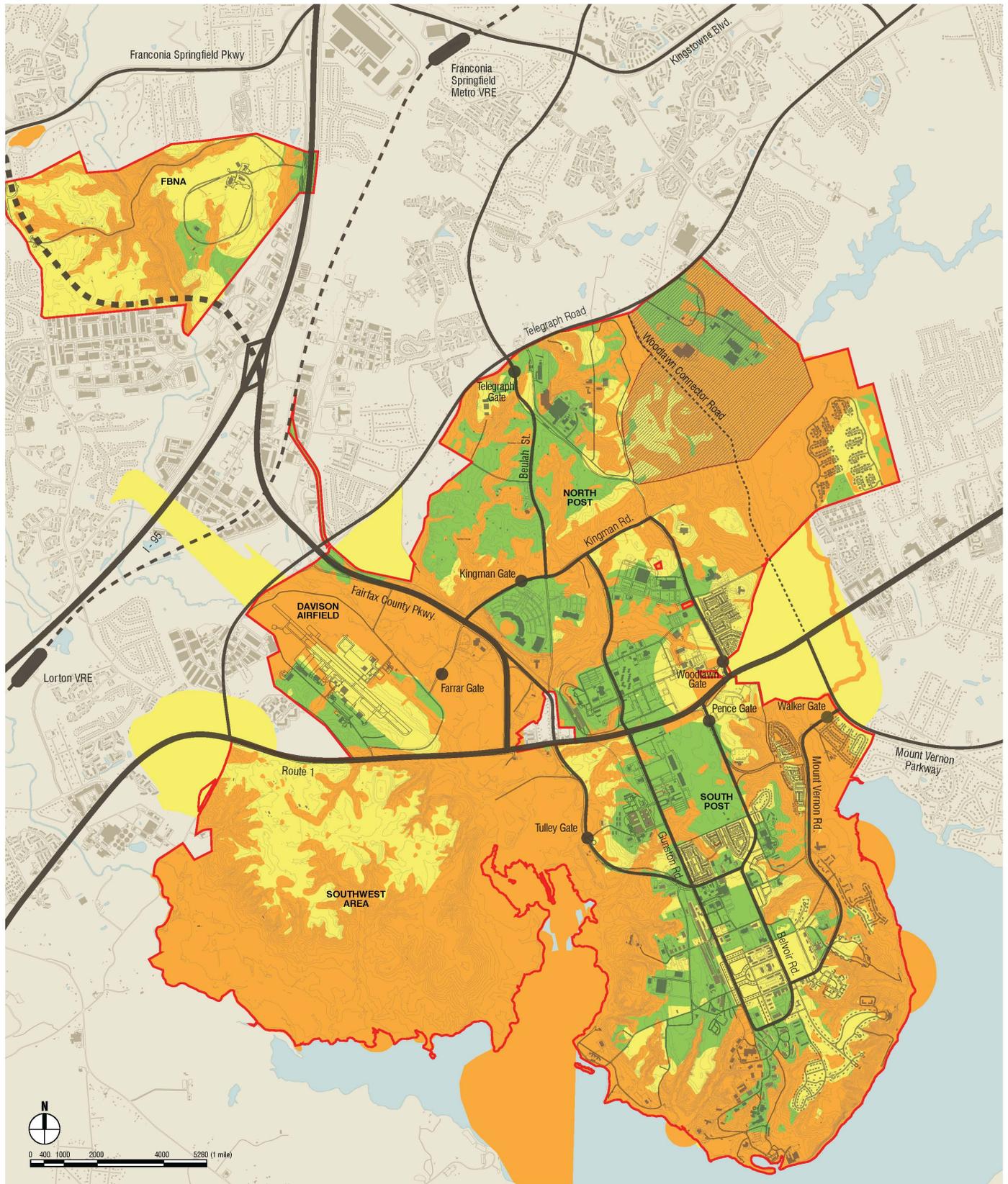
Constraints differ in criteria and requirements regarding encroachment. Therefore, not all resources are equally impacted by development or require the same level of mitigation. Some constraints are federally mandated and require significant mitigation. Others are simply Best Management Practice (BMP), requiring no or minimal mitigation.

The map (Figure 2.28) shows the Post divided into areas according to three levels of constraints. The areas designated as "Ideal for Development" have no environmental constraints and are recommended for development. The "Restricted Development" areas have some constraints associated with them that require mitigation before development can occur. The "Limited Development" areas have constraints that may require significant mitigation measures (for example, a sensitive natural area).

Future development is expected to be concentrated in the areas designated as "Ideal for Development" as construction would be less costly, faster and more convenient. Developing sites within the "Restricted Development" areas is possible but would require mitigation prior to development.

Sites within the "Limited Development" areas should only be developed as a last resort, such as when the need for contiguous land or roadway access is paramount. Before proposing development within these areas, the value of the environmental feature and the potential to mitigate its disruption should be considered carefully.

Figure 2.28 - Environmental Composite Constraints Map



- Ideal for Development
- Restricted Development
- Limited Development
- HEC (Not in Study Area)

Land Use

This section first provides an introduction to the recently revised land use classifications as presented in the 2007 Army Master Planning Technical Manual. This is followed by a narrative summary of existing land use conditions (on-post and off-post), the Existing Land Use Map, and an analysis of inconsistencies and incompatibilities. (Potential solutions will be presented in subsequent chapters.)

New Land Use Classifications

The land use map developed in this study is based on the new system adopted in 2007 by the Army for classifying land uses into seven categories. The Land Use Plan developed in the 1993 RPMP (Figure 2.29) used 12 categories.

The new 2007 Existing Land Use Map (Figure 2.30) is meant to reflect a generalized view of the installation, not a precise reflection of what is on the ground. The map is meant to reflect the dominant use of the area. The new system is intended to provide more flexibility in siting facilities and to encourage mixed-use development.

The seven categories used in the new system are: Professional/Institutional, Residential, Community, Troop, Industrial, Ranges and Training, and Airfield. In general, this new land use system allows more flexibility and the ability to create more dynamic mixed-use areas. The most recent Army Master Planning Technical Manual includes a land use matrix that indicates specifically which facility types are allowed, conditionally allowed, or not allowed in each new land use category. An edited version of this matrix (one that reflects Fort Belvoir specific requirements) is provided in Appendix B. An excerpt of the matrix is provided in Table 2.12, this includes the predominant facility types for Fort Belvoir.

One of the notable changes for land use classification is the elimination of a “constrained land” category, which was used to categorize protected land, environmentally sensitive areas, or otherwise undevelopable land. This type of land is now designated as the dominant land use category that surrounds it. Constrained land is now depicted on land use maps and plans with hatched overlay.

The lack of a land use designation for these constrained lands does not reduce environmental areas or increase developable areas. All of the constraints and use restrictions associated with these areas are still effective. For example, if a part of the Industrial land use has environmental “hatches”, the area still has all the limitations associated with the specific environmental feature concerned.

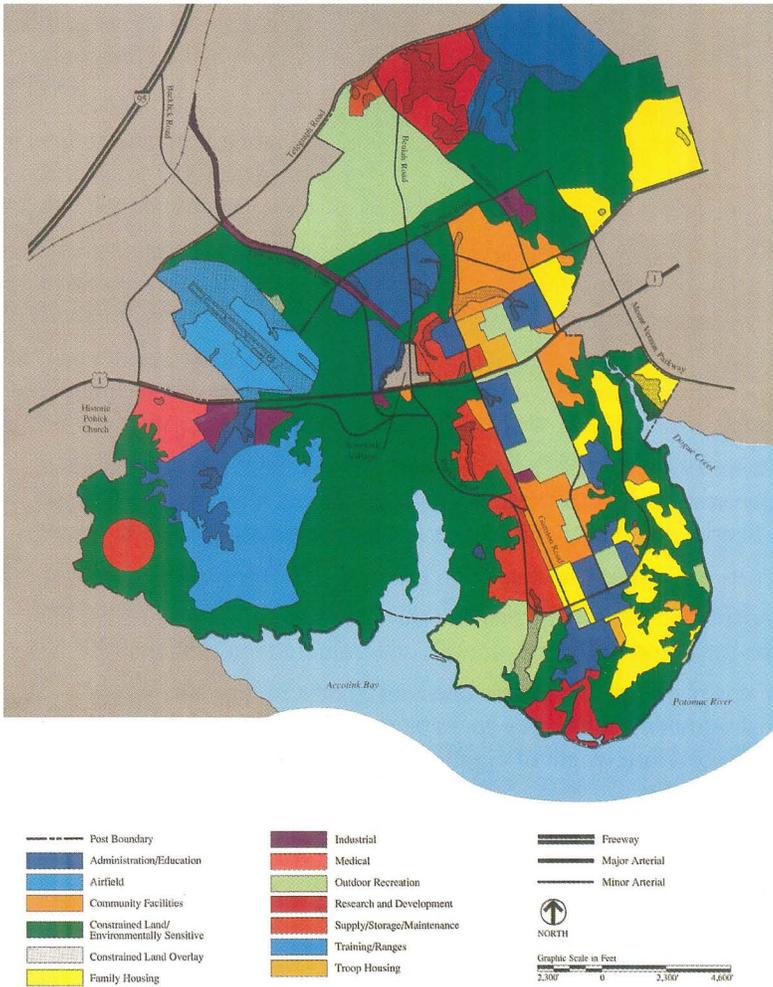


Figure 2.29 - 1993 Land Use Plan

A brief description of each land use category is included below.

- **Professional/Institutional** – This land use provides for non-tactical organizations including military schools, headquarters, major commands, and non-industrial Research, Development, Test and Evaluation (RDT&E).
- **Residential** – This land use provides space for family housing and senior unaccompanied personnel housing. It also includes family services and may have other neighborhood services associated with the community land use cluster included in the area.
- **Community** – This land use encourages a mix of uses. Facilities allowed include religious, family support, personnel services, professional services, medical, community, housing, commercial and recreational services. Users live both on and off Post and may include soldiers, dependents, retirees, and other civilian personnel.
- **Troop** – This land use is designated for operational facilities for TOE units, as well as complexes for Basic Combat Training (BCT), One Station Unit Training (OSUT), and selected Initial Entry Training (IET). The goal is to provide contiguous facilities to related organizations in order to facilitate operational readiness; to support operations security for deployable units; and to improve circulation and movement of trainees between sleeping, eating, and training facilities.
- **Industrial** – This land use is designated for production; maintenance; depot and other storage; and activities that generate significant amounts of heavy vehicle traffic, loud outdoor equipment operations, noise, smoke, steam, or pollutants that must be processed on the site.
- **Ranges and Training** – This land use includes live fire ranges, non-live fire ranges, and special training areas, such as confidence courses, drivers training, or land navigation.
- **Airfield** – This land use is designated for flight operations (including runways and taxiways) and airfield support facilities (including airfield operations, aviation refueling, aviation maintenance, and related test facilities).

Table 2.12 Land Use Matrix Excerpt *

Class	FCG	FCG Description	UM	Airfields	Ranges & Training	Industrial	Community	Professional / Institutional	Residential	Troop
D	F17120	General Instruction Buildings	SF	C	C	C	C	A	N	C
P	F51000	Medical Centers/ Hospitals	SF	N	N	N	A	A	N	N
P	F53080	Fisher Houses	SF	N	N	N	A	A	C	N
D	F60000	Administrative Facilities	SF	A	C	C	C	A	C	A
P	F7110F	Family Housing, Families	FA	N	N	N	A	C	A	N
P	F7201P	Army Lodging, Spaces	SF	N	N	N	A	A	C	A
P	F7210P	Unaccompanied Personnel Housing, Enlisted Spaces	SF	N	N	N	C	C	A	A
P	F7217P	Unaccompanied Personnel Housing, SR NCO Spaces	SF	N	N	N	C	C	N	A
P	F7240P	Unaccompanied Personnel Housing, Officer Spaces	SP	C	N	N	C	C	A	N
P	F73010	Fire and Rescue Facilities	SF	A	A	A	A	A	A	A
P	F73016	Police/MP Stations	SF	C	N	A	A	A	N	N
P	F73017	Religious Facilities	SF	N	N	N	A	A	A	A
P	F73046	Dependent Schools	SF	N	N	N	A	C	A	N
P	F74006	Banks	SF	N	N	C	A	A	A	C
P	F74012	Eating Facilities Not Exchange Managed	SF	C	N	N	A	A	A	A
P	F74014	Child Development Centers	SF	N	N	N	A	A	A	N
P	F74028	Fitness Facilities	SF	C	N	N	A	C	A	A

NOTE: * See Appendix B for the complete Land Use Matrix.

A Allowed
 N Not Allowed
 P Primary
C Conditional
 D Dual-use

Existing Land Use

Fort Belvoir's existing land use is fairly well-organized. A summary of existing land use conditions and an analysis of inconsistencies and incompatibilities are provided here. Numbers listed next to descriptions are keyed to locations on the Existing Land Use Map (Figure 2.30).

Professional / Institutional

Fort Belvoir's current administrative land uses are generally organized into seven areas. There are four pockets of administration and education facilities located along the central north-south axis of the Post, and there are three larger research and development (R&D) areas that connect to this core but extend outward toward the Post Boundaries. These R&D areas have restricted access and security in addition to the Post security.



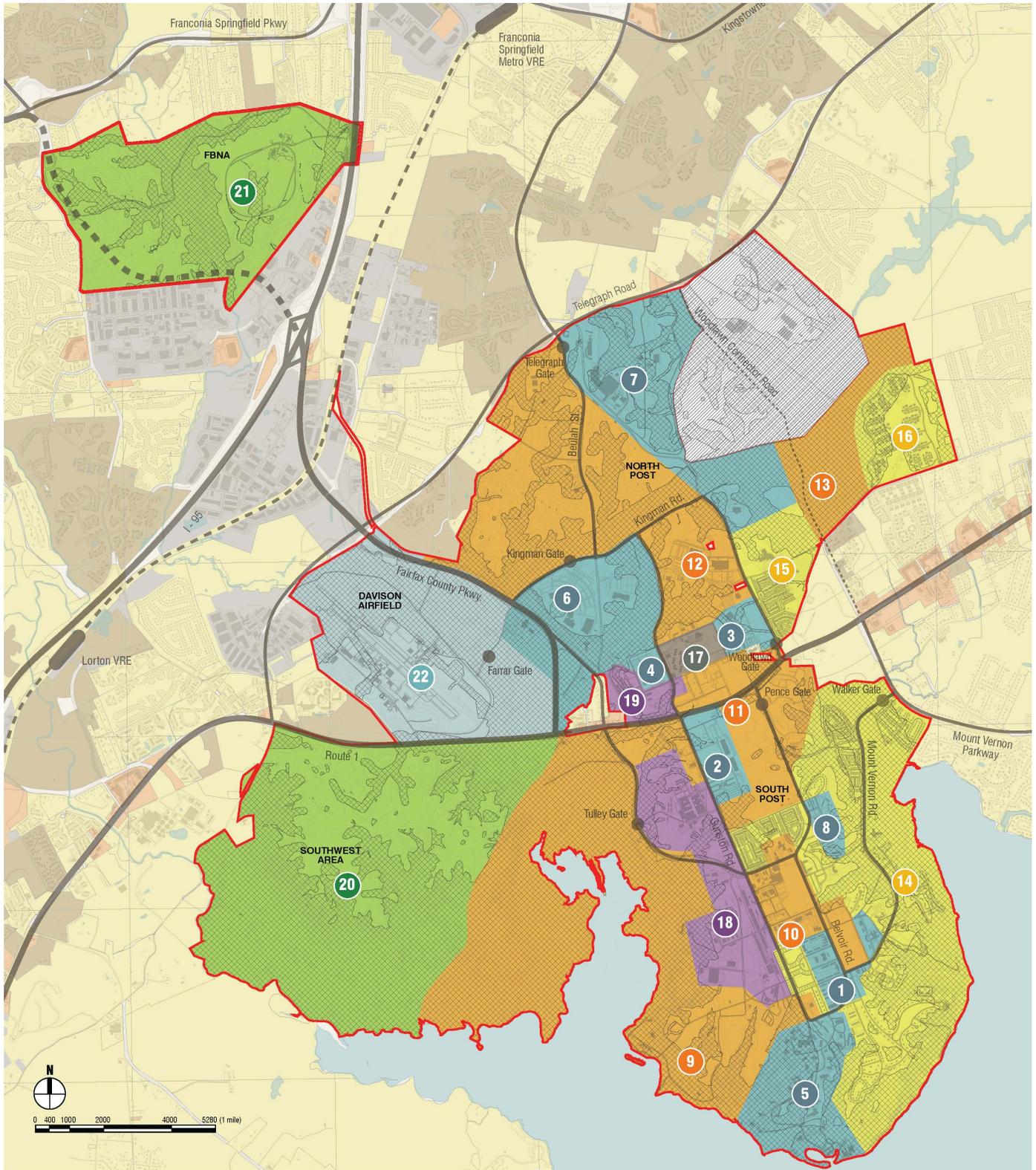
Headquarters Building



Center for Army Intelligence

- 1 The first cluster is located around the historic Parade Grounds on South Post. This area includes the Post's Headquarters, other agencies' headquarters, general administrative facilities, and training facilities.
- 2 The second cluster is directly west of the South Post Golf Course along Gunston Road. The buildings within this region were converted from troop housing to office space in the 1990's.
- 3 There are two small areas on the North Post
- 4 located between Abbot and Goethals Roads. They are separated by the troop area. The area located to the east of the troop area includes general administration functions and the Center for Army Analysis. The area to the left of the troop area includes the Army National Guard Reserve Center.
- 5 The fifth cluster is located on the southern fringes of the Post's peninsula just west of Fairfax Village. This area extends to between 21st and 23rd Streets close to the Post's historic homes and villages. The main focus of this administrative cluster is primarily research-oriented and includes numerous older laboratories and research facilities.
- 6 The sixth cluster of administrative land is located on the North Post between Fairfax County Parkway and Gunston Road. The Defense Logistics Agency (DLA) building dominates this area as the main administrative facility.
- 7 The seventh cluster of administrative land is located amid the Post's northern boundaries between Telegraph Road and Woodlawn Road. The activities on this land are of a classified nature, and access is restricted to authorized civilians and military personnel. The Defense Communications-Electronics Evaluation and Testing Agency (DCEETA) is the primary tenant on this land.
- 8 The eighth cluster is located on the South Post and is surrounded by Residential land uses. It encompasses the DeWitt Army Hospital, which is the primary medical facility on the Post. The facility is outdated and BRAC has expanded the hospital functions by adding missions from Walter Reed, which is closing as part of BRAC 2005. This new larger hospital program was part of the Siting Analysis performed in June 2006.

Figure 2.30 - Fort Belvoir Existing Land Use



- | | | | | |
|------------------------------|----------------|-------------------------------|--------------------------------|---------------------------------|
| Professional / Institutional | Range/Training | HEC (Not in Study Area) | SURROUNDING AREA ZONING | |
| Residential | Airfield | Constrained Development Areas | Commercial | Residential |
| Troop | Industrial | | Industrial | Planned Development Residential |
| Community | | | | |

Community

Most of the commercial based activities - shopping, dining, services - are located along the primary north-south axis of the Post. There are three main areas set aside for outdoor recreation: two golf course areas and the Tompkins Basin Recreation Area. Other small areas for outdoor recreation are dispersed throughout the Post, and include ball fields, tennis courts, racquetball courts, a skateboard park, and football fields.



Town Center



Post Exchange

- 9 The first area, Tompkins Basin Recreation Area, is located on the southwestern portion of the Post's main peninsula adjacent to Gunston Cove. Currently, this area offers modest recreational opportunities. However, the area has potential to be a significant recreation area.
- 10 The second area is located at the center of the South Post. This area comprises the original community facilities that were built on Post in the early-mid twentieth century. Additional community services were built here during later years, but they are primarily small in scale. No new development had occurred in this area until recently when, in conjunction with Residential Communities (RC), the start of a town center was developed along 12th Street. This new development is a mixed-use development of retail and residential.
- 11 The third area spans either side of U.S. Route 1. It includes the South Post golf course, the Community Club, and the open fields and Parade Grounds on the North Post. This area can be perceived as the public interface of the Post because of its proximity to and views into this area from U.S. Route 1.
- 12 The fourth area is on North Post between Abbot and Telegraph Roads. It includes community support facilities such as the PX, the Commissary, the bank, and the 36-hole golf course. In general, the community facilities on North Post are considerably larger in scale than those on South Post. They serve a more regional purpose, and therefore attract a larger volume of users and traffic.
- 13 The fifth area is the Abbott Wetlands Refuge near the Woodlawn Village Housing area along Dogue Creek. The Refuge, open to the public, provides recreational trails through 150 acres of non-tidal wetland and forest.

Residential

Family Housing consists of twelve villages primarily situated along the southeast and east edges of the Post. Under the U.S. Army's Residential Communities Initiative (RCI), Clark Pinnacle and the Department of the Army (DA) formed a 50-year public-private partnership to develop, rehabilitate, and construct 2,070 homes on 576 acres of the Post. Prior to the RCI, all of Fort Belvoir housing was in poor condition and was built at low to medium densities.

The RCI project commenced operations on December 1, 2003. The development plan, spanning eight to ten years, includes the demolition and replacement of 1,900 homes and the renovation of 170 historically significant homes.

14 The first residential area is essentially the eastern side of South Post. This area contains the first housing developments, which were constructed in the 1920s to the early 1940s. These included Belvoir Village, Gerber Village, and Jadwin Loop. By the mid 1950s, construction began on Fairfax and Dogue Creek Villages. Colyer, George Washington, and River Villages are located just south of U.S. Route 1 and east of the South Post Golf Course. River Village is located on the eastern bank of Dogue Creek; approximately one-third of the community lies within the 100-year floodplain. RCI is currently in the process of replacing all of the housing units within this area, with the exception of the historic housing, which is being renovated.

15 Lewis Village, located off of Woodlawn Road just north of U.S. Route 1, is one of two family housing clusters on North Post. This cluster was demolished and replaced in 2005.

16 Woodlawn Village, the second cluster on North Post located in the northeastern section of the Post, is isolated from the rest of the Post. This family housing cluster has been further isolated by the closing of the gate at Pole Road. Residents of Woodlawn Village must exit the Post and reenter at a different gate in order to access other portions of the Post.



Herryford Village - New RC Housing



Historic Housing

Troop

The primary area troop land use on Post is located between Abbott and Goethals Roads. There are some individual student and unaccompanied housing buildings located on other areas of the Post. These are located: adjacent to the Officer's Club; South of 23rd Street on Forney Loop (primarily used for student housing); at Knadle Hall on Gaillard Road; adjacent to DeWitt Army Hospital; at the corner of Peterson Loop and Belvoir Road; at the corner of Petrarcha Road and Farrel Road; and at McRee Barracks on North Post.

17 The primary troop area consists of McRee Barracks, a fitness center, theater, and dining hall. This area also includes the maintenance facilities between Meade and Goethals Roads just north of U.S. Route 1. There are five motor pools (two being Army Reserve) and six maintenance shops (two again being Army Reserve). McRee Barracks are in poor condition and slated for replacement in the current five-year development plan. These do not need to be relocated in place.



McRee Barracks

Industrial

There are two primary industrial areas on the Post. They are organized along the former rail line and consist primarily of warehousing functions. Additionally, there are utility plants and waste disposal facilities scattered throughout the Post. These generally fall within their surrounding, broader land use categories and are categorized as such.

- 18 The larger of the two industrial areas is located on South Post. It serves as the primary supply/storage area on the Post. It contains over 35 storage facilities, many of which are in inadequate condition. The area also includes two small maintenance clusters: a vehicle maintenance shop (directly west of Gunston Road in the 700-area) and a transportation motor pool (on 16th Street).
- 19 The second industrial area, located along Meade Road comprises the remaining storage area on Post. The facilities in this area are in very poor condition.



Industrial Area along Meade Road



South Post Industrial Area

Ranges and Training

There are two large range and training areas designated on Fort Belvoir: the Southwest Post and FBNA. In addition to these, the Fort Belvoir Range Plan maintains range designations at numerous areas throughout the Post. Many of these smaller areas and most of FBNA are not active, and only maintain their range designation because the process to officially remove the designation has not been done. There are 15 operational ranges and 19 Military Munitions Response Program (MMRP) range sites on Fort Belvoir.

- 20 Primarily outdoor training takes place on the Southwest Area. Much of the land on the Southwest is not developable due to operations and environmental constraints.
- 21 The second area is FBNA. There is only one small mission housed there, which does not functionally need to be located on FBNA. Additionally, the facilities are in very poor condition.

Airfield

- 22 Davison Army Airfield is located on the Post's western periphery just north of U.S. Route 1. It serves the Army's aviation needs in the National Capital Region with an average of 20 missions (takeoffs and landings) per day. An increase in takeoffs and landings is projected by the airfield operators. The facilities are in poor condition.



Davison Army Airfield

Adjacent Off-Post Land Uses

Fort Belvoir resides in a populous county composed of a diversity of land uses. As projections continue to forecast population growth well into the future, an understanding of adjacent development will highlight the types of encroachment impacts on the Post. The variety of land uses that surround the post are discussed in this section.

Residential

Areas zoned residential constitute the majority of lands adjacent to Fort Belvoir's main post and FBNA. These are located along the Main Post's eastern, western, and north/northwestern boundaries; and along the north, east, and west edges of FBNA.

These zones vary in density, ranging from R-1 (one dwelling unit per acre) to R-20 (twenty dwelling units per acre). However, most are zoned low-density, single-family detached units. The medium-density zones for row and town houses and multi-unit buildings are primarily located off U.S. Route 1 to the east and west of Main Post. The other two types of residential zones adjacent to Fort Belvoir include Residential Estate District (R-E) and Rural Agricultural District (R-A). Residential Estate Districts are zoned for one dwelling unit per two acres, or 0.5 dwelling unit per acre. Rural Agricultural Districts are zoned for one dwelling unit or manufactured home per five acres, or 0.2 dwelling unit or manufactured home per acre. Lands zones with these categories are located south/southwest of the Main Post.

For the most part, the residential zones around Fort Belvoir have been built to capacity. Older residential zones date from 30 years or greater and feature single-family homes. Recent demolition of older neighborhoods to create new developments at higher densities has produced contemporary town houses and apartment building complexes. New single-family housing communities have also replaced older neighborhoods. A trailer home community, the only example of this housing type in the area, is located north of U.S. Route 1 to the east of the Main Post.

Many residential zones also contain several types of community use facilities, including civic centers, places of worship, cemeteries, schools, and parks. Therefore, the overall character of these residential zones varies greatly from neighborhood to neighborhood. A few large pockets of open or wooded residentially zoned lands remain undeveloped or not fully developed around Fort Belvoir. These areas can be found: along the northern boundary of Main Post on Telegraph Road; between Newington Industrial Park and Lockport Industrial Park; along Telegraph Road; along the eastern boundary of Main Post off U.S. Route 1; along the southern side of U.S. Route 1 to the west of Main Post; and on the eastern boundary of FBNA off Interstate 95.



Residential Neighborhood along West Side of FBNA



New Housing Area West of Fort Belvoir off of Route 1

Historic Properties

There are a number of historic properties located adjacent to Fort Belvoir, such as Woodlawn Plantation, the Friends Meeting House, Pohick Church, and Mount Air. Fairfax County has delineated zoning overlay buffers of roughly ¼ mile around these off-post resources, with buffers extending on-post. More details about these areas can be found in the Cultural and Historic Resources section presented earlier in this report.

Industrial

Four classifications of industrial district zones are adjacent to Fort Belvoir. These include: Light Intensity Industrial District (I-3); Medium Intensity Industrial District (I-4); General Industrial District (I-5); Heavy Industrial District (I-6). Each zoning district varies greatly from warehouses and retail centers to major production, distribution, and manufacturing centers.

The majority of industrial zones adjacent to Fort Belvoir are located to the northwest of the Main Post and to the southeast of FBNA.

Lockport Industrial Park and Pohick Industrial Park are located in an area along Telegraph Road. This industrial area is marked by smaller retail outlets as well as business and production centers.



Industrial Area along Telegraph Road

Alban Industrial Park, Allen Industrial Park, Gateway 95 Business Park, Hill Top Industrial Park, and Newington Commerce Center and Industrial Park are all located south of I-95 near the interchange with Fairfax County Parkway. This heavy industrial area is made up of major manufacturing centers, including a pipe line company whose tanks dominate the skyline along the Fairfax County Parkway.

Fullerton Industrial Park, Interstate Industrial Park, and VA 95 Industrial Park run along the southern boundary of FBNA. This industrial area along FBNA is comprised of service and repair stations, office buildings, and retail centers.



Industrial Area near the Interchange of I-95 and Fairfax County Parkway

The overall character of the industrial zones adjacent to Fort Belvoir is dictated by substantial development, intense uses, large footprint buildings, heavy equipment traffic flow, an overabundance of surface parking, and very little, if any, green space. Additionally, due to the size of the facilities and their nearness to major transportation corridors, these industrial districts are highly visible and have a negative impact on the visual character of the area between Fort Belvoir's Main Post and FBNA.

Commercial

The following commercial district zones can be found in lands adjacent to Fort Belvoir: Limited Office District (C-2); Neighborhood Retail Commercial District (C-5); Community Retail Commercial District (C-6); Highway Commercial District (C-8). Within these commercial zoning districts, building types range from small office complexes to major retail shopping centers.



Industrial Area south of FBNA

Commercial zones adjacent to Fort Belvoir are generally located in three major areas: east and west of the Main Post along U.S. Route 1, and south/southeast of FBNA along Interstate 95. A few small pockets of commercially zoned land are located north of the Main Post along Telegraph Road.

The commercial zones adjacent to Fort Belvoir, especially those along U.S. Route 1, are comprised of strip malls, big box retailers, chain restaurants, and service stations that collectively define the visual character of these areas. Around Fort Belvoir, these low rise commercial zones are highly developed, possess very little green space, and produce a continuous flow of traffic. These poorly planned and developed areas along U.S. Route 1 leave a negative visual impact on the area. Fortunately, some of this development is buffered from the main post by way of properties owned by Woodlawn to the east and undeveloped land to the west. Commercial areas located along Interstate 95, which are south/southeast of FBNA, only add to the already haphazard appearance of the industrial districts that govern the area.



Commercial Area along Route 1

Planned Development - Housing

The Planned Development Housing District is established to encourage innovative and creative design and to facilitate use of the most advantageous construction techniques in the development of land for residential and other selected secondary uses. The district regulations are designed to ensure ample provision and efficient use of open space; promote high standards in the layout, design and construction of residential development; promote balanced developments of mixed housing types; encourage the provision of dwellings within the means of families of low and moderate income; and otherwise implement the stated purpose and intent of the Fairfax County Zoning Ordinance.

For purposes of computing density, the Planned Development Housing District is divided into subdistricts in which the residential density is limited as follows:

Table 2.13 - Planned Development Housing District Densities	
Subdistrict	Density
PDH-1	1 dwelling unit per acre
PDH-2	2 dwelling units per acre
PDH-3	3 dwelling units per acre
PDH-4	4 dwelling units per acre
PDH-5	5 dwelling units per acre
PDH-8	8 dwelling units per acre
PDH-12	12 dwelling units per acre
PDH-16	16 dwelling units per acre
PDH-20	20 dwelling units per acre
PDH-30	30 dwelling units per acre
PDH-40	40 dwelling units per acre

Planned Development Housing Districts are primarily located between the northern boundary of Fort Belvoir's Main Post and Interstate 95. Planned Development Housing Districts are also located north of FBNA along the Franconia-Springfield Parkway. A few Planned Development Housing Districts are located to the east of Main Post off U.S. Route 1.

The Planned Development Housing Districts surrounding the Main Post and FBNA are mainly zoned for low-density, single-family housing units, ranging from PDH-2 to PDH-5. A few of the Planned Development Housing Districts off U.S. Route 1, located east of the Main Post, are zoned for medium-density row and town houses (PDH-16 to PDH-20).

A majority of these Planned Development Housing Districts already contain new residential development. These residential communities primarily consist of single-family detached units on individual lots. A few communities are comprised of or contain a portion of attached row and/or town houses.

The overall character of many of these neighborhoods is generally defined by a notable effort to maintain shared public green space and demonstrate a sense of community. Several developments along Telegraph Road, for example, have provided residents with tree-lined avenues, sidewalks, and community playgrounds that have a positive impact on these neighborhoods.



Planned Development Housing Area adjacent to Fort Belvoir near the intersection of Telegraph and Kingman Roads



Planned Development Housing Area north of Fort Belvoir



Planned Development Housing Area north of Fort Belvoir

Compatibility/Adjacency Concerns

There are a number of incompatibilities in the existing on-post and off-post land uses that need to be addressed in any redevelopment plans proposed for those areas (Figure 2.31).

On-post land use issues that need to be taken into account include:

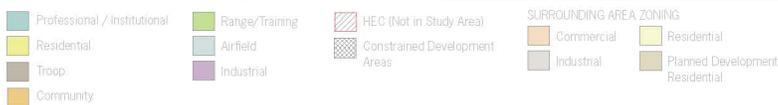
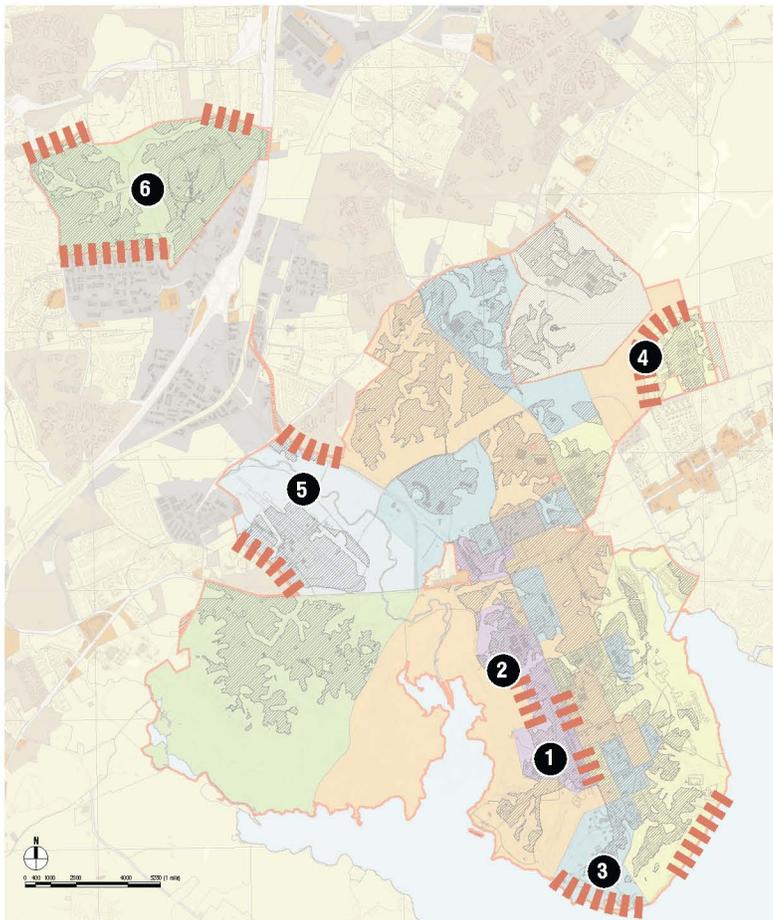
- 1 The Industrial land use on the South Post is located adjacent to the Town Center and the residential development in the historic district. An adequate area must be dedicated to buffering or providing a transition between these uses.
- 2 Tulley Gate is the visitor entrance to the Post and all visitors will pass by the Industrial land use. Care must be taken to redevelop this part of the Post to present an appropriate first impression to visitors.

- 3 Professional/Institutional uses in the 300 area and residential uses on the South Post that are located on slopes close to the water must be mindful of the viewshed of historic areas across the water.
- 4 The Community land use encompassing Abbott Wetlands Refuge isolates Woodlawn village from the rest of the Post. Residential land uses could be consolidated in order to provide better access to amenities and infrastructure.

Off-post land use issues that need to be taken into account include:

- 5 Residential and other sensitive land uses in the vicinity of DAA affect the operational capability of the airfield. The Post must keep up community awareness and outreach efforts. A special joint land use study (JLUS) may be undertaken to identify actions that can and should be taken jointly by the surrounding community and the Post to solve existing encroachment problems and prevent future ones.
- 6 Industrial development to the south and residential uses to the north of FBNA about the installation boundary. Redevelopment of the FBNA must address the transition between on-post and off-post development.

Figure 2.31 - On and Off Post Land Use Concerns



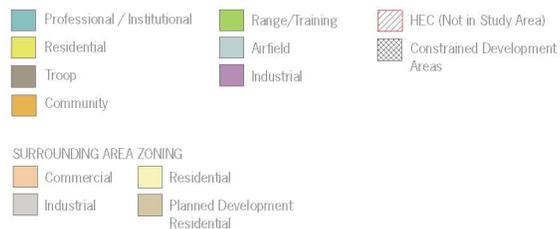
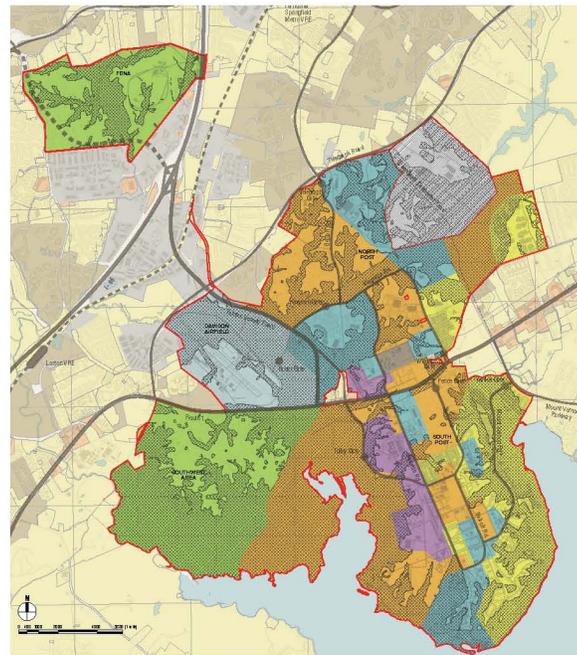
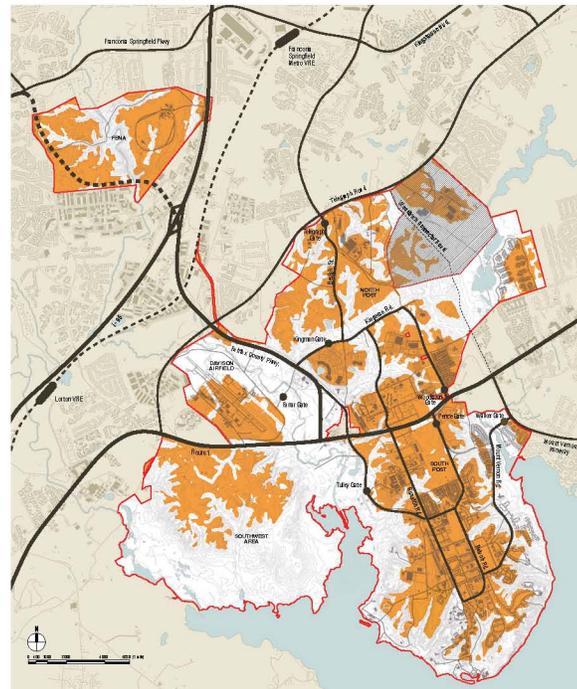
Developable Areas

The developable areas map (Figure 2.32) is a result of combining the areas identified as “Ideal for Development” and “Restricted Development” on the Composite Environmental Constraints Map provided previously in this section (Figure 2.28). It is expected that most of the new development will be directed toward these developable areas.

To better understand the land currently available for development, a “constrained development” layer was created (the inverse of the “developable areas”), and overlaid onto the Existing Land Use Map (Figure 2.32). The map depicts how much of any land use category is actually available for development. Actual acreages for each land use category, for both the gross and net (developable) land, are shown in Table 2.14

Table 2.14 Land Use Acreages			
	Total Acres	Constrained Acres	Developable Acres
Professional / Institutional	1233	673	560
Residential	1306	786	520
Troop	46	0	46
Community	2602	1662	940
Range/Training	2227	1297	930
Airfield	707	469	238
Industrial	379	103	276
TOTAL	8500	4990	3510
TOTAL PERCENTAGES	100	59	41
MAIN POST TOTAL	7700	4705	2995
FBNA TOTAL	800	285	515

Figure 2.32 - Developable Areas Map and Land Use Overlay



Transportation

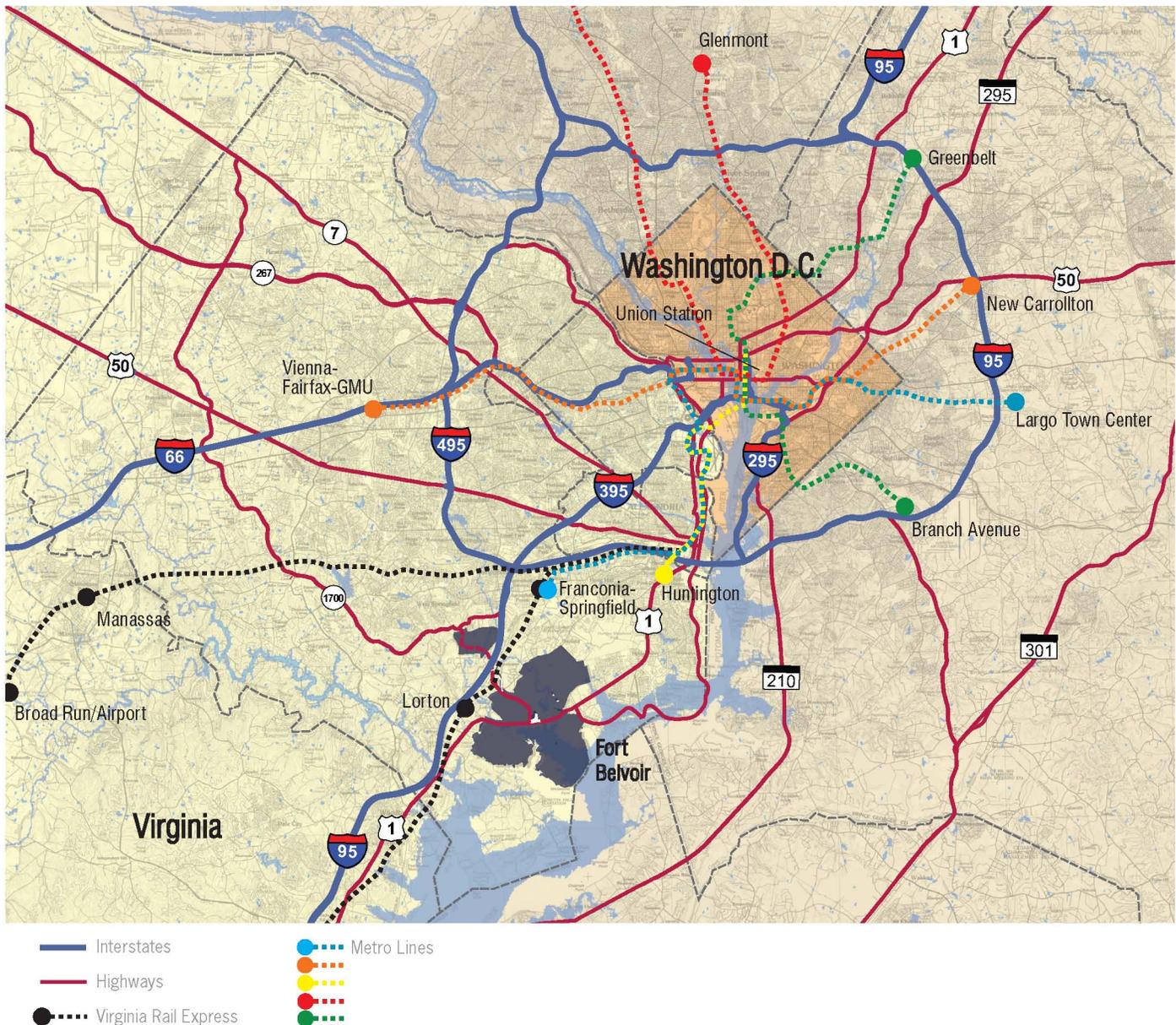
Road Network

The northern Virginia transportation network is already greatly strained from rapid development, significant employment growth within Fairfax County and Alexandria's Cameron Valley area, and residential growth in Prince William, Stafford, and Fredericksburg counties to the south. The result is one of the busiest, most congested transportation corridors in the country. Even if no further growth results from Fort Belvoir's BRAC action, area traffic would substantially increase over the next two decades.

The roadways in the vicinity of Fort Belvoir:

- Provide access to adjacent land uses
- Serve as major commuter routes to employment locations along the Capital Beltway (I-495) and the Shirley Highway (I-395), including Merrifield, Tyson's Corner, the Bailey's Crossroads area, the Pentagon, Pentagon City, Crystal City, and the Washington D.C. core area
- Provide for long distance truck and auto travel along the Eastern Seaboard's I-95 corridor

Figure 2.33 - Regional Transportation Map



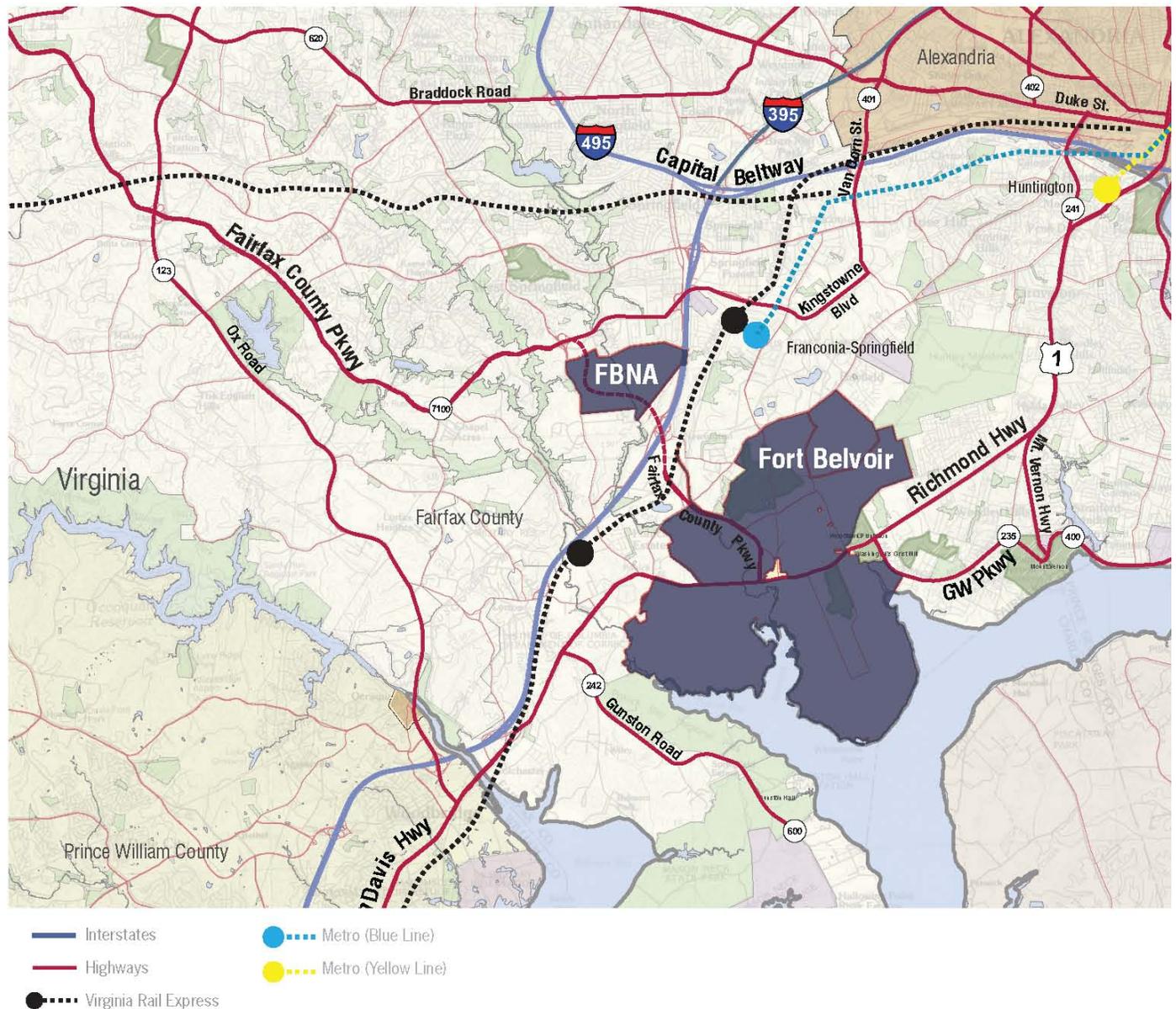
In the vicinity of Fort Belvoir Main Post (Figure 2.33 and 2.34) the Northern Virginia highway system primarily consists of the major roadways that serve as commuter routes:

- Interstate 95 (I-95)
- Interstate 395 (I-395 Shirley Highway)
- Interstate 95/495 (I-95/I-495 Capital Beltway)
- U.S. Route 1 (Richmond Highway)
- Virginia Route 7100 (Fairfax County Parkway)
- Virginia Route 611 (Telegraph Road)
- Virginia 613 (Beulah Street/Van Dorn Street)
- Virginia Route 235 (Mount Vernon Memorial Highway)
- Virginia 641 (Pohick Road)
- Virginia 642 (Lorton Road)
- George Washington Memorial Parkway

In addition to I-95 and the Fairfax County Parkway, the following regional roadways also serve as commuter routes for FBNA:

- Virginia Route 7900 (Franconia-Springfield Parkway)
- Virginia Route 617 (Backlick Road)
- Virginia Route 638 (Rolling Road)

Figure 2.34 - Sub-Regional Transportation Map



Main Post Road Network

The roadway system on Main Post (Figure 2.35) includes:

- John J. Kingman Road on North Post – provides access from Fairfax County Parkway to a number of sites, including the Andrew T. McNamara Headquarters Complex, Mosby Reserve Center, and Davison Army Airfield.
- Beulah Street – provides access to North Post from Telegraph Road and connects to Kingman Road.
- Woodlawn, Meade, Goethals, Abbot, Gorgas and Meeres Roads provide internal circulation within North Post from Gunston and J.J. Kingman Roads.
- Gunston Road – is the major north-south roadway connecting North and South Posts, and the only roadway connection that crosses over U.S. Route 1.
- Pohick Road – provides access to South Post from U.S. Route 1 via Tulley Gate, where all Post visitors enter and are processed at the Post Visitor Center.
- Belvoir Road – provides access to South Post from U.S. Route 1 via the Pence Gate.
- Mount Vernon Road – provides access to South Post from Mount Vernon Memorial Highway via the Walker Gate.
- 9th, 12th, 16th, 18th, 21st and 23rd Streets – provide east-west movement on South Post and connecting Gunston Road with Belvoir Road.

FBNA Road Network

FBNA entrance is via gates from Backlick Road and Rolling Road. There is minimal roadway circulation within the grounds itself (Figure 2.35). Barta Road provides entry from Backlick Road on the east side of FBNA. Barta Road connects to Cissna Road, which crosses FBNA from east to west. Cissna Road connects to Rolling Road on the west side of FBNA. The Cissna Road bridge over Accotink Creek is presently not in service.

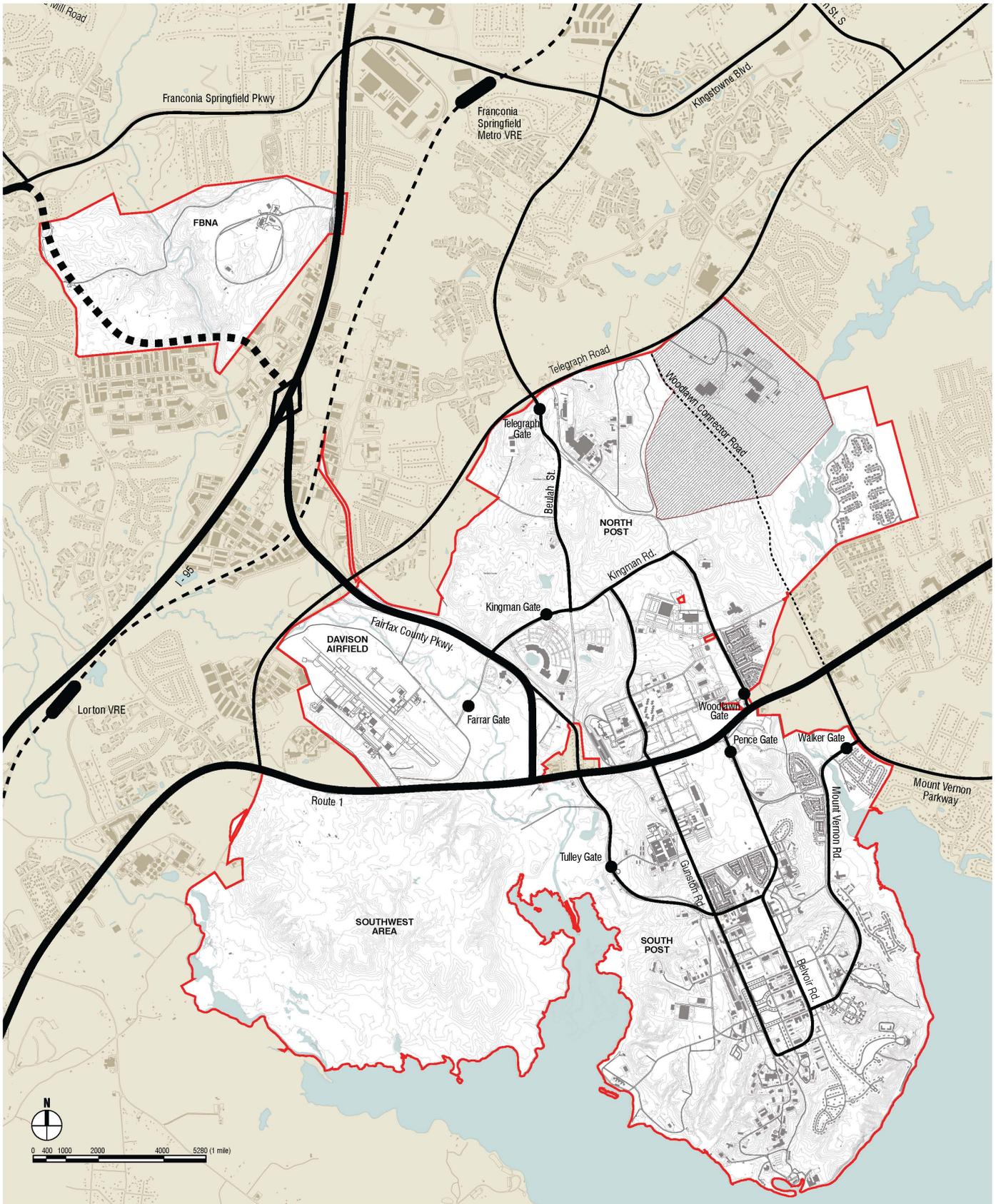
Rail Transit

While no rail transit service is directly provided to Fort Belvoir, a rail line serving both WMATA's Metrorail and the VRE is less than a mile from both Main Post and FBNA boundaries. Additionally, each service has rail stations within a few miles of Fort Belvoir, as discussed below.

Metrorail - WMATA's Metrorail system has two stations that provide access to Fort Belvoir. The Franconia-Springfield Station, on Metrorail's Blue Line, is located approximately three miles north of Fort Belvoir. Huntington Station, on the Yellow Line, is located approximately seven miles northeast of the Post. Both the Blue and Yellow Lines provide service to Ronald Reagan National Airport and the Pentagon, as well as the central core area of Washington, D.C., with connections to every other Metrorail line.

VRE - The Fort Belvoir area of Fairfax County is served by VRE's Fredericksburg Line. Two VRE stations are located in the general vicinity of Fort Belvoir. The Lorton Station is located approximately 1.5 miles west of Fort Belvoir, east of I-95, and south of Pohick Road. The Franconia-Springfield Station is located adjacent to the Franconia-Springfield Metrorail Station, approximately three miles north of Fort Belvoir. The Fredericksburg Line operates between Fredericksburg and Union Station in Washington, D.C. It serves locations in Stafford County, Prince William County, Fairfax County, Alexandria, and Arlington County.

Figure 2.35- Local Road Map



Bus Service

Currently, a total of six bus routes directly serve portions of Fort Belvoir. Six additional bus routes operate within the vicinity of Fort Belvoir, either terminating immediately outside the boundaries of the Post or passing nearby. Figure 2.36, the South Fairfax County Bus Service, illustrates existing bus services in this section of Fairfax County, provided by the Fairfax Connector and WMATA Metrobus.

Bus Routes in the Vicinity of Fort Belvoir - These routes (which currently do not serve any Fort Belvoir locations) represent a potential resource for expanded bus transit service to Fort Belvoir. If demand for service should ever increase, these nearby routes could be modified at relatively low cost:

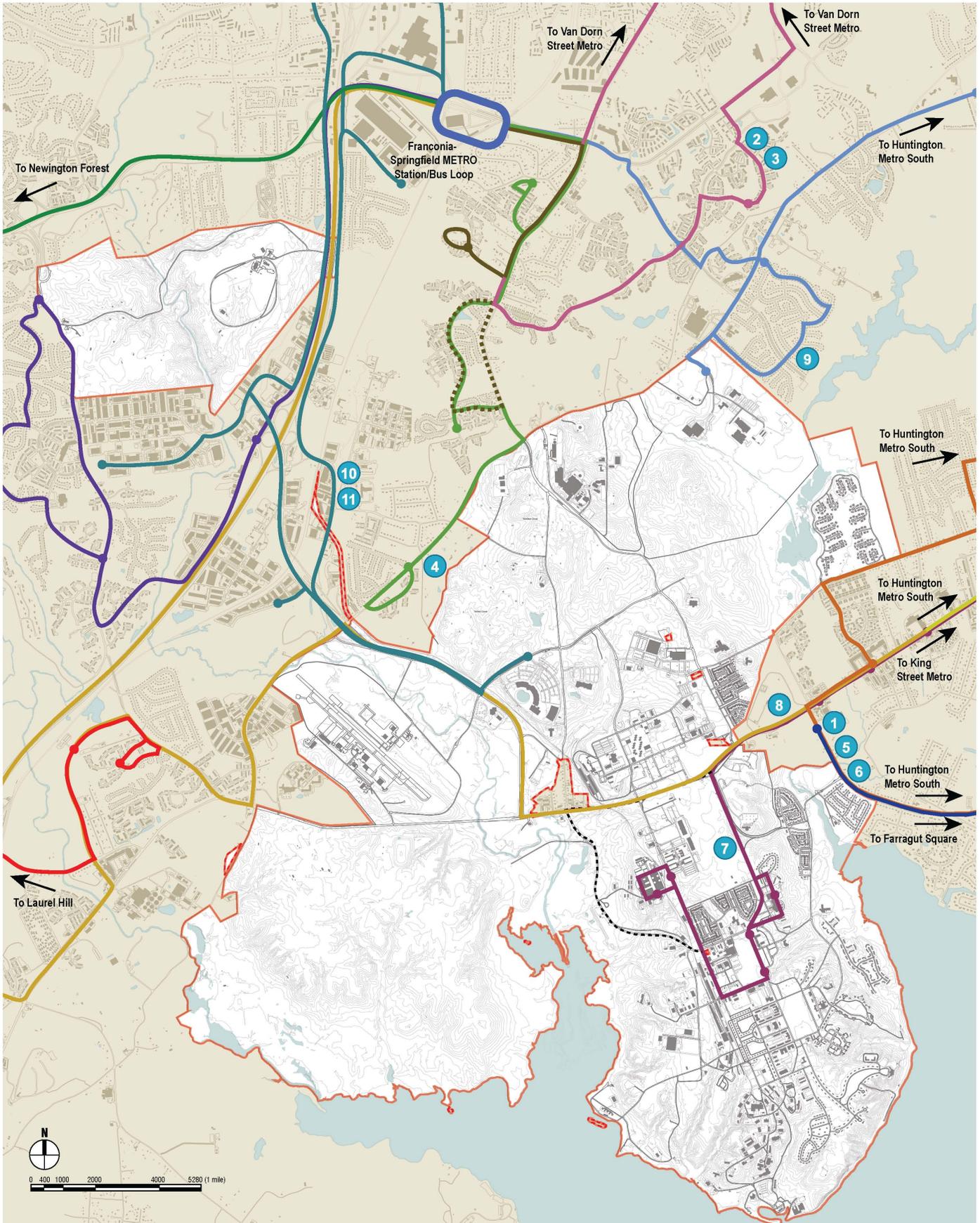
- 1 Metrobus Route 11Y (Mt. Vernon Express Line) – This route provides express service between the Mount Vernon area and Farragut Square in downtown Washington, D.C.
- 2 Fairfax CONNECTOR Routes 231/232 (Kingstowne Line) – These loop routes operate between the Van Dorn Metrorail Station and Franconia-Springfield Metrorail Station.
- 4 Fairfax CONNECTOR Route 303 (Island Creek Line) – This route provides local service between Franconia-Springfield Metrorail Station and the intersection of Mt. Air Drive and Telegraph Road.
- 3
- 5 Fairfax CONNECTOR Routes 151/152 (Richmond Highway Circulator) – These routes operate in a loop between the Mount Vernon area and Huntington Metrorail Station.
- 6

Bus Routes Serving Fort Belvoir - Various sections of Fort Belvoir are currently served by a total of six bus routes, including one WMATA Metrobus route, four Fairfax CONNECTOR routes, and one private bus line. These routes include:

- 7 Metrobus REX (Richmond Highway Express) – The route provides express service between Fort Belvoir and the King Street Metrorail Station in Alexandria.
- 8 Fairfax CONNECTOR Route 171 (Richmond Highway Line) – This route provides service between Franconia-Springfield Metrorail Station and the Huntington Metrorail Station.
- 9 Fairfax CONNECTOR Route 301 (Telegraph Road Line) – This route also operates local service between Franconia-Springfield Metrorail Station and the Huntington Metrorail Station.
- 10 Fairfax CONNECTOR Routes 331/332 (I-95 Circulator)
- 11 – These two routes operate in a loop, connecting Franconia-Springfield Metrorail Station, Springfield Mall, the Springfield business district, Fort Belvoir, and various destinations along both sides of the I-95 corridor.
- 12 Lee Coaches – This is a private bus company located in Stafford County. Once a week on a weekday year-round it operates between the Route 208 Commuter Lot in Spotsylvania and Fort Belvoir. It also serves the Route 17 North Commuter Lot near Fredericksburg. At Fort Belvoir, the bus circulates through the South Post making a number of stops. (Not shown on map.)

The vacant FBNA site is not currently served by bus service, however, a number of bus routes operate within a half-mile or less. These include Fairfax CONNECTOR Routes 304, 305, 331, and 332; and Metrobus Routes 18R and 18S. All six routes connect to the Franconia-Springfield Metro Station. Major roads with transit service that are adjacent or in proximity to the FBNA include: Backlick Road, Fullerton Road, Rolling Road, Fairfax County Parkway, and Franconia-Springfield Parkway.

Figure 2.36- Local Bus Routes



Travel Patterns

Existing travel patterns were examined based on MWCOC's Cooperative Land Use Forecast (Round 7, revised) and a review of the payroll data of Fort Belvoir employees (to determine their residential locations) as of August 2006 (Table 2.15, Figure 2.37). Residential distribution, based on the payroll data, is similar to a 2002 survey, except for a notable increase in the estimated number of employees in Fairfax County. The difference between the payroll and survey data indicates that those employees with longer commutes tend to be more likely to respond to surveys regarding transportation which may result in an overestimate of longer distance trips.

Figure 2.37- Current Residential Distribution of Fort Belvoir Employees

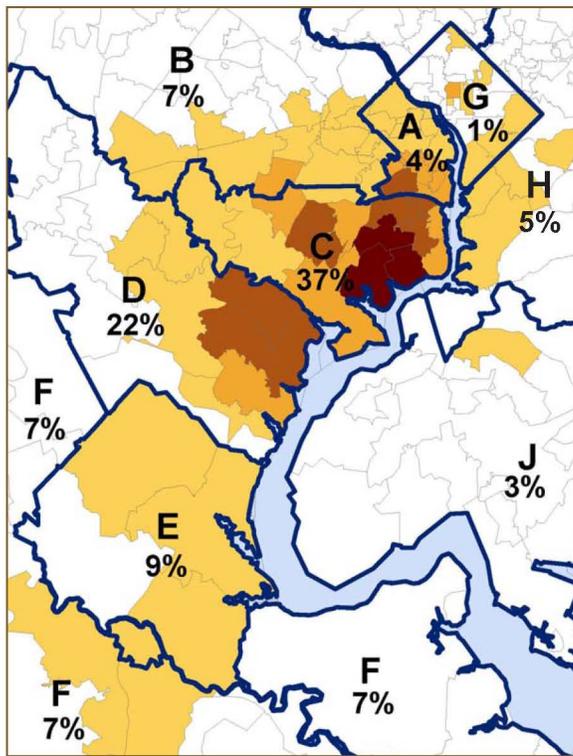


Table 2.15: Existing Residential Locations of Fort Belvoir Employees		
District	Location	Distribution (%)
A	Arlington/Alexandria	4%
B	N. Fairfax Co. and Loudoun Co.	7%
C	S. Fairfax County	37%
D	Prince William County	22%
E	Near South	9%
F	Remainder of Virginia	7%
G	District of Columbia	1%
H	Prince George's County	5%
I	Montgomery County	1%
J	Remainder of Maryland	3%
K	Outside of DC, MD and VA	4%
TOTAL		100%

Travel time contours surrounding Fort Belvoir's Main Post and FBNA for both the AM and PM peak hours were developed (Figures 2.38 and 2.39). These figures illustrate the travel time contours for existing Fort Belvoir employees traveling to work in the morning and returning home in the evening. Depending on specific residential location, some employees travel in the off-peak direction for a large portion of their trip. Comparing the contours to available information of residential locations of existing employees indicates that more than 70 percent of incoming employees currently live within an hour of Fort Belvoir at peak-hour travel speeds.

Figure 2.38 - Travel Times - AM Peak Hour

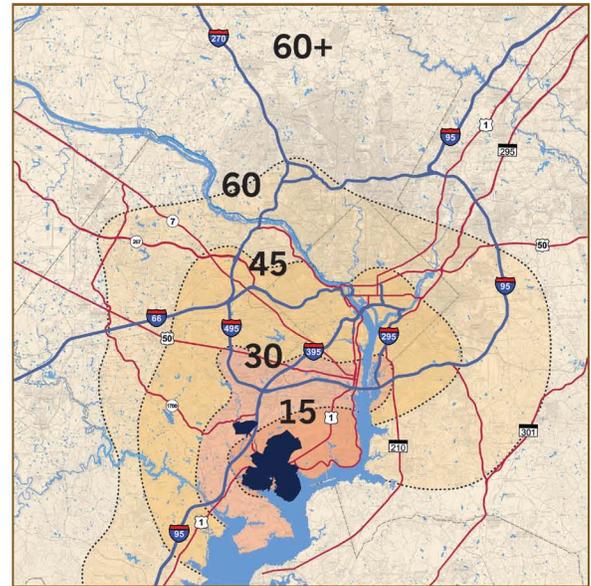
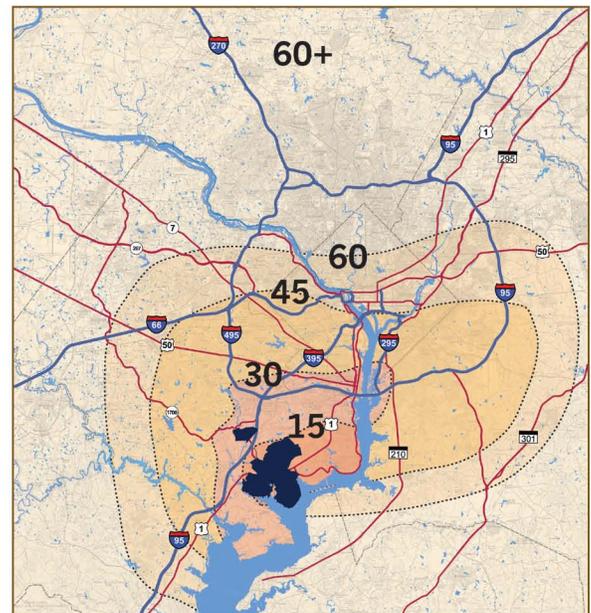


Figure 2.39 - Travel Times - PM Peak Hour



Off-Post Roadway Capacity

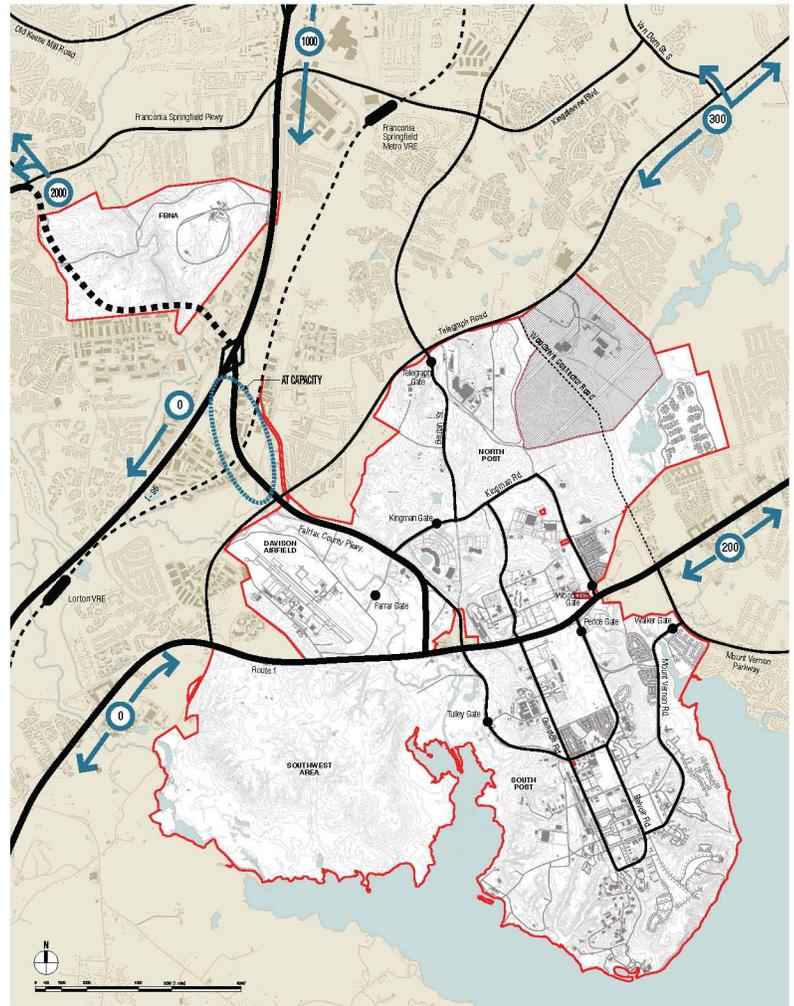
To assess available roadway capacity and identify possible transportation system improvements to accommodate the projected travel demand, available traffic counts from the past three years were reviewed and compared to the capacity of the major facilities approaching Fort Belvoir. Assessing the transportation network for its available capacity will allow for understanding the constraints to accommodate additional traffic destined for Fort Belvoir. The available capacity then can be used to determine the sizing of any transportation improvements that might be needed. As the expected traffic conditions are analyzed for each of the alternatives, the assessment of available capacity will allow for sizing that would be needed to mitigate any effects to the transportation system. Table 2.16 identifies the per lane assumptions that were made for each facility type.

Facility Type	Capacity (vehicles per hour (vph))	Notes
Freeway	1,600-1,800	Varies due to interchange spacing; weaving, merge, and diverge operations; and downstream bottlenecks.
HOV	1,900-2,100	Volume is higher due to fewer ramps (ideally, volume would remain below 1,700 vph to provide an adequate level of service).
Ramp	1,200-1,600	Specific design features determine actual capacity.
Major Arterial	1,100-1,300	Varies based on signal progression, green time split, and cross street volume.
Minor Arterial	850-1,000	Varies based on signal progression, green time split, and cross street volume.

Review of available capacity indicates that the existing transportation network within the Fort Belvoir area is operating at or near capacity during peak periods in peak directional travel. Available vehicle capacity for additional vehicle trips traveling to Fort Belvoir or FBNA is limited to trips to and from the north and west, because there is no available capacity from the south on I-95 and U.S. Route 1 under existing conditions. I-95 will be widened from three to four general purpose lanes between the Fairfax County Parkway and Route 123 by 2011. This improvement is not expected to help alleviate congestion along I-95 because the region will continue to grow, offsetting any additional roadway capacity.

Regional and local roadways (upon completion of the Springfield Interchange, the Fairfax County Parkway through the FBNA, and the Van Dorn Street/Franconia Road Interchange) could potentially accommodate 3,500 vehicles per hour (vph). From the west, the proposed Fairfax County Parkway extension (depending on ultimate design) may provide access for another 2,000 vph. From the north, an additional 1,000 vph could travel to Fort Belvoir or FBNA via I-95. Local access via major arterials could provide access to approximately 500 vph. This available capacity is illustrated in Figure 2.40.

Figure 2.40 - Available Roadway Capacity (peak hour)



Off-Post Intersection Capacity

To assess existing conditions and available capacity in the immediate areas surrounding FBNA and the Main Post, turning movement counts were performed at 28 intersections. These intersections were analyzed for their operational performance. Table 2.17 presents the Volume-to-Capacity (V/C) ratio, intersection Level-of-Service (LOS), and delay measures of effectiveness. The V/C ratio is a quantitative measure of demand versus the capacity of an intersection. LOS is a qualitative measure of an intersection's performance. LOS is ranked A to F, where A represents free flow or negligible delay, and F represents extensive delay and congestion. An intersection's LOS is typically at LOS F once the control delay at the intersection reaches an average of 80 seconds per vehicle.

Table 2.17: Intersection Measures of Effectiveness—Existing Conditions - Off-Post

Intersection Location	AM Peak Hour ^a			PM Peak Hour ^a		
	V/C	LOS	Delay ^b	V/C	LOS	Delay ^b
Commerce Street/Old Keene Mill Road	0.59	B	16.3	0.80	C	20.5
Commerce Street/Amherst Ave.	0.65	C	27.1	0.79	D	36.6
Commerce Street/Backlick Road	0.29	C	22.1	0.70	D	38.5
Commerce Street/Franconia Road EB	0.45	C	30.6	0.78	C	31.6
Commerce Street/Franconia Road. WB	0.55	E	59.4	0.57	D	45.0
Backlick Road/Calamo Street	0.68	A	5.6	0.73	B	17.4
Loisdale Road/Spring Mall Drive	0.42	C	21.8	0.80	D	36.4
Franconia Springfield Parkway/Spring Village Drive	1.02	E	59.5	1.07	E	70.7
Franconia Springfield Parkway EB Ramp/Backlick Road	0.93	E	55.6	0.78	D	36.0
Franconia Springfield Parkway WB Ramp/Backlick Road	0.85	B	10.3	0.77	B	19.4
Franconia Springfield Parkway/I-95 HOV Ramps	0.89	D	35.5	1.23	F	96.6
Franconia Springfield Parkway EB Ramp/Frontier Drive	0.61	C	28.3	0.82	D	39.4
Franconia Springfield Parkway WB Ramp/Frontier Drive	0.45	C	24.3	0.75	F	99.3
Franconia Springfield Parkway/Beulah Street	1.12	F	87.4	1.26	F	135.7
Fairfax County Parkway/Fullerton Road	1.23	F	304.1	1.66	F	349.6
Fairfax County Parkway/Terminal Road	0.84	D	40.4	0.82	C	21.9
Fairfax County Parkway SB Ramps/Telegraph Road	0.45	B	18.0	0.68	D	50.7
Fairfax County Parkway NB Ramps/Telegraph Road	0.49	B	14.3	0.66	C	21.8
Fairfax County Parkway/John J. Kingman Road	0.75	D	40.0	0.99	F	83.6
Telegraph Road/Beulah Street	0.56	D	35.2	0.54	C	28.1
Telegraph Road/S. Van Dorn Street	0.73	C	21.3	0.90	D	42.4
U.S. Route 1/Telegraph Road—Old Colchester Road	0.76	D	47.6	0.74	D	43.8
U.S. Route 1/Fairfax County Parkway	0.94	D	36.2	0.87	C	32.8
U.S. Route 1/Backlick Road—Pohick Road	0.85	C	29.3	1.06	F	107.4
U.S. Route 1/Belvoir Road	0.80	B	16.1	0.57	B	11.7
U.S. Route 1/Woodlawn Road	0.70	A	6.2	0.72	B	11.9
U.S. Route 1/Old Mill Road	1.37	F	187.8	1.08	F	118.5
Loisdale Road./GSA Access Road ^d	0.50	A	1.5	0.30	A	1.1

Note: Delay represents the average number of seconds a vehicle is delayed from free-flow conditions.

^aAM Peak Hour: 7:15 AM to 8:15 AM; PM Peak Hour: 4:30 PM to 5:30 PM

^dIntersection analyzed as unsignalized intersection

Several intersections shown in Table 2.17 are of key interest because of their proximity to the Main Post and FBNA. Key intersections along U.S. Route 1 operate at or above capacity. The intersection of Franconia- Springfield Parkway and Spring Village Drive is at capacity, and a number of intersections on Fairfax County Parkway are also congested. The intersection between the Franconia-Springfield Parkway and the I-95 HOV ramps operates under LOS F. This indicates the need for improvements to the HOV system under existing conditions.

Fort Belvoir Trip Generation

The trip generation at Fort Belvoir must be examined to understand how the above intersection capacity analyses relate to Fort Belvoir. Understanding Fort Belvoir arrival and travel patterns will aid in developing concepts for the future development. Currently, a total of 26,000 daily trips are destined to Fort Belvoir. This value is a low trip generation to the site, considering that approximately 23,000 military personnel, civilians, and contractors work on the Main Post. Also, approximately 8,500 people live on Fort Belvoir, which helps reduce external trips to the site, as some residents work on Post.

During the AM peak hour, there are only approximately 4,000



Route 1 and Pence Gate

trips destined to Fort Belvoir, a generation rate of 18 inbound trips per 100 people (0.18 trips for every person). The Fort Belvoir trip generation rate is lower than typical rates calculated in the Institute of Trip Engineers (ITE) Trip Generation Manual. Sample rates from the ITE manual include 54 inbound trips per 100 employees traveling to a government office complex and 40 trips per 100 employees traveling to an office park (ITE, 2003). Thus, Fort Belvoir traffic does not have as large an effect on the transportation system as would other developments of similar size. Table 2.18 presents the inbound hourly flow into Fort Belvoir and Figure 2.41 presents the hour-by-hour flow rate.

Figure 2.41 illustrates the inbound flow into Fort Belvoir of approximately 4,000 vph during the AM peak hour of the cumulative daily flow of about 26,400 vehicles (14.7 percent of the daily flow). Tulley Gate is the most heavily used gate for South Post with more than 9,000 trips (representing 34 percent of the total trips) because it serves all visitors and is the southernmost gate on U.S. Route 1 for traffic from U.S. Route 1 and the Fairfax County Parkway. The Kingman Gate is the busiest gate for North Post with more than 5,000 trips (25 percent of the total trips). Since the time of the count reported in Table 2.18, the Woodlawn Road Gate has been closed to traffic. The counts do not include all gates at Fort Belvoir (DLA and DCEETA gates are not included). These gate counts are used as a guide in conjunction with turning movement counts at intersections that serve as gateways onto the Main Post, as well as employee surveys, to develop future trip generation rates for Fort Belvoir.

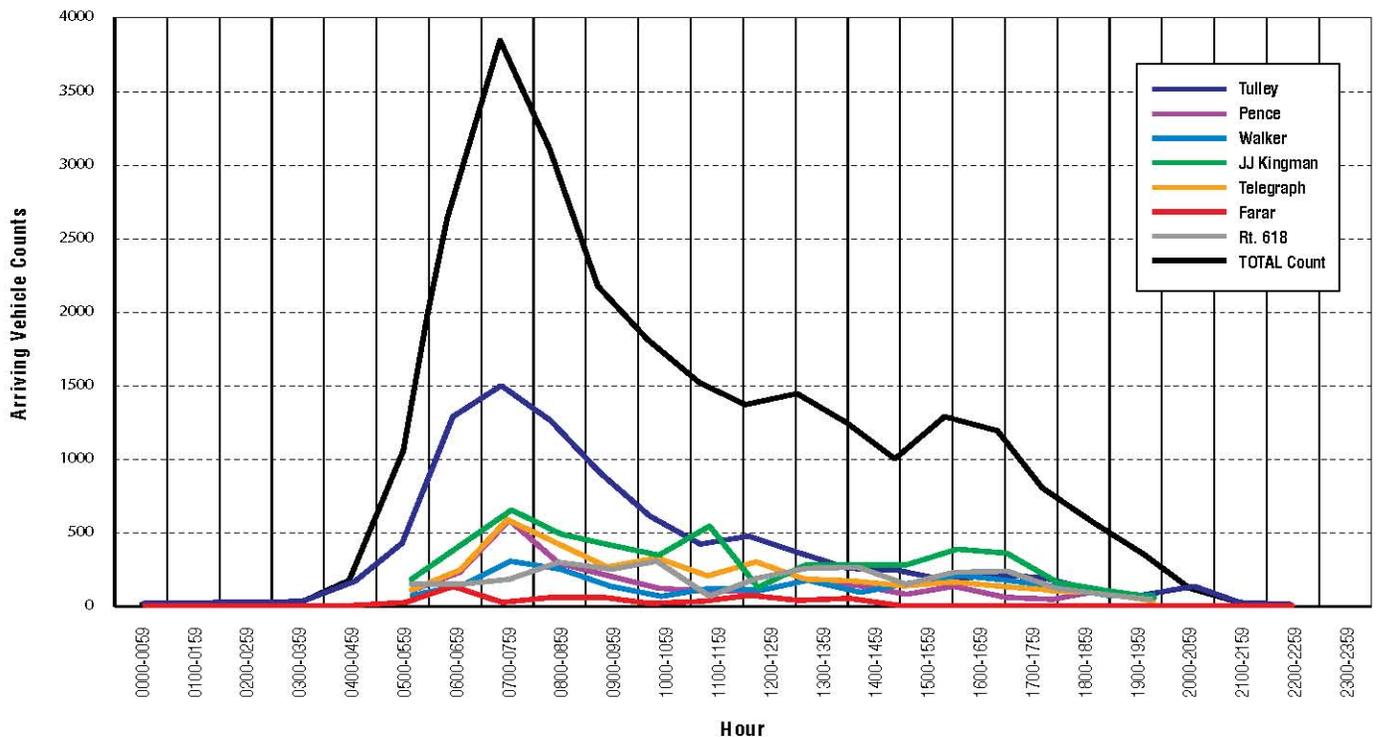
Table 2.18: Inbound Gate Counts for Fort Belvoir Access Points

Gate	Tulley	Pence	Walker	Kingman	Telegraph	Farrar	Woodlawn	All Gates
Gate serves	South Post	South Post	South Post	North Post	North Post	Airfield	North Post	Fort Belvoir
No. of ID booths	3	2	1	2	1	1	1	11
Hour								
0000-0059	21					1		22
0100-0159	18					3		21
0200-0259	21					4		25
0300-0359	34					3		37
0400-0459	171					9		180
0500-0559	441	112	64	192	90	25	140	1,064
0600-0659	1,317	230	157	423	264	114	150	2,655
0700-0759	1,519	585	301	651	597	40	200	3,893
0800-0859	1,287	321	265	504	429	42	303	3,151
0900-0959	921	203	125	413	248	52	254	2,216
1000-1059	630	138	68	351	325	15	307	1,834
1100-1159	428	119	119	548	224	27	81	1,546
1200-1259	495	120	92	128	303	74	197	1,409
1300-1359	368	162	172	271	192	31	274	1,470
1400-1459	273	155	103	275	174	37	266	1,283
1500-1559	245	88	133	280	133	9	150	1,038
1600-1659	181	134	198	388	157	5	242	1,305
1700-1759	214	81	178	352	130	7	255	1,217
1800-1859	203	70	114	189	111	5	135	827
1900-1959	110	105	82	116	91	0	95	599
2000-2059	88	76	37	37	50	2	76	366
2100-2159	123					8		131
2200-2259	34					2		36
2300-2359	27					0		27
Total	9,169	2,699	2,208	5,118	3,518	515	3,125	26,352

Source: Greenhorn and O'Mara, 2005.

Notes: Light shading indicates time period when gate is closed; dark shading represents the AM Peak Hour.

Figure 2.41 - Inbound Gates Hour-by-Hour Flow Rate



On-Post Intersection Capacity

Table 2.19 presents the intersection measures of effectiveness for signalized and unsignalized intersections on the Main Post. The signalized intersections on Post perform at a reasonable level of service – at level of service C or better during both peak periods. The unsignalized intersections typically operate at a reasonable level of service; however, certain approaches fail at a number of the two-way stop controlled (TWSC) intersections. For these intersections, the stop-controlled leg has a lower level of service as stopped vehicles must wait for acceptable gaps on the major roadways. Minor streets where this occurs include 3rd Street and Jackson Loop, especially during the lunch hour, when vehicles must wait for acceptable gaps within the traffic stream on the main roadway.

Intersection Location (signalized)		AM Peak Hour			PM Peak Hour				
		V/C	LOS	Delay	V/C	LOS	Delay		
Kingman Road / Beulah Street		0.57	C	23.6	0.51	C	21.6		
Kingman Road / Gunston Road		0.35	B	14.6	0.63	B	19.1		
Gorgas Road / Woodlawn Road		0.23	B	12.6	.030	B	13.5		
Pohick Road / Theote Road		0.45	B	13.2	0.79	C	23.3		
Pohick Road - 12th Street / Gunston Road		0.61	B	13.7	0.44	B	19.3		
12th Street / Belvoir Road		0.41	B	16.7	0.28	B	13.9		
16th Street / Gunston Road		0.21	A	5.0	0.23	A	5.0		
16th Street / Belvoir Road		0.24	A	5.3	0.21	A	8.5		
21st Street / Belvoir Road		0.22	A	8.9	0.14	A	8.3		
Intersection Location (unsignalized)	Control Type	AM Peak Hour				PM Peak Hour			
		Worst Approach		Overall		Worst Approach		Overall	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Gunston Road / Gorgas Road	AWSC	20.5 SB	C	16.1	C	53.2 NB	F	33.5	D
Gunston Road / Abbot Road	AWSC	30.4 SB	D	22.3	C	40.7 NB	F	28.8	D
Gunston Road / Goethals Road	AWSC	25.4 SB	D	20.2	C	40.5 NB	E	29.5	D
Gunston Road / 1st Street	TWSC	15.7 WB	C	1.2	A	18.0 WB	C	1.1	A
Gunston Road / 3rd Street	TWSC	22.4 EB	C	1.3	A	213.4 WB	F	85.8	F
Gunston Road / 9th Street	TWSC	46.2 WB	E	9.5	A	17.4 WB	C	14.9	B
Gunston Road / 18th Street	TWSC	9.2 WB	A	4.5	A	10.1 WB	B	5.1	A
Belvoir Road / 9th Street	TWSC	27.1 EB	C	3.4	A	22.6 EB	C	5.6	A
Belvoir Road / 18th Street	TWSC	15.9 WB	C	3.1	A	14.4 EB	B	2.9	A

Transportation Plans

Various transportation projects within regional, state, and local long-range plans may have potential to alleviate some of the congestion anticipated with the relocations and meet the shortfall in roadway capacity. These plans are described below. In addition, Table 2.20 and Figure 2.42 illustrate the improvements within these plans slated for the region.

Six-Year Improvement Program. The Commonwealth Transportation Board (CTB) of Virginia maintains this program, which allocates funds for transportation projects proposed for construction, development, or study over the next six fiscal years. The program is updated annually. The CTB has updated the Virginia Transportation Six Year Improvement Program for Fiscal Years 2006-2011, beginning July 1, 2005.

Fairfax County Capital Improvement Program (CIP). This is Fairfax County's five-year roadmap for creating, maintaining, and funding present and future infrastructure requirements. While the program serves as a long-range plan, it is reviewed and revised annually. When adopted, the CIP provides the County Executive and County Board of Supervisors a framework for managing bond sales, investment planning, and project planning. Fairfax County's CIP not only includes a 5-year plan but a future outlook with potential long-term requirements.

Constrained Long-Range Plan. The CLRP is a comprehensive plan of transportation projects and strategies that the Transportation Planning Board realistically anticipates can be implemented over the next 30 years. Major highway, high-occupancy vehicle (HOV), and major transit improvements/studies are identified in the plan, which is updated annually.

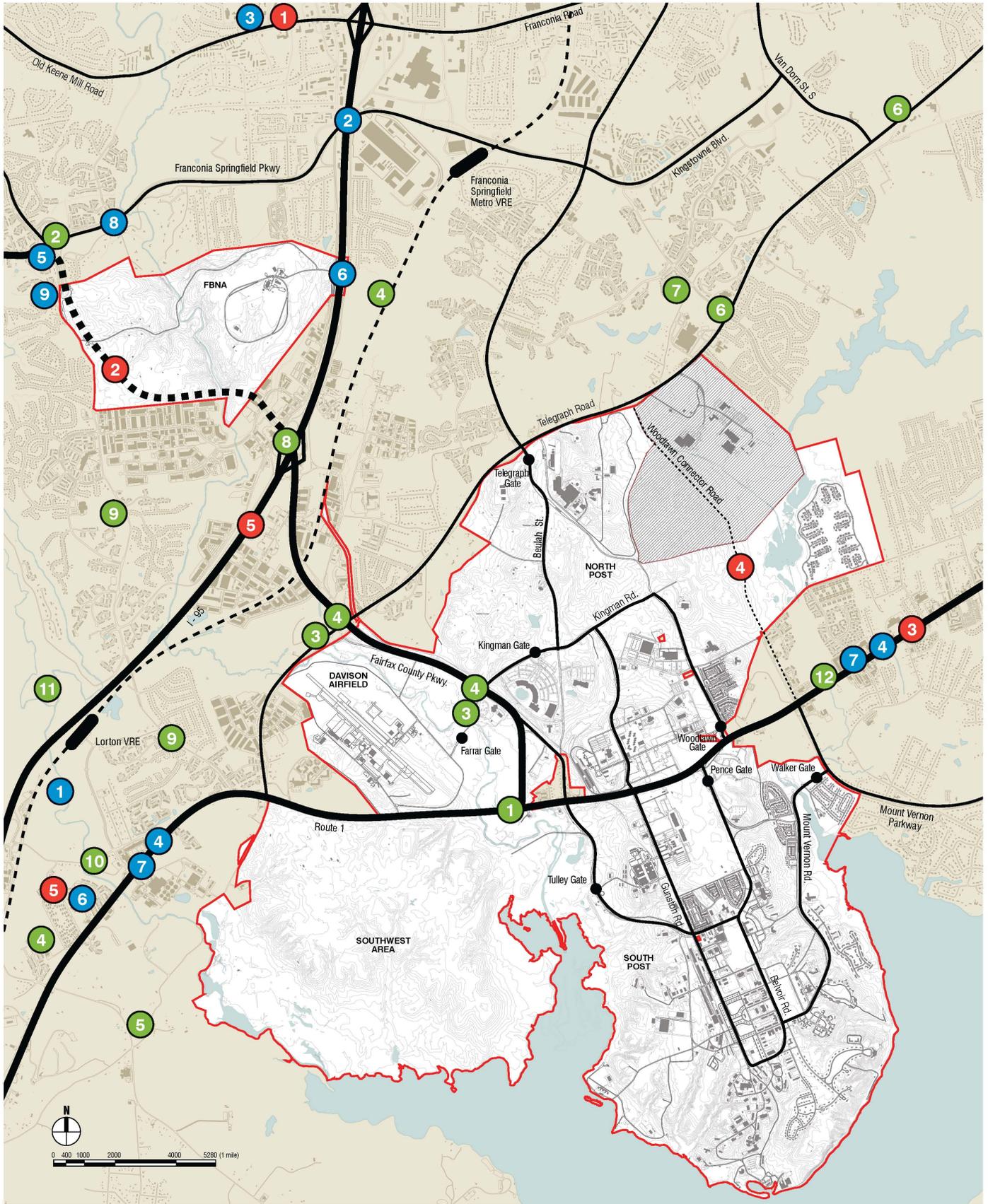
Fairfax County Comprehensive Plan. This plan is required by state law to be used by the County's Board of Supervisors and other agencies, such as the Planning Commission and Board of Zoning Appeals. It functions as a guide in decision-making regarding the built and natural environment. It is made available for County staff and the public. The Fairfax County Transportation Plan is an element of the Fairfax County Comprehensive Plan, and serves as a guide for long-range transportation development in the County. The County makes modifications to the Comprehensive Plan, including the Transportation Plan, through a continual plan review process. The County is currently undertaking a comprehensive review of the Transportation Plan to provide an update on the system.

TransAction 2030. This plan, sponsored by the Northern Virginia Transportation Authority, was a regional transportation planning effort covering the Counties of Arlington, Fairfax, Loudoun, and Prince William, as well as the cities of Alexandria, Fairfax, Falls Church, Manassas, and Manassas Park. TransAction 2030 is a study that identified the short, medium, and long-term transportation needs in Northern Virginia, along with the specific improvements to pursue to meet those needs.

Table 2.20 - Long-Range Transportation Improvements

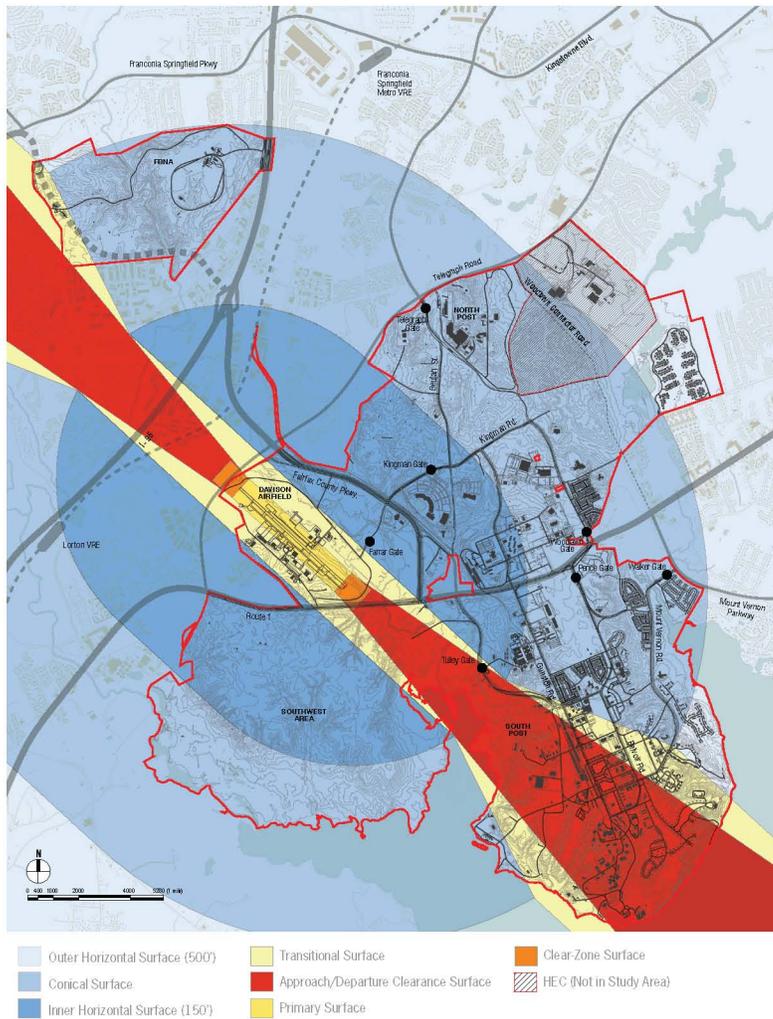
Table 2.20 - Long-Range Transportation Improvements				
FUNDED PROJECTS	Map #	VDOT SIX YEAR IMPROVEMENT PROGRAM (Draft FY 07 - 12)	From	To
	1	HIGHWAYS: Reconstruct I-95/I-395/I-495 Interchange (Phase II-VI)		
	5	HIGHWAYS: I-95, widen to 8 lanes	Newington	VA 123
	2	HIGHWAYS: VA 7100 (Fairfax County Parkway), construct 4 lanes	Rolling Road	Fullerton Road
	4	HIGHWAYS: New Connector Road ¹	U.S. Route 1	Telegraph
3	TRANSIT: US 1 Bus Priority Project			
¹ Timeline depends on funding. Most funding has been identified to construct Phase 1 (2 lane cross-section); however there is a funding shortfall for the full cross-section.				
FUNDED PROJECTS	Map #	FAIRFAX COUNTY SPOT IMPROVEMENTS PER CIP	From	To
		HIGHWAYS: Additional turn lane for NB U.S. Route 1 left turn movement at Engleside Post Office HIGHWAYS: Provide turn lanes at Harrison Lane and South Kings Highway HIGHWAYS: Additional turn lane for NB Mount Vernon Highway left turn movement at U.S. Route 1 Additional turn lane for SB Roberts Road left turn movement at Braddock Road		
		TRANSIT: Park & Ride lots along Franconia-Springfield Parkway TRANSIT: New structured parking at Burke Centre VRE station TRANSIT: U.S. Route 1 Public Transit initiatives TRANSIT: New structured parking at Huntington Station to replace and expand existing parking		
CLRP PROJECTS	Map #	2004 CLRP HIGHWAY IMPROVEMENTS	From	To
	1	I-95, reconstruct interchange at VA 642	Reconstruct Lorton Road Interchange	
	2	I-95, construct interchange at VA 7900	LOV access to & from W / from & to N	
	4	U.S. Route 1 Improvements		
		U.S. Route 1 Location Study (4 to 6 lanes, 6 to 8 lanes) Widen (4 to 6 lanes) Widen (3 lanes NB, 4 lanes SB) Install Reconstruct Intersection Widen (Neabsco Creek Bridge) (4 to 6 lanes) Reconstruct Interchange Widen (4 to 6 lanes) Widen (4 to 6 lanes) Widen (bus/right-turn lanes) (6 to 8 lanes)	Stafford County Line Armistead Road Lorton Road @ VA 1332 (Huntington Ave) @ VA 619 (Joplin Road) VA 610 (Neabsco Road) @ Russell Road VA 235 South Stafford County Line VA 235 North	SCL Alexandria Lorton Road Telegraph Road USMC Heritage Ctr Access VA 638 (Neabsco Mills Rd) VA 235 North VA 235 South SCL Alexandria
		VA 123, widen to 6 lanes, 2008, 2015		
		Widen (4 to 6 lanes) Construct Interchange	U.S. Route 1 @ U.S. Route 1	Occoquan Road
	5	VA 7100, construct 2, 6 lanes, 2007, 2015	VA 640 (Sydenstricker)	VA 7900 (F-S Pkwy)
	Map #	2004 CLRP HOV/TRANSIT IMPROVEMENTS	From	To
	6	I-95 HOV, extend HOV lanes	Stafford County Line	Quantico Creek
	6	I-95 HOV, restripe to 3 lanes	Quantico Creek	I-395/I-495 intersection
	3	I-95/I-395/I-495, Interchange reconstruction with access ramps to I-495, HOV		
		U.S. Route 1, widen for bus right turn lanes		
	7	U.S. Route 1 Transit Improvements		
		U.S. Route 1 Corridor Light Rail Study Install U.S. Route 1 Traffic Signal Preemption Implement U.S. Route 1 Transit Improvements U.S. Route 1 Transit Service Improvements Study U.S. Route 1 Bus Rapid Transit (BRT) Study U.S. Route 1 Priority Bus Study U.S. Route 1 Corridor Light Rail Study U.S. Route 1 Priority Bus Study	King Street Metro Station Mount Vernon Highway / Old Mill Road Gunston Road Stafford County Line Stafford County Line Stafford County Potomac Yard SCL Alexandria	Potomac Yard Fort Hunt Road Huntington Avenue Pentagon Pentagon SCL Alexandria Pentagon King Street Metro Station
8	Franconia/Springfield Parkway HOV	VA 7100	VA 2677 (Frontier Drive)	
9	Fairfax County Parkway HOV, construct 2 lanes	VA 640 (Sydenstricker)	VA 7900 (F-S Pkwy)	
Map #	TRANSACTION 2030 - BEYOND CLRP	From	To	
	CORRIDOR 8 - I-95/I-395/U.S. Route 1			
1	HIGHWAYS: Construct U.S. Route 1 interchange HIGHWAYS: Construct U.S. Route 1 interchange HIGHWAYS: U.S. Route 1/Neabsco Creek Bridge, widen	Rippon Boulevard/Dale Boulevard Fairfax Co. Pkwy, Kings Hwy, Huntington Ave./Ft Hunt Rd VA 610 (Neabsco Road)	VA 638 (Neabsco Mills Rd)	
4	TRANSIT: Metrorail Extension TRANSIT: High capacity transit along Route 1	Springfield Alexandria to the Pentagon	Potomac Mills	
	CORRIDOR 5 - Fairfax County Parkway			
2	HIGHWAYS: VA 7100 (Fairfax County Parkway), construct interchanges	Rolling Road, Pohick Road		
3	TRANSIT: Implement Corridor-Wide Priority Bus Service			
Map #	FAIRFAX COUNTY TRANSPORTATION PLAN - BEYOND CLRP	From	To	
5	HIGHWAYS: Improve Old Colchester Road	U.S. Route 1	Somewhere south	
6	HIGHWAYS: Widen Telegraph Road	Beulah Street	I-495 Capital Beltway	
7	HIGHWAYS: Improve Old Telegraph Road	North and south of Hayfield	North and south of Hayfield	
8	HIGHWAYS: Improve I-95/Rt 7100 Interchange			
9	HIGHWAYS: Widen Rolling Road - Pohick Road	Route 7100	U.S. Route 1	
10	HIGHWAYS: Widen Lorton Road	Laurel Hill area	U.S. Route 1	
11	HIGHWAYS: Widen Silverbrook Road	Laurel Hill area	Lorton Road	
12	TRANSIT: Construct LRT along Route 1	Fort Belvoir	Huntington Metrorail Station	

Figure 2.42- Long-Range Transportation Improvements



All red numbers represent funded projects.
 All blue numbers represent projects within the Constrained Long Range Plan (not yet funded.)
 All green numbers represent Transaction and County projects beyond the Constrained Long Range Plan.

Figure 2.43- Airfield Constraints Map



Airfield Facilities

Davison Army Airfield

Davison Army Airfield (DAA) is an operational and training facility. DAA accommodates five operational flying units within the Washington/National Capital Region Military District and a training unit of the District of Columbia Air National Guard. The five operational flying units are:

- 12th Aviation Battalion - Rotary
- Operational Support Airlift Agency (OSAA/OSACOM) - Fixed wing
- DC Air National Guard - Rotary
- Aviation Night Vision Lab - Rotary/ Fixed wing
- Civil Air Patrol - Fixed wing

The operational units are primarily responsible for supporting Post-related missions and operations. Currently DAA supports training and operations by both helicopter and fixed wing aircraft. DAA Air Traffic Services Staff's monthly activity records show that there were a total of 50,181 fixed wing and helicopter operations from April 2005 to April 2006. Helicopter operations account for approximately 60 percent of the total annual flight operations.

DAA is required to comply with guidelines and regulations to meet a Class A airfield as outlined in the Unified Facilities Criteria (UFC) 203-260-01, Airfield and Heliport Planning and Design. The maximum aircraft size that can be safely accommodated at DAA is UC-35 (Citation 560). Operations at the DAA accommodate a helicopter fleet ranging from small OH-6s to large UH-60 Blackhawks and CH-53 Stallions, while fixed wing aircraft operations range from small Cessna 182s to large C-130 Hercules aircraft. Although C-130 operations exceed the design weights and pavement geometry parameters of this Class A regulated airfield, they have occurred frequently and resulted in the rapid deterioration of the airfield pavements. Additionally, the existing facility layout often results in the interaction of helicopter and fixed wing aircraft operations, which reduces the operational safety and capacity of the airfield.

Figure 2.43 maps the imaginary surfaces associated with the runway at DAA. No manmade structures or natural features are allowed on the primary surface and clear zones. Height restrictions are imposed on the development and landscape below the rest of the surfaces. The DAA runway elevation is +74 ft MSL. The associated imaginary surfaces are calculated based on this level.

Maximum allowed height for development on any given parcel is determined by the topography and the imaginary surface the parcel falls under. Figure 2.44 depicts the maximum allowed height for development surrounding the airfield.

Figure 2.44- Maximum Building Heights based on Airfield Imaginary Surfaces Restrictions

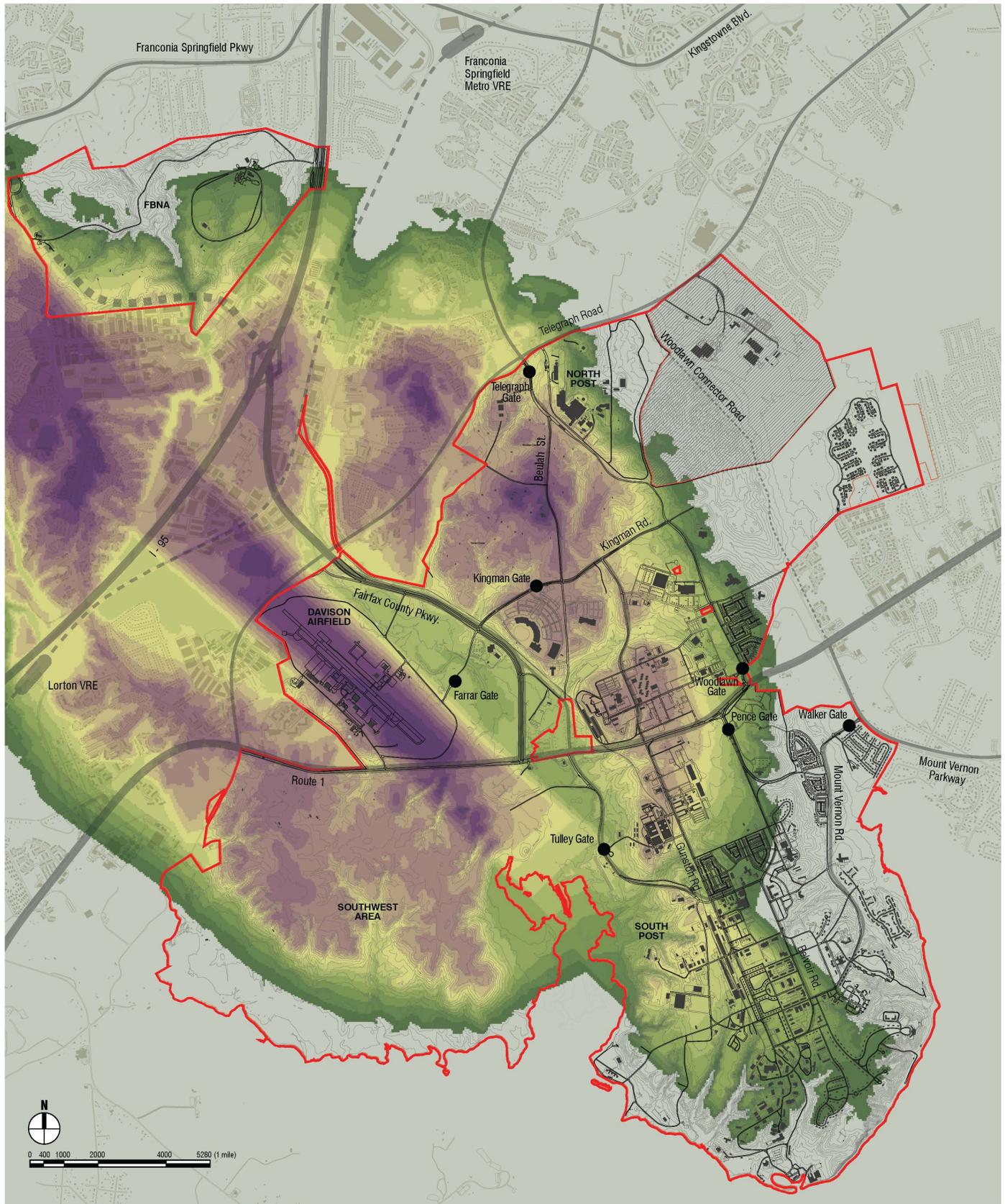


Table 2.21 - DAA Imaginary Surfaces, Existing On-Post Obstructions and Impacts on Development

Imaginary Surface	Definition	Development Impacts and Existing Obstructions*
Primary Surface	A surface longitudinally centered on the runway and extending 200 feet beyond each runway end. The width of the primary surfaces varies depending on the class of runway and coincides with the lateral clearance distance.	No manmade or natural features are allowed. Obstructions include building nos. 3136, 3137, 3138, 3140, 3141, 3230, 3231, 3233, 3234, 3237, and 3239.
Clear Zone (graded area only)	A surface located on the ground at the runway end and symmetrical about the runway centerline extended.	No manmade or natural features are allowed. No obstructions identified.
Approach-Departure Surface	An inclined plane arranged symmetrically about the extended runway centerline. The beginning of the inclined plane starts at the end of the primary surface and the elevation of the centerline at the runway end. The surface flares outward and upward from these points at a uniform slope.	No structure must puncture this surface. No obstructions identified.
Inner Horizontal Surface	An imaginary plane that is oval in shape, and is located at a height of 150 feet above the established airfield elevation.	No structure must puncture this surface. Obstructions include building no. 2462.
Conical Surface	An imaginary surface that extends from the periphery of the inner horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 7,000 feet and a height of 500 feet above the established airfield elevation.	No structure must puncture this surface. Obstructions include building nos. 2901, 2902, 2903, 2905, and 2907.
Outer Horizontal Surface	An imaginary plane located at a height of 500 feet above the established airfield elevation, extending outward from the edge of the conical surface at a horizontal distance of 30,000 feet.	No structure must puncture this surface. No obstructions identified.
Transitional Surface	An imaginary surface that extends outward and upward at right angles to the runway centerline at a slope of 7 to 1, and connects the primary and approach departure surfaces to the inner horizontal, conical, and outer horizontal surfaces.	No structure must puncture this surface. No obstructions identified.

Note: * Existing Obstructions were calculated based on Fort Belvoir GIS data provided. Field investigations are required to verify these conclusions.

Planning Considerations

Current and future facilities should not penetrate the imaginary surfaces detailed in Figure 2.43, so that DAA may operate at its full capacity. Table 2.21 lists the existing facilities that conflict with the imaginary surfaces. While height restrictions apply to the entire Post and FBNA, restrictions of 100 feet or lower only apply to parts of the North Post and Southwest Area (Figure 2.44). Severe restrictions of 40 feet or lower apply to small areas within the North Post Golf Course and the eastern portion of the Southwest Area. It is extremely important that existing obstructions are removed and potential future obstructions are prohibited. This will help DAA regain lost operational capacity and protect against further loss of overall airfield functionality.

DAA plays a key role in the National Emergency Response plan. In the event of a National Emergency, Andrews Air Force Base (AFB) will be used to launch fighter aircraft and the Presidential Command Control Berth. Andrews AFB will be locked down to all other operations. DAA will provide for simultaneous operations, such as evacuation of the Secretary of Defense and other key personnel. DAA's assets will be used primarily within the DC area Beltway. During a National Emergency, DAA will be in "lockdown", restricting personnel from leaving or accessing the airfield until the Emergency has passed. These National Emergency Response plans must be considered during land-use development planning.



Airfield Facilities

Facilities

Each item of real property is defined as a facility. The Army uses four facility types for analysis purposes:

- **Land (L)** - Land (in acres) comprises whole, or part, of a military installation owned in fee by the Federal Government and/or under custody and accountability of the Army.
- **Building (B)** - Buildings (in square feet) are constructed on a space of land that is completely enclosed by a roof, walls, and usually flooring. It normally serves the purpose of occupancy.
- **Utility (U)** - A utility (in capacity) is a distribution system, commodity source, or commodity collection point that provides a service or commodity to more than one building or structure. (*The Fort Belvoir Real Property Inventory lists this type as LS.*)
- **Structure (S)** - A structure is any real property facility that is not classified as a building, utility system, or land by the previous definitions. Typical examples are airfield pavements, roads, firing ranges, and athletic fields.

Sources:
1. Department of the Army, Pamphlet 415-28: Guide to Army Real Property Category Codes, 11 April 2006

Building Quantity

Fort Belvoir has over 2400 facilities on the Main Post and FBNA. (Real Property Inventory downloaded on July 13, 2007.) There are about 1,600 buildings, totaling over 12 million GSF. Table 2.22 shows the distribution of facilities by functional area.

Functional Area	Buildings GSF (approximate)	No. of Facilities (approximate)
South Post (incl. Core)	6,750,000	1,050
Lower North Post	1,180,000	235
Upper North Post	3,720,000	235
Southwest Area	17,000	10
Davison Army Airfield	380,000	50
Fort Belvoir North Area	120,000	35

The sheer number of facilities is sizable, with considerable effort invested in maintenance and upkeep. As funding decreases and maintenance budgets tighten, it is becoming increasingly more difficult to maintain buildings at minimum habitable standards. Often, older buildings require the most effort and cost, due to their advanced age and rate of deterioration.

Building Quality

The Installation Status Report (ISR) communicates installation conditions by using Q-ratings for facilities. The Q-ratings are based on a ratio of restoration cost estimates ("cost to fix") to facility plant replacement value (PRV). Restoration cost is based on facility condition assessments conducted by facility occupants. These Q-Ratings are used to derive an installation-wide Quality Rating at the Facility Class level. All military services report Q-ratings using the same DoD methodology. The four Q-Ratings are defined in Table 2.23.

This rating system is used to model and justify funding levels for the installation. It also indicates where facilities and infrastructure are inadequate and may negatively affect the Army's overall mission. The ISR rating provides a standard, Army-wide system to support decision-making processes as they relate to operations, sustainment, modernization, revitalization, and re-stationing.

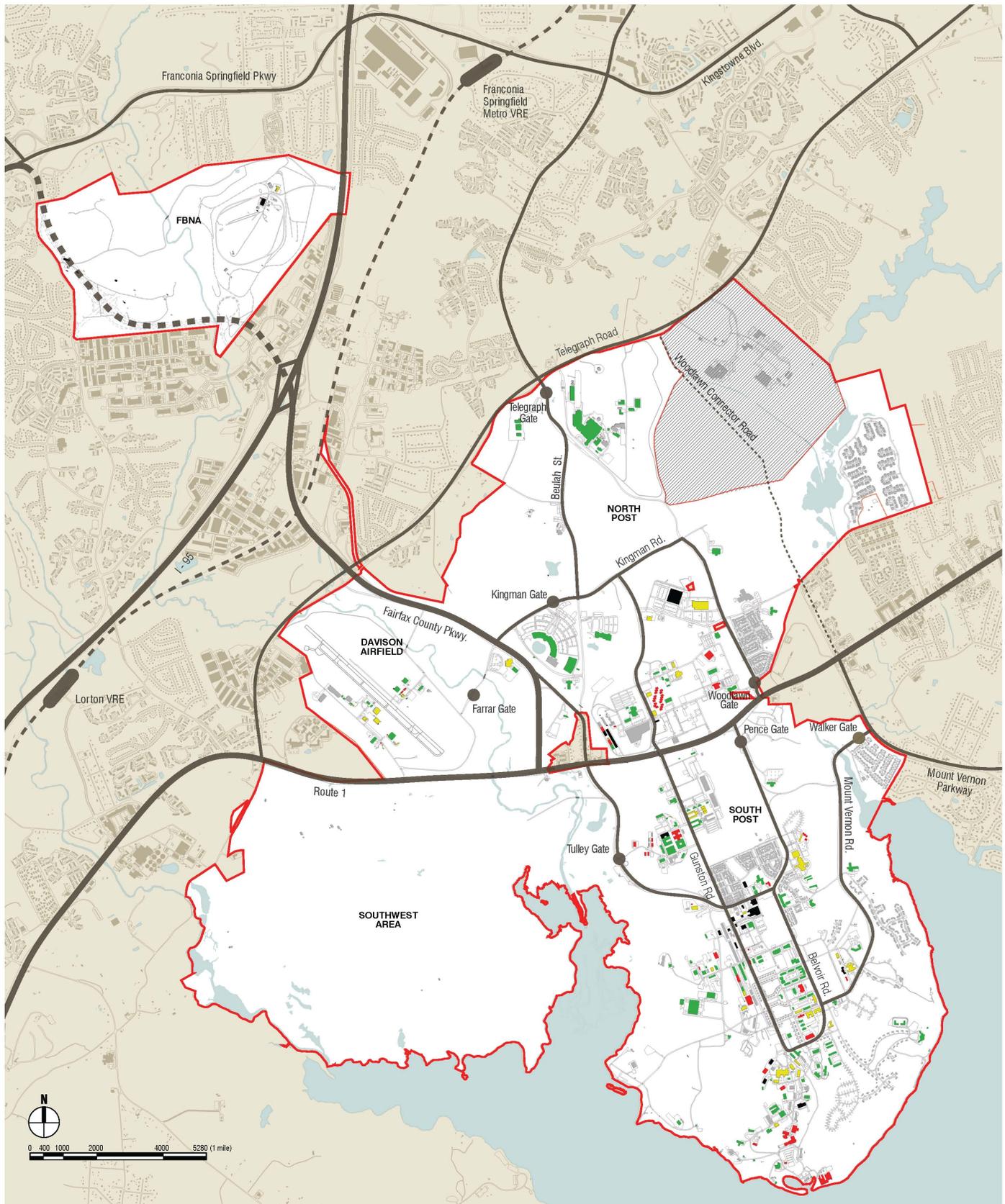
The Figure 2.45 displays facility conditions based on the Installation Status Report (ISR) ratings downloaded on March 5, 2007. Detail maps with analysis by functional area are shown in Chapter 4.

Rating	Definition
Q-1 (Green)	Minor facility condition deficiencies and no significant facility configuration deficiencies, with negligible impact on the capability to support the tenant organizations' required missions.
Q-2 (Yellow)	Some facility condition deficiencies and/or configuration deficiencies that have limited impact on the capability to support the tenant organizations' required missions.
Q-3 (Red)	Significant facility condition deficiencies and/or configuration deficiencies that impair the capability to support some of the tenant organizations' required missions.
Q-4 (Black)	Major facility condition deficiencies and/or configuration deficiencies that present significant obstacles to the tenant organizations' accomplishment of required missions.

Table Sources:
1. Military Planning Technical Manual
2. U.S. Army Installation Management Agency, Public Works Digest Vol. XVIII No. 1, Jan/Feb 2006, downloaded from http://www.ima.army.mil/sites/pw/digest/pwd_janfeb06.pdf

Based on the Fort Belvoir Real Property Inventory, approximately 58 percent (35 = calculated) of the buildings on the Post are fifty years old or older. Many qualify for historic designation, due to their symbolic importance or structural character. Other facilities may not warrant preservation, as their current function is better served in modernized facilities with upgraded infrastructure and utilities.

Figure 2.45 - Facilities Condition Map



Infrastructure/Utilities

The Fort Belvoir utility systems can be generally characterized as an aging, moderately well maintained system. Parts of the Post infrastructure date from the 1930's and 40's, and as such are nearing the end of their useful life.

Water

Existing System - Supply

Fairfax Water delivers potable water to Fort Belvoir at a metering station near Telegraph Road under a wholesale customer agreement. This water is supplied from the Occoquan reservoir and treated at the Frederick P. Griffith Water Treatment Plant located in Lorton, Virginia. The Griffith Plant was opened for operation in May 2006, and is a state-of-the-art facility with a 120-mgd treatment capacity. The Griffith Plant is one of several supply points that feed the overall Fairfax Water system, providing redundancy and reliability to Fort Belvoir. The Post has purchased capacity of 4.6 mgd (peak flow) from Fairfax Water. When the demand reaches 80 percent of the purchased capacity, Virginia Department of Health (the regulating Authority) requires a plan to be submitted for a complete system upgrade. The purchased capacity only covers the Main Post, not FBNA or HECSA. Fairfax Water also supplies water to FBNA. Privatization of the Fort Belvoir water system is scheduled for FY 2008. Figure 2.46 indicates the Post's primary distribution system.

Existing System - Distribution

Fairfax Water provides water to Main Post via a 30-inch main on Telegraph Road that feeds a 24-inch main owned and operated by the Post. The total average water usage by the Post is 2.0 mgd. About 1.0 million gallons are held in emergency storage in Government owned tanks. Water pressure is aided by a pump station located near the Telegraph Road connection and by five elevated water storage tanks. The Government owned distribution system consists of approximately 525,000 linear feet of distribution piping that includes approximately 81,000 feet of service laterals, 1,100 main line valves, two primary meters, 68 sampling stations, and 641 hydrants. There are three elevated storage tanks providing a combined capacity of 2.3 million gallons. The majority of the distribution system was installed in 1940 and is approaching the end of its design life. (Assuming a typical fifty-year design life, the majority of the system is now 17 years past its design life.)

Fairfax Water provides water to FBNA via existing 24 to 42 inch diameter mains on Rolling Road and Backlick Road. Existing onsite distribution mains are all small diameter (4 to 8 inch) dead end mains. There is no cross connection through FBNA between the Fairfax Water mains on Rolling and Backlick Roads.

Figure 2.46 - Water Distribution System Map

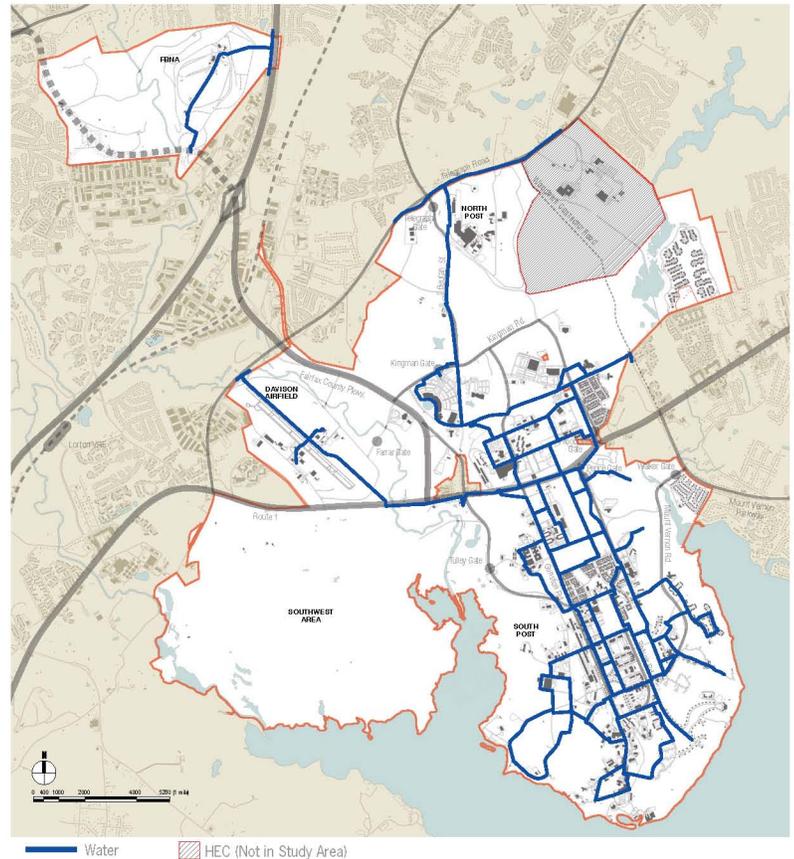


Figure 2.47 - Stormwater Collection System Map

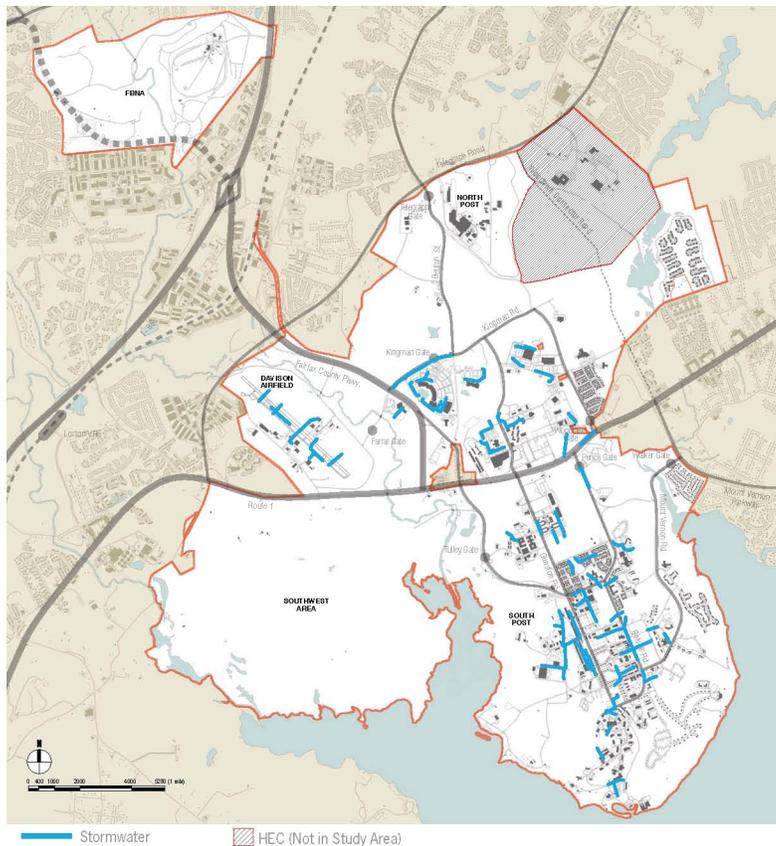
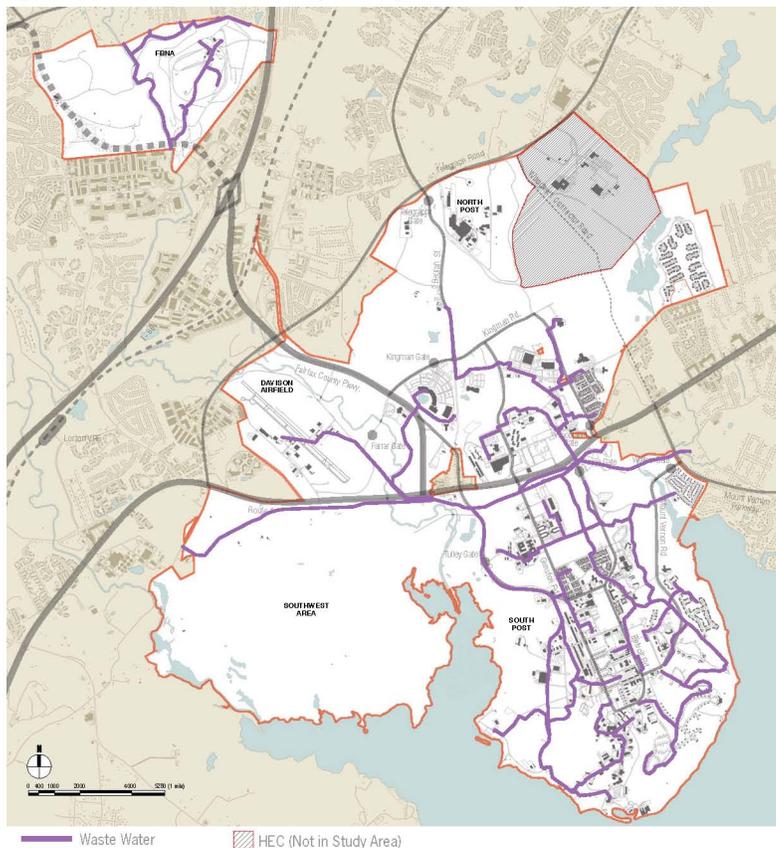


Figure 2.48 - Waste Water Collection System Map



Sewer

Existing System - Trunk Capacity

There are Fairfax County trunk lines traversing both the FBNA site and Main Post of Fort Belvoir that feed the Lower Potomac Treatment facilities. The Lower Potomac Treatment facility has a plant capacity of 67 mgd and receives an average daily flow of 45 mgd. The Post purchased 3 mgd capacity (average flows; 6 mgd peak flows) in collection/treatment from Fairfax County, exclusive of FBNA and HECSA. The capacity is based on a quarterly running average with a “not to exceed” peak limit of 6 mgd. The post reportedly uses only 1.1 mgd of the purchased capacity. Preliminary estimates of new loads from BRAC tenants indicate that the total flow at FBNA will approach 1 MGD; total flow from Main Post will approach 2 mgd. As the design progresses, monitoring of the proposed loads will be necessary so that additional capacity can be purchased in a timely fashion, if required. Privatization of the Fort Belvoir sanitary sewer system is scheduled for FY 2008. Figure 2.48 indicates Post primary collection system.

Existing System - Collection

Existing sewerage collection infrastructure on the base consists of 385,000 linear feet of gravity sewer pipe, force main and service laterals, and 36 pump stations. The Fort Belvoir wastewater collection system is composed primarily of clay pipe, with the remainder comprised of mixed concrete, cast iron, and asbestos. Pipes range in size from 24 inches to less than 4 inches. The most common size is 8 inches. Additionally, Fairfax County owns and operates two major pumping stations close to the base, as well as a large-diameter force main running generally parallel to U.S. Route 1 to the south. Due to a premature RCCP pile failure, design for a replacement of Fairfax County’s Dogue Creek force main (running parallel to Rt 1 on the east side of Fort Belvoir) is currently underway. The alignment of the new pipe runs generally parallel with the existing pipe, but does encroach into the parcel south of the Parade Grounds. Government-owned collection systems tie to those of Fairfax County at several points along the Dogue Creek trunk line. Existing sewerage at the FBNA site is minimal, and will need to be replaced to support proposed development there.

Electric Power

Existing System - Supply

The Main Post of Fort Belvoir is supplied power by Dominion Virginia Power under the rate schedule MS – Federal Government Installations. The power is delivered from a single main substation (Belvoir Substation) at 34.5 kV to four 34.5 kV feeders. FBNA is served by medium voltage to a point along Backlick Road. This distribution main is fed from the Franconia substation located a half-mile south of FBNA. Figure 4.19 indicates the Post's primary distribution system.

The distribution system is privatized, a contract was signed by the Installation and Dominion Virginia Power (DVP) in September 2006. Effective 2 August 2007, DVP assumed control of the distribution system. (Electric supply has always been privatized.)

Existing System - Distribution

Four Government owned 34.5 kV distribution feeders serve as both distribution supply chains and as sub-transmission circuits. These supply four 34.5 kV switching stations, one 34.5 kV / 22.9 kV substation, four 34.5 kV / 4.16 kV substations, and one 34.5 kV / 12.5 kV substation. The primary distribution system contains 75 circuits (4.16 kV, 12.5 kV, and 34.5 kV), mostly configured with loop tie switches to neighboring circuits. The distribution system also contains three 34.5 kV sub-transmission stations, ten 4.16 kV distribution substations, approximately 388,000 linear feet of overhead primary/secondary distribution lines, and approximately 45,400 linear feet of underground distribution line. The current electric rate schedule is GS-4 for 34.5 kVA service and GS-7 for a few smaller delivery points, which are not connected to the main service. Figure 2.49 indicates Post primary distribution system.

Natural Gas

Existing System - Supply

Washington Gas supplies natural gas to Fort Belvoir and the surrounding community. The gas company has a robust distribution system in the area that appears capable of providing adequate natural gas, regardless of the BRAC scenario selected. Figure 2.50 indicates Post primary distribution system.

Figure 2.49 - Electrical Distribution System Map

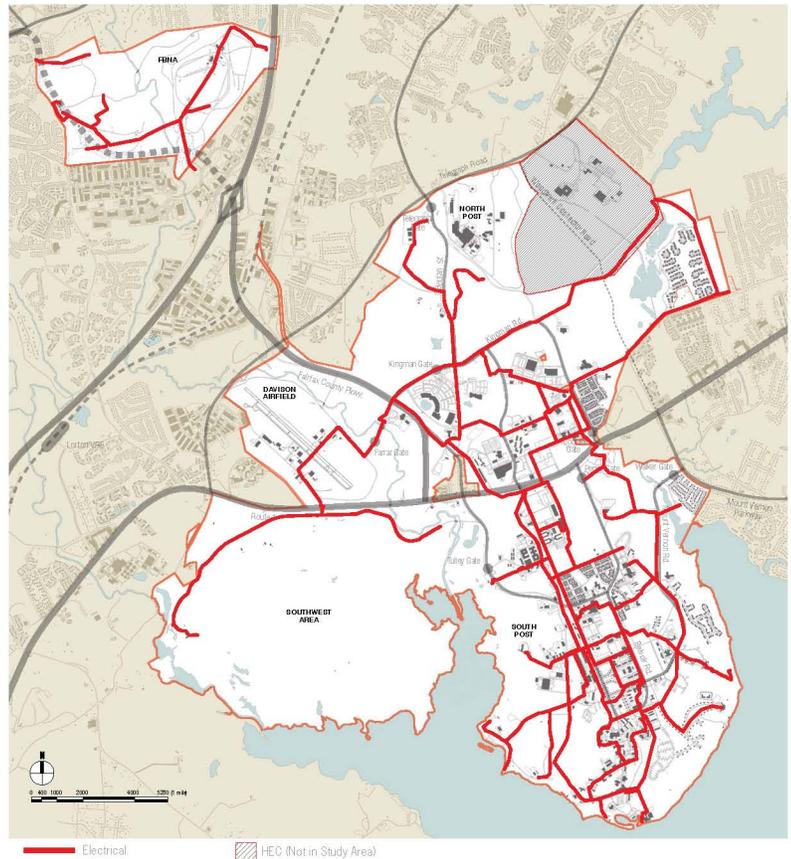
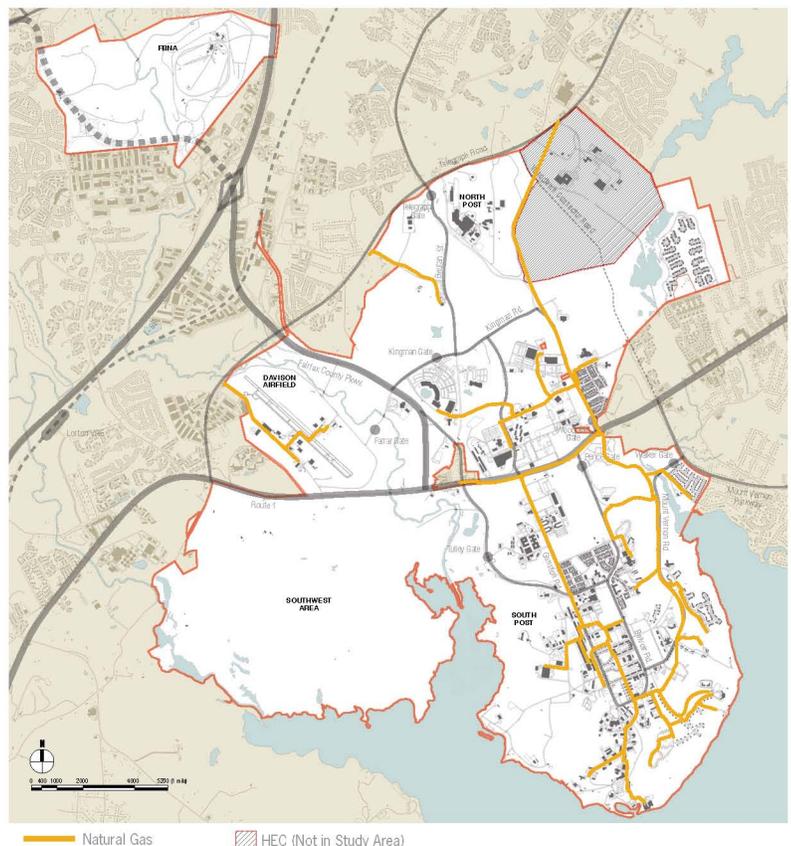


Figure 2.50 - Natural Gas Distribution System Map



Opportunities and Constraints

Development on Fort Belvoir faces many planning issues that will influence future growth and the evolution of the Post over time. While those planning issues are numerous, not all are equal in the hierarchy of importance. The opportunities and constraints presented here are of primary concern. These rank as major regional and local issues, offering both positive assets to build upon and liabilities that impair growth. Categories of concerns include:

- Regional
- Environmental
- Land use
- Infrastructure
- Force protection

The following diagrams (Figures 2.51 through 2.55) summarize those issues of major importance that will affect even the most minor of concerns and possibilities. These influential issues often create impacts beyond installation borders.

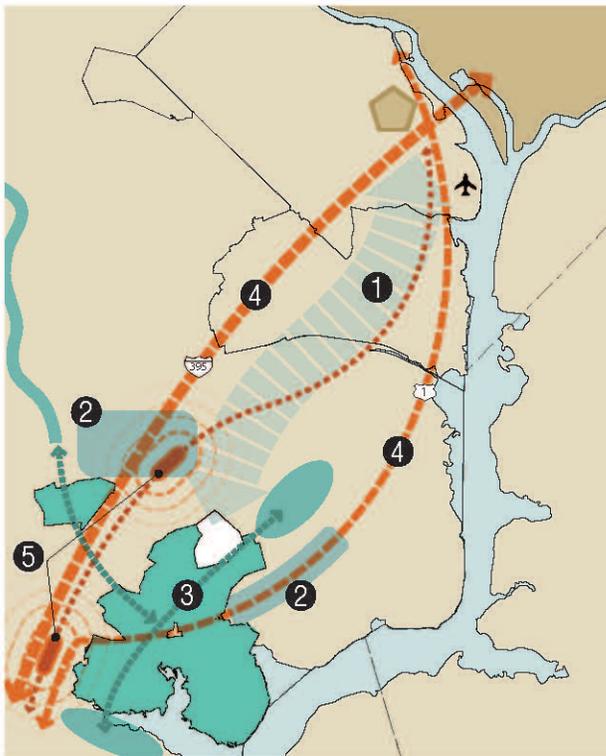


Figure 2.51 - Regional Opportunities and Constraints

Regional

Opportunities

- 1 Area is situated along major transportation corridors, with proximity to Washington D.C. and the Pentagon.
- 2 County plans revitalization efforts for areas adjacent to the Post
- 3 Links to regional parks and recreation areas exist

Constraints

- 4 Road infrastructure is congested; solutions could cost several hundred million dollars.
- 5 Rail service is inconvenient: bus service is the only transit to the Post.

Environmental

Opportunities

- 1 Large areas of contiguous developable land exist on South Post, Lower North Post, and FBNA.
- 2 Environmentally sensitive areas have potential as recreation and open space.

Constraints

- 3 Environmentally constrained areas can isolate installation functions.
- 4 Cultural resource viewsheds may impose development restraints.

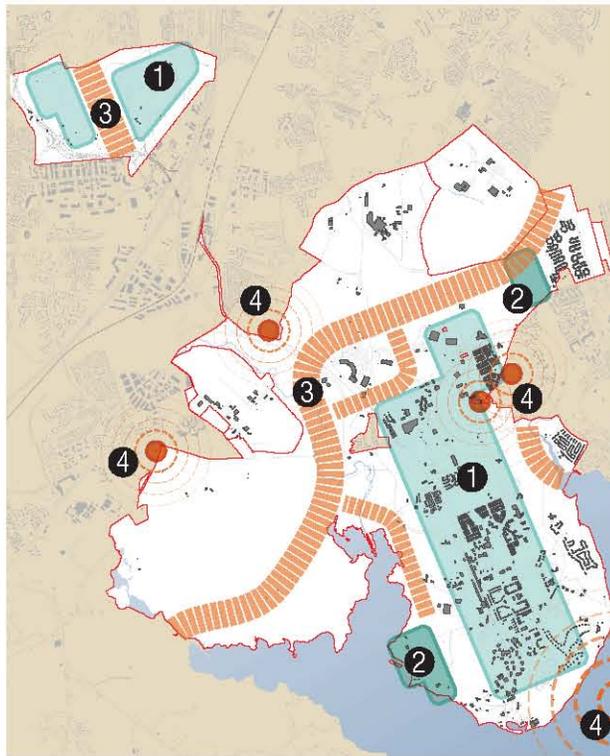


Figure 2.52 - Environmental Opportunities and Constraints

Land Use/Open Space/Airfield

Opportunities

- 1 Potential exists to concentrate urban redevelopment on level terrain of plateau and transition to suburban patterns at the perimeters..
- 2 Adjacent land uses are compatible.
- 3 An easily accessible network of recreation areas and open spaces can be created by utilizing and expanding these existing areas.

Constraints

- 4 Davison Army Airfield safety surfaces may impose height restrictions.
- 5 Adjacent land uses are not compatible without adequate buffering.

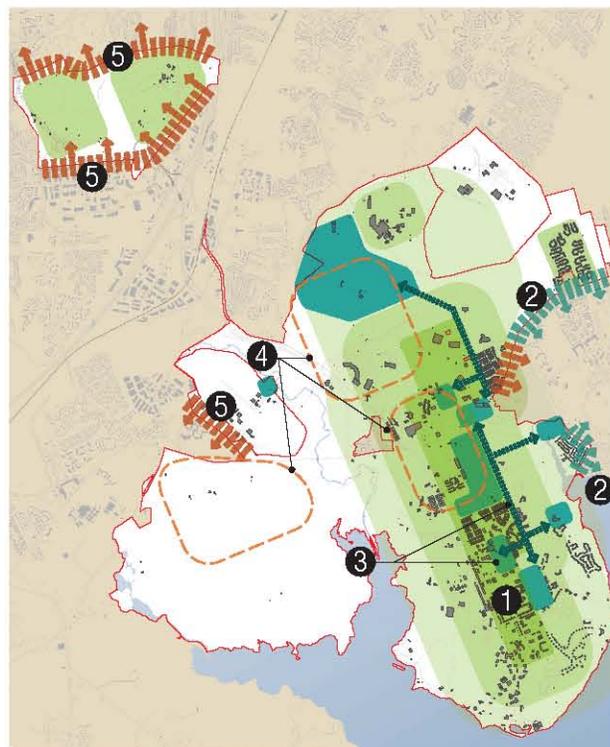


Figure 2.53 - Land Use / Open Space Opportunities and Constraints

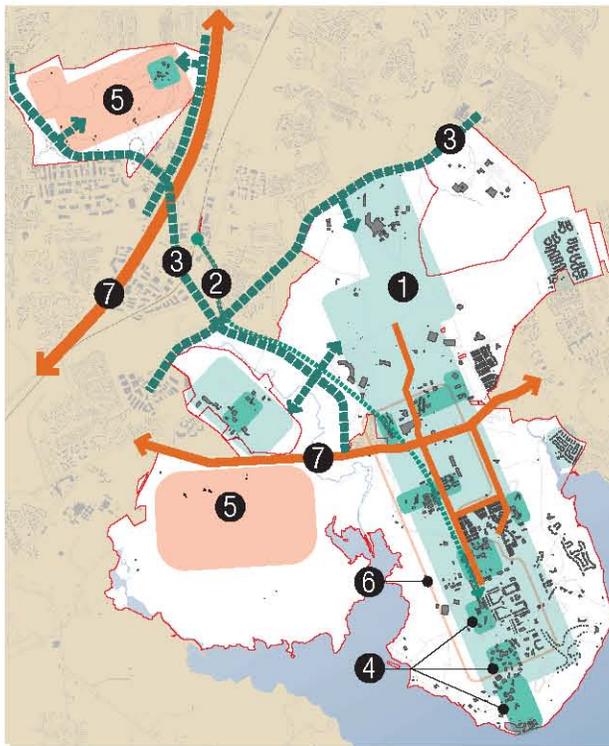


Figure 2.54 - Infrastructure/Transportation/Utilities Opportunities and Constraints

Infrastructure (Utilities/Transportation/Facilities)

Opportunities

- 1 Existing utility and road infrastructure systems can service redevelopment.
- 2 Existing rail corridor could be used for transit service to the Post.
- 3 North Post, Davison Army Airfield, and FBNA are readily accessible to regional roads.
- 4 Aging facilities have good redevelopment potential.

Constraints

- 5 Infrastructure systems are unable to support additional capacity; solutions could cost tens of millions of dollars.
- 6 Many utilities on South Post are at the end of their service life cycle.
- 7 There is a lack of north-south and east-west road connections.

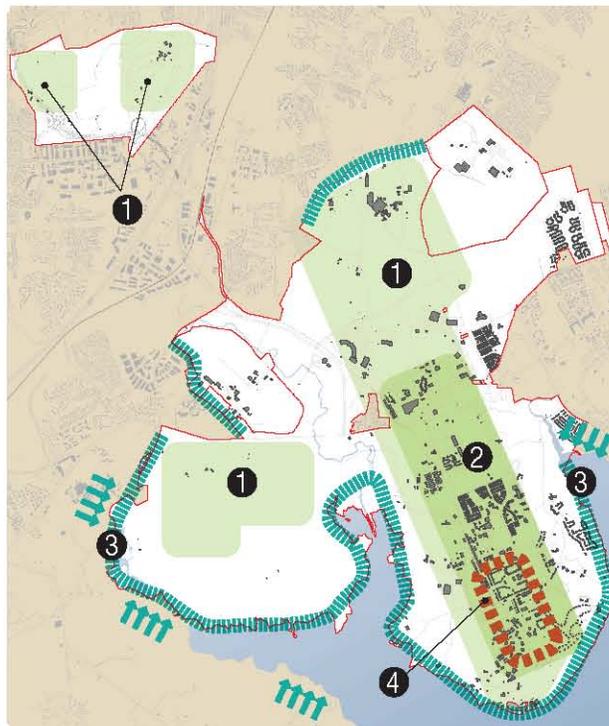


Figure 2.55 - Force Protection Opportunities and Constraints

Force Protection

Opportunities

- 1 Agencies that require additional standoff distances can be located on North Post, Southwest Post, and FBNA.
- 2 Agencies requiring minimum standoff distances can be located on the South Post and Lower North Post.
- 3 Preserved mature woodlands at the Post's perimeter create natural visual barriers.

Constraints

- 4 Existing buildings have inadequate standoffs, and will need mitigations to meet minimum force protection.

Land Development Patterning

3 CHAPTER

Overview

Land development patterning is the second part of Long Range Component development. In this chapter, functional and spatial patterns and relationships are examined. This provides a deeper understanding of how existing land use works, how patterning may be changed to better accommodate proposed redevelopment, and how to improve existing conditions. This ultimately leads to the optimal organization of real property (with buildable land allocated to the highest and best use), and a more efficient installation. Specifically, this process will:

- Ensure effective mission support
- Institute effective means to support and sustain Army readiness
- Identify compatible/incompatible component activities
- Achieve functional economies of scale, visual order, and quality of life
- Use fewer resources to satisfy greater demand
- Meet power projections
- Improve circulation patterns and efficiency of operations

This analysis results in a concept diagram, which depicts proposed land use placements and major factors driving these decisions. The concept diagram is further analyzed using planning framework diagrams. This provides a meaningful tool to rationally organize development patterns in accordance with the guiding principles documented in Chapter 1. Framework plans are then synthesized into a proposed land use plan, which determines the type and location of future redevelopment for the Post.

Approach

This chapter begins with a functional analysis of the existing land use pattern at Fort Belvoir. Functional relationships take into account the Post's missions and how they relate to land use categories. Next, existing spatial relationships are analyzed to highlight redevelopment opportunities and constraints of various parts of the Post. Understanding spatial relationships will help identify the best and highest use of the land available for redevelopment. This chapter results in the development of the Proposed Land Use Plan.

Current Planning Initiatives

This section discusses Fort Belvoir's current planning initiatives, which help guide the development of future functional and spatial relationships. These initiatives are congruent with the planning assumptions, mission, and vision of the Post (stated in Chapter One of this report). This Master Plan will ensure that the planning and siting of these initiatives work toward a long-term strategy to make Fort Belvoir a world class installation.

The actions of the 2005 BRAC Commission will nearly double the existing facilities and personnel of Fort Belvoir. This growth necessitates taking a broad view, in order to fully envision how the Post will successfully accommodate this great influx of people and development. Primary programs within the BRAC action include (see Figure 3.1):

- **National Geospatial-Intelligence Agency (NGA):** This project consolidates NGA's intelligence operations, administrative functions, and training programs from various locations in and around the National Capital Region (NCR) into a single secure complex. The complex projected size is nearly 2,420,000 SF. There are no existing facilities on Belvoir that could accommodate the consolidation of NGA.
- **Washington Headquarters Services (WHS):** This project provides secure administrative space for various agencies and organizations currently housed in leased facilities in and around the NCR.
- **Missile Defense Agency (MDA):** This project provides a 107,000-SF facility to house the Headquarters Command Center for MDA.
- **Hospital:** This project proposes a new 870,000-SF DeWitt Army Community Hospital. This replaces the existing DeWitt Hospital, and accommodates the re-stationing of some elements from the Walter Reed Army Medical Center in Washington, D.C. to Fort Belvoir.
- **Army Lease:** This project provides 133,000 SF of secure administrative space for various agencies, units, and activities currently located within leased space in and around the NRC.
- **Program Executive Office Enterprise Information Systems (PEO EIS):** This project consolidates PEO EIS from various locations on and off Post into a 450,000-SF secure administrative complex and a 74,000-SF information processing center.

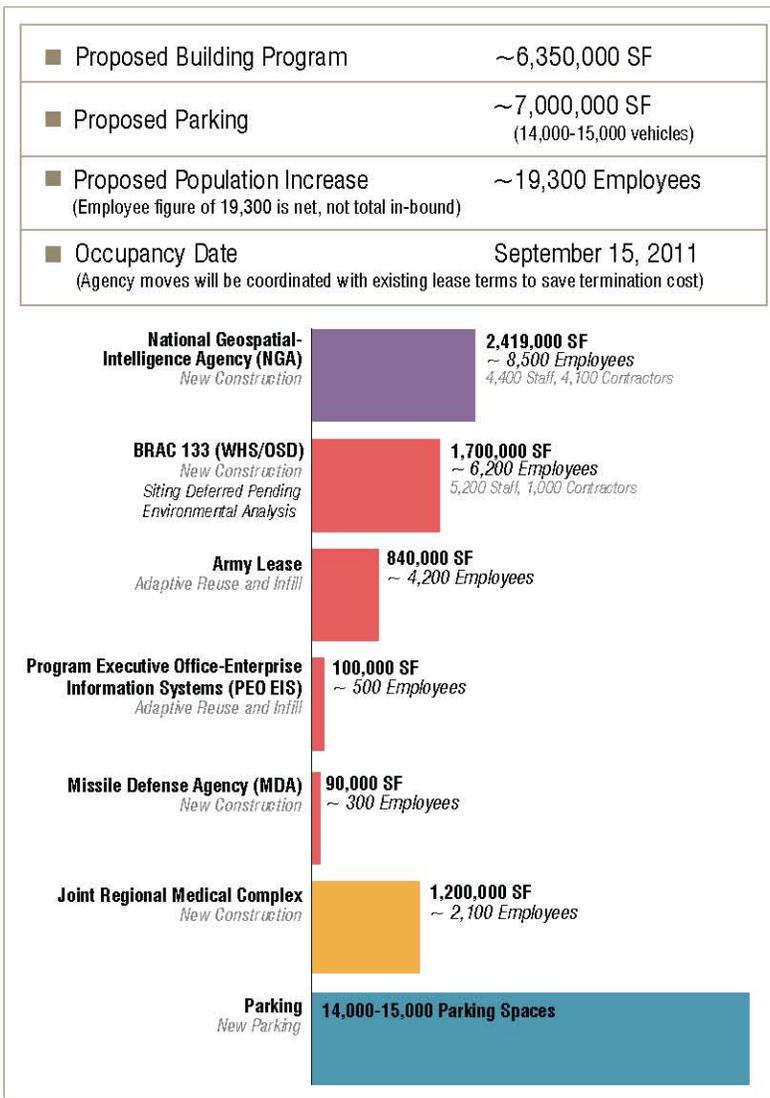


Figure 3.1 - BRAC Program

While BRAC is a significant planning initiative, Fort Belvoir has many other initiatives (both large and small) that need to be addressed by this Master Plan. In addition to the nearly twenty BRAC projects, Fort Belvoir has identified over seventy other short- and long-range future redevelopment initiatives. Some of which are listed here:

- Residential Communities (RC): This is a 50-year public-private partnership to develop, rehabilitate, and construct 2,070 homes within 12 villages on 576 acres. In the first eight years, 1,630 homes will be replaced and 170 historic properties renovated. Additional phases will create three more villages.
- National Museum of the United States Army (Museum): This 200,000-SF museum will tell the story of the U.S. Army as an institution and be a tribute to the American soldier.
- INSCOM: There are plans to expand its current facility on North Post, between 2011 and 2013. This will nearly double the size of its HQ building and site program.
- Fairfax County Parkway: Nearly 160 acres of the Fort Belvoir North Area is dedicated to the final segment of an inter-county connector road, which will link the installation with western suburbs of Fairfax County.
- Woodlawn Connector Road: This new road is meant to replace Woodlawn Road and Beulah Street, which were both closed after 9/11. This will serve as a non-secure road for public travel between Telegraph Road and U.S. Route 1.
- New Entrance Gate: This is a fully monitored gate that provides access to North Post from U.S. Route 1, and is located across from Pence Gate..
- Town Center: This mixed-use redevelopment within the center of South Post is to extend the recently completed mixed-use development on 12th Street. A specific program is not developed, but will include a mix of shops, restaurants, housing, and other community services.
- PX/Commissary: AAFES and DECA are constructing new facilities to create a regional shopping center that includes an open-air, pedestrian-oriented complex featuring restaurants, entertainment, and retail.
- Troop Village: This new troop housing complex replaces McRee Barracks and provides a good quality of life for unaccompanied personnel.
- Various Community Facilities: There are numerous support facilities under construction, including child development centers, fire stations, a marina, fitness centers, and a travel camp and park.
- Infrastructure Improvements: In order to accommodate projected and future population growth, road infrastructure and basic systems for delivering utilities must be replaced and extended.



New RC Housing Area



12th Street

Functional Relationships

Ideal Functional Relationships

The following text describes the ideal functional relationships for the existing and proposed uses on Fort Belvoir and Figure 3.2 visually depicts these relationships.

Professional/Institutional functions are part of the core mission of Fort Belvoir. The Post provides a secure environment for offices, laboratories, classrooms, and similar functions that serve local and regional organizations. Many DoD agencies that are currently located in off-post commercial office space plan to relocate to Fort Belvoir for this reason. Currently, the Professional/Institutional functions are located in pockets of development on both North and South Post. This function has strong relationships with on-post Residential, Community Support, Industrial, and Troop functions, as well as off-post organizations. A number of these various Professional/Institutional functions are unrelated, and may not benefit from co-location.

Troop functions have a strong relationship with each other, and co-location of these facilities increases functional efficiency. The Troop function also has on-post relationships with Professional/Institutional, Industrial, and Community Support functions.

Industrial functions mainly provide maintenance and storage support for the Professional/Institutional and Troop functions on the Post, but have a few regional relationships as well. Community Support and Residential functions support the personnel related to Industrial functions. Co-location of these Industrial functions may not provide much functional efficiency, but allows for better provision of infrastructure and transportation needs.

Community Support includes a large number of organizations that have a largely regional clientele and a few facilities with a local focus. Facilities may not benefit from co-location with each other. Circulation and other needs would determine optimum locations. Community Support functions are expected to increase on Fort Belvoir.

Currently, on-post Residential is not projected to increase. A housing market study is scheduled to be conducted in 2008. Even though unit numbers are not on the rise, opportunities exist to strengthen the functional relationships of residential areas with other functions, creating new areas of activity for both day and evening hours. Residential functions benefit from co-location due to higher efficiency of recreational and support facilities.

The Ranges/Training and Airfield functions accommodate missions that primarily have off-post or regional focus. The Post's Ranges/Training missions have decreased or changed dramatically, and the FBNA has lost its training mission. Range/Training and Airfield functions have a local or internal focus, and co-location with other functions can be detrimental to the function.

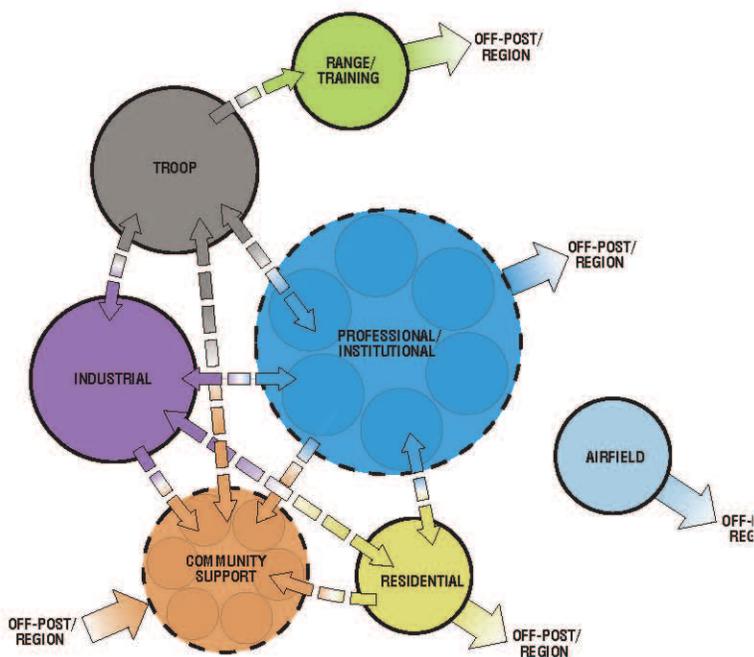


Figure 3.2 - Ideal Functional Relationships Diagram

Functional Relationships and Existing Land Use

On-Post Assessment

Several functional relationships should be strengthened (see Figure 3.3) when analyzing existing land use configurations. These include:

- In the future, outlying Residential and Industrial land use pockets (Figure 3.4) should be modified, as these land uses benefit from co-location of facilities. Dispersed parcels should be better connected or consolidated in the proposed land use plan.
- The Community support functions located within the core of South Post also benefit from co-location with the surrounding Residential, Industrial, and Professional/Institutional land uses. This configuration of land uses strengthens relationships and provides an opportunity to establish the Town Center for the South Post

Off-Post Assessment

Off-post relationships that exist and should be strengthened in the future (Figure 3.4) include:

- Aircraft accessing the Davison Army Airfield
- Water access for: the Range/Training functions on the Southwest Area; Thompson's Basin recreation area; Professional/Institutional functions in the 300-area; and Residential near Dogue Creek
- Access to major roadways and public transit for the Hospital complex, as well as Community Support functions (such as the North Post golf course, PX/Commissary, Thompson's Basin recreation area, and Abbott Wetlands Refuge)
- Access to I-95, Fairfax County Parkway and public transit for the FBNA
- Buffer protection for the Airfield and the Range/Training area on the Southwest Area

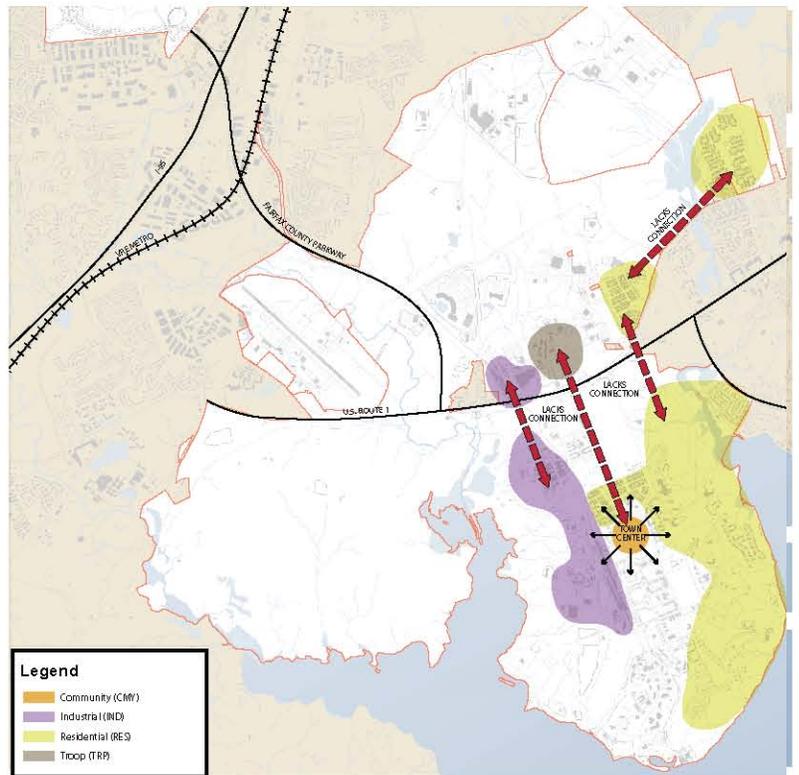


Figure 3.3 - On-Post Functional Relationships

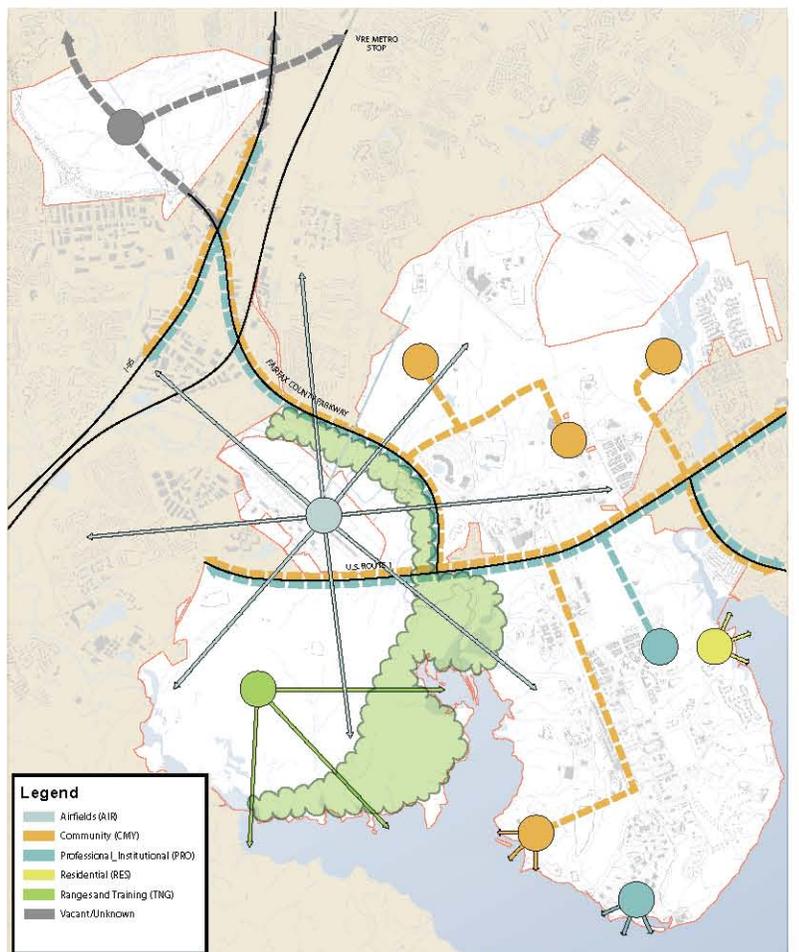


Figure 3.4 - Off-Post Functional Relationships



South Post



Historic Structures on South Post



Historic Housing on South Post

Spatial Relationships

Spatial relationships address physical development, including building conditions, site layouts, visual character, and open space. This assessment along with the conceptual land use will determine the highest and best use for each of the available areas on Fort Belvoir.

Spatial relationships on the Post have been evaluated separately for the following sub-areas: South Post, Lower North Post, Upper North Post, Southwest, FBNA, and the Airfield. This section results in recommendations for the type of development or redevelopment is best suited on each land parcel.

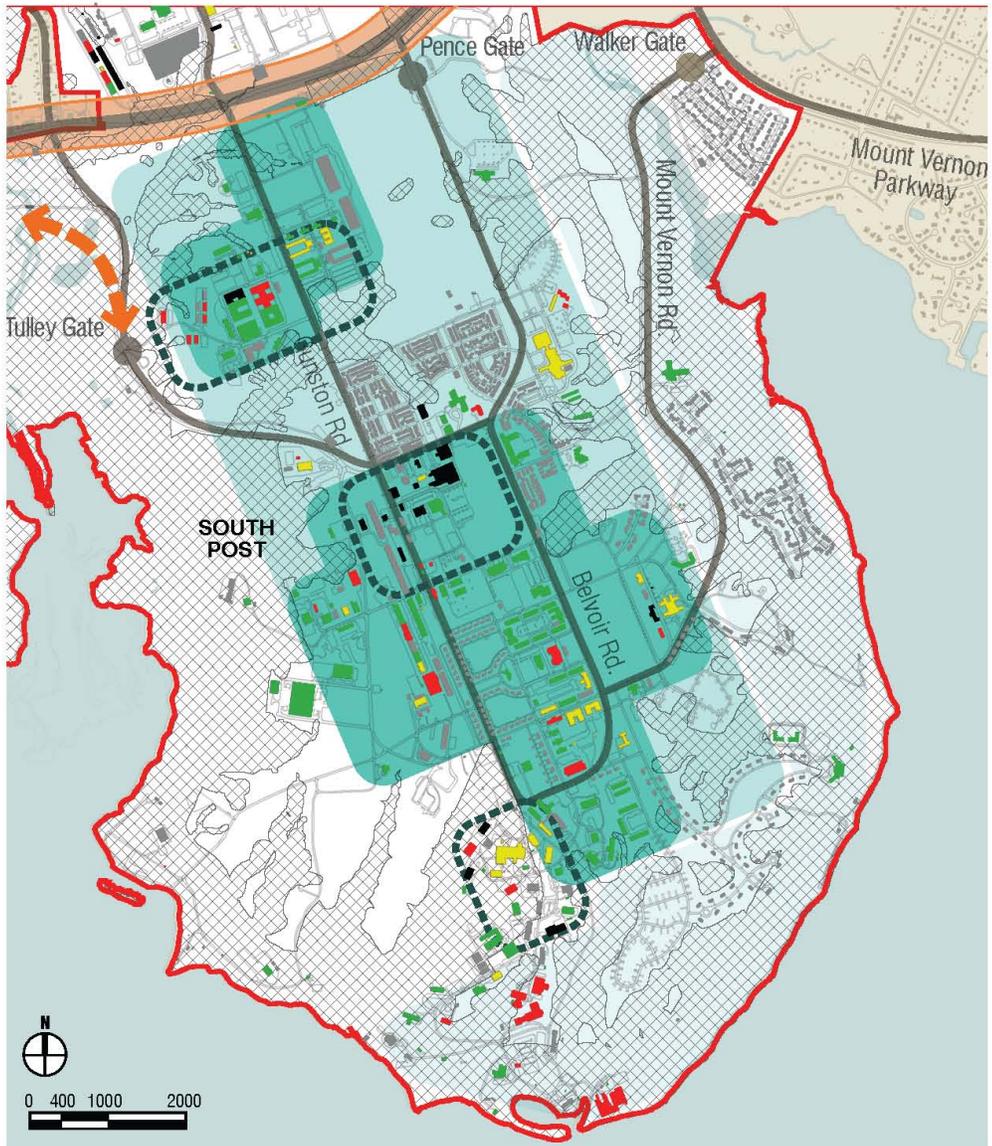
South Post

The South Post has a central plateau area where most of the development is concentrated (Figure 3.5). Natural resource areas are located on the slopes and along the water's edge. The existing character of the core development is urban, and most development is fairly dense. There are a number of historic structures and an established historic district. Utility systems are already in place, and can be extended or upgraded for new development. The terrain slopes from the plateau to the water's edge, and a number of neighborhoods or campuses are nestled within these slopes. Local roads on the central plateau follow a grid pattern, with meandering roads and cul-de-sacs occurring on the slopes. Regional access is primarily from U.S. Route 1.

The central plateau of the South Post offers good redevelopment potential. Its mixed-use development and dense grid pattern can be developed into a contiguous developed core with walkable neighborhoods. Encouraging infill redevelopment on vacant sites, assigning users to vacant facilities, and replacing older facilities with better designed ones can help increase density to fully utilize development potential (Figure 3.5). Because the central plateau would house the dominant development on the Post, it would define the identity of the Installation.

The South Post golf course, located in the northern part of South Post, is a large parcel of under-utilized land that can support a new organization requiring a large facility or campus. Currently, the northern part of South Post has regional access via U.S. Route 1 and Mount Vernon Parkway. The proposal to extend the Fairfax County Parkway on to the installation would improve regional access to the core development on South Post from I-95 and points west of the Post.

Figure 3.5 - South Post Spatial Relationships



South Post spatial relationships include:

- Level plateau comprises a large tract of contiguous developable land, capable of supporting large redevelopment programs
- Three areas are designated as redevelopment areas; these contain aging facilities that offer the best potential for replacement.
- Increasing the connectivity of North and South Post would improve the circulation system and functional relationships of the entire Post.
- High density redevelopment should be concentrated in two primary areas: to the north of 9th Street and south of 12th Street.
- Sloped terrain should be limited to small footprint development that can be successfully integrated with existing site conditions.
- The public interface along U.S. Route 1 is the primary means of public interaction with the Post; any redevelopment here should maintain a positive image that relates well to the public realm.



North Post

North Post

The North Post is spatially divided into two areas: Lower North Post and Upper North Post. Most of the facilities on Lower North Post are aging, inadequate, or in poor condition; many are vacant or under-utilized. Although the urban grid pattern of the Post's core development extends to the Lower North Post, U.S. Route 1 divides South and North Post. As a result, this area is perceived as a distinct entity. Despite its large frontage on U.S. Route 1, Lower North Post has very limited access to this route and South Post. Lieber Gate can provide direct access to this area, but is unmanned and is only used as an exit. Woodlawn Gate is closed and being transferred to the National Trust. The Gunston Road bridge over U.S. Route 1 is the only direct link to the South Post. This lack of regional access and insufficient connections to core development has resulted in under-utilization of most land parcels.

The Lower North Post is poised for major redevelopment, because many existing functions are recommended for relocation to enhance efficiency (as mentioned previously in this chapter). Therefore, many existing facilities are slated for demolition, due to their poor condition or obsolescence. Improved traffic flow and better connections to South Post and the region are possible by providing additional bridges across U.S. Route 1 and aligning Lieber Gate with Pence Gate (Figure 3.6). Existing local road and utility networks can support fairly dense development.

The Upper North Post has a mix of new and aging facilities, arranged in scattered, suburban complexes with large parking lots. The complexes are buffered by large natural resources and open areas, including the forest and wildlife corridor, Abbott Wetlands Refuge, and North Post golf course. This pattern of development is a result of the hilly terrain, which is a significant constraint to contiguous development. The Upper North Post has excellent connections to the regional road network via access points on all perimeters.

A relatively small piece of land on the eastern-most part of the Upper North Post is isolated from the rest of the Post by Abbott Wetlands Refuge. This land is low-lying and prone to flooding. Access to this land is controlled by a gate on Pole Road, a local Fairfax County street.

The Upper North Post has room for new redevelopment, both on new sites and within the existing complexes. The existing road network and utilities can be extended to serve new development. Regional connections can be strengthened by using the existing right-of-way for a busway or transit corridor to the VRE/Metro station.

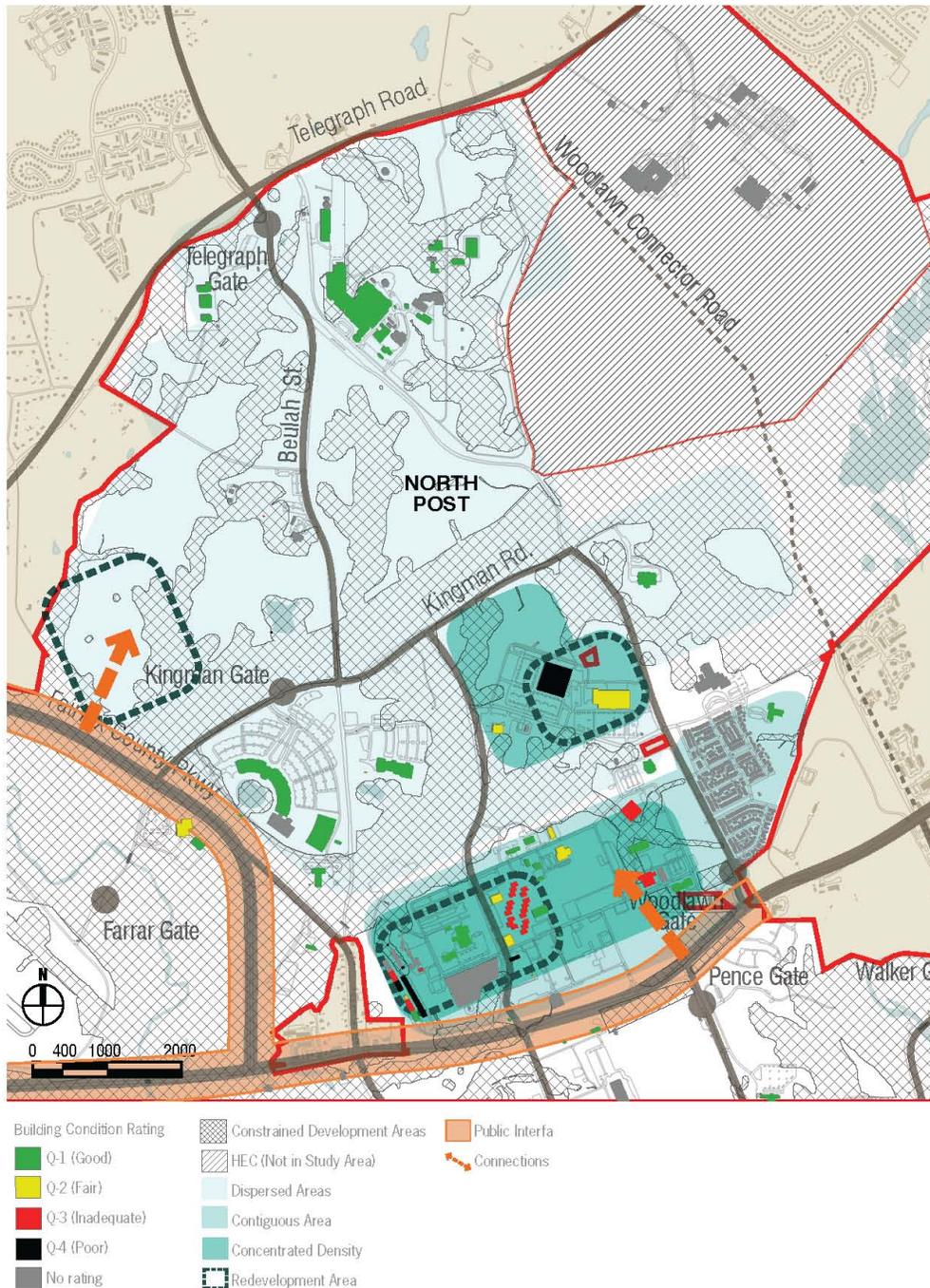


Barracks on Lower North Post



DLA on Upper North Post

Figure 3.6 - North Post Spatial Relationships



North Post spatial relationships include:

- The Lower North Post represents a sizeable parcel of contiguous developable land, suitable for large programs and facilities with big footprints.
- Upper portion of North Post is comprised of dispersed land areas that can support a minimum of facilities. This results in isolated parcels separated by constrained land.
- Three redevelopment areas have a significant number of aging facilities that are suitable for replacement, and represent potential for redevelopment.
- The future museum site responds to its public function, by providing a public presence from off Post and proximity to regional roads.
- Concentrated density areas delineate where redevelopment can achieve compact growth patterns to obtain greater efficiencies of land use.
- Access is primarily via the Fairfax County Parkway, Telegraph Road, and U.S. Route 1. Additional connectivity can bring transit along the existing rail corridor.
- There are significant historic properties located on the eastern edge around U.S. Route 1 that impose some restrictions and require sensitivity with regard to types planned development.



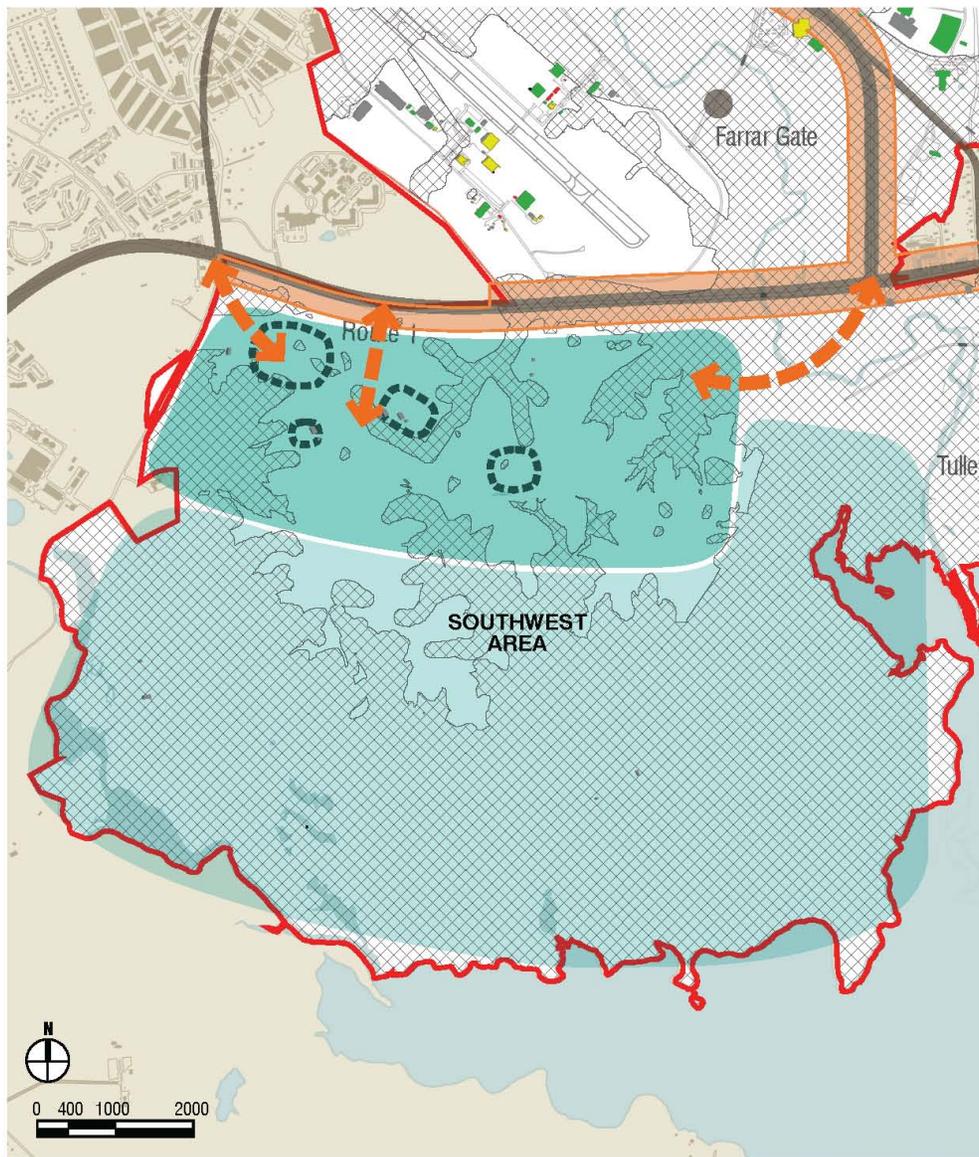
Southwest Area

Southwest Area

Except for a few solitary structures in poor condition or small clearings that support the training mission, the vast majority of the Southwest Area is forested and undisturbed. Natural resource areas include: the Accotink Bay Wildlife Refuge, foraging habitats of the bald eagle, wetlands, RPAs, and riparian areas. Due to the undisturbed nature of this land, the Southwest Area has a high density of archeological sites. Regional access here is currently limited to one gate leading to U.S. Route 1 (Figure 3.7).

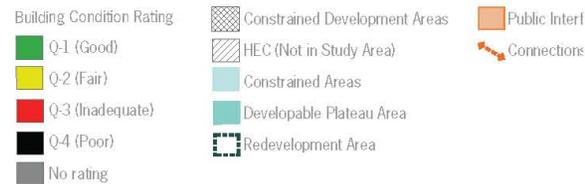
Less than ten percent of the Southwest Area (approximately 150 acres) is considered developable land. This land does not have any existing infrastructure to support development. The amount of environmental cleanup required before developing this land is unknown, but is expected to be extensive due to the training ranges and landfills located here. The majority of archeological sites in this area will need to be evaluated for National Register of Historic Places eligibility prior to any planned development. Archeological sites will also have to be considered when developing training areas, as these may limit the types of training activities that can occur. Of all parts of the Post, the Southwest Area is least suited for new development, especially Professional/Institutional uses.

Figure 3.7 - Southwest Post Spatial Relationships



Southwest Post spatial relationships include:

- The developable plateau area is comprised of more or less contiguous land areas suitable for redevelopment. However, it is dissected into irregular parcels that may limit development to smaller programs or individual tenant facilities.
- Potential re-developable areas represent an inventory of aging structures that are suitable for replacement. Undetermined operational constraints may impose difficulties with development.
- Access to the Southwest Post can be obtained via connections to U.S. Route 1 and the Fairfax County Parkway extension.
- Development must respond to the public interface along U.S. Route 1 to adequately address public perceptions.
- The majority of Southwest Post is comprised of constrained land unsuitable for development. Steep slopes, protected refuges, and other environmentally sensitive areas prohibit development





Davison Army Airfield

Davison Army Airfield

Existing buildings and infrastructure at Davison Army Airfield support the airfield mission. The airfield was built before 1960, and few improvements have been undertaken since then. Several facilities are in poor condition. They no longer meet current operational standards for aircraft serviceability or safety requirements for existing and forecasted aircraft operations.

The airfield mission is anticipated to remain in this location for the foreseeable future. However, it should be noted that the Davison Army Airfield offers good potential for redevelopment for a variety of land uses, as it is a flat area with existing infrastructure that can be upgraded and extended. It also has good regional access via U.S. Route 1 and Fairfax County Parkway (Figure 3.8). Also, there is potential for a direct connection to the VRE/Metro station via the existing right-of-way. Although natural resource areas constrain development on the northern and eastern parts of the land parcel, approximately 200 acres of contiguous buildable land would be available for redevelopment.

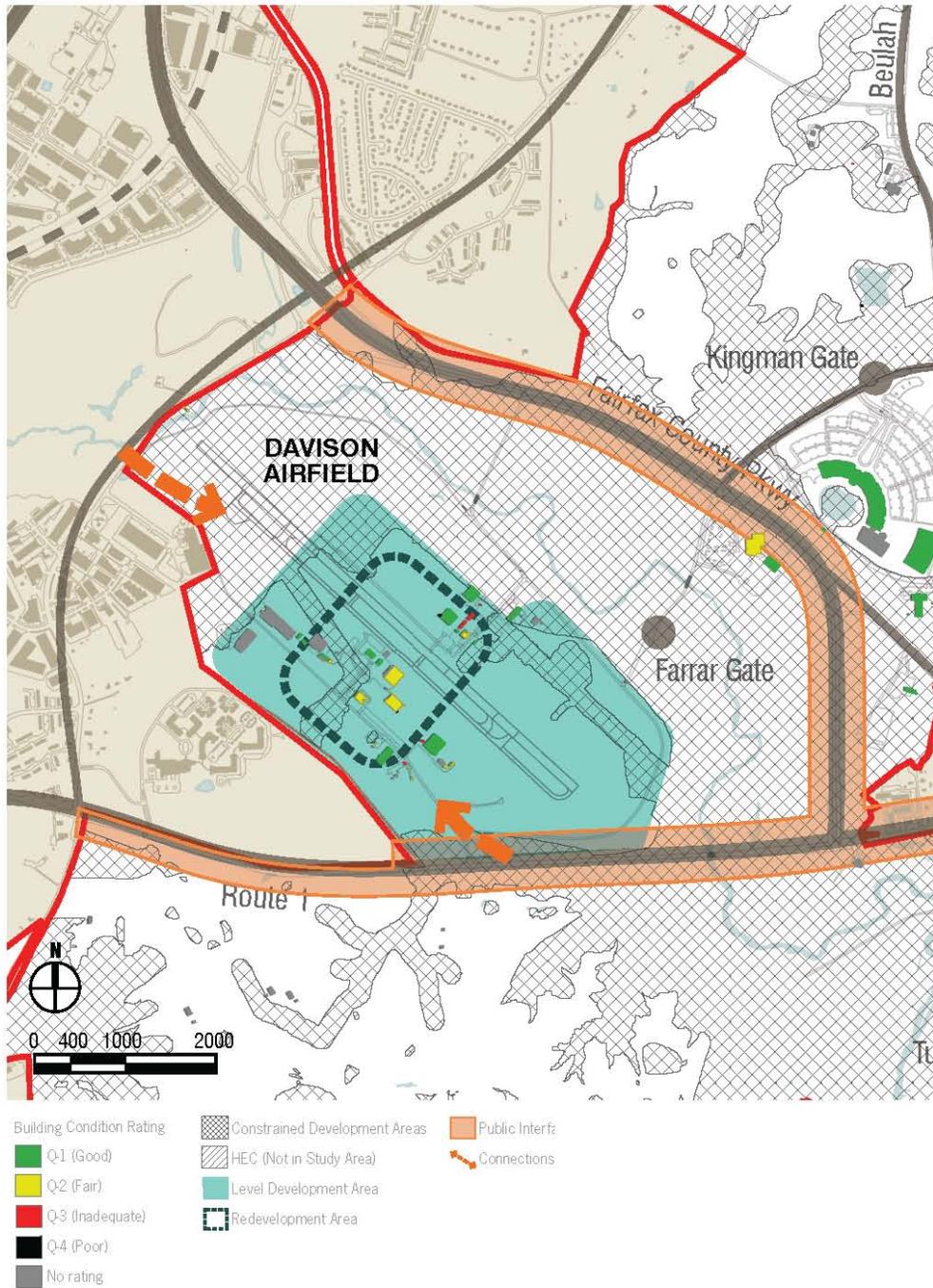


Davison Army Airfield



Davison Army Airfield

Figure 3.8 - Airfield Spatial Relationships



Airfield spatial relationships include:

- The airfield represents a sizeable land area that is ideal for the continuing operations of its current mission, but is also suitable for redevelopment involving programs with large footprints.
- The redevelopment area is comprised of several large hangar structures and other smaller facilities that are aging and in need of replacement. Land area these encompass also represents a sizeable parcel suitable for new construction.
- Beside primary access from the Fairfax County Parkway, additional access to regional roads can be achieved by connecting to U.S. Route 1 and Telegraph Road.
- Proximity to public interface areas, especially along U.S. Route 1, necessitates consideration of how redevelopment presents a positive public image and responds to adjacent land uses.



FBNA

Fort Belvoir North Area (FBNA)

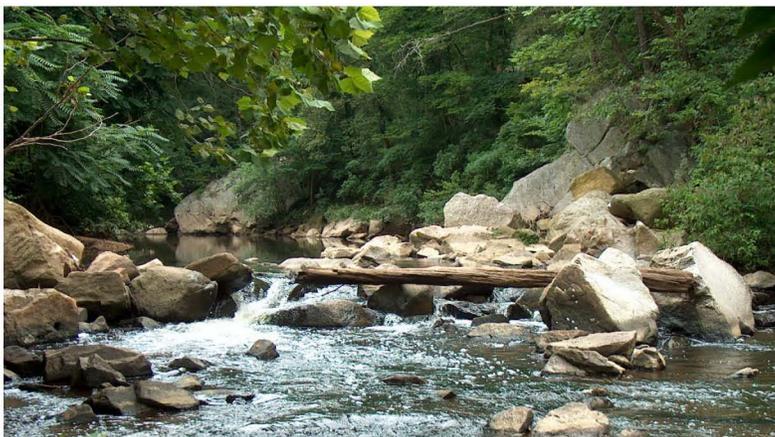
FBNA comprises of two distinct developable parcels located on flatter hilltop areas. The facilities on FBNA are vacant or in very poor condition, and can be demolished to provide a clean slate for new development. Currently, there are no active missions at FBNA. The proposed extension of Fairfax County Parkway along the southern edge of FBNA, along with the site's proximity to Interstate 95 and the VRE/Franconia-Springfield Metro station, offer opportunities for excellent regional road and transit connections (Figure 3.9). FBNA is isolated from the Main Post.

FBNA is largely forested with clearings near existing infrastructure, which can be upgraded to support new development. The Accotink Creek and other environmentally sensitive habitat run through the center of the site, and steep slopes are associated with the stream channels. Readily available unconstrained land for development is roughly 130* acres. Clean up of about 400 acres of former training ranges and 44 SWMUs will increase the amount of buildable land. Therefore, the FBNA parcel has excellent potential for new development.

*Note: Partners In Flight buffers were not taken into account.

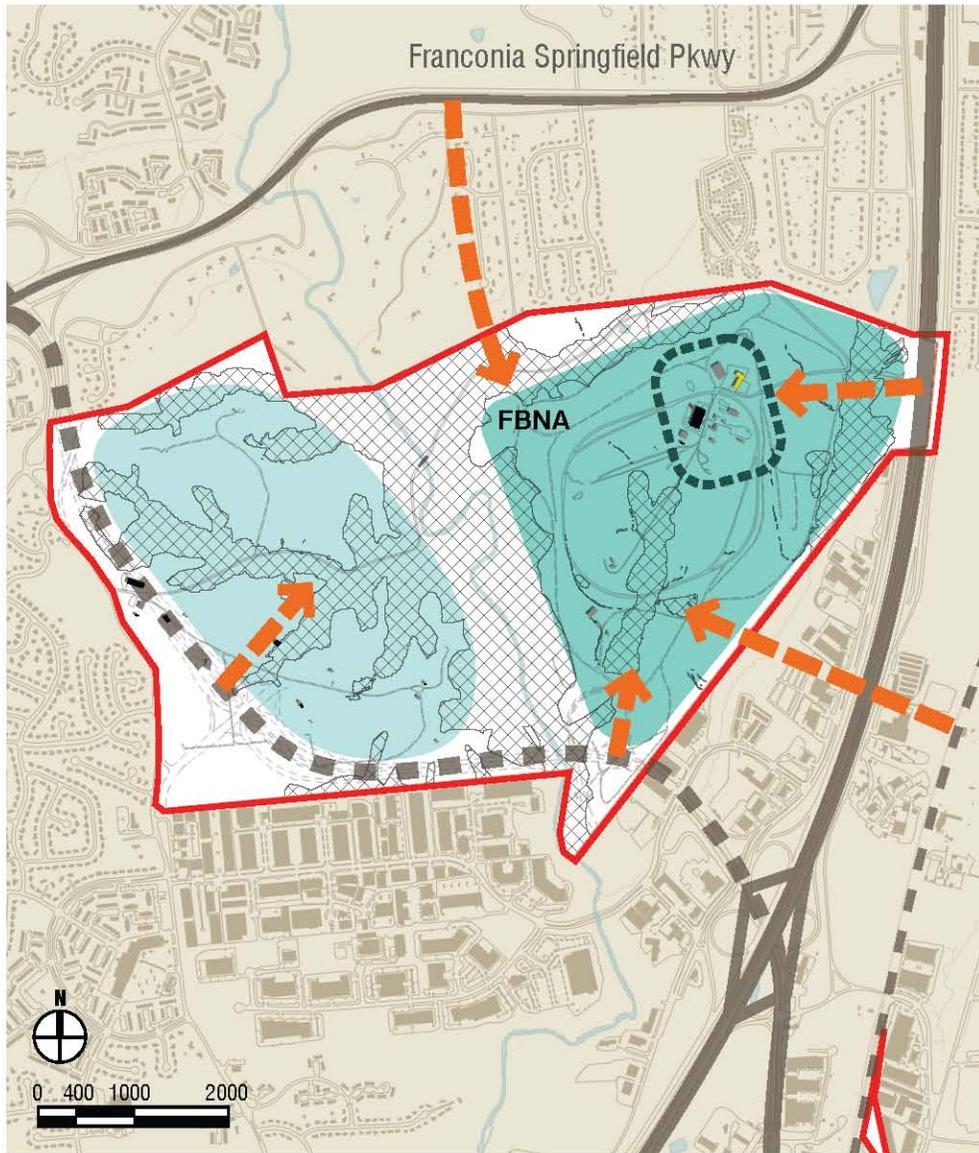


FBNA



FBNA

Figure 3.9 - FBNA Spatial Relationships



FBNA spatial relationships include:

- The eastern portion of FBNA represents a large parcel of contiguous developable land. It can support large programs with sizeable footprints.
- The western half of FBNA is comprised of dispersed parcels of developable land. Programs will be smaller by necessity. This dispersion of available land creates isolated areas disconnected by environmental constraints.
- Derelict and aging facilities on FBNA that are no longer in use can be easily demolished with little impact to current missions. The area they occupy represents a sizeable redevelopment potential.
- Access to FBNA is very good, with direct connections to Interstate 95, Backlick Road, and the Fairfax County Parkway. Additional connections may be made to the Fairfax-Springfield Parkway.

Building Condition Rating	Constrained Development Areas
■ Q-1 (Good)	■ HEC (Not in Study Area)
■ Q-2 (Fair)	■ Dispersed Area
■ Q-3 (Inadequate)	■ Contiguous Areas
■ Q-4 (Poor)	■ Redevelopment Area
■ No rating	■ Connections

Summary of Spatial Analysis

Table 3.1 summarizes the spatial analysis presented on the previous pages. It indicates:

- There is a need for significant redevelopment on the Post, because of under-utilized sites and aging facilities.
- The northern part of the Main Post and FBNA have better access to the regional transportation network.
- The Southwest Area is not a prime development area, due to a lack of infrastructure and accessibility and height restrictions imposed by airfield operations.
- The southern part of Main Post and lower North Post have large developable areas, but require better access to regional roads (adding another overpass to connect South-North Post would help alleviate this problem).

Proposed Land Use

The Land Use Plan (Figure 3.10) classifies all land on the installation into one of seven categories. Table 5.2 indicates the changes in land use based on acreage. When comparing this land use plan to existing land use, notable changes include:

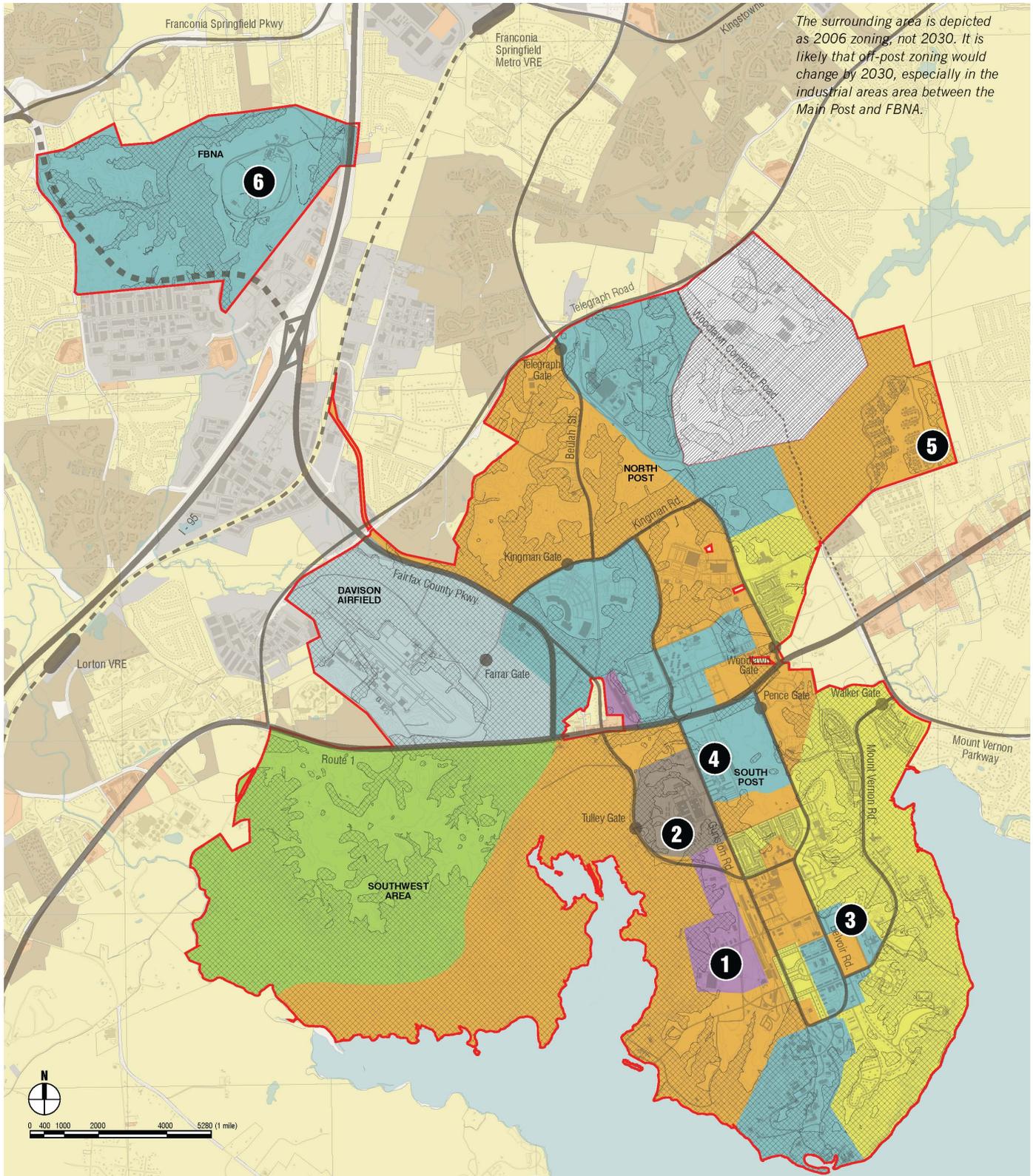
- 1 Industrial land use is reduced to a smaller acreage, which will be compensated by constructing more efficient modern facilities for these functions.
- 2 A Troop village is established on South Post near the Town Center. This includes troop housing and support facilities.
- 3 The open area north of the Parade Field is changed to a Professional/Institutional land use in anticipation of an office development here. An appropriately scaled development will complete the definition of and provide a good backdrop for views across the Parade Field.
- 4 On the upper South Post the Professional/Institutional land use is expanded east and north. This then connects the smaller existing administration areas on North Post into this one larger contiguous land use category, forming an area able to accommodate a significant amount of Professional/Institutional and associated uses.
- 5 Woodlawn Village, a neighborhood (440 units) that is too removed from Main Post, is relocated on to the Main Post and its land is categorized as Community. The proposed Community land use would allow future designation of this land as park or recreation area for the local community; however, an official future use for this land has not been determined.
- 6 FBNA is changed from Range/Training to primarily Professional/Institutional.

Table 3.2, provided after the Land Use Plan (Figure 3.10), indicates the changes in land use based on acreage. For easy reference, both the existing and proposed land use graphics are shown with the table.

Table 5.1: Factors affecting Development Potential

	South Post	Lower North Post	Upper North Post	Southwest Area	Davison Army Airfield	FBNA
Buildable sites are under-utilized	■	■	■	■		■
Facilities are old or improperly located	■	■	■		■	■
Utilities and roads networks exist and can be extended	■	■	■		■	
Good regional access by road and transit			■		■	■
There are large contiguous developable areas	■	■				■

Figure 3.10 - Proposed Land Use Plan



The surrounding area is depicted as 2006 zoning, not 2030. It is likely that off-post zoning would change by 2030, especially in the industrial areas area between the Main Post and FBNA.

- | | | | | |
|------------------------------|----------------|-------------------------------|--------------------------------|---------------------------------|
| Professional / Institutional | Range/Training | HEC (Not in Study Area) | SURROUNDING AREA ZONING | |
| Residential | Airfield | Constrained Development Areas | Commercial | Residential |
| Troop | Industrial | | Industrial | Planned Development Residential |
| Community | | | | |

Figure 3.11 - Land Use Comparison

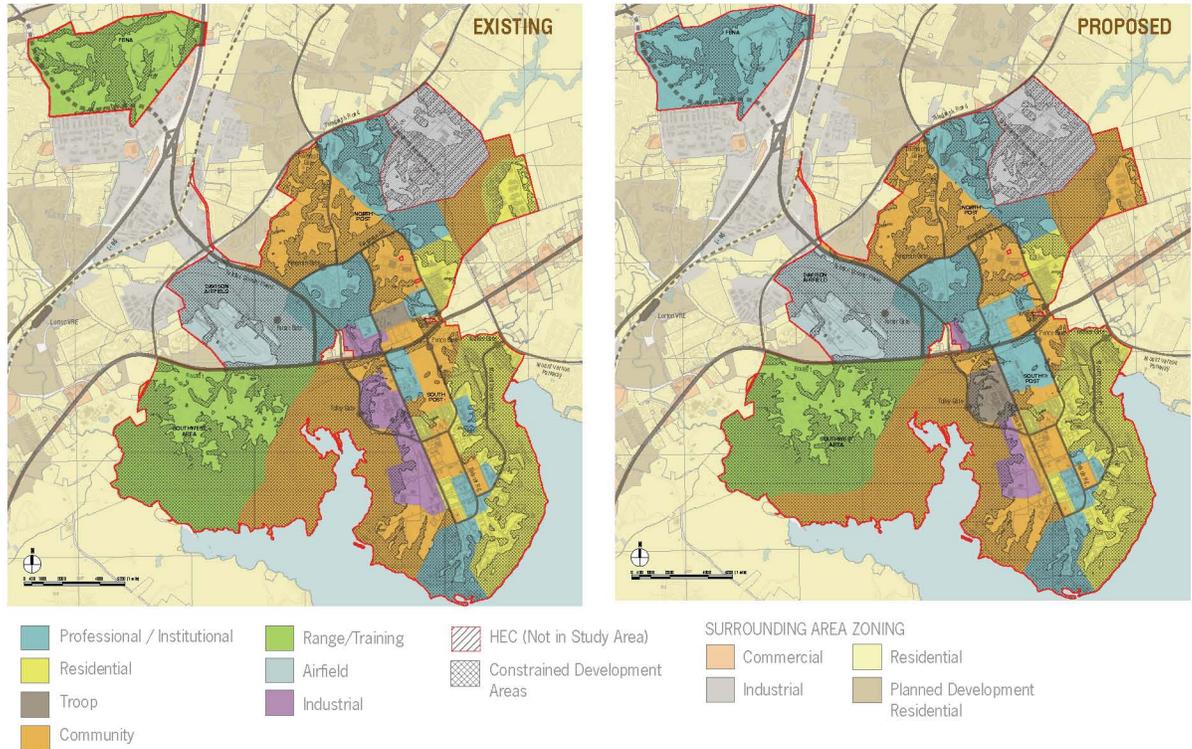


Table 3.2 Land Use Acreage Comparison

Land Use Category	Existing Land Use Acreage			Proposed Land Use Acreage			Acreage Change Developable Acres
	Total	Constrained	Developable	Total	Constrained	Developable	
Professional / Institutional	1233	673	560	2186	972	1214	654
Residential	1306	786	520	1149	701	448	(-72)
Troop	46	0	46	139	44	95	49
Community	2602	1662	940	2899	1891	1008	68
Range/Training	2227	1297	930	1286	872	414	(-516)
Airfield	707	469	238	689	466	223	(-15)
Industrial	379	103	276	152	44	108	(-168)
TOTAL	8500	4990	3510	8500	4990	3510	0
TOTAL PERCENTAGES	100	59	41	100	59	41	0
MAIN POST TOTAL	7700	4705	2995	7700	4705	2995	0
FBNA TOTAL	800	285	515	800	285	515	0

Future Development Planning

4 CHAPTER

Overview

This chapter reflects a consensus for all aspects of future installation development, and provides an adaptable blueprint that brings control, coordination, and direction to current and potential change. This important exercise integrates divergent issues with competing long-range development directions, while complying with the installation's Mission, Vision, Goals and Objectives.

This section begins with several framework plans that depict overall concepts of long-term vision for developable parcels, circulation, and open space. These lead to the presentation of the future development plan. This plan is presented in two phases, a 2015 phase and a 2030 phase.

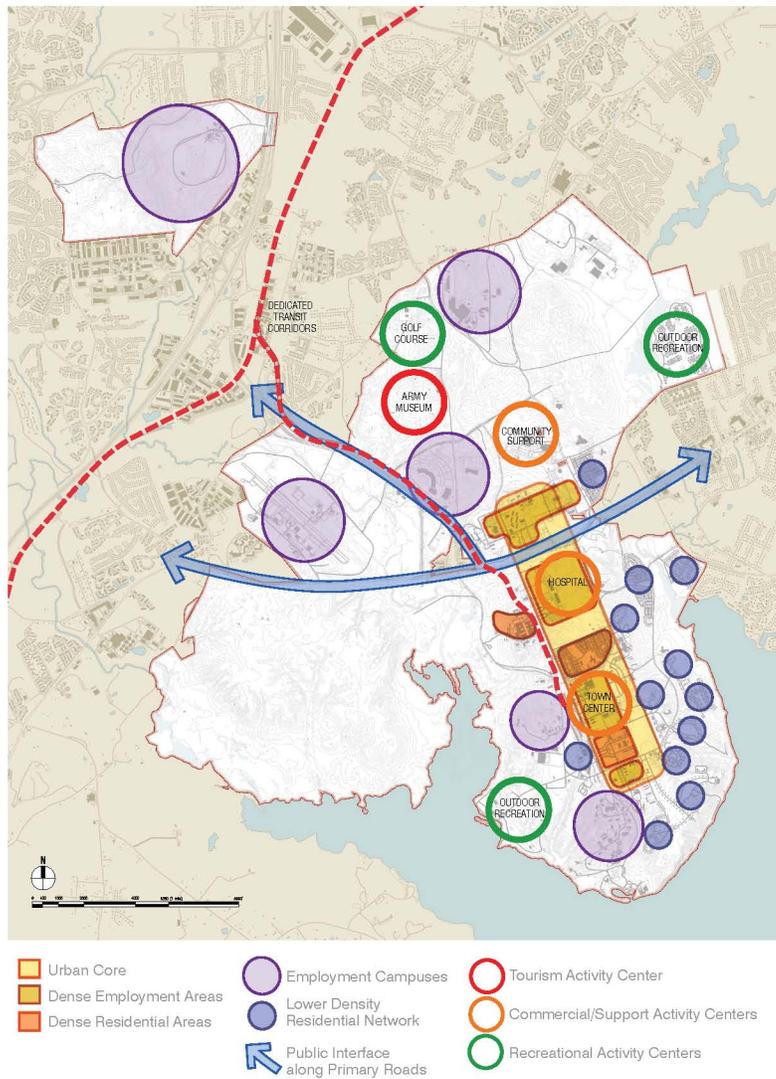
With the large increase in population from BRAC 2005, Fort Belvoir will essentially meet its 2030 projected growth by 2015. The Army is planning for minimal additional growth on Fort Belvoir from 2015 through 2030. Each of the phased plan includes transportation and utilities assessments which depict impacts and improvements needed to facilitate the 2015 and 2030 development plans.

The framework developed in this master plan provides a structure for development beyond the 2030 Master Plan. A plan showing full build out of the installation has been developed as a stand alone report titled *Fort Belvoir 2050: Capacity Assessment*.

Planning Framework

This section discusses the planning framework for the long-range vision of the entire installation of Fort Belvoir. A framework on this scale serves as a guide for all future development. It depicts the roads, trails, and open spaces – those elements that serve as connectors for the installation. This network of linkages must work together, and not just function in isolation. The framework also recommends the best type of development for each location. It indicates where high density developments and high level activity nodes should occur. (See Figure 4.1.) Building on this framework are the Area Development Plans (ADPs) and Installation Design Guide (IDG). These specifically address details about the organizations, massing, and the character of proposed developments. Framework plans discussed here include: Development Parcels, Circulation, Housing, and Open Space.

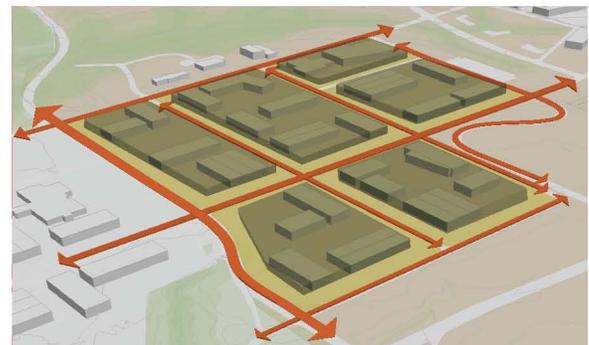
Figure 4.1 - Activity Nodes (2030)



Framework: Development

The development framework plan:

- Through redevelopment of the plateau area, creates a dense urban core along the primary north-south axis of Main Post
- Provides subdistricts in the Main Post urban core for scale and orientation
- Through redevelopment, increases the efficiency and density of employee campuses located outside the urban core (off the plateau)
- Ensures that the potential transit corridor is not encroached upon
- Strengthens existing development and locates additional developments along the potential transit corridor
- Locates regional recreation near Post boundaries
- Locates other regional uses along the primary roads to take advantage of this public interface



Future development should observe the development patterns already established on Post. They have efficiently served the installation in terms of its mission and defined its character.

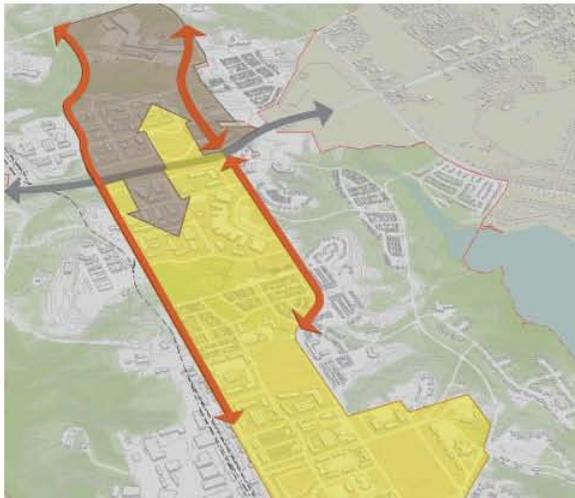


Most development on Post is focused around a central core of activity nodes. These offer the urban amenities that encourage a vibrant mixed-use community on Post.

Framework: Circulation

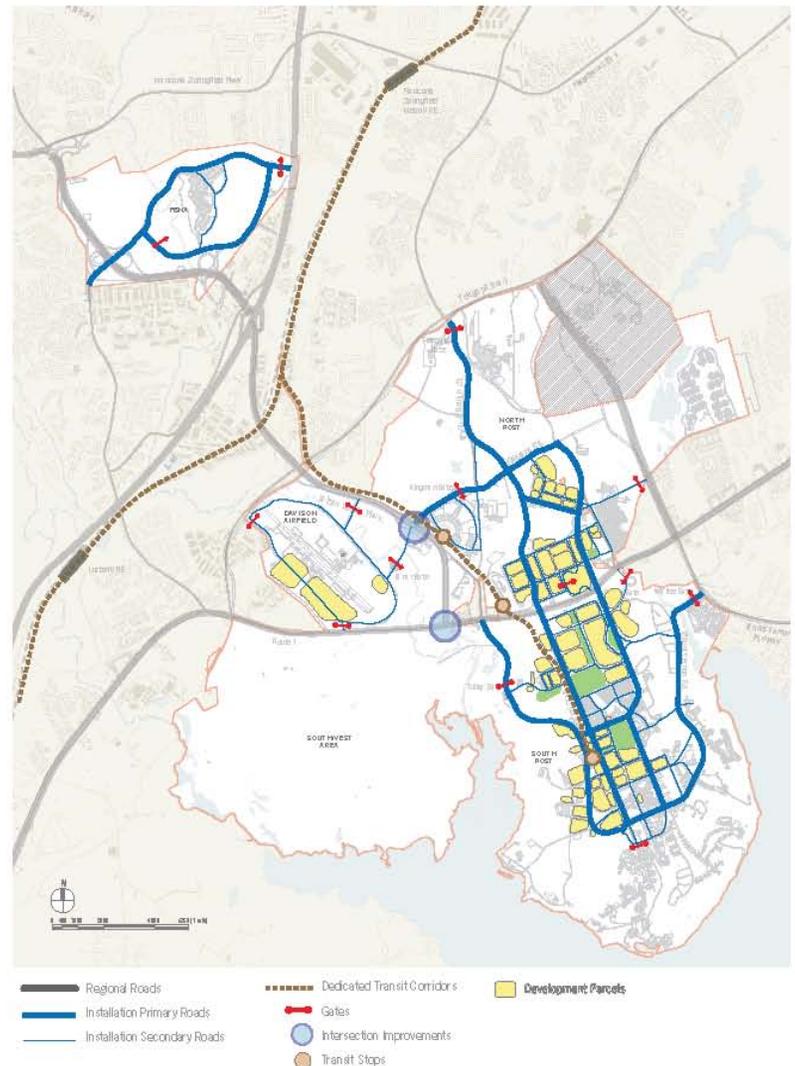
The circulation framework plan provides the following features:

- Capitalizes on the future Fairfax County Parkway for both FBNA and Main Post connections
- Provides an additional bridged connection between North and South Post
- Creates a loop road circulating around the Main Post urban core
- Provides additional east-west connections between Belvoir and Gunston Roads
- Provides a corridor easement along the abandoned rail line for potential future transit
- Depicts the future infrastructure proposed for FBNA
- Ensures the network of residential neighborhoods along the east and south side of the core stay connected to each other and to town center development
- Provides pedestrian linkages between all of the main activity centers



Connectivity between the North and South Post is important to establish a unified urban core. Long severed by U.S. Route 1, strong linear elements such as Gunston Road and Belvoir Road can span this formidable barrier. Connectivity can also be accomplished with well-orchestrated development that visually ties both halves of the post together.

Figure 4.2 - Circulation Plan (2030)





Framework: Housing

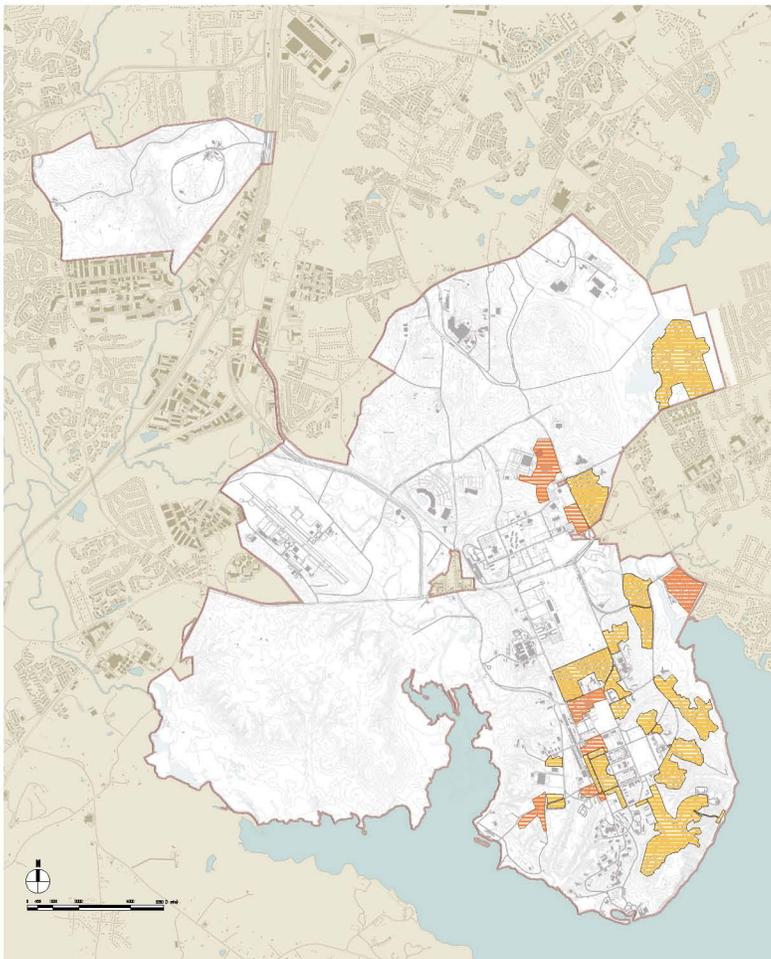
Since the inception of the Residential Communities Initiative by the U.S. Army, the residential neighborhoods at Fort Belvoir have undergone a dramatic change. Reconstructed Villages now follow the standards of Traditional Neighborhood Design (TND). TND, which is experiencing a resurgence in regional/national planning trends, is a development pattern that reflects the characteristics of the smaller, older communities of the late 19th and early 20th centuries. It achieves this by shifting the development focus from the automobile to the pedestrian. These traditional communities are typically characterized by mixed land uses, grid street patterns, pedestrian circulation, intensively-used open spaces, architectural character, and a sense of community.

With the exception of Belvoir, Gerber, Woodlawn, and River Villages, all on-post villages are undergoing redevelopment as TND communities.

Historic Belvoir Village and Gerber Village are the only neighborhoods being preserved in their entirety. Both are exemplified by distinctive architecture and site planning. Belvoir Village features grand Georgian style homes on curvilinear streets. Gerber Village is comprised of more modest homes in the Neocolonial style, which are arranged in a formal symmetrical grid pattern. Both villages are being maintained due to their durable construction and timeless style, which is still fresh and enduring to this day. The mature landscaping within these villages creates an idyllic setting of tree-shaded properties and well established plantings that make these neighborhoods distinctive.

Because Woodlawn Village is isolated from the rest of the Post, these units will not be redeveloped in place, but will be distributed into and around other Post housing areas. Figure 4.3 shows the potential locations for the relocation of the Woodlawn Village housing units.

Figure 4.3 - Potential Locations for Distribution of Woodlawn Village Housing Units



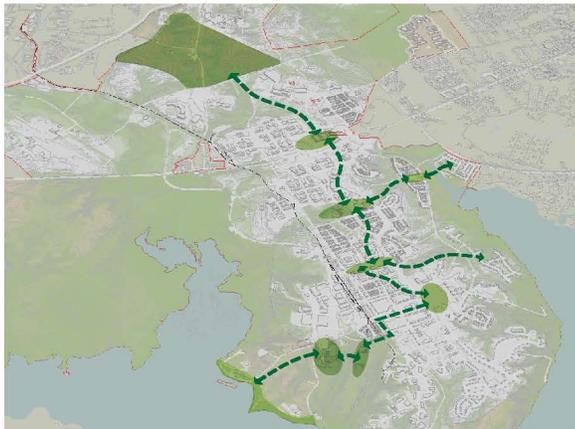
- RCI Leased Areas
- Proposed New Housing Areas

Framework: Open Space/Recreation

The open space framework plan provides the following features:

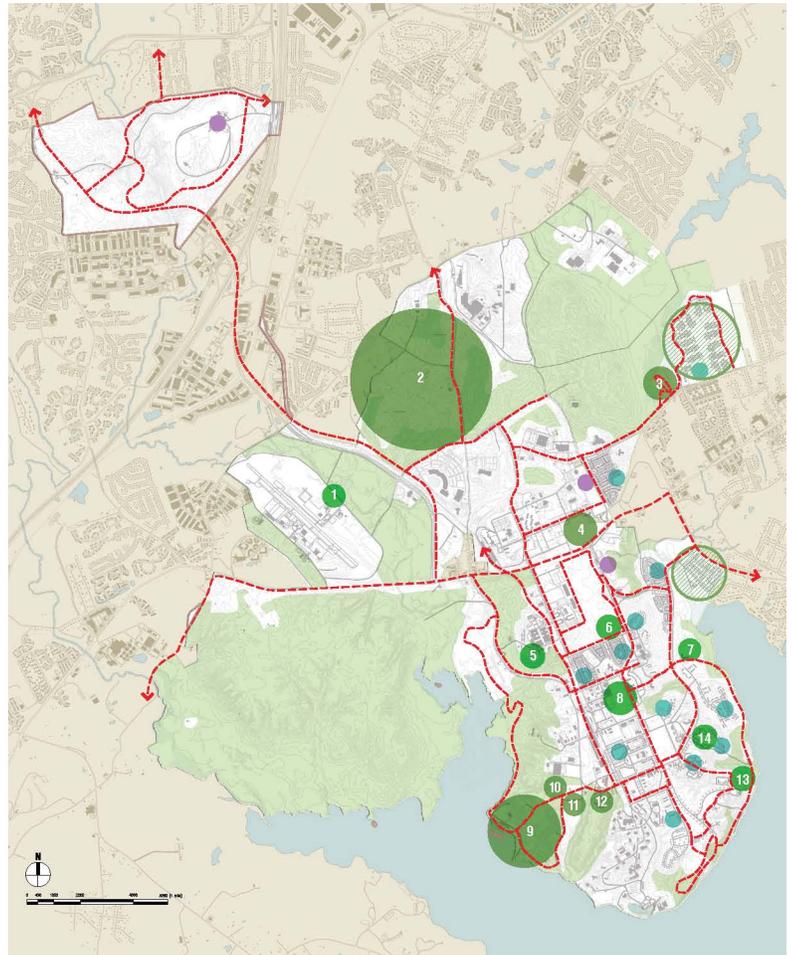
- Strategically locates community centers and recreational facilities to serve as hubs for the Main Post community
- Incorporates additional recreational amenities within smaller parks and open spaces
- Provides an accessible trail system that links open spaces and recreation areas together as an integrated network
- Provides recreational trails throughout the natural area on Post
- Aligns pedestrian trails with regional trails
- Provides a fitness trail around the proposed Troop Village area
- Preserves existing natural features whenever possible and integrate as an amenity
- Provides a variety of open spaces accommodating many types of activities
- Utilizes open spaces as buffers to help mitigate impacts to neighboring historic properties
- Groups recreational fields together to create a sports complex

This overall framework has been further refined into a detailed plan (Figure 4.4).



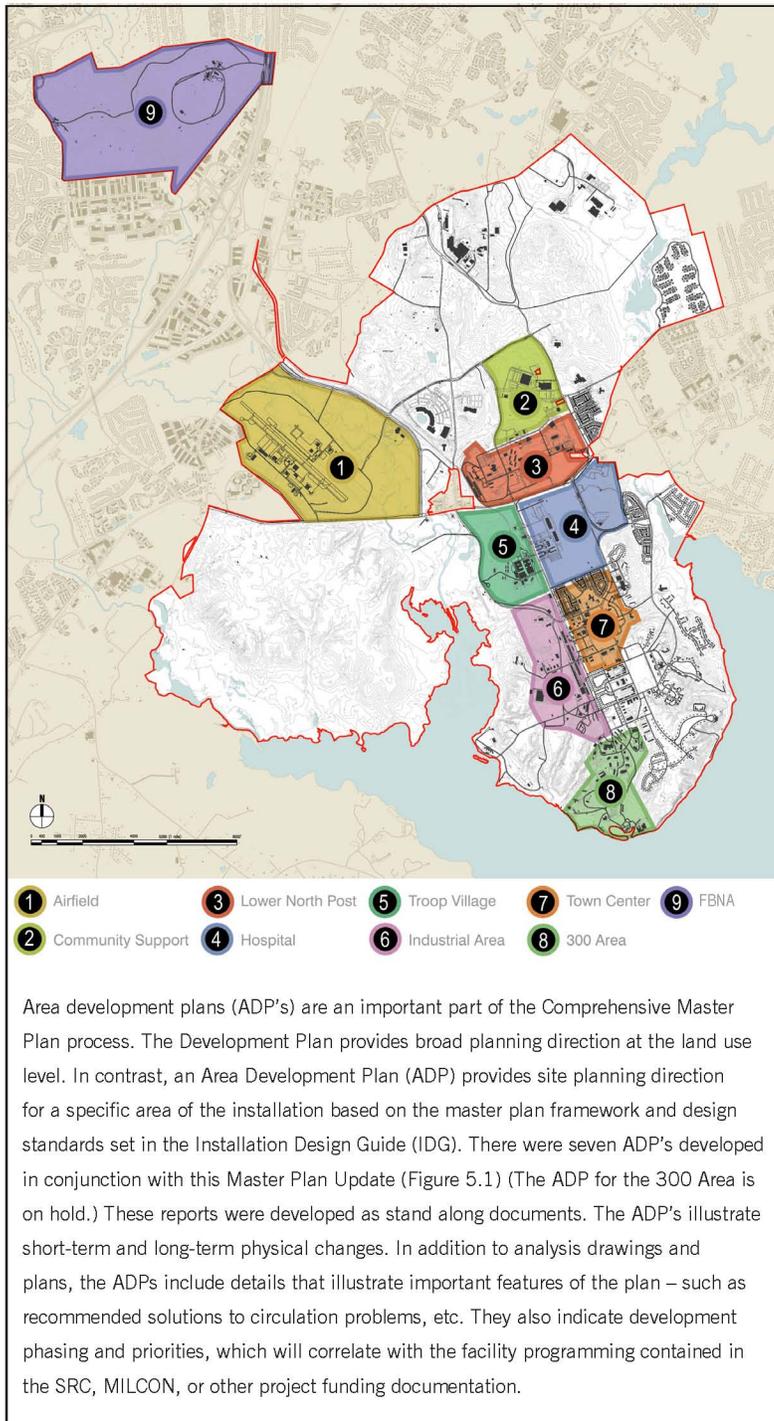
Prominent green spaces are well distributed throughout the Post. These include the golf course, parade fields, recreation areas, and local parks. A strong network of trails should link open spaces together and provide green ways for pedestrians and bicyclists.

Figure 4.4 - Open Space and Recreation Plan



- | | |
|---------------------------------|--|
| ● Regional Recreation Areas | 1 Anderson Park |
| ● Community Recreation Areas | 2 Golf Course (36 holes) |
| ● Neighborhood Recreation Areas | 3 Abbott Wetland Refuge |
| ■ Hunting Area (bow only) | 4 Recreation Fields (soccer, football, community fair ground) |
| --- Trails (multipurpose) | 5 Recreation Area (tennis, basketball, softball, football, soccer) |
| ○ Potential Recreation Areas | 6 Tennis Courts |
| ● CDC | 7 Recreation Area (playgrounds, soccer) |
| | 8 Pullen Field (track, soccer, softball, fitness center) |
| | 9 Tompkins Basin (Archery Range, Nature Center, Travel Camp, Trail Head) |
| | 10 Water Park and Skate Park |
| | 11 Recreation Fields (baseball, track, soccer) |
| | 12 Recreation Fields (Little League fields) |
| | 13 Community Pool |
| | 14 Tennis Courts |

Figure 4.5 - Area Development Plan Locations



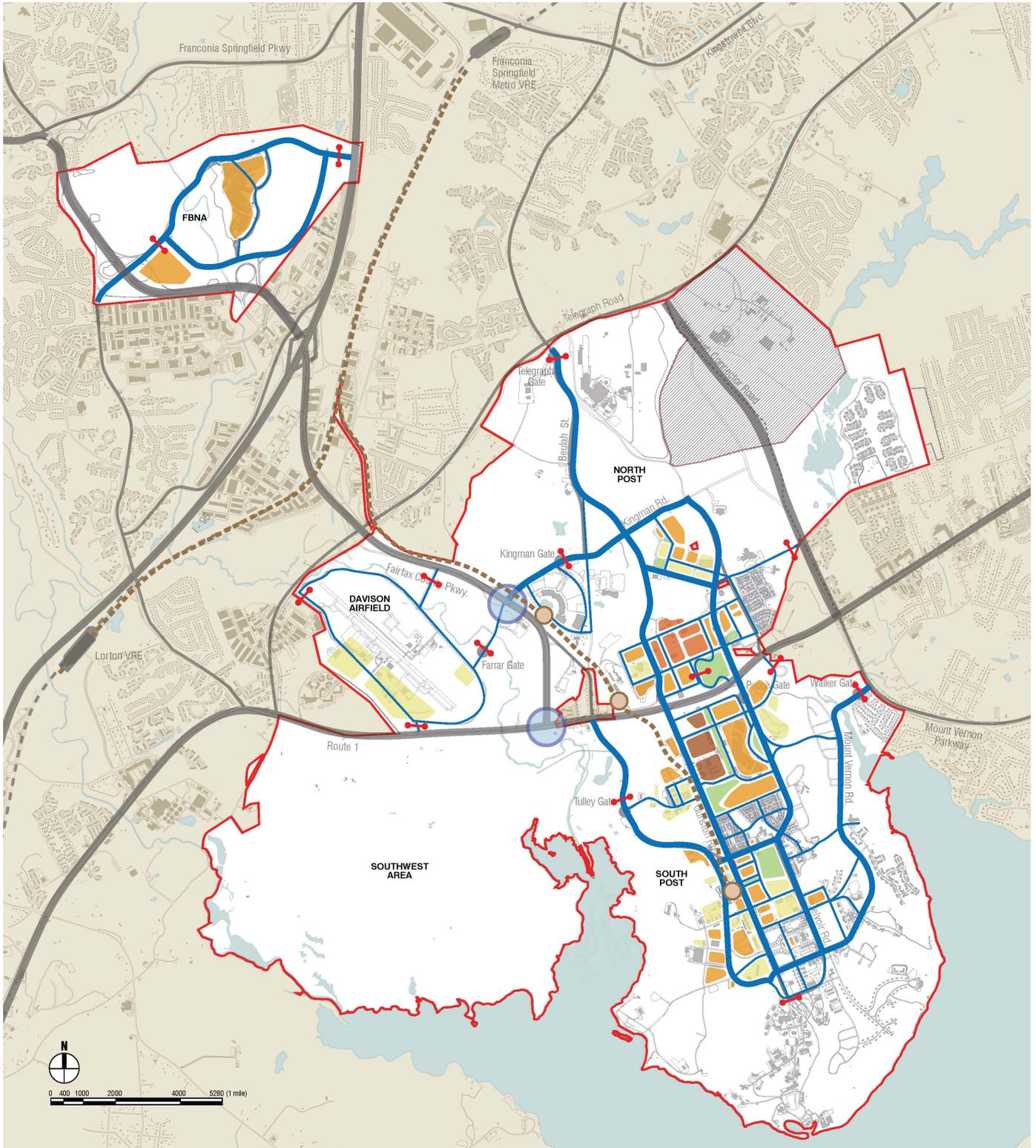
Framework Development Plan

Figure 4.6 shows the overall framework for Fort Belvoir in two phases, 2015 and 2030. The plan recommends the type and location of development, not specific projects. Reserving detailed project information for the Short Range Component (SRC) and Area Development Plans (ADPs) extends the life of this Development Plan. (See Figure 4.5 for locations of the ADPs.) It allows this plan to serve as a flexible, overall guiding framework that does not become outdated as soon as one project changes location. The plan:

- Provides the framework for accommodating the growth of approximately 22,000 employees by the year 2015 and another 3,000 employees by 2030 (Total projected population for 2030 is 48,000.)
- Provides a dense core of mixed-use development on the plateau that extends north-south across the installation
- Establishes a strong connection between north and south post
- Reserves parcels for development beyond 2030
- Maintains the rail right-of-way for potential transit use
- Incorporates relocation of the Woodlawn Village housing units onto the South Post

The following pages depict the Transportation and Utility Assessments for the proposed Development Plan. Each assessment details the improvements needed for both the 2015 and 2030 phases of development.

Figure 4.6 - Framework Development Plan



- | | | |
|--|---|---|
|  Regional Roads |  Dedicated Transit Corridors |  Development Parcels (2015) |
|  Installation Primary Roads |  Gates |  Development Parcels (2030)
<i>Lower North Post Option</i> |
|  Installation Secondary Roads |  Intersection Improvements |  Development Parcels (2030)
<i>South Post Option</i> |
| |  Transit Stops |  Other Potential Development Parcels |

Transportation Assessment

The Master Plan proposes significant improvements to the transportation systems (traffic circulation, transit, parking, and pedestrian) on Fort Belvoir. It addresses the current deficiencies on Post, to the extent possible, and discusses the relationship between on-post actions and the currently planned off-post transportation improvements.

The Master Plan Transportation Goals are:

- Improve traffic circulation and wayfinding.
- Develop a “grid” system of roadways to distribute traffic.
- Improve connections between North and South Post.
- Improve interfaces with regional transportation systems.
- Accommodate security requirements.
- Support new and consolidated functions.
- Encourage alternate modes of transportation.
- Guide projected growth around transit opportunities.
- Create convenient access to transit.
- Enhance shuttle connections between Army neighborhoods, parking facilities, and regional transit.
- Accommodate local plans for transit improvements (Route 1 corridor).

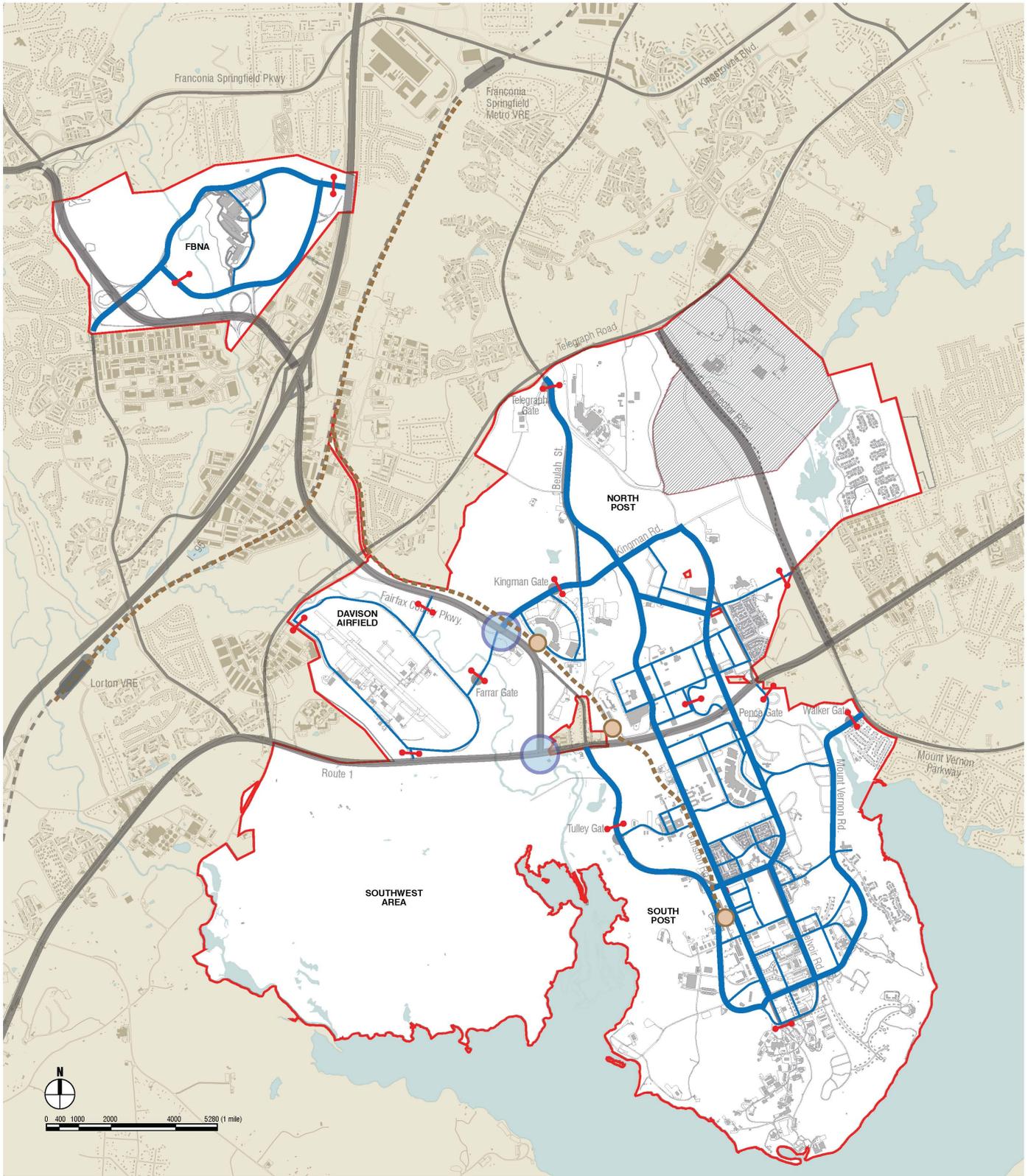
Key assumptions made for analytical purposes were as follows:

- Total employment at Fort Belvoir is expected to grow to 44,000 employees by 2015 and to 48,000 employees by 2030. Residential population is not projected to grow.
- Growth in the surrounding areas of Fairfax County is expected to continue at approximately 2 percent per year. The MWCOC Round 7 Cooperative Land Use Forecasts were used to develop traffic projections.
- Planned Regional Transportation Improvements are in place in the region by 2030.
- Transit operations by the various service providers, such as the Washington Metropolitan Area Transit Authority’s (WMATA) Metrobus or the Fairfax CONNECTOR, are periodically reviewed to ensure quality of service for transit riders and to determine needed improvements.

Key elements of the circulation plan and specific improvements to the transportation systems are highlighted in the following sections. The Transportation management plan is provided in Appendix C.

Figure 4.7 Circulation Plan conceptually illustrates the circulation plan for Fort Belvoir. Moving 48,000 people on and off the Post every day will be increasingly challenging. This challenge is exacerbated by the fact that Fort Belvoir is located amid a rapidly growing suburban area with a heavily congested regional transportation system. Traffic studies conducted during the development of the Master Plan were focused on creating an efficient internal transportation network and improving, to the extent possible, the interface with regional transportation facilities. Congestion on the regional road network will occasionally cause back-ups on the Post. Both Local and State government agencies recognize that future growth demands in the region will require extensive transportation improvements, and have identified needed improvements in their master plans. This includes widening of U.S. Route 1 to six lanes. Off-site regional transportation improvements within the areas surrounding Fort Belvoir are key to supporting its growth, and have been considered accordingly. The design and/or future detailed analysis and evaluation of these regional improvements are beyond the scope of this installation master plan.

Figure 4.6 - Circulation Plan



- Regional Roads
- Installation Primary Roads
- Installation Secondary Roads
- Dedicated Transit Corridors
- Gates
- Intersection Improvements
- Transit Stops

Transit

Through its transportation management programs, the Post will actively implement measures to reduce single occupant vehicle (SOV) trips. As a major employment center, Fort Belvoir needs to be connected to the regional rail system. In the near term, this connection includes shuttles between the Post and both the Lorton VRE Station and the Franconia-Springfield Transportation Center, which includes a second VRE stop, access to the regional Metrorail system, and access to a number of bus providers. By providing direct shuttle services, it would reduce the amount of time required to travel between the rail stations and Fort Belvoir, thereby making the existing rail lines a more attractive alternative and helping the Post meet its Transportation Demand Management TDM goals for non-SOV access. To accomplish this objective, multiple shuttle routes will be required in order to provide timely connections to each of the major employment centers within the Post.

These shuttles, as well as any new bus routes, must be supplemented by an efficient on-post circulation system. This circulation system should include the establishment of convenient bus stop locations, passenger shelters, and a coordinated pedestrian trail system linking the stops to the various sites on Post, including FBNA, North Post, and both upper and lower South Post. Figure 4.8 (Transit Plan) shows the proposed routing of the on-post circulator for Main Post. The circulator would link to a transit center and circulate along the major roadways to provide access to each sub-area.

In order for the various services – the regional bus routes, shuttles, and on-post circulation system – to be brought together and effectively serve the employees, some form of transit center must be developed. This center would provide a sheltered location for coordinated transfers between services and provide real-time transit information to encourage ridership.

Ultimately, the Master Plan for full expansion includes the development of the abandoned rail line into a transit corridor that links Main Post to the Franconia-Springfield Metrorail Station and VRE. As the proposed project advances through various levels of the planning process, the actual alignment and type of service (bus rapid transit or light rail) will become more defined.

Ride-Share

To meet the long-term 40 percent TDM goal, nearly as many Post employees must arrive via transit and car/van pools as those that drive alone. To achieve this, additional HOV facilities will be needed. Also critical to reaching this goal is the provision of HOV access at I-95 and the Fairfax County Parkway.

Park and ride lots are located throughout Fairfax and Prince William Counties. Currently, these lots provide adequate bus and HOV service to high density centers, such as the Pentagon and downtown District of Columbia. As Fort Belvoir becomes a high density employment center, it too needs to have efficient connections to these park-and-ride lots. Lots to be served should provide direct service to Fort Belvoir, preferably with access to HOV lanes.

Pedestrian, Joggers, Cyclists

The existing system of pedestrian paths on Post should be enhanced to increase the capacity of certain highly trafficked areas (including emergency and evacuation egress), and to improve existing connections between building entries, visitor destinations, parking areas, and surrounding neighborhoods.

On-site bikeway facilities and a linkage between the Post and the Fairfax County Bikeway System are important elements in promoting alternative transportation modes for employees, both on and off Post.

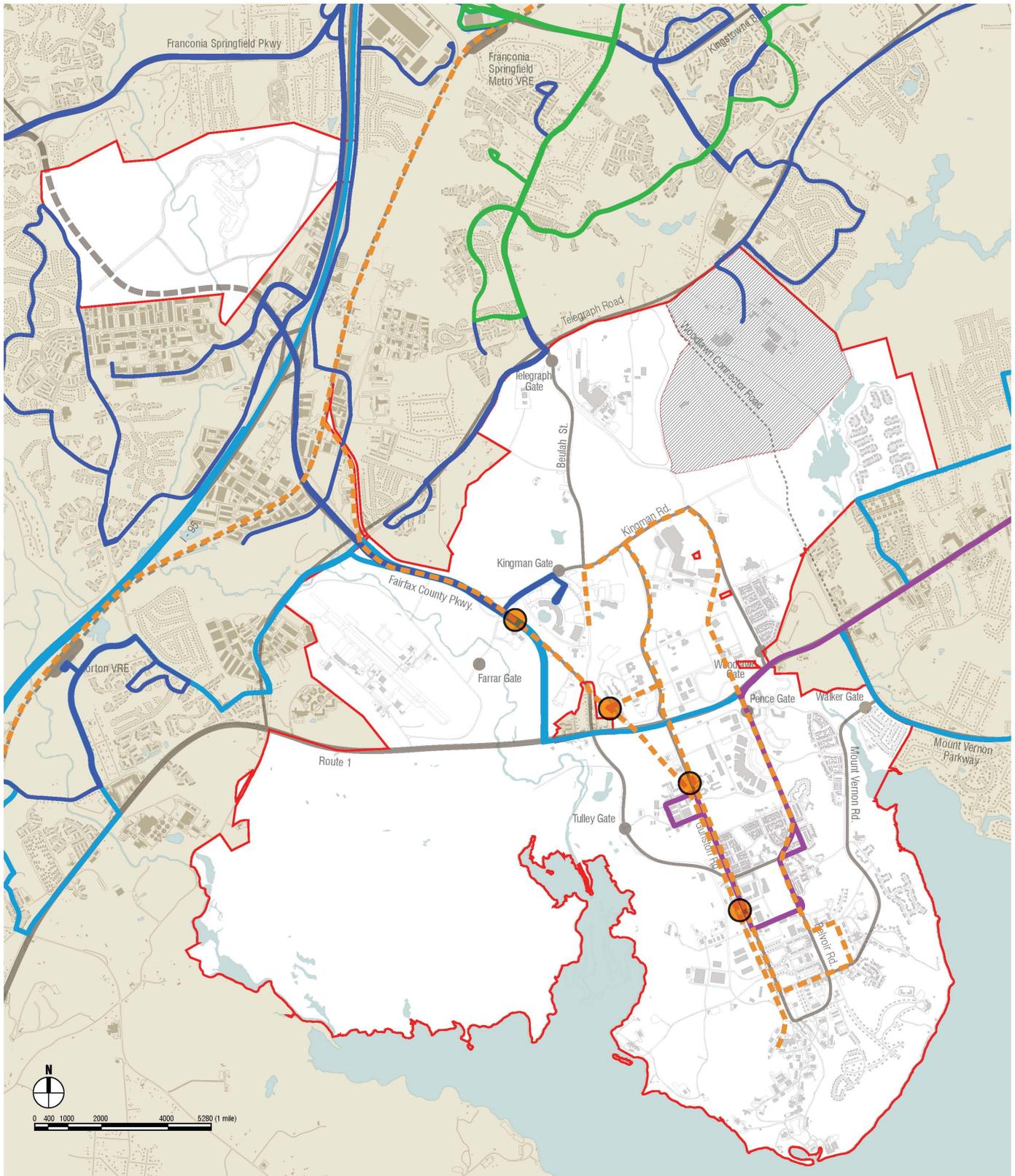
Parking

Parking management is key to achieving the goals of the Transportation Management Plan (TMP). Currently there are 23,000 parking spaces for 23,000 employees for a ratio of 1:1 (with an additional 5,000 spaces in residential areas and recreational areas). By 2015, there will be nearly 33,000 spaces for 36,000 employees, a ratio of just over 9 spaces to every 10 employees. By 2030, the ultimate goal is to achieve a ratio of 6 spaces for every 10 employees.

To minimize demand for parking, a balance must be struck between limiting spaces to discourage single occupant vehicle (SOV) use and providing ample parking as not to impact adjacent communities and roadways. Cost, availability, and location of parking will greatly influence mode choice. Parking supply can be gradually reduced, as other viable alternatives become available.

Other balancing efforts to discourage SOV use might include: a paid parking program, clustered parking that limits spaces and provides more area for pedestrian paths, and preferential parking spots for car/van poolers.

Figure 4.7 - Transit Plan



- FFX Connect 300 Series
- FFX Connect 200 Series
- FFX Connect 100 Series
- Potential Transit Route (BRT or Rail)
- Metro REX Route
- Potential Public Access Transit Center

Table 4.1 Signalized Intersection Measures of Effectiveness - Near Term (2015) - On-Post

Intersection Location (signalized)	AM Peak Hour			PM Peak Hour		
	V/C	LOS	Delay	V/C	LOS	Delay
Kingman Road / Beulah Street	0.92	D	46.0	0.99	D	37.2
Kingman Road / Gunston Road	0.98	E	57.8	0.77	C	22.5
Gorgas Road / Woodlawn Road	0.23	B	12.6	0.3	B	13.5
Pohick Road / Theote Road	0.61	B	13.4	0.78	C	20.2
Pohick Rd - 12th St / Gunston Road	1.10	D	40.8	0.88	D	44.0
12th Street / Belvoir Road	0.57	B	16.6	0.48	B	14.8
16th Street / Gunston Road	0.45	A	5.9	0.67	B	10.8
16th Street / Belvoir Road	0.50	B	14.2	0.43	B	11.2
21st Street / Belvoir Road	0.22	A	8.1	0.14	A	8.3
New Hospital Access / Belvoir Road	0.27	A	7.6	0.45	B	15.1

Table 4.2 Unsignalized Intersection Measures of Effectiveness - Near Term (2015) - On-Post

Intersection Location (unsignalized)	Control Type	AM Peak Hour				PM Peak Hour			
		Worst Approach		Overall		Worst Approach		Overall	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Gunston Road / Gorgas Road	AWSC	129.6	F	126.6	F	277.2	F	226.8	F
Gunston Road / Abbot Road	AWSC	96.1	F	64.8	F	108.2	F	74.9	F
Gunston Road / Goethals Road	AWSC	97.6	F	4.7	A	130.7	F	83.8	F
Gunston Road / Meade Road	TWSC	41.3	E	31.5	D	91.5	F	61	F
Gunston Road / 1st Street	TWSC	46.2	E	3.4	A	679.7	F	117	F
Gunston Road / 3rd Street	TWSC	65.5	F	2.8	A	-	F	-	F
Gunston Road / 9th Street	TWSC	25.5	D	6.4	A	13.8	B	1.4	A
Gunston Road / 18th Street	TWSC	11.9	B	7.3	A	22.1	C	14.3	B
Belvoir Road / 9th Street	TWSC	262.6	F	52.4	F	41.9	E	9.5	A
Belvoir Road / 18th Street	TWSC	11.9	B	7.3	A	36.9	E	9.3	A

Table 4.3 Intersection Measures of Effectiveness - Signalization Improvements

Intersection Location (signalized)	AM Peak Hour			PM Peak Hour		
	V/C	LOS	Delay	V/C	LOS	Delay
Kingman Road / Beulah Street	0.92	D	46.0	0.99	D	37.2
Kingman Road / Gunston Road	0.98	E	57.8	0.77	C	22.5
Gorgas Road / Woodlawn Road	0.23	B	12.6	0.3	B	13.5
Pohick Road / Theote Road	0.61	B	13.4	0.78	C	20.2
Pohick Rd - 12th St / Gunston Road	1.10	D	40.8	0.88	D	44.0
12th Street / Belvoir Road	0.57	B	16.6	0.48	B	14.8
16th Street / Gunston Road	0.45	A	5.9	0.67	B	10.8
16th Street / Belvoir Road	0.50	B	14.2	0.43	B	11.2
21st Street / Belvoir Road	0.22	A	8.1	0.14	A	8.3
New Hospital Access / Belvoir Rd	0.27	A	7.6	0.45	B	15.1

Near Term Implementation (2015)

Most of the development on Main Post will occur on South Post. The new hospital will be located on the South Golf Course; Army Lease and PEO EIS will backfill into buildings vacated by tenants leaving Main Post; and MDA will be located on the ball fields at the north end of the Parade Grounds. (The analysis assumes that Dewitt is absorbed into the new Hospital.) Near-term BRAC action will include roadway improvements on Main Post (Figure 4.9), including:

- Gunston Road is widened to four lanes with appropriate turn lanes.
- Belvoir Road is widened to four lanes with appropriate turn lanes.
- Pohick Road is widened to four lanes with appropriate turn lanes.
- Ninth Street is widened to four lanes with appropriate turn lanes.
- Goethals Road is widened to four lanes with appropriate turn lanes.
- A new access control point is constructed at the former Lieber Gate site opposite to Belvoir Road, providing access to U.S. Route 1.

Traffic analyses of on-post intersections (both unsignalized and signalized) have been performed. These show that, as the Post implements its BRAC development, signalized intersections would continue to perform at an acceptable LOS; this is not the case for unsignalized intersections. Tables 4.1 and 4.2 present the measures of effectiveness for signalized and unsignalized intersections on Post in the near term.

Eight intersections will require signalization to mitigate impacts due to increased development for the near term. These new traffic signals should include: actuation for left turn bays on main approaches; full actuation for side streets; and the capability for coordination with adjacent signals to ensure optimum flow of traffic along main streets. Table 4.3 presents the measures of effectiveness due to signalized improvements.

Figure 4.8 - Transportation Improvements - Near term (2015)

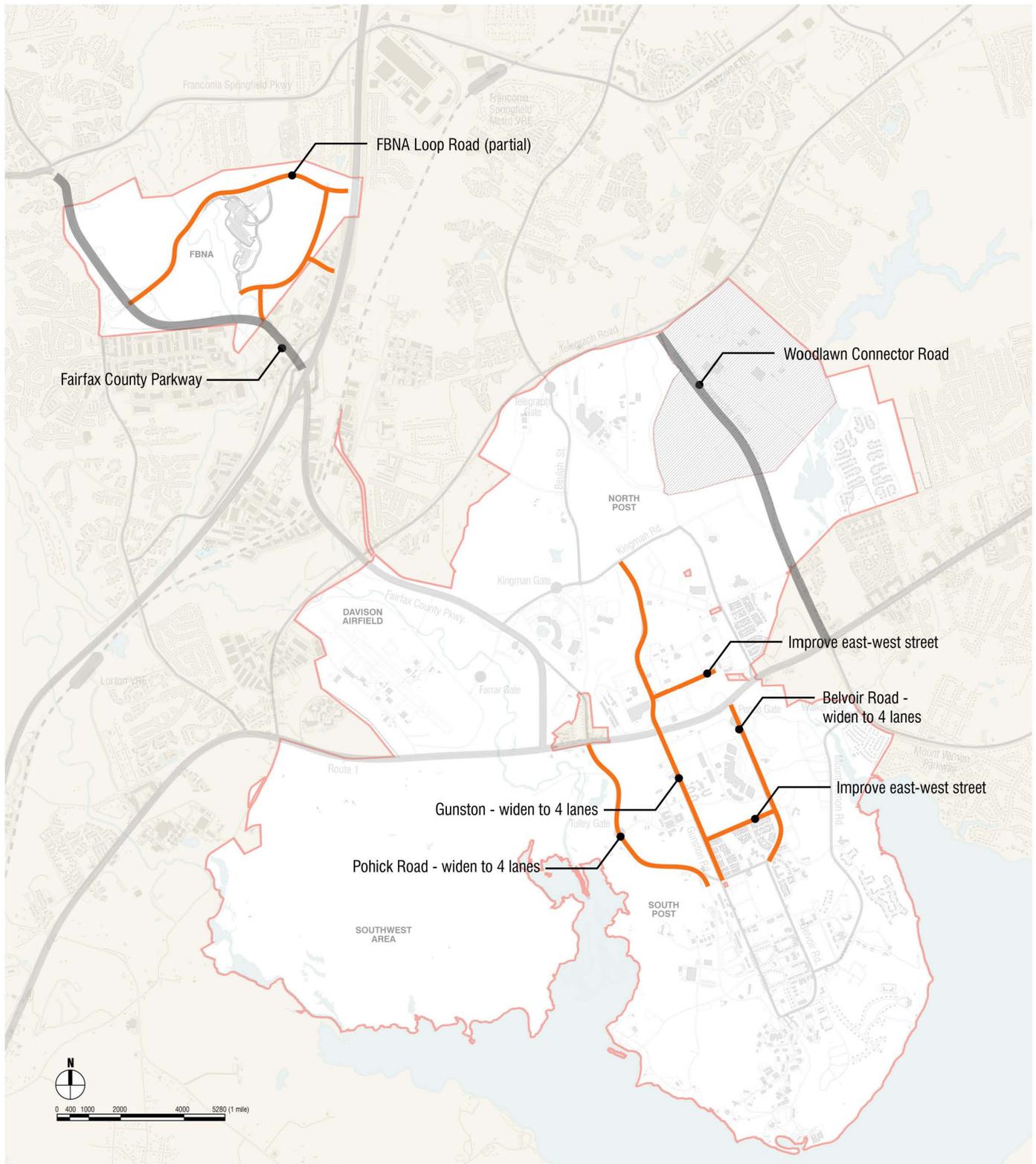


Table 4.4 Signalized Intersection Measures of Effectiveness - Long Term (2030) - On-Post

Intersection Location (unsignalized)	Without TMP and Transit				With TMP and Transit			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Kingman Rd / Beulah St	F	329.2	F	302.1	D	52.5	D	47.6
Kingman Rd / Gunston Rd	F	88.6	E	72.0	A	6.7	A	10.0
Gunston Rd / Gorgas Rd	A	9.8	E	68.2	A	6.1	B	18.3
Gunston Road / Abbot Road	D	38.0	B	17.2	B	15.5	A	8.3
Gunston Rd / Goethals Rd	B	16.8	C	34.2	A	8.8	B	18.3
Gunston Rd / Meade Rd	A	7.2	B	13.8	A	2.4	A	9.0
Gunston Rd / 1st St	A	9.0	B	14.9	A	6.4	A	8.3
Gunston Rd / 3rd St	E	62.8	C	30.2	C	30.4	B	17.9
Gunston Rd / 6th St	B	12.7	B	15.9	A	5.5	A	9.9
Gunston Rd / 9th St	B	19.5	A	9.5	B	11.4	B	12.0
Gunston Rd / Pohick St - 12th St	D	38.2	C	33.4	C	28.0	C	27.8
Gunston Rd / 16th St	C	24.1	C	21.2	B	16.9	B	15.6
Pohick Rd / Theote Rd	B	11.3	B	15.2	B	13.7	B	13.7
Pohick Rd / 3rd St	A	9.3	D	52.0	B	10.4	C	20.6
Kingman Rd / CSC North Access Rd	B	16.5	B	14.6	B	18.0	B	16.3
Gorgas Rd / CSC North Access Rd	B	11.3	B	18.8	A	6.3	B	18.1
Kingman Rd / Belvoir Rd	C	30.7	B	12.6	C	30.0	B	10.7
Belvoir Rd / Gorgas Rd	C	22.0	C	23.6	C	20.4	C	21.5
Belvoir Rd / Abbot Rd	D	35.6	C	21.2	C	23.7	B	19.5
Belvoir Rd / Goethals Rd	C	29.5	C	20.2	B	18.7	C	21.2
Belvoir Rd / 3rd St	F	108.7	E	56.5	C	32.2	C	23.9
Belvoir Rd / New Hospital Access	A	7.7	B	15.5	A	6.2	B	12.2
Belvoir Rd / 9th St	B	15.2	B	13.0	B	10.5	A	9.7
Belvoir Rd / 12th St	E	65.1	E	68.4	C	20.6	C	31.2
Health Campus East Access / 3rd St	E	69.2	C	23.5	B	19.0	B	16.3

Long Term Implementation (To Year 2030)

Fort Belvoir will be redeveloped over the long term as each of the sub areas on Main Post is redeveloped. These projects will change the roadway network, including roadway realignments and/or widening. Major changes to the on-post roadway network include:

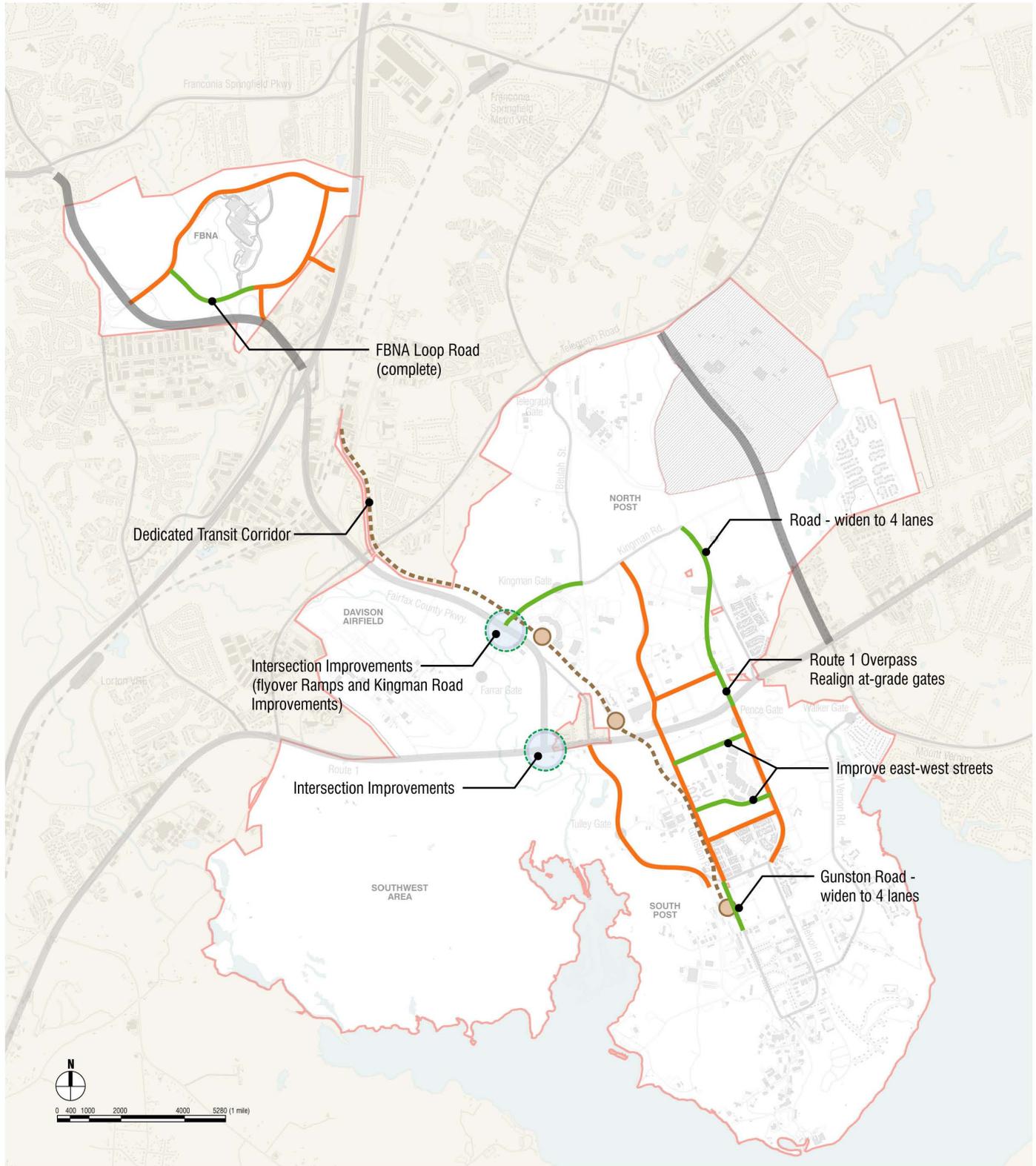
- Extension of Belvoir Road from South Post to North Post – with a grade-separation from U.S. Route 1 and an alignment into Woodlawn Road
- Realignment of the intersection of Theote and Pohick Roads – to promote the major north-south movement for lower South Post traffic to Theote Road, rather than Gunston Road
- Realignment of the lower portion of Theote Road into 23rd Street – to extend into Belvoir Road to promote a “ring-road” on South Post (An alternative alignment would be to extend Theote Road into 21st Street.)
- Third Street is extended as a 4-lane roadway to connect Belvoir and Gunston Roads.
- Sixth Street is extended as a 2-lane roadway with on-street parking to connect Belvoir and Gunston Roads.
- Conversion of the abandoned railway into a transit corridor – either as a BRT or light-rail system

Some of these changes will impact U.S. Route 1; therefore coordination will be required with VDOT and Fairfax County to implement these roadway improvements. These improvements are shown in Figure 4.10.

The analysis tested these roadway projects for the Long-Term Vision for Main Post. The purpose was to examine future traffic flows with the planned redevelopment of Fort Belvoir, and to ensure that planned on-post roadway improvements would be able to accommodate planned development. Table 4.4 presents the measures of effectiveness for Main Post intersections, and compares on-post intersections with and without an implemented TMP or transit programs. To support the planned growth on Post, Fort Belvoir should:

- Implement a TMP to reduce SOV trips. This plan should strive for a reduction of 40% of peak hour SOV trips. Elements of the TMP are described in Appendix C.
- Develop the abandoned Fort Belvoir railway into a transit corridor, in conjunction with the TMP to support bus-rapid transit or light rail service to connect to Franconia-Springfield Metrorail Station and VRE stations. This will help reduce SOV trips (especially during peak periods) and benefit both on-post and off-post roadways.
- As each sub area is developed per its ADP, traffic impact studies will be required to assess needed roadway improvements and to phase in the long-term vision for circulation on Main Post

Figure 4.9 - Transportation Improvements - Long Term (2030)



-  Existing Roads
-  Road Improvements (2015)
-  On-Post Road Improvements (2015)
-  On-Post Road Improvements (2030)
-  Dedicated Transit Corridor (2030)
-  Intersection Improvements (2030)

Utility Assessment

In support of the Master Plan, a capacity analysis of current domestic water, wastewater, storm drainage, storm water management, and hot water systems was prepared to determine future demands for 2015 and 2030 Programmed Projects. Specific studies (summarized here and included in a separate Supplement to this Master Plan) include:

- Existing Fort Belvoir Main Post water system
- Fort Belvoir Main Post water system required for BRAC and other near-term (2015) projects
- Fort Belvoir North Area (FBNA) water system required for near-term (2015) proposed development
- Existing Fort Belvoir Main Post sanitary sewer system
- Fort Belvoir Main Post sanitary sewer system required for near-term (2015) projects
- Recommendations for storm water management facilities
- Central Steam Plant Study
- Overview of existing Fort Belvoir Main Post drainage system and what is required for BRAC and other near-term (2015) development

Also provided here is an overview of requirements for electric and gas systems to serve anticipated development at Fort Belvoir and the FBNA. Because these systems have been privatized on the Installation, a detailed study has not been performed.

The master plan study does not include condition assessments.

Water and sanitary capacity analyses indicate that significant portions of both systems are presently at or near capacity, and will require major improvements to meet the projected growth for the BRAC and other near-term projects

Population Projections for Analysis

The “Fort Belvoir Expansion Capability Assessment Report” (submitted separately), shows estimated existing population and projected increases for 2011 BRAC and 2030 Programmed Projects

Estimated utility demands were developed using the 2011 BRAC and the 2030 Programmed Projects. More detailed capacity analyses were performed for the water and sanitary systems at Main Post and the water system required to serve FBNA.

Master plan utility analyses were developed in early summer 2007, and were based only on sited projects. These analyses included all BRAC projects and other sited programmed projects with a completed 1391. (Projects not sited and not reflected in the analyses include several “2030 Programmed projects, such as

Army Lease and PEO EIS.) Since these analyses were completed, several minor changes have occurred in expected building size and population:

- Expected population at FBNA was initially estimated at 18,000 in 2011, assuming occupancy by NGA, WHS, and miscellaneous support facilities. Current plans indicate that FBNA’s employment population will be 8,500 in 2011.
- By BRAC law, WHS must relocate to land owned by Fort Belvoir by 2011. A final site location for WHS has not yet been determined. For the study, it was assumed that WHS will be located at the GSA site, with a population of 6200.

The 2011 and 2030 population projections and utility analyses indicate significant infrastructure requirements. Large, stand-alone projects (such as the new Fort Belvoir Community Hospital) may require major infrastructure improvements. Smaller, combined projects can also cause similar impacts and infrastructure needs. The Installation needs to track current demands and projected growth on a regularly updated five-to-seven year look-ahead, to ensure that required infrastructure improvements can be funded and constructed as needed. The Installation should also maintain regular contact with local utility providers (Fairfax Water, Fairfax Sewer, Washington Gas, and Dominion Virginia Power) to ensure that contractual capacities and infrastructure to be provided by these privatized systems will be available as needed.

Overall Sewer and Water Demand and Contracted Capacity

Sewer service to Fort Belvoir Main Post is provided under an existing contract with the Fairfax County Sewer Department which allows the Installation to discharge up to an average flow of 3.0 MGD and a peak flow of 6.0 MGD. This contract does not include flows from FBNA.

The current average sewage flow from Main Post ranges from 1 to 2 MGD. Peak flows are approximately 3 MGD. (The sewer capacity model indicated existing sewage flows at approximately 1.3 MGD.)

Average flows from Main Post are projected at 1.6 to 2.0 MGD in 2015 and at 2.3 MGD in 2030.

Table 4.5 summarizes anticipated 2015 and 2030 sewer flows from Main Post, GSA, and FBNA, along with the modeled sewer flows for existing conditions and 2011.

Because combined flows from Main Post and FBNA are projected to approach the current contract limits in 2015 and exceed them in 2030, the Installation should begin discussion with Fairfax County Sewer to amend the existing contract to include FBNA sewage flows and increase the contracted amount.

Water service to Fort Belvoir Main Post is provided under an existing contract with Fairfax Water with a contracted limit of 4.6 MGD peak flow. This contract does not include FBNA. Discussions are underway between the Installation and Fairfax Water to provide water service at FBNA.

2006 average metered demand is 2.2 MGD, with the 2006 peak calculated at 3.5 MGD. The water model indicates existing average water demand at approximately 1.9 MGD.

Peak water demand from Main Post is projected at approximately 4.3 MGD in 2011, approaching the maximum contracted amount. The Installation should begin discussions with Fairfax Water to amend the existing contract and to provide service to FBNA.

Peak demand from Main Post is projected at approximately 4.8 MGD in 2030.

Table 4.6 summarizes anticipated 2011 and 2030 water demands from GSA, FBNA and Main Post.

These projected sewer and water flows are not precise, but provide a good order of magnitude estimate of anticipated demands. Existing average metered flows do not exactly match the existing flows developed by the model; and the demands based on population projections do not match those developed in the more detailed utility analyses. However, the demand projections are similar and the discrepancies do not affect the conclusions.

Table 4.5 - Existing and Projected Sewer Flow		
Main Post only		
	Average (MGD)	Peak (MGD)
Existing		
Existing metered flows 2006	1.5	3.0
Existing flows from sewer model	1.3	2.6
2015		
2015 total flows from sewer model	1.6	3.2
2015 flows based on population growth	0.5	1.0
Existing flow	1.5	3.0
2015 Total flows	2.0	4.0
2030 flow based on population growth	0.8	1.6
Existing flow	1.5	3.0
Total flow	2.3	4.6
Main Post, GSA and FBNA combined		
	Average (MGD)	Peak (MGD)
Current contract amounts	3.0	6.0
2015 Main Post	2.0	4.0
2015 GSA and FBNA	0.75	1.5
Total	2.75	5.5
2030 Main Post	2.3	4.6
2030 GSA and FBNA	0.75	1.5
Total	3.05	6.1

Note: Peak flow assumed at 2 x average

Table 4.6 - Existing and Projected Water Demand		
Main Post only		
	Average (MGD)	Peak (MGD)
Existing		
Existing metered flows 2006	2.2	3.5
Existing flows from water model	1.9	2.8
2015		
2015 total demand from water model	3.1	4.3
2015 demand based on population growth	0.5	0.8
Existing demand	2.2	3.5
Total demand	2.7	4.3
2030		
2030 demand based on population growth	0.8	1.3
Existing demand	2.2	3.5
Total demand	3.0	4.8
Main Post, GSA and FBNA combined		
	Average (MGD)	Peak (MGD)
Current contract amounts		4.6
2015 Main Post	2.7	4.3
2015 GSA and FBNA	0.75	1.2
Total	3.5	5.5
2030 Main Post	3.0	4.8
2030 GSA and FBNA	0.75	1.2
Total	3.8	6.0

Note: Peak demand assumed at 1.6 x average

FBNA

1) Sanitary Sewers:

The existing development at FBNA includes a limited network of sanitary sewer lines, connecting to the Fairfax County trunk sewer that runs along Accotink Creek. This trunk sewer varies in diameter from 42 to 54 inches. Based on discussions with Fairfax County staff, this existing trunk sewer and the existing County wastewater treatment plant both have adequate capacity to serve the proposed development at FBNA. However, based on discussions with Installation staff, the existing onsite sewer lines are 40 to 50 years old and near the end of their useful life. Also, most of these existing lines either conflict with or are not located to service proposed future development on FBNA. Therefore, development plans for FBNA have assumed that existing lines would be abandoned/removed and a new network of sanitary sewers constructed to connect to the existing Accotink Creek trunk sewer.

Sewer service to FBNA was previously metered, but (according to Installation staff) these meters were pulled in anticipation of new construction. Because the Installation's contract for sewer service does not presently include service to FBNA, a new contract with Fairfax County needs to be negotiated.

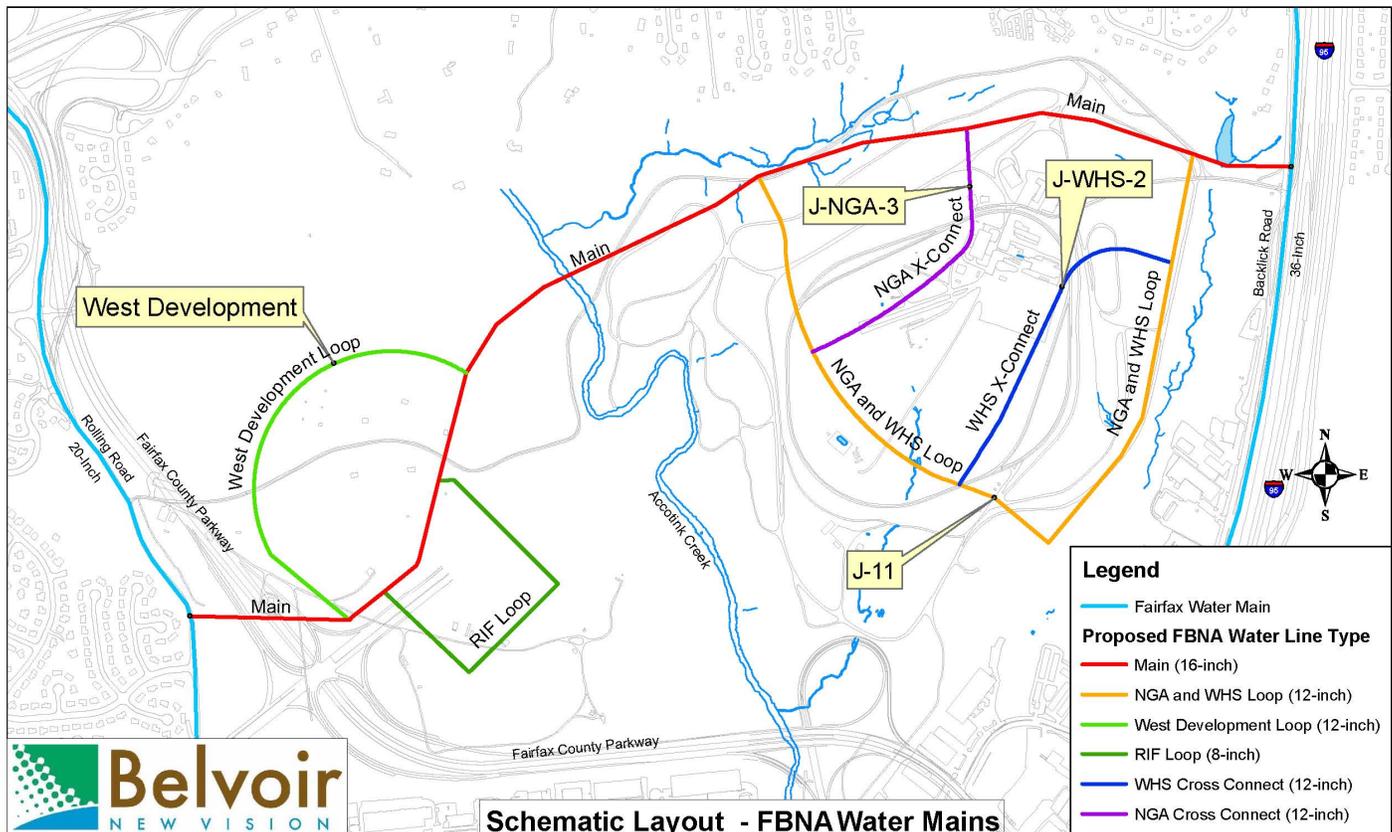
2) Water Distribution:

The existing development at FBNA includes a limited network of water lines connecting to the Fairfax Water system on Backlick Road. Based on discussions with Fairfax Water, this existing County water system has adequate capacity to serve proposed development at FBNA. However, based on discussions with Installation staff, these existing onsite lines are 40 to 50 years old and near the end of their useful life. Therefore, development plans for FBNA have assumed that the existing lines would be removed and a new water network would be constructed.

Water service to FBNA was previously metered, but (according to Installation staff) these meters were pulled in anticipation of new construction. Because the Installation's contract for water service does not presently include service to FBNA, a new contract with Fairfax Water needs to be negotiated.

An analysis was conducted of the water system required to serve proposed development, including employment for NGA, WHS, and ancillary uses anticipated by the 2011 BRAC required completion date (with a 25% allowance for future growth). This report is included in the Appendix. Findings include:

Figure 4.11- Proposed Water Network at FBNA



- Proposed development at FBNA will require a 16-inch cross connection between the existing Fairfax County Water lines on Backlick Road and Rolling Road to provide adequate pressure and supply for domestic and fire flow requirements.
- Fairfax Water recommends a below-grade water line crossing of Accotink Creek.
- Fairfax Water may request that the cross connection between Rolling and Backlick Roads be oversized. If so, Fairfax Water will pay the cost difference associated with the oversizing.
- Looped 12-inch lines within the FBNA campus will provide for domestic and fire flow requirements.

The proposed water network at FBNA is shown on [Figure 4.11](#).

Although the FBNA water study was based on a higher population than is presently anticipated, it is recommended that the major infrastructure (such as the cross connection between the east and west sides of FBNA) be designed for the ultimate anticipated population at the site.

3) *Electric and Natural Gas:*

Both electric and natural gas service at the Main Post and FBNA are being privatized. Dominion Virginia Power (DVP) and Washington Gas will provide electric and natural gas service, respectively, to the Installation boundary, as well as distribution and service lines within the Installation.

Electric: The Installation is conducting ongoing discussion with DVP to provide temporary and permanent power to FBNA. Limited temporary electric service for initial construction needs can be provided from existing adjacent lines. Permanent service will require a new substation, to be located on the southeast corner of FBNA. DVP has begun design for offsite transmission lines and the substation.

Natural Gas: Discussions have begun with Washington Gas to extend service to FBNA. Washington Gas does not foresee any difficulty in providing service.

4) *Drainage:*

Existing development at FBNA is served by several small storm culverts, swales, and channels, which convey runoff to the existing onsite channels that eventually drain into Accotink Creek. Final site development at FBNA will include demolition of all existing buildings and construction of a completely new drainage system. Therefore, no capacity study has been conducted for FBNA.

BNVP provided recommendations for storm water management facilities that will be required with the development of FBNA. This included a summary of regulatory requirements and the potential types and locations of water quality and quantity control. This report is included in the Appendix (provided as a separate report).

Main Post

1) *Sanitary Sewers:*

A sewer capacity study has been completed for Main Post. It analyzed existing conditions and considered requirements to serve growth to the year 2015. This study, included in the Appendix, identified several areas of concern:

- Two large lift stations serving the southern part of Main Post (Pump Stations 00097 and 00687) are overloaded and require significant reconstruction and
- Several parts of the existing sewage collection system appear to be at or over-capacity. These include the sewer lines serving DLA and Davison Army Airfield, as well as the trunk sewer that runs southeast from Belvoir Road and Surveyors Road.
- The study recommends that the new Hospital and associated area development be connected directly to the Fairfax County sewer line that runs along U.S. Route 1, rather than to the existing gravity sewer system (which drains to Pump Station 00097). This would reduce flows to the overloaded trunk sewer and pump station.

These facilities are shown in [Figure 4.11](#).

Other recommendations for the year 2015 are:

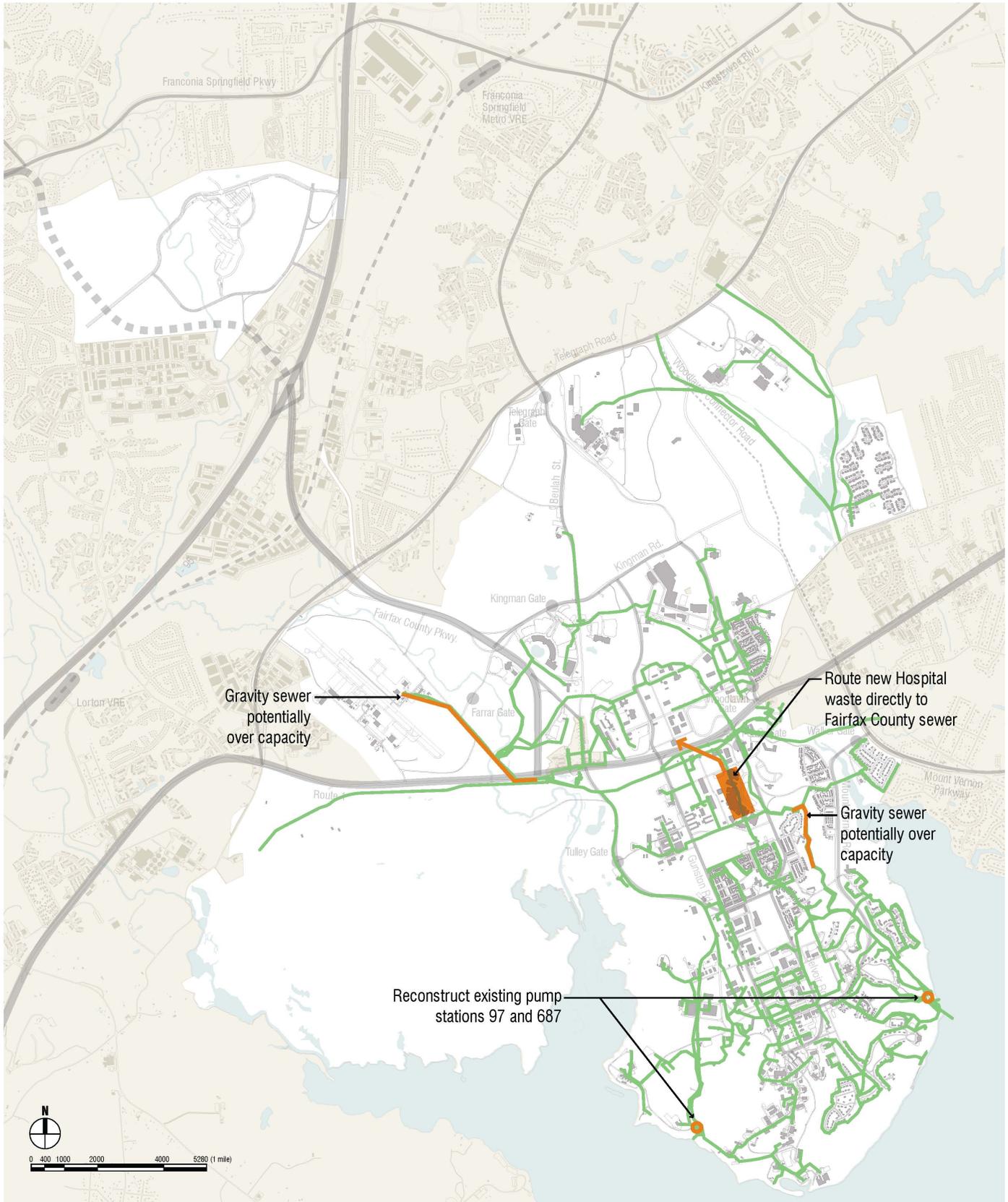
- Provide a condition survey of the existing system.
- Develop more accurate data on the existing system to verify the system capacities.
- Provide sewer service to the proposed MDA that will not overload downstream sewer capacity.

2) *Water Distribution:*

A water capacity study at Main Post was prepared to analyze existing conditions and consider requirements to serve growth to the year 2015. This study is included in the Appendix. The study identified several areas of concern:

- Near the intersection of U.S. Route 1 and Belvoir Road, adjacent to the proposed new Fort Belvoir Community Hospital – there is an existing area of low water pressure.
- Around the intersection of Kingman Road and Beulah Road – there is an existing area of low water pressure.
- In the vicinity of the Gorgas Road/Meeres Road and Woodlawn Road intersection – full build-out conditions will create an area of low water pressure.
- Proposed new Fort Belvoir Community Hospital site – future growth to 2015 will increase the pressure deficiency in this area and create an additional area of low pressure near Belvoir Road and 12th Street.

Figure 4.12- Overall Sanitary System - Near Term (2015)



Suggested improvements to the water system by the year 2015 include:

- Replace the existing 12-inch main on Belvoir Road between U.S. Route 1 and 12th Street with a new 16-inch main.
- Replace approximately 150 LF of 8-inch water main on U.S. Route 1, west of Belvoir Road, with a new 12-inch main.
- Replace the existing elevated storage tank near Belvoir Road and U.S. Route 1 with a new tank located farther north. The existing elevated tank and ground storage tank are too closely located to each other to allow the elevated tank to operate effectively. Providing a storage tank at a different location would maintain required storage volumes and allow for higher system pressures.
- A second connection from the Fairfax water system to the Fort Belvoir system should be provided by extending a larger line (probably a 16-inch line) from Telegraph Road near DCEETA, south on Beulah Road, to the existing system near Kingman Road. This would alleviate pressure deficiencies near DLA.

These facilities are shown in [Figure 4.13](#).

3) *Electric and Natural Gas:*

Both electric and natural gas service at the Main Post are being privatized. Dominion Virginia Power (DVP) and Washington Gas will provide electric and natural gas service, respectively, to the Installation boundary, as well as distribution and service lines within the Installation

Electric: The Installation is conducting ongoing discussion with DVP to provide power to proposed new development at Main Post.

Natural Gas: The Installation is conducting ongoing discussions with Washington Gas to provide service to proposed new development at Main Post. Washington Gas does not foresee any difficulty in providing service.

4) *Steam Plant Analysis:*

The existing steam plants and distribution system has been analyzed to determine their adequacy for current and future needs. Recommendations for possible renovations, reconstruction, and expansion of the system for more efficient operation are based on future demands for the near-term and full build-out scenarios. (See Appendix A-3 in the Area Development Plans for details on the existing plant capacity and recommendations for expansion.)

5) *Drainage:*

The existing Main Post storm sewer system includes approximately 280,241 linear feet (LF) of storm drainage pipe and 597 culvert crossings (representing an additional 32,181 LF of pipe.) Pipe diameters range from 6 inches to 54 inches, and vary in material: reinforced concrete, asbestos cement, cast iron, brick, corrugated metal, ductile iron, and polyvinyl chloride (PVC). There are about

501 manholes and 2,140 inlets. In addition, 43 storm basins, primarily dry ponds, exist on Main Post. The storm system drains via a series of piping that discharges to various streams and tributaries, and ultimately, to the Potomac River and its tributaries. Installation staff maintains the system.

Previous development at Main Post occurred without the provision of storm water management. The increased runoff exceeds the capacity of the receiving water courses, resulting in serious erosion in many natural channels.

Based on meetings with Installation staff, stream erosion is their primary concern associated with the drainage system. Installation staff did not identify any other existing drainage problems.

As part of the Master Plan effort, "Storm water Management Guidance" (dated March 2007) was developed to summarize design criteria, provide guidelines for meeting the Fairfax and VDEQ design criteria, and suggest methods of providing quality and quantity control.

Analysis of the existing drainage system is based on available information, primarily GIS data and discussions with Post staff. Because the information does not provide slope and invert data for existing storm pipes, a capacity analysis was not conducted. However, an overview of the existing drainage system has identified several inadequacies

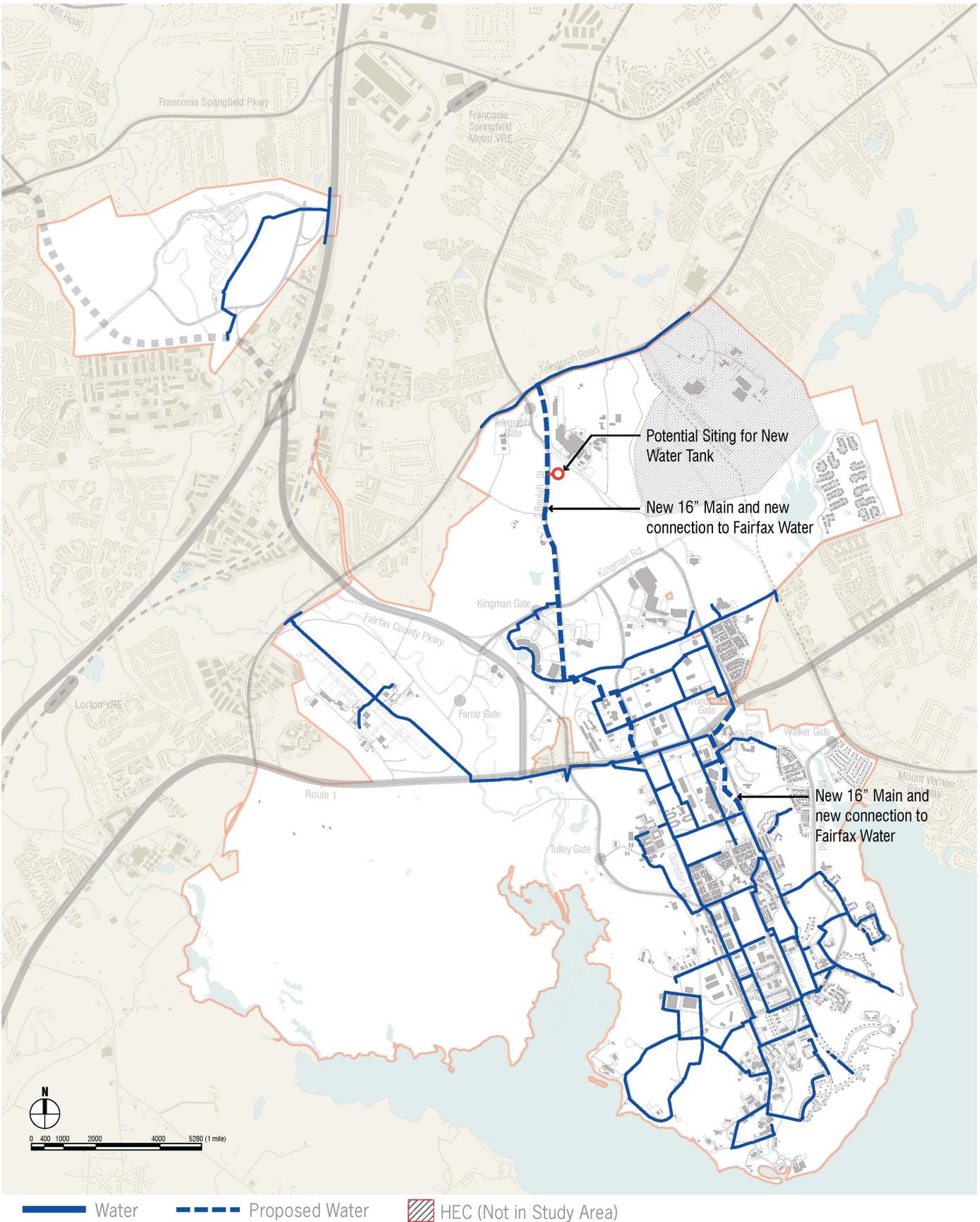
The drainage system at Main Post can best be understood within the context of the overall site topography, which can be divided into three zones:

- The flat, low areas along the Potomac River shoreline and Accotink Creek
- The upland plateau areas
- A steep transition zone between the low, flat areas and the upland plateau areas

The flat shoreline zone typically has slopes less than 3%, and extends to an elevation of 10 to 50 feet mean sea level (msl). The width of this area varies from only a few feet to over 1000 feet. Much of this area is within the Potomac River or Accotink Creek floodplain.

Upland plateau areas south of Kingman Road are generally flat, with slopes ranging from less than 1% to about 4%. Elevations in this area are between 120 and 140 feet msl. North of Kingman Road the topography is more rolling, and elevations range up to 240 feet. Most buildings at Fort Belvoir have been constructed on the upland plateau. Drainage for the developed areas on the plateau includes a combination of underground storm sewers and surface drainage swales, which convey runoff to the larger stream channels that drain the plateau.

Figure 4.13 - 2015 Overall Water System Map



Between these two areas, the plateau drops off steeply towards the shoreline. Numerous small stream channels are incised into the plateau. Stream slopes exceed 5% in some cases; ground slopes perpendicular to the streams range from 4% to over 30% (3 horizontal to 1 vertical). All the storm sewer networks end at or near the high end of the steep transition zones, with storm sewer outfalls discharging into the existing streams. Drainage areas to the outfalls range from less than five acres to over 40 acres.

Many areas of the Installation have well developed storm drainage systems, with adequate inlets, an extensive network of storm sewers, and what appear to be large storm water management (SWM) facilities. These include:

- Tracy Loop and Theote Road-16th Street areas
- New RCI housing areas, such as Vernondale and Herryford Village
- DLA and DTRA complex
- Area along the east side of Gunston Road, between Abbot Road and Goethals Road, around Buildings 02101 and 02105

However, there are also numerous areas with limited inlet and pipe networks and no storm water management facilities. Examples include:

- The block between 16th and 18th Streets and Gunston and Belvoir Roads, near Buildings 00187, 00189, 00238, and 00240 (The 6-8" pipes in this area appear to be undersized for the drainage area. Paved areas are relatively flat, but there are very few inlets.)
- The block between 12th and 16th Streets and Gunston and Middleton Roads, in the vicinity of Buildings 001150, 001155, and 001190 (Very little storm drainage exists.)
- East of Belvoir Road, between 12th Street and Langfitt Loop (The 8" and 15" outfall pipes that drain this area appear to be too small for potential runoff from existing development.)
- Area where Gunston Road intersects with Jackson Loop and Sharon Lane Road, adjacent to Buildings 01414 and 01415 (An extensive storm sewer network exists, but pipes appear to be undersized for the large impervious area here.)
- East of Gunston Road, between U.S. Route 1 and 9th Street, within the 3rd, 4th, 5th, and 6th Streets vicinity (Pipes within this area appear to be undersized for the amount of impervious area associated with full build-out conditions.)

Funding to upgrade existing inadequate drainage systems is likely to be unavailable. Therefore, it is critical that all new development include: an adequate storm drainage system (including upgrades to the existing system where runoff is directed from new development), storm water quality/quantity control, and an analysis of the existing downstream storm system to ensure adequate outfall is available. Specifically, currently proposed projects include:

- The new Fort Belvoir Community Hospital – will drain to major existing channels to the east, northwest, and southwest. Plans developed so far include storm water management for the site. As noted previously, adequate analysis should be provided at all outfalls.
- The Missile Defense Agency (MDA) site – slopes to the east, north and northwest, with all drainage running to a major channel on the north side. Although there is an existing storm system on the west side of the site, this system serves existing adjacent property and may not have capacity to serve the MDA site. Site development at MDA should consider any existing erosion concerns on the stream to the north to minimize any additional adverse impacts.
- The Commissary/Post Exchange expansion, the DLA Receiving and Screening Facility, and the INSCOM expansion – are proposed in areas with existing storm sewer networks and what appear to be existing SWM facilities. Upgrades to the storm system and ponds will be necessary for the increase in impervious areas.
- Other proposed development on Main Post (for example, the Shoppette, Child Development Center, Family Travel Camp, Network Operations Center, Museum Support Center, Soldier Support, and Religious Ed) – are located in areas without a well-developed drainage system or SWM facilities. Although these projects are small and will not significantly increase runoff, they are also located in drainage sheds with a history of stream erosion due to lack of runoff control. Design should include adequate outfall analysis, and the proposed site plans systems should be designed to meet current standards.
- Development at the Town Center – should provide required drainage facilities for the initial proposed development, with the capability to expand storm water management facilities with future development in adjacent areas.
- Design of all new facilities (which require relocation or replacement of existing utilities) – should consider the ultimate anticipated development in the surrounding area, including the entire upstream sanitary or storm drainage-shed. New infrastructure should be designed to serve the ultimate anticipated flow from the upstream area or the ultimate expected demand in the area.

Drainage Design Criteria and Jurisdictional Authority:

Drainage facilities at Fort Belvoir are regulated by Department of Defense (DoD) design criteria and by the Installation's MS-4 storm water discharge permit, which is issued by the Commonwealth of Virginia's Department of Environmental Quality (VDEQ). The MS-4 permit requires that storm water management and erosion control be provided in accordance with Fairfax County standards. Note that Fairfax County has no jurisdictional authority over Fort Belvoir; enforcement of the regulations is the responsibility of the Installation staff.

A summary of drainage design criteria from the DoD Unified Facilities Criteria (UFC) and the Fairfax County PFM is included in the Appendix (provided as a separate document).

Stormwater Management

In accordance with the MS-4 permit, all new development at Fort Belvoir must meet three specific storm water management criteria:

- **Runoff volume control:** To reduce peak runoff of the developed Post to the same level as the pre-developed Post, for both the two-year and ten-year frequency storms
- **Quality control:** To reduce pollutants in runoff caused by paved, roofed, and other impervious areas (This is usually met by detaining the first half-inch of runoff from a site for 48 to 72 hours, which allows solids and other pollutants to settle before runoff is released.)
- **Adequate outfall:** To ensure any new development discharges storm and other surface waters into a natural watercourse or man-made drainage facility, with sufficient capacity to preclude any adverse impacts to the land (over which waters are conveyed) or natural watercourse/facility (into which waters are discharged)

The Fairfax County Public Facilities Manual (Section 6-0203) defines the following requirements for an adequate outfall analysis:

The extent of the review of the downstream drainage system shall be:

- To a point that is at least 150 ft (46 m) downstream to a point where the receiving pipe or channel is joined by another that has a drainage area that is at least 90% of the size of the first drainage area at the point of confluence; or
- To a point at which the total drainage area is at least 100 times greater than the contributing drainage area of the development site; or
- To a point that is at least 150 ft (45 m) downstream of a point where the drainage area is 360 acres (1.46 km²) or greater.

Examples of schematic plans that show potential methods to meet both storm water quality and quantity requirements for a typical site area were developed. (See Appendix D.)

Initially, low density development can provide quality and quantity control for each area as a surface facility. Ultimate development to the densities shown in the Expansion Capability Assessment (submitted separately) may require a combination of surface treatments for quality control (such as bioretention, rain gardens, infiltration trenches, and vegetated swales), with above ground basins or below ground storage to provide the required quantity control. The conceptual storm plan can be used to guide location and design of drainage systems as future projects are authorized.

Utility Improvements for Long Tern 2030 Plan

Fort 2030, two options were considered for siting an additional 3,000 people: 1) the Lower North Post area and 2) adjacent to the proposed Hospital area. This population growth in is in addition to the development that is to occur by year 2015. Recommendations for each areas utilities are as follows:

Water:

A new network of pipes will need to be constructed for the area encompassing the Lower North Post. Proposed buildings are in conflict with most existing water lines here. The proposed 16" water line that will span from the Fairfax County Water System in the north to just south of U.S. Route 1 will provide adequate service for proposed 2030 development.

Most of the internal network that serves the area west of the proposed hospital will need to be abandoned, once new facilities are constructed. The proposed 16" water line (previously mentioned) will also extend into this area and could possibly provide service.

Sanitary:

Based on the ADP, essentially all of the existing sanitary system on Lower North Post will need to be abandoned. New trunk lines will be installed to pick up the flow from the proposed buildings. Discharge from buildings in its southwest corner could flow south along Gunston Road and tie into the existing Fairfax County system along U.S. Route 1. Another option would be to tie into the existing system that runs parallel to the Fairfax County system along this route, but a capacity analysis must be performed to determine whether the existing sanitary sewer pipe is adequate for proposed development.

A new network of sanitary pipes will be needed to accommodate the area just west of the proposed hospital. The existing network will become obsolete as proposed buildings are located atop existing lines. The northern portion of this area could be picked up in a system that runs parallel to U.S. Route 1 and would eventually tie directly into the Fairfax County gravity sewer line north of the area. This direct discharge into the County system will alleviate potential capacity problems on the Post's system. Another option would be to tie directly into the Installation's existing sanitary lines; however, a capacity analysis must be performed to confirm whether the existing system will have adequate capacity.

Storm:

The Lower North Post area will discharge from several proposed SWM facilities, which empty into a stream that eventually becomes Mason Run. The southern portion of Lower North Post, located adjacent to U.S. Route 1, will discharge to another stream that will also eventually become Mason Run.

The area adjacent to the proposed Hospital sits on a high spot. The proposed SWM facilities will discharge to several different outfalls here. The receiving waters to the west and east of the area will be Accotink Creek and Dogue Creek, respectively.

Figure 4.12 - Hospital Area Storm Water - Long Term Plan (2030)

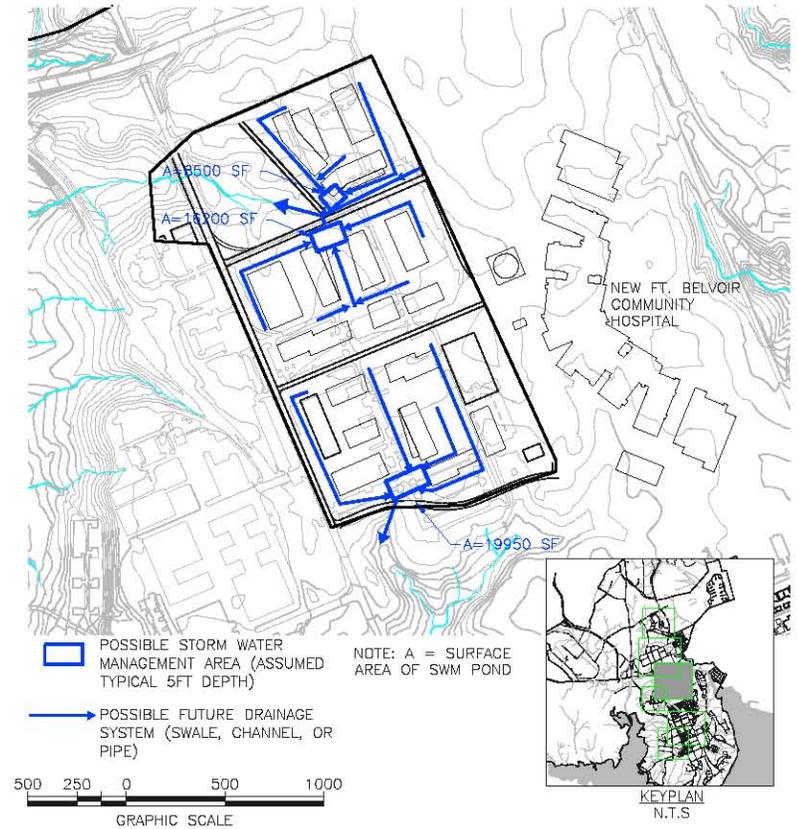
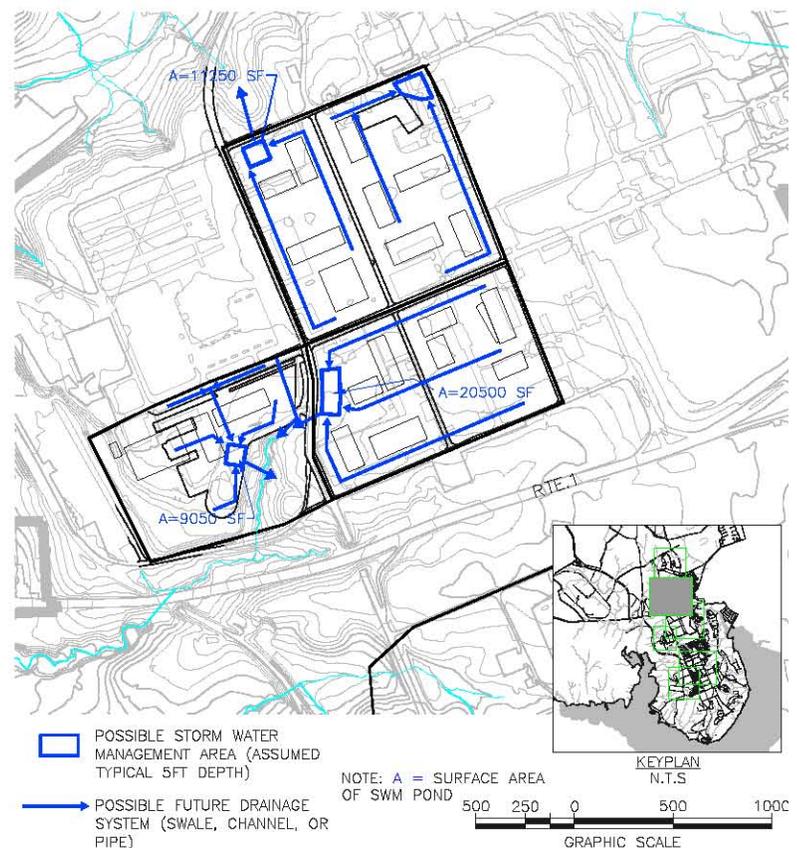


Figure 4.13 - Lower North Post Storm Water - Long Term Plan (2030)



References

Drainage Criteria

- Drainage Appendix (This appendix contains a summary of drainage design criteria, appropriate for new storm water design at Fort Belvoir.)
- The Unified Facilities Criteria (UFC) 3-230-17FA, Drainage in Areas Other than Airfields, dated 16 January 2004 contains the Department of Defense's design criteria for roadway drainage.
- Fairfax County Public Facilities Manual (PFM), Section 06-0000 Storm Drainage, contains the County's design criteria for storm drainage.

The UFC requirements are as follows:

- For developed portions of military installations such as administrative, industrial, and housing areas, the design storm will normally be based on rainfall of 10-year frequency.
- Design of roadway culverts will normally be based on 10-year rainfall.

Note: The UFC contains no specific guidance on design of storm sewer inlets.

Fairfax County has no jurisdictional authority over Fort Belvoir. However, the Installation's MS-4 storm water discharge permit, which is issued by the Commonwealth of Virginia's Department of Environmental Quality (VDEQ), requires that storm water management and erosion control be provided in accordance with Fairfax County standards. The Fairfax County PFM provides specific guidance on storm sewer and inlet design:

- The minor drainage system (normally designed for the 10-year storm) consists of storm sewer appurtenances and conduits (such as inlets, manholes, street gutters, roadside ditches, swales, small underground pipe, and small channels), which collect the storm sewer runoff and transport it to the major system.
- The major system (designed for the less frequent storm up to the 100-year level) consists of natural waterways, large man-made conduits, and large water impoundments.
- The closed conduit system shall be designed for a 10-year rainfall frequency whenever its intended use is to function as the minor drainage system.
- New site development shall provide for adequate drainage of surface waters, which is interpreted from: "the effective conveyance of storm and other surface waters through and from the development site and the discharge of such waters into a natural watercourse, i.e., a stream with a defined channel (bed and banks), or man-made drainage facility of sufficient capacity without adverse impact upon the land over which the waters are conveyed or upon the watercourse or facility into which such waters are discharged."
- Curb Inlets on private streets or parking lots, with projected traffic volumes of 1000 or less ADT (average daily traffic), shall be designed to limit the spread of water at the inlet into the street to a maximum 15 feet.
- Curb Inlets on private streets or parking lots, with projected traffic volumes of more than 1000 ADT, shall be designed to limit the spread of water at the inlet into the street to a maximum 12 feet.
- Sump inlets located in streets shall be designed so the spread into the street does not exceed 10 feet at the low point.

Force Protection Strategies

5 CHAPTER

Introduction

Fort Belvoir refocused the posture of its security and force protection efforts in response to the terrorist attacks on September 11, 2001. The result of this effort is its current Anti-Terrorism (AT) Plan, now being used to guide the Installation's preparedness posture.

Concurrently, Fort Belvoir is being reconfigured to accommodate specific recommendations – first outlined by the Base Realignment and Closure (BRAC) Commission Report in 2005, and then enacted into public law and implemented through Army direction.

In order to ensure future building and infrastructure projects at Fort Belvoir are planned with appropriate consideration of anti-terrorism and force protection (AT/FP) measures, the following sections offer planners and decision makers an awareness of how the AT Plan and the Installation's Real Property Master Plan (RPMP) complement and interrelate with each other.

AT/FP Planning

Because threats change over the life of a facility, building owners and facility managers should be aware that security elements can be more economically integrated within structures during the early planning and design phases of new construction projects than during subsequent additions or renovations. Renovations to existing buildings can be challenging because the existing building systems must be able to accommodate increased security requirements and may not have the additional space or upgrade capacity. Therefore, it is imperative that AT/FP planning begin at the earliest opportunity.

The key to a successful security master plan begins at the initial conception of both new construction and renovation projects and not at the end of the design process. (See Figure 5.1.) Coordination and effective communication are essential in this process, and should start prior to a Planning Charrette. The tenant or user should assemble a Planning Team, which may include representative staff from Garrison Directorates: Logistics, Intelligence, Security, Operations, and Public Works. The team then begins the AT/FP planning:

- Step 1: Identify and categorize assets
- Step 2: Assess asset value
- Step 3: Identify aggressors and assess likelihoods
- Step 4: Identify tactics and severity
- Step 5: Consolidate into design basis threat
- Step 6: Determine levels of protection
- Step 7: Identify design constraints

In conjunction with the steps above, the tenant/user coordinates with the Installation Commander's AT/FP team to complete the following forms:

- DD Form 2683 "Design Criteria Summary Worksheet"
- DD Form 2684 "Asset Value/Aggressor Likelihood Worksheet"
- DD Form 2685 "Tactic and Threat Severity Level Worksheet"
- DD Form 2686 "Forced Entry Design Worksheet"
- DD Form 2867 "Sitework Elements Cost Worksheet"
- DD Form 2688 "Building Elements Cost Worksheet"
- DA Form 7278-R "Risk Level Worksheet"

Upon completion of these forms, cost impacts due to AT considerations can be included in DD Form 1391. It may be prudent for the Installation Commander to make the first site selection for the project, based on the type of facility/operations, design threat requirements, size of the building (footprint/number of floors), and the level of protection required.

Assumptions

The following anti-terrorism and security related assumptions will affect the long-range master planning effort:

- The demographic makeup of Fort Belvoir's population (including active duty military, military families and dependents, civilian government employees, contractors, and military retirees) will remain more or less stable, as the installation is part of a national military restructuring program.
- Fort Belvoir's workforce population is predicted to grow to 48,000 (excluding residents) by 2030.
- The threat environment will continue evolving and changing for the foreseeable future.
- Federal documents governing anti-terrorism and force protection (guidelines, criteria, technical manuals, and regulations) will continue to respond to meet changes in the threat environment.
- Advances in technology will offer more effective and efficient methods to counter and defeat threats.

- Fort Belvoir's infrastructure and facilities must incorporate anti-terrorism and force protection considerations and techniques (during planning/programming, design, and construction), including consideration for sustainability and the environment.
- Development outside the Fort Belvoir perimeter was not part of this evaluation or consideration with regard to the AT Plan.
- The information from the Fort Belvoir's AT Plan is "For Official Use Only".

Strategy

Anti-terrorism and force protection considerations should be incorporated with the Long Range Component of the Real Property Master Plan (RPMP). If not considered early enough in the project planning/programming process, their addition late in the project can become extremely costly and may significantly impair the operation of facilities on Fort Belvoir. By properly identifying and integrating tenant security requirements into project planning during the planning/programming and design phases, the installation may realize significant financial and functional efficiencies related to development density, transportation and site access, utility infrastructure, as well as facility operations and maintenance.

Security plans should be regularly updated to reflect new threats, tenant requirements, and Mission Essential Vulnerable Areas (MEVA).

Although no single entity currently oversees or enforces their application, security measures required by the current Unified Facilities Criteria (UFC) must be incorporated into all planning initiatives, complying with appropriate DoD guidance.

Design efforts must incorporate the UFC requirements, while remaining innovative in providing additional layers of protection. Conversely, the design of physical Anti-Terrorism/Force Protection (AT/FP) measures must take into account the unique historic and visual character of Fort Belvoir and its status within the jurisdiction of the National Capitol Planning Commission (NCPC). Recommendations for the design and the visual character of AT/FP facilities are provided in the Installation Design Guidelines (IDG). Additionally, any AT/FP measures should be implemented utilizing sustainable methods in accordance with (IAW) DoD and Army policy, to the greatest extent practical.

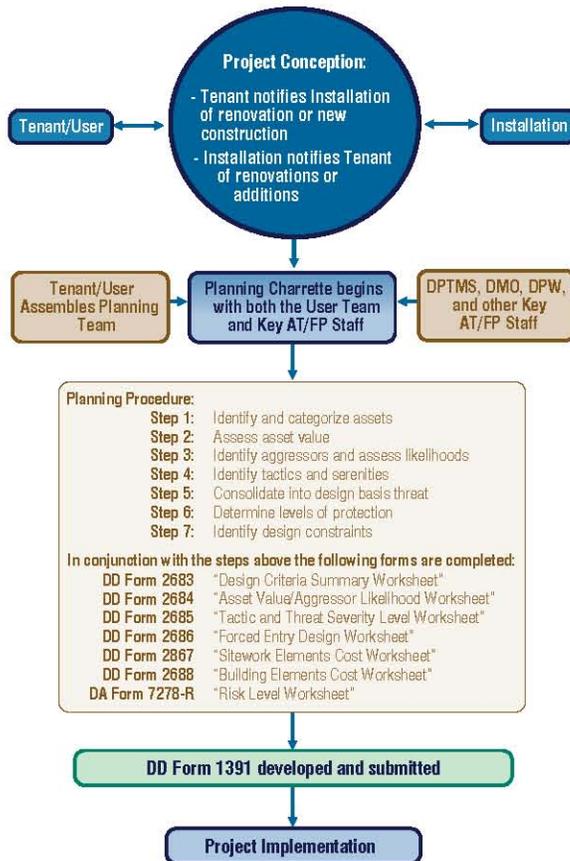


Figure 5.1 - AT /FP Process

Land Use

Land use, project siting, and compatible adjacencies reflected in the RPMP (see Long Range Component and Area Development Plans) must be considered when applying AT/FP measures. In co-locating organizations with similar security requirements, planners and designers should incorporate a layered protection system, effectively balancing site access with the appropriate level of security and anti-terrorism considerations. Each layer of the system should increase levels of security and limit access from approaches and the perimeter, as pedestrians and vehicles move about the installation. In planning for access through these layers, flexibility must be maintained to allow Force Protection Condition (FPCON) levels to change without disrupting permanent infrastructure with temporary mechanical apparatus, such as temporary bollards and concrete barriers.

Population

The impacts of population growth on Fort Belvoir's infrastructure must be carefully considered. Impacts to networks – utility, communication, entry access, and transportation – must be closely coordinated with the entities managing and providing these services. In many cases, utilities, communication links, transportation networks, and other parts of the installation infrastructure may be privatized and require coordination with commercial entities, outside typical military channels. Efforts to improve or upgrade these services to support increased demands must be planned for, coordinated, and scheduled accordingly.

Additionally, as Fort Belvoir gains more Department of Defense (DoD) and non-DoD tenants, it transitions from a traditional Army Garrison with regional support focus to a world-class DoD installation, supporting an increasingly global mission. As the transition continues, the make-up of Fort Belvoir's population will include more and more government employees, contractors, and civilians using Garrison facilities and commuting to and from the installation. Not only will the number of vehicles and personnel that need to be screened increase, but also the percentage of specialized screenings processing. This means greater scrutiny. Therefore, operational considerations that address screening requirements must be considered in the project planning/programming process.

Transportation

Installation security and anti-terrorism planning must address the safe movement of people and materials into and out of Fort Belvoir, including their transition from one security layer to the next. Planning must consider all aspects of the transportation system including: access control points, traffic circulation, parking, transit vehicle access and screening, pedestrian circulation, primary and emergency aircraft landing zones, emergency evacuation routes, and evacuation outlets, as well as the shipment of equipment, materials, perishable and non-perishable food, overnight and courier delivery services, emergency supply services, weapons and ammunition, fuel, equipment, and consumable materials (brought onto or taken off the Post by vendors and delivery/transfer agents).

The transportation network that serves these needs can complement the layers of protection when properly planned and integrated into the overall design. For example:

- Major elements of the road network should channel traffic around, rather than through, the high security layers.
- The geometric alignment of these roads can be used to manipulate and manage vehicles from attaining high speeds on the approaches to access control points, building entrances, and exterior walls.

As the population on Fort Belvoir continues to grow, the Installation's reliance on mass transit options will also grow. Provisions must be made for security and anti-terrorism features in the development, selection, and design of these options, especially related to vehicle and personnel screening. Careful consideration should be given to the techniques for streamlining these screening processes to avoid lengthy delays that would otherwise discourage commuter use.

Facility Design

Facility design, landscape design, environmental screening, interior space planning, access controls, and key surveillance components (as appropriate) can also provide additional layers of protection. Individual facility designs, including site layout and interior design, should be developed to further protect assets from potential threats. For example:

- Building footprints and exterior wall geometries should be oriented so that blast pressures are dissipated around the structure and not contained in re-entrant corners.
- Interior floorplans and building materials may be selected to harden the structure protecting a given asset and augmenting the exterior security and anti-terrorism efforts.
- Detailed guidance on AT/FP considerations for facility design can be taken into account, as described and presented in various UFC documents.

Current AT/FP Practices & Security Plans

Fort Belvoir's Anti-Terrorism (AT) Plan details the roles and responsibilities of each organization or agency under the Installation Commander's command. The AT Plan has two main phases – (1) Pre-attack Planning and (2) Responding to a Recognized Threat.

Pre-Attack Planning

As part of the planning process several groups are established. The Anti-Terrorism Committee (ATC), the Anti-Terrorism Working Group (ATWG), the Force Protection Working Group (FPWG) and the Threat Working Group (TWG).

The ATC mission is to assist in the development, integration, and management of the AT program. It provides Commanders and leaders at all levels with the tools to assure maximum protection. The Committee meets every six months. The ATWG mission is to assist in planning, coordinating, and executing Fort Belvoir's AT program. The Force Protection Working Group (FPWG) meets once a month.

The working groups (ATWG and FPWG) work with FPCON measures:

- The Fort Belvoir AT mission is conducted in three phases with efforts directed toward providing the appropriate protection for personnel and high-risk targets / mission essential vulnerable areas (HRT/MEVA) during the current FPCON level.
- The three phases related to FPCON levels are:
 - Phase 1 - FPCON ALPHA and BRAVO
 - Phase 2 - FPCON CHARLIE and DELTA
 - Phase 3 - FPCON CHARLIE back to NORMAL
- Barrier / Parking Plans
- Military Construction (MILCON) plans with new construction responsibilities assigned to:
 - Installation Anti-Terrorism Officer (ATO) who ensures AT considerations are included in all new construction and major renovation projects.
 - Installation Physical Security Officer who ensures appropriate physical security considerations are included.
 - Military Construction Army (MCA) Project Planner who acts as the liaison with the ATO and Physical Security Officer and reviews DD Form 1391s.
 - Directorate of Information Management (DOIM)
 - Structural Engineer
 - Infrastructure Engineer
 - Fire Chief
 - Facility User

The TWG mission is to provide intelligence support for the installation AT Program. Representatives from selected Base Operations (BOSOPS) organizations and tenant organizations provide operational requirements to the TWG, which meets at least once a month.

Responding to a Recognized Threat

After a criminal act occurs or a threat is established, the AT Plan is placed into action.

- Initial Response (First Responders): Once detection of a criminal act occurs or a threat is established, an initial response force is activated. Once the initial response force has responded to the incident and determined the circumstances, the Installation Commander activates the required forces and begins notification procedures for Fort Belvoir.
- The Installation Commander (IC) activates the Installation's Operations Center (IOC), notifies specialized response forces, and immediately reports the incident to: the Military District of Washington (MDW) Operations Center, the Army Criminal Investigation Division (CID), the FBI, and civilian law enforcement authorities, in accordance with established procedures.
- When directed by the IC, the Directorate of Plans, Training, Mobilization, and Security (DPTMS) activates Fort Belvoir's AT crisis organizations and IOC to meet contingency or emergency requirements, and provides for a 24-hour operation until conditions allow a return to normal status.
- Once the Chain of Command is established and appropriate response personnel and agencies are notified (both on and off Post), three standard secure communications circuits are used:
 - Command net (administrative matters, support, routine traffic)
 - Tactical net (operations)
 - Intelligence net

Plan Annexes

The AT Plan is divided into 18 Annexes (sections), A through R. A summary of each Annex is listed below:

A. Task Organization Annex: This annex lists the different organizations, activities and agencies that are considered to be the minimum resources necessary to conduct anti-terrorism operations within the concept of the AT Plan. The Appendices contain a Table of Organization, the Post Prioritization Chart, and a list of Unit Functions and Responsibilities.

B. Intelligence Annex: Fort Belvoir has no organic elements specially tasked with collection of information concerning major threats. Acquisition and dissemination of intelligence to support Fort Belvoir's AT program are presented in this annex. Fort Belvoir will have a fully integrated foreign, domestic, and criminal intelligence support program. The Threat Information Action Officer (TIAO) and Security Division (DPTMS) are the focal points for foreign intelligence, while the Provost Marshal's Office (DES/PM) is the focal point for domestic and criminal intelligence. Six appendices in this intelligence annex also identify the responsibilities and procedures for conducting various assessments, including: a local threat assessment, a Weapons of Mass Destruction (WMD) assessment, a local criticality and vulnerability assessment, a risk assessment, and instructions on obtaining weather support.

C. Operations Annex: This annex illustrates how to conduct normal base sustainment operations, plan and execute pre-incident measures, and execute the appropriate measures to establish an FPCON level. Appendices in this section are listed by number:

1. Identifies key considerations during AT planning and planning steps, defines Force Protection Condition (FPCON) levels and implementation authority, and assigns responsibilities for planning responses to AT incidents.
2. Provides guidance for planning and executing measures to protect Fort Belvoir personnel and other critical assets against terrorist incidents.
3. Identifies Special Threat Situations.
4. Establishes Special Security Areas, which identify techniques and procedures to provide maximum AT protection for airfields, shoreline and piers, buildings, and embarkation and arrival areas.
5. Provides an operational guideline during conventional or chemical, biological, radiological, nuclear, and/or high explosive (CBRNE) terrorism responses.

6. Provides general guidance in physical security matters to installation and tenant unit commanders, which will increase security of the installation by increasing surveillance, ensuring the effective utilization of physical security aids, emphasizing security awareness procedures, and implementing FPCON measures
7. Covers the law enforcement function of the Directorate of Emergency Services (DES).
8. Identifies other security forces.
9. Provides guidance for identifying and protecting high risk personnel (HRP).
10. Provides operations security.
11. Provides guidance on the implementation of Information Condition (INFOCON) measures at Fort Belvoir.
12. Installation Operations Center (IOC) – Under separate cover; not reviewed.
13. Critical Systems Continuity of Operations – Under separate cover; not reviewed.)
14. Provides emergency mass notification procedures and a matrix list of phone numbers and email addresses.
15. Provides guidance on the use of technology to maximize the effectiveness of limited manpower and other critical resources.
16. Higher Headquarters Vulnerability Assessments – Under separate cover; not reviewed
17. Provides guidance and procedures in preparing Memorandums of Agreement (MOA) and Memorandums of Understanding (MOU).

D. Logistics Annex: This annex establishes procedures and designates responsible activities for the Directorate of Public Works (DPW), the Directorate of Logistics (DOL), and the Directorate of Installation Support (DIS) to provide logistics support for Fort Belvoir's FP operations. This Annex has six appendices:

1. The Priority of Work Appendix identifies the priority of the logistic work to support the planning and execution of Fort Belvoir's response to terrorist incidents.
2. The Emergency Supply Services Appendix provides guidance concerning emergency supply services to support the planning and execution of Fort Belvoir's response to terrorist incidents. It includes responsibilities and procedures for providing and obtaining emergency supply services to support AT operations. It is applicable to all personnel assigned or attached to Fort Belvoir to support the installation's AT/ access control mission.
3. The Weapons and Ammunition Supply Services Appendix provides guidance on the status and disposition of weapons to support the planning and execution of Fort Belvoir's response to terrorist incidents. It includes responsibilities and procedures for providing and obtaining weapons and ammunition to support AT operations and applies to BASOPS organizations.

4. The Emergency Equipment Services Appendix provides guidance on the status and disposition of emergency equipment to support the planning and execution of Fort Belvoir's response to terrorist incidents. It includes responsibilities and procedures for providing and obtaining emergency equipment to support AT operations.
5. The Evacuation Shelters Appendix identifies evacuation shelters available to support the execution of Fort Belvoir's response to terrorist incidents.
6. The Generator Refueling Matrix Appendix contains general policy for refueling emergency generators, and information (number, location, size, fuel capacity, whether fixed or mobile, and points of contact) for each generator.

E. Fiscal Annex: This annex provides resource management support during crisis situations. Appendices within this section include:

1. AT Funding Requirement Input to the Program Objective Memorandum (POM)
2. Anti-Terrorism Readiness Submission Instructions
3. Fiscal Management during Exigent Operations

F. Partner Commanders Annex: The annex establishes an AT Program that provides standards, policies, and procedures to reduce the vulnerability of personnel and other critical assets from terrorist attacks, and supports Fort Belvoir's AT Program. This annex also provides personnel as required to support the installation implementation of escalating FPCON levels. Appendices include:

1. Partner Organizations Tasking (Tenant/Partner area of responsibility)
2. List of Partner Organizations Plans (listed as TO BE COMPLETED)

G. Air Operations Annex: This annex establishes procedure and guidance in requesting aerial support to enhance the installation ability to respond to major disruptions. The annex has three appendices:

1. Instructions for air transportation support using DD Form 2768, "Military Air Passenger – Cargo Request"
2. Landing Zone preparation
3. List of Landing Zones (used for emergency medical evacuations or equipment and personnel staging areas)

H. Legal Annex: This annex establishes the responsibility of the Staff Judge Advocate (SJA). The SJA will advise the commander and staff on all legal aspects of the AT Plan operations.

I. Public Affairs Annex: This annex establishes Fort Belvoir Public Affairs Office to conduct public affairs activities in support of Fort Belvoir's FP Program and to serve as the local point of contact for the release of information relative to crisis situations and the installation's FP Program. This Annex has two Appendices:

1. Command Information Organization & Operation
2. Local/Regional Media Contact Information

J. Command Relationships Annex: This annex provides the procedure that is followed when the Directorate of Plans, Training, Mobilization, and Security (DPTMS) activates Fort Belvoir's AT crisis organizations and IOC to meet contingency or emergency requirements, and provides for 24-hour-a-day operation until conditions warrant a return to normal status. Once activated, it becomes the focal point for conducting operations at Fort Belvoir during emergencies/contingency missions.

K. Communications Annex: The installation's official government telephone system will be used as the primary means of communications for planning and coordinating FP activities. Classified/sensitive information will not be transmitted over non-secure telephone systems.

- Non-Secure telephones
- Limited secure telephones
- Cellular telephones
- Desktop networks
- Mobile radios
- Fixed FM radios

At the Incident Site Command Center, the communications are:

- Cellular telephones
- Desktop networks
- Mobile radios

L. Health Services Annex

This annex establishes procedure and guidance for the Medical Department Activity (MEDDAC) to plan and provide medical support during crisis situations. This annex has two appendices; however, none within the AT document were reviewed. Listed appendices were:

1. Mass Casualty Plan (Directorate of Human Support Services (DHSS))
2. Procedures for Operating with Civilian Emergency Medical Service and Hospitals

M. Safety Annex: This annex provides procedure and guidance for safety measures during the planning and execution of AT response.

N. AT Program Review, Training, & Exercises Annex: This annex provides responsibility and policy for performing various assessments, program reviews, planning, training and conducting exercises. This annex has four appendices:

1. AT Program Review
2. AT Required Training
3. Exercises
4. Quarterly Anti-terrorism Training Report

O. Personnel Services Annex: This annex provides for the utilization of Fort Belvoir's military, civilian, and religious personnel; community assets; and Directorate of Morale, Welfare, and Recreation (DMWR) facilities and equipment to support AT operations. This annex has five appendices:

1. Military Personnel
2. Civilian Personnel
3. Religious Support
4. Family/Community Support
5. Operating Emergency Evacuation Shelters

P. Reports; (No annex in the AT Plan)

Q. References: (No annex in the AT Plan; however, references were included throughout the AT Plan.)

R. Distribution; (No annex in the AT Plan)

Strategy for Data Collection

The Fort Belvoir Anti-Terrorism Plan (August 2006) was used to develop initial discussion points and questions to frame a meeting dialogue with the installation's key security personnel. This included representatives from: the Directorate of Plans, Training, Mobilization, and Security (DPTMS); the Provost Marshall's Office (PMO), and various security consultants. Through this process, a greater understanding of the Garrison's current security planning was achieved

Recommendations for Current Operations

The Garrison has successfully developed and implemented an Anti-Terrorism Plan that provides adequate security for the installation. After reviewing this plan, the following areas are recommended for improvement:

- It is imperative that tenants integrate security requirements during their conceptual planning/programming phases for budgeting purposes. It is essential that the AT/FP team (tenant/user and installation) be involved during the entire design process, including a planning charrette process. DD Form 1391s for tenant relocation project(s) should reflect all costs required to adequately protect assets per DD Forms 2683 through 2688 (see Section 1.1), while managing risk per a completed DA Form 7278-R, "Facility Risk Analysis". Fort Belvoir should provide oversight and assistance to tenants relocating to or within the installation in this regard. This is especially true when tenant requirements exceed the minimum UFC criteria. (*Note: The UFC criteria reflect the minimum AT/FP standard and shall not be considered all-inclusive, as each project may be unique. A Design Basis Threat Analysis should be completed to cover all issues, including infrastructure.*)
- Begin enforcing the scheduled annual reviews of tenant security plans. The Garrison's plan currently provides structure to inspect, review, and update each tenant's integration into the Post's Anti-Terrorism Plan. However, this program is not highly prioritized, due to the recent demands of BRAC relocations to the Installation, the coordination of master planning considerations, and to the daily maintenance of Garrison security operations. It is recommended that the Garrison reinvigorate these inspections, and that it does so with consideration of BRAC and master planning initiatives related to Fort Belvoir Main Post, Fort Belvoir North Area (FBNA), and any other real property transferred to Fort Belvoir.

Critical Infrastructure Security Protection Measures and Requirements

Critical infrastructure is considered to be any system and asset, whether physical or virtual, that is so vital its incapacity or destruction would have a debilitating impact on security, health, safety, or the Installation's mission. Critical infrastructure, according to Presidential Executive Order 13010, Critical Infrastructure Protection (as amended), pertains to:

- Telecommunications
- Electrical power systems (including emergency generators)
- Gas and oil storage
- Transportation (including Davison Army Airfield)
- Banking and finance
- Water supply systems
- Emergency services
- Continuity of government (COG)

Much of the infrastructure located on the installation is considered critical to Fort Belvoir. The Directorate of Public Works (DPW) and the Directorate of Information Management (DOIM) are responsible for identifying critical infrastructure on the installation. The list of critical infrastructure will continue to increase and evolve as the Installation grows and expands. The AT Plan also has identified over 39 high-risk targets (HRTs) at Fort Belvoir. A prioritized listing of HRTs is submitted to the DPTMS annually or when its status changes, for integration with the installation's HRT listing. During any change of occupancy, building usage, or classification, a vulnerable study should be conducted to assess any changes that may be required to achieve the appropriate level of protection.

Recommendations for Processes and Technology

Access Control Point (ACP) system improvements must include the integration of electronic recognition, as the Garrison continues to look for ways to incorporate more technology into its screening processes. These improvements should provide faster means for recognizing authorized personnel in authorized vehicles to ensure unimpeded access to the installation, and also efficiently recognize and screen visiting personnel and their vehicles. Possible means include recognition technology that allows quick, electronic verification of decaled vehicles (via radio-frequency transponders or similar systems) and personnel (via Common Access Card (CAC)

swipe or similar card-reader systems). This greatly reduces stopping and queuing time for active duty and government employees living and working on the Post. The Garrison should consider programming and implementing an integrated system, linking databases with cameras and license plate recognition software, and upgrading identification and pass issuance (Pass and ID) stations that can be used to track and monitor visiting vehicles, drivers, cargo, destinations, and times of arrival and departures. The installation should also consider including a large vehicle imaging inspection station to screen commercial delivery trucks entering the installation, as well as drive-over undercarriage inspection stations (roadway mounted cameras) for all visiting vehicles

The Installation is scheduled to install an Automated Radio-Frequency Identification (RFID) system in February 2008, which will be operational in 2010. In addition to the RFID, an Automated Installation Entry Enterprise-wide system will also be installed and implemented during the same period.

Mission Essential Vulnerability Areas

Mission Essential Vulnerability Areas (MEVA) are identified in the Fort Belvoir Physical Security Plan. The Directorates of Logistics (DOL) and Emergency Services (DES) assist in developing and prioritizing a MEVA list in accordance with Army Regulation (AR) 525-13 and AR 190-13. Partner Organizations will provide resources to protect MEVAs/HRTs and sensitive facilities within their area of responsibility. This includes access control, as well as acquisition and placement of barriers. BASOPS activities, partner organizations, and sub-installations/satellite facilities provide an updated list to the DES/PM whenever the status of a MEVA changes.

Security Planning Alternatives

This section of the document discusses some major alternatives that affect land use decisions, adjacencies, and potential set-backs of buildings within the Post. It is most effective to discuss these "big picture" alternatives early in the planning process.

The two items discussed in this section are Access Control Points (ACPs), where personnel and materials enter the Post, and the supplementary Internal Control Points within the Post.

Access Control Points

Location of Access Control Points

Detailed discussions of the existing and planned ACPs, including their locations, are contained in the transportation sections of the Master Plan.

Design of Access Control Points

The design of ACPs for Fort Belvoir is governed by UFC 4-022-01, Security Engineering: Entry Control Facilities/Access Control Points, and AR 190-13, Army Physical Security Program. The Summary Sheet for UFC 4-022-01 notes that a Facility Design Team under the Department of the Army Facilities Standardization Program will develop and issue a standard design titled Access Control Points for U.S. Army Installations, meeting the requirements of the Army Physical Security Program and AR 190-13.

As indicated in UFC 4-022-01, the mission of the entry control facilities is to "...ensure the proper level of access control for all DoD Personnel, visitors, and commercial traffic to an installation. The objective of the entry control facility (ECF)/ACP is to secure the installation from unauthorized access and intercept contraband... while maximizing vehicular traffic flow." Elements to be considered in the design (in order of priority) are: security, safety, capacity and image.

In light of the need to discourage the use of single occupant vehicles, it is suggested that the third item, Capacity, be interpreted as the capacity to move people through the ACP, and that one of the lanes approaching the entry point be designated for High Occupancy Vehicles (HOV) only.

The design of the ACP should support the Physical Security Plan required by AR 190-13 and the strengths and weaknesses identified in the security engineering surveys described in Section 2-14 of that document. Section 2-9 of AR 190-13 contains a list of the annexes of the Physical Security Plan; the titles are listed here. It is recommended that "Annexes G through J" of the existing Physical Security Plan be revised to reflect the new tenants and groups that will be moving to and off Fort Belvoir.

Annexes to the Physical Security Plan (per AR 190-13, Section 2-9):

- Annex A -An Installation Threat Statement
- Annex B - A Terrorism Counteraction Plan
- Annex C - A Bomb Threat Plan
- Annex D -An Installation Closure Plan
- Annex E - A Natural Disaster Plan
- Annex F - A Civil Disturbance Plan
- Annex G - A Resource Plan to Meet Minimum Essential Physical Security Needs
- Annex H - A Communications Plan
- Annex I - A List of Designated Restricted Areas
- Annex J - A List of Installation MEVA

Screening of Large Trucks and Deliveries

Equipment and materials delivered to the Post require screening and inspection, as do the delivery and transfer trucks. Although these inspection activities can be conducted in the same area where people and vehicles enter the Post, it is best that this screening process take place in a designated area with special inspection equipment using the latest screening technology.

Deliveries from outside vendors for the North Main Post and the South Main Post currently take place through Tulley Gate. Deliveries for Davison Army Airfield are inspected through Farrar Gate at the airfield. All visitors to North and South Main Post are required to enter through Tulley Gate. A large soft-sided covered canopy structure has been erected on the right side of the gate area to protect personnel inspecting trucks from inclement weather.

There are several alternatives for the screening and inspection of deliveries in the future:

- Alternative 1 – Continue inspections at Tulley Gate based on current procedures
- Alternative 2 – Enhance inspections by constructing a Remote Inspection Facility (RIF) near Tulley Gate
- Alternative 3 – Enhance inspections by constructing a Remote Delivery Facility (RDF) near the Industrial Area (zone)
- Alternative 4 - Combine Alternative 1 at the Tulley Gate with Alternative 2 or 3 and locate at a tenant site or Post building site (separate RIF and/or RDF)
- Alternative 5 – Combine Alternative 2 (RIF) and locate at the Tulley Gate with Alternative 3 (RDF) at a tenant site or a Post building site

Remote Inspection Facility

The characteristics of the Remote Inspection Facility and the Remote Delivery Facility are described in the following sections.

As the primary entrance to Fort Belvoir, Tulley Gate should become the focal point for a new Remote Inspection Facility (RIF) serving the Main Post. UFC 4-022-01 identifies a series of considerations for Large Commercial Vehicle and Truck Inspection Facilities at an RIF. These include:

- Inspection Equipment that is likely to be installed:
 - Under- Vehicle Lighting Systems
 - Closed Circuit Television (CCTV) Under Vehicle Search Systems
 - X-Ray and Gamma Ray Cargo and Vehicle Inspection Systems
- Space Requirements
- Layout Considerations and Guidelines
- Ancillary Facilities

Although a Tulley Gate RIF may be adequate for all deliveries, there are some advantages in establishing two RIFs – one for the South Main Post and one for the North Main Post. A determination of whether one or two facilities will be required should be based on an estimate of the number of delivery vehicles expected in the short and long term, as well as the threat estimate. These approximations should be based on a procedure that estimates needs and delivery histories of the individual tenants and organizational groups on both geographical sides of the Post.

Remote Delivery Facility

An additional level of security that may be appropriate for some organizations and tenants on the Post can be achieved by the use of a Remote Delivery Facility (RDF). The RDF concept was implemented at the Pentagon after the terrorist attacks on September 11, 2001. At an RDF, materials are off-loaded from the delivery vehicle to be more thoroughly screened. Delivery to the final destination within the Post would be made by a secure government owned vehicle. Large items that cannot be conveniently off-loaded from the vehicle can be escorted to their final destination after a thorough inspection.

Depending on the requirements of the various organizations using the RDF, a warehouse can be built close to the RDF to provide short-term or long-term storage or transfer for some materials. The availability of storage areas for unscreened and screened material will also help improve inspection management and continuity in the daily delivery cycle, minimizing the number of screening units and secure government delivery vehicles needed.

Concept of Operations

It is strongly recommended that a Concept of Operations or CONOPS be developed for an RIF or RDF. A Concept of Operations should identify procedures that will be followed to inspect and accept deliveries, as well as the handling and packaging of materials. A CONOPS should address the following questions:

- How will deliveries be scheduled?
- How will a delivery be placed on a guard or inspector's list of anticipated (authorized) deliveries?
- What documents are required?
- How are unauthorized deliveries handled?
- What are the procedures for expediting handling and inspection of materials?
- How are small deliveries and transfers for waste and trash, equipment repair, service vendors, and food handled?
- What anti-terrorism and force protection measures should be used during screening and processing?

The CONOPS identifies the information associated with the deliveries and the chain of events that should take place. It also identified the authorities involved, along with their roles and responsibilities. Data in the CONOPS document, when combined with the estimated number of deliveries, can be used to develop: the facility's physical requirements, the systems and necessary equipment to process deliveries, and the required staffing to perform inspections and operate/maintain equipment

Exclusion Zones

It is assumed that all authorized persons and visitors to gates on the Post will continue to be screened at the ACPs. Under this assumption, any vehicle that has entered the Post is able to drive to most authorized areas within the Post. The exceptions to this include: the U.S. Army Intelligence and Security Command (INSCOM) center on the North Post (where supplementary screening takes place); those facilities outside of existing ACPs, such as the Defense Logistics Agency (DLA) and the Defense Communications-Electronics Evaluation and Testing Agency (DCEETA); or other facilities that have their own entrances from the public road system.

Other tenants and organizations relocating to Fort Belvoir may also have security requirements that exceed the security screening process. There are two alternative concepts that govern exclusion zones associated with these facilities

Exclusive Standoff Zone

In this alternative, an exclusive standoff zone is established around a building where people work. The exclusive zone may be used at all threat severity levels. Vehicles park outside this zone, and kept from penetrating it by means of natural barriers and mechanical devices. No vehicles are allowed into this zone, except delivery and service vehicles that were first searched at a control point and granted entry.

This alternative allows parking to be shared with the occupants of adjacent buildings, and is more compatible with a dense development scheme.

The size of these exclusive zones should conform to the recommendations and guidelines in UFC 4-010-02 "DoD Minimum Antiterrorism Standoff Distances for Buildings."

Non-exclusive Standoff Zone

In this alternative, a non-exclusive standoff zone is established around a building and its parking lot. For high and very high threat security levels, the non-exclusive zone may be used with an exclusive zone to minimize limitations on land use. An exclusive standoff zone is enclosed by the non-exclusive standoff zone. Passenger cars are allowed into the area between the exclusive and non-exclusive standoff zones without being searched or inspected, but should be cursorily examined. The exclusive standoff zone perimeter is established at a distance necessary to mitigate the effects of explosive material carried in passenger cars. Trucks, associated with the high and very high threat levels, are not allowed into the non-exclusive standoff zone without being searched.

If this alternative is implemented, the parking area cannot be shared with other tenants or groups unless their security needs are as equally high.

Facility Clustering

Facilities that are functionally compatible and have similar threat levels should be clustered together. This reduces the perimeter area to be protected, limits access points to serve multiple facilities, and provides compact security areas. However, the practical benefits of clustering facilities must be balanced with the survivability benefits of resource dispersal in the event of an attack. Buildings arranged into complexes with strongly delineated boundaries and oriented to enhance surveillance opportunities result in the creation of "defensible space", which can be protected more efficiently than scattered buildings. Vehicle parking should not be permitted between clusters of high-risk buildings.

Figure 5.2 - Standoff Distances and Building Separation - Controlled Perimeter

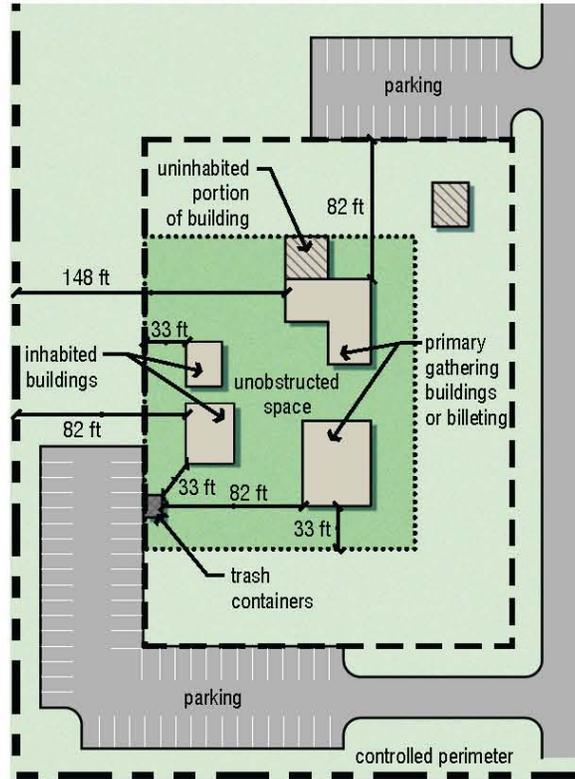
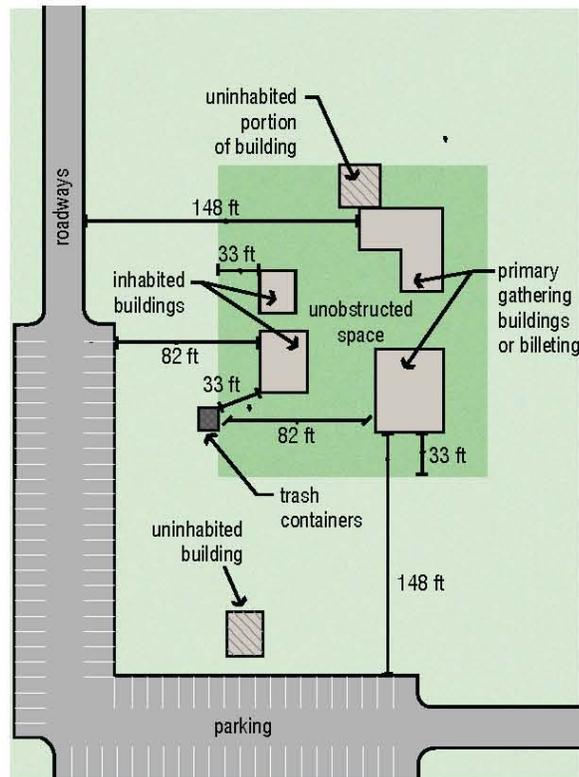


Figure 5.3 - Standoff Distances and Building Separation - No Controlled Perimeter



Summary

Fort Belvoir has successfully developed and implemented an Anti-Terrorism Plan that provides adequate security for the installation. However, as the installation continues to grow and expand, system upgrades to AT/FP measures will be required to adequately ensure the latest security capabilities. In addition, the AT Plan should be continually reviewed to also ensure that appropriate planning, policies, and procedures remain current and relevant. The following list summarizes the recommendations contained in this section:

- Tenant/users should work closely with the installation's AT/FP Team prior to organizing a facility project Planning Charrette process, to ensure appropriate funds are allocated for the project.
- Security plans should be regularly updated to reflect new threats, tenant requirements, and Mission Essential Vulnerable Areas (MEVA).
- During annual reviews, reinforce the importance of tenant security plans.
- Whenever there is a change in building occupancy, usage, or classification, a vulnerability study should be conducted to assess for any changes necessary to achieve an appropriate level of protection.
- As the installation grows, the need to expand the current inspection facilities at Tulley Gate will be necessary. It is recommended that a Remote Inspection Facility (RIF) be constructed within the working area of the current Tulley Gate. This RIF should include areas for screening visitors coming on to the installation. The Garrison should consider programming and implementing an integrated system, linking databases with cameras and license plate recognition software, and upgrading identification and pass issuance (Pass and ID) stations that can be used to track and monitor visiting vehicles, drivers, cargo, destinations, and times of arrival and departures. The installation should consider including a large vehicle imaging inspection station to screen large commercial delivery vehicles entering the installation, as well as drive-over undercarriage inspection stations (with roadway-mounted cameras) for all visiting vehicles.
- Currently, the installation does not have a Remote Delivery Facility (RDF). Some mail and packages are delivered by agents, such as Federal Express, directly to the tenant/user without screening. Therefore, it is recommended that a RDF be placed at the Installation to screen mail and packages.

Additional Resources

Additional planning and design resources are available through numerous federal departments and agencies:

- Facility Standards for the Public Building Service, General Services Administration (GSA)
- Crime Prevention Through Environmental Design (CPTED), National Crime Prevention Institute
- Publications by the National Institute of Law Enforcement and Criminal Justice (NILECJ)
- UFC 3-340-01 Design and Analysis of Hardened Structures for Conventional Weapons Effects
- UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings
- UFC 4-010-02 DoD Minimum Antiterrorism Standoff Distances for Buildings (FOUO)
- UFC 4-020-01FA / TM 5-853-1 Security Engineering: Project Development
- UFC 4-020-02FA / TM 5-853-2 Security Engineering: Concept Design
- UFC 4-020-03FA / TM 5-853-3 Security Engineering: Final Design
- UFC 4-020-04FA / TM 5-853-4 Security Engineering: Electronic Security Systems
- UFC 4-022-01 Security Engineering: Entry Control Facilities / Access Control Points
- UFC 4-023-03 Security Engineering: Design of Building to Resist Progressive Collapse

Sustainability Strategies

6 CHAPTER

Overview

This section details the framework of sustainable goals and strategies for setting building and related utility benchmarks for the installation. It is divided into four sections:

1. Setting Building Criteria and Goals
2. Technical Guidelines Goals and Strategies
3. Implementation - Process and Procedures
4. Reference Resources

Setting Building Criteria and Goals

Building Construction Challenge

Clearly balancing interrelationships between ecosystem processes and natural resources can be a challenge when examining specific areas of the base and individual building projects. Physical structures and buildings will continue to be built on the Installation, as it is on the cusp of a major expansion. Fort Belvoir has a unique opportunity to continue to maintain and enhance the Sustainable and Environmental design efforts that it has incorporated for years. Building construction, operation, and maintenance at the Post are costly and produce many negative environmental impacts, but are vital to support the base mission and provide a good quality of life for its employees and residents. The challenge becomes:

How can Fort Belvoir achieve building infrastructure that meets the needs of its users, while reducing overall operating costs, environmental impacts, and dependence on non-renewable energy sources?

Key Considerations

Relating to sustainable goals and objectives on the building scale, the Federal Government continues to set into motion initiatives to promote sustainable practices, operations, and procedures. To this end, there are several federal mandates and executive orders

for sustainability. (See Table 6.1 for a partial listing that continues to set sustainable performance benchmarks required of all federal buildings.)

Federal Energy Legislation and Executive Orders

DoD Energy Managers Handbook, November 1996, Chapter 11 – Alternative, Renewable, and Clean Energy indicates DoD’s goal is to “increase utilization of renewable energy in compliance with EO 12902 by implementing alternative, renewable, and clean energy projects where they are LCC effective. EPA of 1992 calls for implementation of projects having a payback of 10 years or less.

Executive Order 13123, June 1999 Greening the Government Through Efficient Energy Management indicates each agency “shall reduce energy consumption per gross square-foot of its facilities by 30 percent by 2005 and 35 percent by 2010 relative to 1985.” This order has been strengthened by Executive Order 13243.

Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management was signed January 24, 2007 by President George W. Bush. This Executive Order strengthens the goals of the Energy Policy Act of 2005. A summary of the mandated goals are:

- Achieve the annual energy incremental reduction goal of 3% through FY 2015 or 30% reduction by the end of FY 2015 from 2003 baseline consumption levels.
- At least 50% of the statutorily required renewable energy consumed must come from new renewable sources (in service after January 1, 1999). Renewable generation projects on agency property for agency use shall be implemented to the extent feasible.
- Beginning in FY 2008, reduce water consumption intensity, relative to the baseline of the agency’s water consumption in fiscal year 2007, through life-cycle cost-effective measures by 2 percent annually through the end of fiscal year 2015 or 16 percent by the end of fiscal year 2015.
- Require in agency acquisitions of goods and services: (i) use of sustainable environmental practices, including acquisition of bio-based, environmentally preferable, energy-efficient, water-efficient, and recycled-content products; and (ii) use of paper of at least 30 percent post-consumer fiber content.
- Ensure that: (i) new construction and major renovation of agency buildings comply with the Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings set forth in the Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding (2006); and (ii) 15 percent of the existing Federal capital asset building inventory of the agency (as of the end of fiscal year 2015) incorporates the sustainable practices in the Guiding Principles.

The DoD energy consumption goals are based on the Energy Policy Act of 2005 (Public Law 109-58). Engineering and Construction Bulletin No. 2005-20 summarizes the mandated energy efficiency improvement and renewable energy requirements in existing and new Federal facilities. The applicable requirements are:

- Annual energy incremental reduction goal of 2% from FY 2006 - FY 2015
- Energy/electric metering required in federal buildings by FY 2012
- Energy Star and FEMP recommended products procurement requirement
- Premium efficient products required, i.e. electric motors, air conditioning, and refrigeration equipment
- Buildings to be designed to achieve energy consumption levels that are 30% below ASHRAE 90.1 - 2004, if life-cycle cost effective
- Renewable electricity consumption by the Federal government cannot be less than:
 - 5 percent in FY 2010 – FY 2012
 - 7.5 percent in 2013 and thereafter
- Renewable energy produced on site and used at a Federal facility receives double credit
- Establishes a photovoltaic energy commercialization program in Federal buildings

Sustainable Design and Construction – The adoption of sustainable design principles can significantly reduce the life cycle and operational costs of buildings. In a January 2006 memorandum, the Assistant Secretary of the Army for Installations and Environment announced that the Army will transition from the Sustainable Project Rating Tool (SPiRiT) to the Leadership in Energy and Environmental Design (LEED®) Green Building Rating System, effective with the FY08 Military Construction Program.

SPiRiT, which stands for Sustainable Project Rating Tool, was developed for the U.S. Army Corps of Engineers in 2001 to provide a sustainable rating tool that offered a checklist, strategies and project scores specific to Army facilities. The rating system was a near direct copy of the U.S. Green Building Council's LEED® rating system, with the exception of several modifications to address the reality of military installation planning, design, and construction. The tool was intended to be a self evaluation for project teams and installations. In 2006, The USACE announced the planned transition in Sustainable Design and Development (SDD) Policy from SPiRiT to LEED®. This memorandum states:

“All military vertical building construction projects starting with the FY 08 military construction program will achieve the SILVER level of LEED® NC (New Construction). This policy includes all new construction projects, regardless of fund source. Horizontal construction, such as ranges, roads and airfields, will continue to incorporate Sustainable Design and Development features to the maximum extent possible. The installation Director of Public Works or the Reserve Component equivalent, supporting Engineering District, designer and constructor will jointly certify the final LEED® score and rating. This third party certification developed by the US Green Building Council has become a national standard. One requirement that has become common place in many Federal projects is LEED® building certification.”

Facility construction, operation, maintenance, and demolition influence the environment and the surrounding community. Construction activities significantly affect the environment through land disturbance, waste generation, and subsequent effects on water quality. Construction also requires building materials and labor, which could be purchased locally to benefit the regional economy and reduce transportation costs. Building use requires energy, the production of which affects regional air quality and water, the use of which influences regional aquifers. The demolition of infrastructure results in solid waste and negative impacts on water and air.

Sustainable Design Guidelines recognize the environmental cost of buildings and development. The ultimate goal is to protect our finite natural resources. These guidelines recommend strategies for future development that can minimize the environmental impact and are typically outlined within the five broad categories: (1) Planning Sustainable Sites, (2) Safeguarding Water, (3) Energy Efficiency and Performance, (4) Conserving Materials and Resources, and (5) Enhanced Indoor Environmental Quality. These categories are used to structure the upcoming technical guidelines, goals, and strategies section.

LEED® as a Sustainability Benchmark – The Leadership in Energy and Environmental Design Green Building Rating System (LEED®) is the nationally accepted benchmark for the design, construction, and operation of high performance green buildings. LEED® attempts to quantify the environmental performance of a building. This tool was created by the U.S. Green Building Council (USGBC), a private, non-profit, consensus based organization that helps promote and measure sustainable design.

Table 6.1 - Federal Mandates

	Energy Policy Act of 2005	Executive Order 13243	ECB 2006-7R	Federal Sustainable Performance MOU	DOE 10 CFR
Water Efficiency	Apply water conservation technologies	Reduce water consumption intensity 2% annually through 2015 or 16% by the end of 2015	Waterless urinals required in new construction after January 2010	<ul style="list-style-type: none"> 20% less potable water than EPA - 1992 Water efficient landscape and irrigation strategies Reduce outdoor potable water use by 50% 	
Renewable Energy	<ul style="list-style-type: none"> 3% renewable 2007-2009 5% renewable 2010-2012 7.5% renewable 2013 and continuing Double credit for renewables produced on Federal Lands 	<ul style="list-style-type: none"> 50% renewable energy is from new renewable sources Install renewable energy sources on agency 			
Energy Efficiency	<ul style="list-style-type: none"> Energy Star/FEMP-recommended products required 30% less energy consumption than ASHRAE Standard 90.1 2004 baseline Sustainability applied to site, design, and construction 	<ul style="list-style-type: none"> Reduce energy intensity by 3% annually through 2015, or 30% by the end of 2015 compared to ASHRAE 90.1-2004 baseline Earn Energy Star 7 targets 			<ul style="list-style-type: none"> Meet Energy Star 7 targets Reduce energy by 30% compared to ASHRAE 90.1-2004 baseline building
Commissioning	<ul style="list-style-type: none"> October 1, 2012, all Federal buildings will be metered Measure electricity use in the building 			<ul style="list-style-type: none"> Install utility meters to track and optimize performance Compare performance data with design targets 	
HCFCs / Carbon		Reduce greenhouse gas emission intensity 3% annually or 30% by the end of 2015	<ul style="list-style-type: none"> Availability past phase-out dates enough for HCFC equipment service life In 2030, production/distribution of new HCFCs will stop 		
Indoor Air Quality				<ul style="list-style-type: none"> ASHRAE standards 55-2004 and 62-2004 Moisture control preventing buildings damage and mold Use low-emitting materials Protect indoor air quality during construction 	

LEED® provides a roadmap for measuring and documenting success for every building type and phase of a building's lifecycle. Specific LEED® programs include:

- New Commercial Construction and Major Renovation projects (LEED®-NC)
- Existing Building Operations and Maintenance (LEED®-EB)
- Commercial Interiors projects (LEED®-CI)
- Core and Shell Development projects (LEED®-CS)
- Homes (LEED®-H)
- Neighborhood Development (LEED®-ND)
- Guidelines for Multiple Buildings and On-Campus Building Projects
- LEED® for Schools
- LEED® for Retail

The U.S. Green Building Council is also developing LEED® for Healthcare and LEED® for Labs. For information on the specifics of the rating system and certification levels, visit www.usgbc.org or call the LEED® Customer Service Desk at 1-800-795-1747.

Fort Belvoir has several opportunities to apply LEED® as a tool during installation development and planning. As stated previously, the U.S. Army Corp of Engineers is requiring that all new vertical building projects meet an equivalent LEED®-NC "Silver". This ensures that each new building project will address many sustainable concepts identified by the individual project teams under the guidance of the Technical Guidelines set forth in this document. Final strategies are determined by design and construction teams. In addition to LEED® for New Construction, other strategies should be identified to promote sustainable practices in long-term planning and operations. This would apply to existing buildings through evaluating ongoing maintenance and systems performance, as well as interior renovations where applicable.

The Belvoir New Vision master plan embraces many principles such as: connected street grids, accessible open space, and appropriate and compact development. The recently established LEED® for neighborhood development pilot program is aligned with these principles and provides an open forum to further organize and raise awareness of these complex and comprehensive issues. The use of the LEED® for Neighborhood Development Rating System is strongly encouraged. The LEED® Neighborhood Development system emphasis is to:

- Revitalize existing urban areas and reduce land consumption
- Reduce automobile dependence and promote pedestrian activity
- Improve air quality
- Decrease polluted stormwater runoff
- Build more livable communities for people of all income levels

LEED® for Neighborhood Development - Implementing best practices in sustainable design is important for the installation to maintain its long standing commitment to conserve the natural beauty of the land and preserve its standing as one of America's enduring installations. The purpose of LEED® Neighborhood Development (ND) pilot program is to provide an accessible and comprehensive framework to make environmentally sensitive and livable places. This framework incorporates the principles of smart growth, new urbanism, and green building technologies. Participation in the program: would be a first for the U.S. Military, serve as a model for other installations, and ensure Fort Belvoir as a world-class installation.

What is a "Neighborhood Development"? The LEED® ND rating system is designed to certify exemplary development projects that perform well in terms of smart growth, new urbanism, and green building. The LEED® ND rating system is organized into three sections: smart location and linkage, neighborhood patterns and design, and green construction and technology. Recommend application for localized areas of the installation are address in individual Area Development Plans (ADPs).

Technical Guidelines, Goals and Strategies

The following section establishes recommended goals and strategies, and lists technical resources to be evaluated during new construction, renovation, and retrofits on all Fort Belvoir facilities. These Technical Guidelines are arranged in five categories and address several additional miscellaneous topics important to the installation:

- Planning Sustainable Sites
- Safeguarding Water
- Energy Efficiency and Performance
- Conserving Materials and Resources
- Enhanced Indoor Environmental Quality

These guidelines incorporate content from a variety of published sustainable design guidelines and standards, including LEED®. Selected approaches from these guidelines will be incorporated into the design of individual projects, if applicable and feasible (given unique site/building characteristics). Use the following determination factors when evaluating:

- What are the environmental impacts and benefits?
- What are the cost differentials?
- What are the operational cost savings?
- What are the long-term maintenance implications?
- Is the aesthetic and design consistent with the Installation Design Guide?
- Are the strategies compatible with intended use?

No single factor should determine whether or not a strategy is relevant or practical. Other considerations must be weighed.

Technical Guidelines: Planning Sustainable Sites

With the high level of growth projected for Fort Belvoir, it is imperative to focus on site issues and the built environment as it affects ecosystems. A statement from Fort Belvoir's environmental office emphasizes this importance:

"All decisions affecting Fort Belvoir's wealth of natural resources have a critical impact on the surrounding environment. Fort Belvoir's comprehensive ecosystem management philosophy is designed to protect and manage vital aspects of that environment, including waterways, wildlife, and vegetation. Fort Belvoir enlists the cooperation of many groups and individuals from the installation and surrounding community through public education and community outreach programs. Promoting regional environmental stewardship is one of the cornerstones of Fort Belvoir's mission."

The following goals and strategies highlight important considerations for the installation.

Goal 1.1: Plan installation growth on the most suitable sites possible, avoiding unnecessary environmental impacts to the existing open space and natural resources, while addressing living infrastructure goals of: hydrology, biodiversity, carbon neutrality, nutrient cycling, and reducing urban heat islands. Strategies include:

- Ensure consistency with the current master plan, Fort Belvoir Public Works, Fort Belvoir Environmental Office, and state/ local plans for conservation and development.
- Protect lands that are recharge areas.
- Protect habitats of threatened and endangered species.
- Preserve and protect wetland areas and Resource Protection Areas (RPAs).
- Preserve vegetated buffers when disturbance is anticipated.
- Avoid development in flood plain areas.

Goal 1.2: Minimize the physical impact of new development on the surrounding natural landscape. Strategies include:

- Conserve high quality natural areas and restore damaged landscapes.
- Encourage development over the footprint of previously developed or disturbed areas.
- Comply with established limits of disturbances on all previously undisturbed sites.
- Locate construction staging areas that avoid sensitive site areas.
- Limit the disruption of trees and vegetation according to the protection guidelines.
- Exceed applicable requirements for mitigation of any wetlands impacted by development.
- Consider using native or adapted planting for their lower maintenance, water efficiency, ornamental and pest tolerance characteristics, and educational value.
- Anticipate and plan for maintenance access throughout the installation to minimize impacts to landscaped areas.

Goal 1.3: Reduce the impact of automobiles and roadways by providing and encouraging alternative transportation methods and means. Strategies include:

- Create an effective program for evaluating potential transportation needs when designing and locating all future installation facilities.
- Encourage clustering and promote density of residential and barracks, office, health and research, and recreational uses to lessen the need for vehicular travel.
- Develop and build to support an effective regional commuting system.
- Develop schedule and management plan to offset air emissions during construction periods.
- Build to encourage pedestrian and bicycle use. Use parking management as a tool to encourage walking and bicycling.
- Consider purchasing all new fleet vehicles, buses, and maintenance vehicles that use alternative fuels.

Goal 1.4: Develop site features to minimize adverse impacts to the site's microclimate and promote biodiversity. Strategies include:

- Consider using light colored materials for paved areas in ordinance with the Base Installation Design Guide.
- Provide cool roofing materials to mitigate Heat Island effects in ordinance with the roofing guidelines prescribed in the Base Installation Design Guide.
- Protect against summer heat conditions by shade trees, trellises, and other vegetated plantings. Consider bio-retention landscaped swales.
- Observe strategic building placement to take advantage of all site energy.

Goal 1.5: Provide site lighting that is sensitive to light pollution of the night sky and minimizes light trespass/impacts to nocturnal environments. Strategies include:

- Follow the light level and uniformity ratios recommended by the Illuminating Engineering Society of North America (IESNA), Recommended Practice Manual (RP-33).
- Exterior fixtures should be evaluated for Cutoff and Full Cutoff capabilities to minimize light trespass while still maintaining all site specific security requirements.

Technical Guidelines: Safeguarding Water

The incorporation of sustainability principles into the design, construction, and operations of the Fort Belvoir green infrastructure can reduce water demand in buildings. This would enhance both the availability and quality of regional water resources, while saving associated energy. Using large volumes of water increases maintenance and lifecycle costs for building operations, and increases consumer costs for additional municipal supply. Also water demand by Fort Belvoir will rise with continued growth. A reduced demand for water can also significantly decrease the use of treatment chemicals.

In addition to potable water supply and conservation, upgrades and proper maintenance of storm water and wastewater systems are necessary to reduce discharges, bypasses, and releases into the environment. Many sustainable building practices maximize the natural ground absorption of rainwater, reducing the pollution and costs of treating this runoff before final release into streams. On-site biological treatment systems can often reuse and treat building grey water and wastewater, thereby reducing water pollution and associated treatment costs. This would include the installation of localized Low Impact Development (LID) strategies.

The following goals and strategies highlight important considerations for the installation.

Goal 2.1: Reduce building development stormwater runoff impacts to include both quantity and quality control. Strategies include:

- Develop and implement a comprehensive stormwater resources management program (quality and quantity).
- Develop a plan and timeline to upgrade facilities to protect and enhance water quality and quantity.
- Require individual building projects to prevent any increase in the rate of stormwater from leaving project sites.
- Limit impervious surfaces.
- Utilize vegetated roofs.
- Consider rainwater collection and associated uses or store for slow release.
- Implement landscaping strategies with high absorption rates to include consideration for Low Impact Development (LID), rain gardens, constructed wetlands, and on-site treatment of storm water with filtration strips. .

Goal 2.2: Reduce potable water consumption by 50% (or more) by 2030. Strategies include:

- Limit potable water usage for irrigation. Landscape with native and drought tolerant plants.
- When irrigation is required, utilize high-efficiency irrigation systems.
- Consider rainwater collection as a building system for possible irrigation and other greywater applications.
- Consider greywater systems to collect wastewater from drinking fountains, condensate lines, and sinks for reuse in toilet or urinal fixtures.
- Upgrade fixtures to meet or exceed performance requirement of the Energy Policy Act of 1992 for all renovations and retrofits.
- Consider waterless urinals.
- Consider dual-flushing toilets.
- Consider infrared sensors on faucets.
- In Barracks and other relevant building types, install water saving appliances to include (but not limited to) dishwashers and clothes washing machines.
- Perform assessments to identify projects that conserve water resources through conservation, reuse, and reclamation. This should include a water education program for the installation community.

Goal 2.3: Reduce demand on waste water treatment facilities by 50% by 2030. Strategies include:

- Emphasis water conservation as outlined in Goal 2.
- Consider alternative waste treatment systems.

Technical Guidelines: Energy Efficiency and Performance

Energy efficient buildings and proactive energy management can conserve resources, save money, and ensure mission readiness. The revitalization of current infrastructure and future construction associated with the installation growth is an opportunity to improve on past design and practice, significantly reducing Fort Belvoir's energy costs.

Utilizing the Energy Use Index is another benchmarking tool in evaluating building performance. Energy Use Index (EUI) is a measure of the amount of energy consumed in a building, per year, based upon square-footage and operating hours. A building's EUI is a marker of a property's overall level of energy efficiency. This EUI is used to compare energy consumption from one building to another by attempting to create an equivalent unit of measurement. This index of annual energy source consumption (electricity, natural gas, steam, coal, etc...) can also be used to determine when a building is not operating properly. When calculated on a rolling 12-month cycle, diversions from the average number are identifiable and used to manage energy resources, locate problem areas, and implement corrective action. In a report prepared for the Department of Energy in 2000 called *Economic Energy Savings Potential in Federal Buildings*, it is stated that the EUI in 1985 for Federal Buildings was 139.8 kBtu/sf/yr with an average reduction to 113.7 kBtu/sf/yr in 1998. The goal at the time, in 2000, was to reduce energy to 90.0 kBtu/sf/yr per Executive Order 13123.

Normally measured as kBtu / square foot / year, the Energy Use Index at Fort Belvoir has been as high as 145 kBtu/sf/yr. Through concentrated efforts of the installation a few years ago, this EUI has been as low as 99 Kbtu/sf/yr. For years 2005 and 2006, the installation experienced an average EUI of 133.5 kBtu/sf/yr. There are several factors that could be contributing to this increased energy use, including the age of equipment, efficiency of equipment, and energy losses in piping system deterioration. The long-range plan for Fort Belvoir should be established so that all new construction meets or exceeds a minimum EUI.

Dominion Power is working with Fort Belvoir to provide electrical service. The majority of this power is generated from a diverse mix of coal, gas, nuclear, oil, hydroelectric, and purchased power. All sources have different associated environmental impacts – such as decreased regional air quality, production of hazardous waste, and ecosystem destruction. Opportunities to generate and purchase “green power” from renewable power generation are increasing and should be encouraged.

In addition to requiring constant investment of operations and maintenance funds, inadequately maintained buildings and mechanical systems waste energy and water, in addition to requiring constant investment of operations and maintenance funds. The on-going privatization of Fort Belvoir's utilities may provide strategic opportunity for reversing increasing maintenance levels and costs. Performance contracting is a viable approach in some applications for system upgrades.

The following goals and strategies highlight important considerations for the installation.

Goal 3.1: Reduce energy consumption as prescribed by Executive Order 13423. Meet initial threshold immediately of 30%, and increase 10% by 2030 based on ASHRAE 90.1 2004 standards. Strategies include:

- Reduce building heating and cooling loads by optimized energy performance in systems design and integration, building envelope optimization, performance glazing, and building massing and orientation.
- Incorporate passive design strategies to optimize site energy for solar and wind.
- Incorporate renewable energy and alternative energy technologies wherever feasible to offset energy from the grid. This is to include domestic solar water heating.
- Incorporate seasonal shading and size overhangs as shading devices.
- Minimize plug loads and specify energy efficient equipment and appliances.
- Require premium efficiency motors and use variable speed drives.
- Utilize high-efficiency lighting with electronic ballasts where applicable.
- Require CO2 sensors in large occupancy spaces with demand-controlled ventilation.
- Require air economizers in new construction.
- Require occupancy sensors, particularly in spaces not regularly occupied.
- Require daylighting sensors where feasible to control electric lighting loads.
- Provide incentives to energy users to conserve and implement conservation campaign.

Goal 3.2: Given the Executive Orders and Federal Mandate requirements to reduce energy use and consumption, it is proposed that all new construction be limited to a Site EUI of 60 kBtu/sf/yr or less, and that all buildings provide a monthly evaluation of each facility based upon a rolling 12-month cycle. Strategies include:

- Utilize the same strategies as energy performance goal just mentioned.

Goal 3.3: Increase renewable energy production by 50% by 2030. Strategies include:

- Require a cost analysis and rate of return calculation for each new project to incorporate renewable energy technologies, such as photovoltaics or wind turbines.
- Investigate green power purchases.

Goal 3.4: Ban the use of ozone-depleting substances in Fort Belvoir buildings. Strategies include:

- Phase out all CFC and HCFC refrigerants in existing buildings.
- Require all new equipment be free of CFC and HCRC refrigerants.
- Phase out use of halon gasses in fire suppression systems in existing buildings, and do not install halon systems in new buildings.

Goal 3.5: Measure and verify ongoing performance of building systems to ensure maximum optimization. Strategies include:

- Require that all new buildings be fully commissioned.
- Require that all new buildings have a Measurement & Verification Plan applicable to specific system design.
- Perform and record building operations training that covers the procedures for all building operations.

Technical Guidelines: Conserving Materials and Resources

Proper materials selection and resources allocation are important factors in practicing and evaluating sustainable building construction. This selection is equally important for installation operations in the form of environmentally preferred purchasing.

Waste Management is a component to conserving materials and resources. Conventional demolition of buildings is a major expense and produces large amounts of construction and demolition (C&D) waste, requiring large landfill volumes and permanently converting productive or training land into nonproductive landfill space. Emerging building deconstruction and reuse techniques can reduce the overall costs of building disposal, enable the beneficial uses of salvaged materials, and drastically reduce landfill space requirements.

The following goals and strategies highlight important considerations for the installation.

Goal 4.1: Reduce Landfill waste significantly by 2030. Strategies include:

- Improve waste management and diversion.
- Implement soil reuse and recycling program.
- Implement construction/demolition debris reuse/recycling technologies.
- Divert minimum of 50% of all new construction debris.
- Implement wood and yard waste reuse/recycling technologies.
- Implement municipal solid waste (MSW) reuse/recycling technologies.
- Implement hazardous waste reuse and recycling technologies.

- Encourage new building materials, both interior and exterior ,to be recyclable.
- Provide full evaluation of building potential reuse prior to any demolition.

Goal 4.2: Stimulate local and regional economy for materials and favor environmentally preferred products. Strategies include:

- Comply with both Executive Order 13101 and Executive Order 13423.
- Encourage locally manufactured and locally extracted building materials.
- Encourage specification of materials for durability, recyclable content, and positive life cycle assessment.
- Encourage wood products to be obtained from sources certified by the Forest Stewardship Council (FSC).
- Encourage use of rapidly renewable materials where applications are well suited.

Technical Guidelines: Enhanced Indoor Environmental Quality

Fort Belvoir is committed to providing a quality, healthy, and productive indoor environment for all its residents and workforce.

The following goals and strategies highlight important considerations for the installation.

Goal 5.1: Ensure that indoor air quality is of high quality and free from known contaminants. Strategies include:

- Designate smoking areas at a minimum of 25 feet away from building entrances, outdoor intakes, and operable windows.
- Comply with ASHRAE 62.1-2004 in all new building construction.
- Implement indoor air quality best practices during construction to prevent long-term contamination from construction practices.
- Specify low emitting materials for interior finishes that meet or exceed LEED® standard criteria.
- Where practical implement CO2 monitoring.
- Install entryway pollutant control systems.

Goal 5.2: Maintain comfortable work environments for building occupants. Strategies include:

- Comply with ASHRAE 55-2004 for optimal occupant thermal comfort.
- Provide ample natural daylight to the extent possible in all interior spaces.
- Provide views to the outside to the extent possible in all interior spaces where program requirements allow.
- Establish building specific protocol to handle occupant comfort issues.

Implementation - Process and Procedures

Guidance for implementation is necessary to ensure that future development will be environmentally and economically sustainable. Providing technical guidelines, setting goals, and providing strategies are not enough. The U.S. Army Corps of Engineers (USACE) has developed the Army LEED® Implementation Guide, which is planned to be released at the end of fiscal year 2007. The purpose of the Guide is to assist Project Delivery Teams (PDT) to meet the Army's Sustainable Design and Development Policy for Building Projects. Refer to this document for detailed direction, exemptions, and additional resources. The following process guidelines build on Fort Belvoir's existing design and construction processes.

Excerpts from the Army LEED® Implementation Guide are outlined below and emphasize sustainable design objectives:

1. Develop a strong organizational installation management system that institutionalizes sustainable design concepts.
2. Improve process for site selection and development for major military construction and small construction projects.
3. Optimize Water Efficiency.
4. Optimize Energy and Reduce Atmosphere Impacts.
5. Optimize Materials and Resources.
6. Optimize Indoor Environmental Quality.

LEED® Accredited Professional

The current design and construction process utilized by the USACE and at Fort Belvoir emphasizes an integrated and collaborative approach. An integrated design approach will be used, and the Project Delivery Team composition will reflect this approach. All Project Delivery Teams will include a LEED® Accredited Professional (LEED® AP) for both the design and construction phase. A LEED® AP contributes to the Project Delivery Team by ensuring correct interpretation of LEED® credit requirements, providing guidance and assistance to project members in developing suitable and complete documentation, tracking overall LEED® accomplishments, and monitoring individual actions of team members responsible for each specific LEED® credit.

Validation

Government Validation - Army policy does not require formal third party certification of projects by the USGBC. The supporting Engineer District, as Authorized Design and Construction Agent, is responsible for reviewing the project documentation and validating all credits, in accordance with the USGBC standard, from design through construction closeout.

Coordination and Endorsement - The District is also responsible for coordinating with: the Installation Director of Public Works (DPW) or the Reserve Component equivalent; the USACE designated Center of Standardization (COS) if applicable; the designer; and the constructor to obtain consensus on the project score and rating. The USACE District, as Design and Construction Agent, is ultimately responsible for ensuring correct interpretation and scoring in accordance with the USGBC standards.

USGBC Registration - Army does not require registration of projects with the USGBC, but PDTs may choose to register any project. See Appendix C for special registration requirements for Center of Standardization (COS) Multiple-Contractor projects.

- LEED® LETTER TEMPLATES. Registration allows the PDT to download and use the USGBC LEED® Letter Templates (pre-formatted credit documentation forms with built-in calculators) for project documentation. USGBC registration is the only legal means to access the copyright-protected LEED® Letter Templates. Downloaded LEED® Letter Templates may not be locally duplicated for use on unregistered projects. Sample LEED® Letter Templates are available for review at the www.usgbc.org website. See Appendix C for special requirements for Center of Standardization (COS) Multiple-Contractor projects.
- LEED®-ONLINE. LEED® documentation for registered projects may be compiled, stored, and reviewed on-line at the registered project website using LEED®-Online, if the PDT chooses to do so. Using LEED®-Online for compiling and storing data increases the activities of the project administrator (see the following).
- USGBC CREDIT INTERPRETATIONS. Registered project team members may submit credit interpretation requests to USGBC (contact USGBC for fees associated with this service). Note that all previous credit interpretation requests with USGBC rulings (CIRs) are posted in the "members only" area of the USGBC website.
- REGISTRATION FEES. If the PDT chooses to register a project with the USGBC, fees for project registration may be paid from project design or construction funds. See www.usgbc.org for project registration procedures.
- REGISTERED PROJECT ADMINISTRATOR. Each registered project must designate an online project administrator. This individual controls access and saves/modifies data privileges in the project online Letter Templates. Only one project administrator is allowed per registered project, but project administrator designation may be transferred from one person to another during the course of a project. PDT personnel may manage online administration. Contracts may include a requirement for the Contractor to manage online administration, or a combination with administration transfer(s) may be done based on project requirements and PDT/District staffing and preference.
- WHO REGISTERS A PROJECT. PDT personnel may register the project, or contracts may include a requirement for the Contractor to register the project.
- WHEN TO REGISTER A PROJECT. Projects should be registered before design commences so that the templates are available to the design team from the start. If the site selection points are documented during RFP preparation, the project should be registered during RFP preparation.

USGBC Certification - USGBC certification is independent third party review of all documentation and certification of the project score by USGBC. The U.S. Army does not require certification of projects by USGBC and expects USACE to perform this service (government validation). Project funds will not be used for USGBC certification. If the Installation chooses to seek USGBC certification of a project, it must use a separate funding source. See www.usgbc.org for project certification procedures and fees. PDT personnel may submit the project for certification, or contracts may include a requirement for the Contractor to obtain USGBC certification (funded by a separate line item in the bid schedule).

ARMY USGBC Certification Program - Certain projects may be selected by ACSIM/USACE for formal USGBC Certification each FY. If a project is selected for USGBC certification, the District PM will be notified of the requirement no later than issuance of the Code 3 Design Directive. If a project is included in this program, any associated fees for project registration and certification will be paid from project design or construction funds.

ACSIM Validation Program - The OACSIM may conduct reviews to validate project scores for the continued use of SPiRiT and to assess the effective implementation of LEED® for Army construction projects. A validation team will conduct these project reviews.

Documentation

Government-Validated Projects - Project documentation of Sustainable Design and Development credits must be: separable from other project documentation, consistent in content and level of detail to LEED® requirements, kept current throughout the project, and included in the project files.

- **AUDIT DOCUMENTATION.** The entity responsible for validation of projects may audit any or all credits claimed. The additional documentation that is required for audited credits is indicated in the LEED® 2.2 Documentation Requirements and Submittals Checklist.
- **USGBC CERTIFICATION PROJECTS.** Documentation for USGBC certification projects is the same as Government-validated projects, except that project information must be documented in LEED® Letter Templates using LEED®-Online, and, in the event of conflict, the USGBC submittal content requirements have precedence over the LEED® 2.2 Documentation Requirements and Submittals Checklist submittal content requirements. The Designer of Record and Contractor must support the certification process, including USGBC

Prescribed Reporting Points Documentation - At each prescribed reporting point, the USACE district-validated rating will be coordinated with and endorsed in writing by: the Installation Director of Public Works (DPW) or the Reserve Component equivalent; the USACE designated Center of Standardization (COS) if applicable; the designer; and the constructor as applicable. The endorsed LEED® Project Checklist (initialed or signed by all applicable parties) will be placed in the project files by the Project Manager.

Reporting

Project Manager Responsibility - The PM is responsible at all project phases for ensuring that a PDT consensus LEED® score is established, and for recording and reporting the results.

Prescribed Reporting Points - Formal documentation of the endorsed project rating is required at the following prescribed reporting points:

- **DESIGN-BID-BUILD (DBB) PROJECT PRESCRIBED REPORTING POINTS:**
 - Project Planning Charrette to set target Sustainable Design and Development (SDD) performance goals and address budget impacts
 - Parametric Submittal/Code 3 Design to revise target credits and score
 - Final Design to establish a final design score
 - Beneficial Occupancy /Construction Closeout to establish a final project score.
- **DESIGN-BUILD (DB) PROJECT PRESCRIBED REPORTING POINTS:**
 - Project Planning Charrette to set target SDD performance goals and address budget impacts
 - Parametric Submittal/Code 3 Design/Final RFP to revise target credits and score
 - Conformed Proposal. After negotiations are complete at award
 - Beneficial Occupancy/Construction Closeout to establish a final project score
- **PENDING RATING.** All projects have an assumed or current rating from initial programming charrette to closeout, when the project rating is finalized. The PM will report the current rating in and will not report the rating as “pending”.
- **REPORTING FOR EXEMPT PROJECTS.** For projects that are exempt from the minimum score requirements, provide narrative describing why the project is exempt from the minimum score requirement (example: horizontal construction).
- **REPORTING FOR PROJECTS WITH MULTIPLE BUILDINGS.** Projects with multiple buildings will be rated using the LEED®-NC Application Guide for Multiple Buildings and On-Campus Building Projects to obtain one project rating.
- **REPORTING FOR LEED ®-EXISTING BUILDING PROJECTS.**
- **REPORTING FOR LEED ®-NEIGHBORHOOD DEVELOPMENT PROJECTS.**

Multiple Building Projects

LEED® for Neighborhood Developments is currently in a Pilot phase under the direction of the U.S. Green Building Council. Fort Belvoir is registered under the pilot program

The LEED®-NC Application Guide for Multiple Buildings and On-Campus Building Projects, by USGBC, provides guidance on how to score projects that include multiple buildings. It includes direction on which credits must be earned individually by each building (such as Optimize Energy credits), and which credits may be calculated on an aggregate basis (such as Recycled Content credit). It also provides alternative compliance paths that are uniquely suited to an Army Installation environment, such as the option to provide a remote aggregate open space in lieu of an adjacent open space for the Maximize Open Space credit, and guidance on how to treat shared features, such as consolidated parking and central energy plants. PDTs will use this guide to apply LEED® to multiple-building projects and to simplify documentation. It is a free download at www.usgbc.org.

LEED®-EB Projects

Rating Tool Applicability - The LEED®-EB document itself provides guidance on when to use LEED®-EB and when to use LEED®-NC in the section titled "Guide to When to Use Each LEED® Product". For each major renovation and repair project governed by the Army LEED®-EB policy, PDTs will review this guidance and select the appropriate rating tool for the project accordingly.

Division of Responsibilities - LEED®-EB has many requirements that are related to building operation and maintenance that are outside the normal scope of design and construction. For all LEED®-EB projects, coordination with the Installation is critical to ensure understanding of and commitment to each party's responsibilities for the credits the project pursues.

Documentation - For LEED®-EB projects the Installation will have primary responsibility for documentation (except where a separate local agreement is made). The PM will furnish the Installation all documentation for the agreed-upon USACE responsibilities. The Installation will combine this with their data for a full LEED® documentation set. The PM will retain a copy of the USACE-developed documentation in the project file.

Initial Project Programming/Planning Charrette

LEED® Project Checklist - At the planning charrette, use LEED® to establish a strategy for meeting the sustainability goals for the project, identify all individual credits feasible to reach the goal, and ensure first costs associated with this strategy are captured in the DD Form 1391. The quality of this effort greatly influences the project's success in achieving Sustainable Design and Development (SDD) goals. The strategy will be captured on the LEED® Project Checklist.

Programming SDD Costs - Specific guidance for including sustainable design costs in 1391s is contained in April 27 2007 Deputy Assistant Secretary of the Army (Installations & Housing) memorandum "Sustainable Design and Development Policy Update- Life-Cycle Costs". Applicable guidance contained in the memorandum, beginning with the FY09 program, is as follows: "Under the primary facilities cost, a separate line item will be added labeled "SDD & EPA05" (under DD Form 1391 category code 00005). The cost will include the actual costs associated with achieving this policy. If the costs are undetermined at the time the DD Form 1391 is developed, they will be programmed at 2 percent of the primary facility cost (facilities with climate control systems only) until they are determined. When the costs exceed 2 percent, an explanation will be provided in the description of the proposed construction under block 10 of the DD Form 1391 describing the SDD, EPA05 and/or EO 13423 features (such as distributed generation systems including renewable systems, solar electric, solar lighting, geo (or ground coupled) thermal, wind turbines, biomass, as well as other generation systems such as fuel cell, cogeneration, or highly efficient alternatives) included in the design. For DD Forms 1391 with multiple primary facilities, the SDD & EPA05 primary line item will include sub-line items for each facility's SDD & EPA05 costs".

Endorsement, Reporting and Documentation - The LEED® Project Checklist representing the project strategy resulting from the planning charrette will be endorsed by the Installation DPW or the Reserve Component equivalent, the COS (if applicable), and the supporting Engineer District or Authorized Design and Construction Agent, and included in the project files.

Code 3 Design/Parametric Estimating Using ENG Form 3086

The Code 3 design provides project definition services and the 3086 estimate, which is used as a basis to validate and update the 1391 prior to submission to Congress. See UFC 3-710-01A "Code 3 Design with Parametric Estimating" for a detailed explanation of Code 3 activities.

LEED® Project Checklist - At the project definition charrette, use LEED® to refine and/or validate the target sustainability credit goals for the project identified in the planning charrette, and revise the target LEED® score, as needed.

Validating SDD Costs - Re-validate and update, if necessary, the cost data created during the Initial Project Programming/Planning Charrette.

Endorsement, Reporting and Documentation - The updated LEED® Project Checklist will be endorsed by the Installation DPW or the Reserve Component equivalent, the COS (if applicable); and the supporting Engineer District or Authorized Design and Construction Agent, and included in the project files.

COS Continuous Build Program Projects - As the transition of approved Standard Designs to 'Adapt-Build' advances, the credits each standard design always earns will be better defined. However, the building/site overall combined strategy coordination is still critical to reaching project goals, and the Code 3 activities are the same.

Design-Build (DB) Request for Proposal

General Strategy - Generally, the minimum score requirement is indicated and Offerors are given maximum latitude to develop the overall credit strategy, based on project opportunities and Offeror's experience and strengths. Individual required, preferred, and prohibited credits may be identified as needed, based on project-specific coordination, but should not be overly restrictive. The RFP conveys the status of credits that fall outside design scope (such as site selection credits) and includes coordination information relative to credits (such as availability of Installation recycling facilities). Appendix B contains sample language for RFPs. Include the following information:

- Minimum LEED® rating; Identification of any exempt buildings in the project
- The status of credits that are earned based on site selection, including Site Selection, Development Density, Brownfield, Alternative Transportation (mass transit access); Whether the project earns the Green Power credit (The RFP Preparer is responsible for providing all supporting documentation for these credits if earned.)

- For multiple building projects, use of USGBC LEED®-NC Application Guide for Multiple Buildings and On-Campus Building Projects for project scoring
- For LEED®-EB projects, identification of requirements that are the responsibility of others (the Installation)
- Coordination information relative to credits; Indication of required/preferred/prohibited credits (if any). (LEED® Project Credit Guidance, a modified version of Appendix A of this document, is an appendix document included in the MILCON Transformation RFP templates. Edit this appendix to indicate Installation credit preferences, if any, and include it as an appendix to the Statement of Work.)
- Owner's Project Requirements document for fundamental commissioning for each non-exempt facility type (The RFP Preparer is responsible for providing this document.)
- Indication of who will provide Commissioning Authority services
- USGBC registration/certification requirements, if any (If registration or certification is required, include who pays for it and who administers the online project. If registration is not required, allow Contractor the option to register the project and use online templates.)
- Post-award submittal and documentation requirements (Include the LEED® 2.2 Documentation Requirements and Submittals Checklist for LEED®-NC version 2.2 projects.)
- Requirement for Contractor to provide a LEED® AP assigned to the project
- Requirement for Performance Capability proposal that includes Contractor past LEED® experience, Contractor's plan, and internal monitoring system to meet LEED® requirements; Identification of key responsible personnel that includes the LEED® AP and Commissioning Authority as applicable
- Requirement for Technical proposal that includes LEED® Project Checklist indicating proposed credits to be earned

Conflicts - If the RFP includes mandatory or preferred floor plans or drawings, ensure that these drawings include the prerequisite recyclables storage areas. It is critical that the drawings do not conflict with any individual required credits (example – required views credit versus a floor plan that could not earn a views credit). The same is true of the RFP written design requirements. The RFP must not contain requirements that preclude the ability to earn any individual required LEED® credit or that, in aggregate, make meeting the overall score requirement not feasible. The RFP preparer is responsible for ensuring absence of these conflicts.

RFP Preparation Phase LEED Credit Documentation - Credit documentation from RFP preparation phase is a stand-alone submittal that is separable from other RFP preparation phase project documentation, and is combined with the final project LEED® documentation by the PM.

Design

DB Post Award Conference/DBB Pre-Design Conference

- Conference agenda shall include discussion of roles and responsibilities, goals and compliance requirements, coordination issues, discussion of possible problem areas, and review of documentation requirements relating to LEED®.

Design Documents - LEED® credit requirements shall be incorporated into drawings and specifications.

LEED® Supporting Documentation - Supporting documentation is a separable portion of Design Analysis provided with each required design submittal. Each design submittal shall include the LEED® Project Checklist, identifying all credits claimed. Final design submittal for each portion of the work shall include all required design documentation (as defined in LEED® Documentation Requirements and Submittals Checklist) for that portion of the work (example - all site credit design documentation with final site design).

Design Reviews and Credit Audits - The Design Agent and DPW shall review and comment on the design and the LEED® supporting documentation, and may audit individual credits where deemed necessary. Design review conferences shall include discussion and resolution of all review comments to ensure consensus on achieving credit requirements and satisfactory documentation.

Final Design Submittal - LEED® will be used at 100% project design to establish a final design interim score and rating. The Design Agent will validate and coordinate consensus on the final design LEED® score (including completeness and accuracy of supporting documentation) and satisfactory resolution of all review comments. For DBB projects, the PM will coordinate formal endorsement, reporting and filing of final design score.

Construction

Preconstruction Conference - Conference agenda shall include discussion of roles and responsibilities, goals and compliance requirements, coordination issues, discussion of possible problem areas, and review of documentation requirements relating to LEED®.

LEED® Supporting Documentation - Supporting documentation is a separable closeout submittal. Contractor shall update the documentation on at least a monthly basis, and make it available for review (on the job site at all times during construction) by the PM, Construction Agent, and DPW

Credit Audits - The Construction Agent and Installation will review the LEED® supporting documentation and may request additional audit documentation where deemed necessary.

Construction Agent - Construction Agent administration staff will be responsible for ensuring contractor compliance with contract requirements concerning sustainable design and development.

Beneficial Occupancy / Construction Closeout - LEED® will be used at Beneficial Occupancy/Construction Closeout to verify the final design LEED® score and establish a final LEED® project rating. The PDT (comprised of the Contractor, Installation, and Construction Agent as a minimum) will meet to reach a consensus on the final LEED® score. The Construction Agent will validate and coordinate consensus on the Contractor's final project LEED® score, including completeness and accuracy of supporting documentation and satisfactory resolution of all review comments. The PM will coordinate endorsement, reporting, and filing of the final project score. Conduct a pre-closeout LEED® meeting to review the documentation, request any credit audit documentation, and identify any corrections/missing items prior to the closeout LEED® submittal.

LEED®-EB Projects - For LEED®-EB projects, the activities indicated previously in BENEFICIAL OCCUPANCY/CONSTRUCTION CLOSEOUT establish an endorsed construction closeout rating and consensus on all USACE and USACE contractor responsibilities. The final project rating cannot be established until Installation post-construction activities are complete, and the Installation-determined performance period for those activities has transpired. When requested by the Installation, the PDT (Installation and Construction Agent as a minimum) will meet to reach a consensus on the final LEED® score. The PM will coordinate endorsement, reporting, and filing of the final project score.

Reference Resources

Glossary of Strategies

The U.S. Green Building Council (www.usgbc.org) - The U.S. Green Building Council (USGBC) is a non-profit organization composed of leaders from every sector of the building industry, working to promote buildings that are environmentally responsible, profitable and healthy places to live and work. The USGBC core purpose is to transform the way buildings and communities are designed, built, and operated to enable an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life. Its website provides access to detailed information on: the LEED® rating systems, LEED®-Online, case studies, LEED® credit interpretations, publications, newsletters and technical information for the following specific LEED® programs:

New Commercial Construction and Major Renovation Projects - LEED® for New Construction and Major Renovations (LEED®-NC) is a green building rating system that was designed to guide and distinguish high-performance commercial and institutional projects, with a focus on office buildings. Practitioners have also applied the system to K-12 schools, multi-unit residential buildings, manufacturing plants, laboratories, and many other building types.

Existing Building Operations and Maintenance - LEED® for Existing Buildings (LEED®-EB) maximizes operational efficiency while minimizing environmental impacts. It provides a recognized, performance-based benchmark for building owners and operators to measure operations, improvements, and maintenance on a consistent scale.

Commercial Interiors Projects - LEED® for Commercial Interiors (LEED®-CI) is the much anticipated green benchmark for the tenant improvement market. LEED® for Commercial Interiors gives the power to make sustainable choices to tenants and designers, who do not always have control over whole building operations. LEED® for Commercial Interiors is the recognized standard for certifying high-performance green interiors that are: healthy, productive places to work less costly to operate and maintain; and reduce environmental footprint.

Core and Shell Development Projects - The LEED® Green Building Rating System for Core and Shell Development (LEED®-CS) is for designers, builders, developers, and new building owners who address sustainable design for new core and shell construction. Broadly defined, core and shell construction covers base building elements, such as the structure, envelope, and building-level systems, such as central HVAC, etc. The LEED® for Core and Shell product recognizes that the division between owner and tenant responsibility for certain building elements varies between markets.

Homes - LEED® for Homes (LEED®-H) is a voluntary rating system that promotes the design and construction of high performance “green” homes. A green home uses less energy, water, and natural resources; creates less waste; and is healthier and more comfortable for the occupants. Benefits of a LEED® home include lower energy and water bills; reduced greenhouse gas emissions; and less exposure to mold, mildew, and other indoor toxins. The net cost of owning a LEED® home is comparable to that of owning a conventional home.

Neighborhood Development - The LEED® for Neighborhood Development Rating System (LEED®-ND) integrates the principles of smart growth, urbanism, and green building into the first national standard for neighborhood design. LEED® certification provides independent, third-party verification that a development’s location and design meet accepted high standards for environmentally responsible, sustainable, development. LEED® for Neighborhood Development is a collaboration between the U.S. Green Building Council, the Congress for the New Urbanism, and the Natural Resources Defense Council.

Guidelines for Multiple Buildings and On-Campus Building Projects - LEED® Multiple Buildings and On-Campus Building Projects provides direction in applying LEED®-NC to projects in a campus or multi-building setting, such as corporate campuses, college campuses, and government installations (i.e. a single owner or common property management and control). It is intended for projects where a) several buildings are constructed at once or in phases, or b) a single building is constructed in a setting of existing buildings with common ownership or planning with the ability to share amenities or common design features.

LEED® for Schools - LEED® for Schools recognizes the unique nature of the design and construction of K-12 schools. Based on LEED® for New Construction, it addresses issues such as classroom acoustics, master planning, mold prevention, and more. LEED® for Schools is currently open for member ballot, which is the final step in the LEED® development process. The rating system will officially launch after the ballot concludes.

LEED® for Retail - LEED® for Retail addresses the unique challenges and opportunities of implementing green building strategies into retail projects. USGBC is currently accepting applications for projects for participation in the pilot test of the guide. The pilot test will gather market feedback on the draft modifications to LEED®-NC v2.1/2.2, which include tailored credit language and alternative compliance paths as needed.

USGBC is also developing LEED® for Healthcare, and LEED® for Labs.

Organizations, Programs and Services

Engineering Knowledge Online - The Engineering Knowledge Online (EKO) Portal is currently maintained by the U.S. Army Corps of Engineers (USACE) as a service to all Army installation community members, and serves as the USACE Installation Support Community of Practice portal. From this site several Functional Areas are searchable, including master and regional planning, environmental and sustainable design, and water conservation. (<http://eko.usace.army.mil/>)

Construction Engineering Research Laboratory - The Construction Engineering Research Laboratory (CERL) is part of the U.S. Army Engineer Research and Development Center (USAERDC), which is the U.S. Army Corps of Engineers' integrated research and development (R&D) organization. CERL conducts research to support sustainable military installations. Research is directed toward increasing the Army's ability to more efficiently construct, operate, and maintain its installations, and to ensure environmental quality and safety at a reduced life-cycle cost. Excellent facilities support the Army's training, readiness, mobilization, and sustainability missions. Adequate infrastructure and realistic training lands are critical assets to installations, which serve as platforms to project the image of power worldwide. CERL also supports ERDC's R&D mission in civil works and military engineering. (www.cecer.army.mil)

Whole Building Design Guide - The WBDG is the only web-based portal providing government and industry practitioners with one-stop access to up-to-date information on a wide range of building-related guidance, criteria, and technology from a 'whole buildings' perspective. It is currently organized into three major categories: Design Guidance, Project Management, and Operations and Maintenance. At the heart of the WBDG are Resource Pages and reductive summaries on particular topics. (<http://www.wbdg.org>)

Development of the WBDG is a collaborative effort among federal agencies, private sector companies, non-profit organizations, and educational institutions. Its success depends on industry and government experts contributing their knowledge and experience to better serve the building community.

Charrette Guide for High Performance Projects - The US Office of Energy and Efficiency and Renewable Energy has developed a handbook for building owners, architects, and engineers to use in the charrette process, in order to save time and money by identifying and solving design problems before design and construction begin. A charrette is an intensive workshop in which various stakeholders and experts are brought together to address a particular design project. It is the mechanism that starts the communication process among the project team members, building users, and project management staff. A facilitated discussion allows the team to brainstorm solutions to meeting the building user's requests and the sustainability vision for the building design. (http://www.eere.energy.gov/buildings/highperformance/charrette_handbook.html)

Case Studies

Case studies can be a valuable resource for implementing concepts and lessons learned into future projects. (See Table 6.2.)

Table 6.2 - Case Study Resources

Decision Support Tool	Source	Web Link	Description
High Performance Buildings Database	US Department of Energy, Energy Efficiency and Renewable Energy, Building Technologies Program	http://www.eere.energy.gov/buildings/database/	Detailed database of 92 green building projects, all types
High Performance Federal Buildings Database	Federal Energy Management Program	http://www.eere.energy.gov/buildings/database	Detailed database of green building projects, federal only
Advanced Buildings Case Studies	Advanced Buildings Technologies and Practices	http://www.advancedbuildings.org/frames/fr_cs_gog.htm	Detailed database of sustainable buildings
Green Developments 2.0	Rocky Mountain Institute	http://www.rmi.org/sitepages/pid200.php	CD with case studies
Whole Building Design Guide Case Studies	Whole Building Design Guide	http://www.wbdg.org/references/casestudies.php	On-line database
Energy Building Investment Decision Support (eBIDS)	Carnegie-Mellon University Center for Building Performance and Diagnostics	http://cbpd.arc.cmu.edu/ebids/	Detailed case study information with ROI data
Sustainable Building Toolkit	California Integrated Waste Management Board	http://www.ciwmb.ca.gov/GreenBuilding/ToolKit.htm	Range of detail on cases
American Institute of Architects (AIA) Committee on the Environment (COTE) Top 10 Buildings	American Institute of Architects (AIA) Committee on the Environment (COTE)	http://aiatopten.org/hpb/	Descriptions of winners for each year to 2003, with some prior years
LEED Project Lists	United States Green Building Council	http://www.us-gbc.org/DisplayPage.aspx?CMSPageID=1452&	Detailed project information for a select few obtained. Only select few have detailed project information
Green Building Success Stories	Smart Communities Network	http://www.smartcommunities.ncat.org/buildings/gbsstoc.shtml	Project information through links to project-sponsored web sites
Sustainable Building Case Studies	California Integrated Waste Management Board	http://www.ciwmb.ca.gov/GreenBuilding/CaseStudies/default.htm#California	On-line listing, primarily cases in CA, but others as well; cover sheet with varying amounts of info, links to project websites
Green Globes	Green Building Initiative	http://www.thegbi.com/green-globes/casestudies.asp	Whole building rating tool; assessment protocol and design guide
Case Studies in Indoor Air Quality Multizone Analysis	National Institute for Standards and Testing (NIST)	http://www.bfrl.nist.gov/IAQanalysis/case%20studies/index.htm	Examples of how modeling software has been applied
Buildings Database	AdvancedBuildings.net	http://www.advancedbuildings.net/buildings.htm	Case studies with varying detail; links to other sites
North Carolina Green Building Technologies Database	North Carolina Solar Center	http://www.ncgreenbuilding.org/site/ncg/index.cfm?	Case studies with varying detail, all within North Carolina

Land Use Controls Implementation Plan

Summary

**SOLID WASTE MANAGEMENT UNIT M-26 INCLUDING FORMER ABOVEGROUND TEST
TANK SITE (FATTS) AND SOLID WASTE MANAGEMENT UNIT M-27**

**ENGINEER PROVING GROUND (FORT BELVOIR NORTH AREA (FBNA))
FORT BELVOIR, VIRGINIA
OCTOBER 2007**

1.0 Introduction

This Land Use Controls Implementation Plan (LUCIP) has been developed in accordance with Department of Defense Guidance on Land Use Controls Associated with Environmental Restoration Activities for Active Installations and the Environmental Protection Agency's Memorandum Land use in the CERCLA Remedy Selection Process. This LUCIP serves as an internal management tool for Fort Belvoir that explains the Land Use Controls (LUCs) that will be established and documented. This Plan also defines the responsible parties for maintaining and managing LUCs. This LUCIP has been prepared to implement LUCs at Solid Waste Management Unit (SWMU) M-26 Hydrocarbon Spill Area including the Former Aboveground Test Tanks Site (FATTS) and SWMU M-27 Waste Ordnance Pits at Range 1. Both M-26/FATTS and M-27 are located on the Engineer Proving Ground (EPG) parcel of Fort Belvoir. The locations of M-26/FATTS and M-27 within EPG are illustrated on Figure 1.

2.0 Land Use Controls

LUCs include any physical, legal, or administrative mechanism that places restrictions on the use of, or limits access to, real property to prevent exposure to contaminants above permissible levels. The intent of these controls is to protect the integrity of the engineering remedy and human health and the environment by limiting the activities that may occur at a particular site. This LUCIP requires Fort Belvoir to internally restrict the use of property at M-26/FATTS and M-27 located at EPG in accordance with the specified LUCs described herein.

The Fort Belvoir LUC maintenance process employs three main elements: 1) documentation of controls through the installation's Geographic Information System (GIS) and in the Real Property Master Plan, 2) maintenance of controls through a siting approval process, demarcation of the area (through physical markers or GIS), training and inspections, and 3) tracking, modifying and terminating the LUCs on the installation. Details about the LUC maintenance process are discussed below.

3.0 Land Use Control Implementaion

This LUCIP will be incorporated into Fort Belvoir's Real Property Master Plan. The areas of M-26/FATTS and M-27 included in the LUCIP are summarized in Table 1.

Site ID	Description	Remedy	Location	Land Use Controls	Figure
SWMU M-26/FATTS	Hydrocarbon Spill Area	Soil Removal Land Use Control Groundwater	Southern portion of EPG East	Groundwater restrictions	2
SWMU M-27	Waste Ordnance Pits at Range 1	UXO Removal Land Use Control Groundwater	Central Portion of EPG West on Range 1	Groundwater restrictions	3

The LUCs for M-26 /FATTS will include restrictions on any activities that could disturb the groundwater. Similarly, M27 LUCs will also include restrictions on any activities that could disturb the groundwater.

3.1 Documentation of Land Use Control. Because LUCs on active installations are not recorded in deeds, Fort Belvoir uses their own system and processes for recording LUCs. Fort Belvoir will incorporate LUCs into the existing land use planning and management system used for evaluating planning and construction projects. This LUC documentation is included in the installation's Geographic Information System (GIS), as well as this Real Property Master Plan, and in the Installation Real Property Offices.

As the LUCs are constantly being implemented and terminated, a stagnant list of areas of LUCs is not an effective management tool. For this reason, Fort Belvoir uses a layered process to ensure effective implementation of the LUCs through the planning and construction projects.

3.1.1 GIS. Fort Belvoir DPW maintains a GIS over 400 layers including but not limited to contours, utilities, natural resource areas, chemical release sites, and petroleum storage tank location. In addition to this data, Fort Belvoir GIS includes feature(s) to clearly indicate areas of LUCs. The layer will be named in accordance with the Spatial Data Standards as "land restriction area". Additionally all LUC documentation will be uploaded and maintained in the GID database. This allows for the most current data to be evaluated when planning and constructing.

3.1.2 Installation Master Plan. Incorporating the LUCs maintenance process into this Real Property Master Plan allows for routine consideration of LUCs in making land use and planning decisions. However, since the Master Plan is updated to include or remove LUCs as they are implemented or terminated, the process for LUC maintenance has been included for reference. All planning and construction projects need to refer to the installation's GIS system for the most current LUC data.

3.1.3 Installation Offices. Fort Belvoir DPW includes both the real property and environmental divisions of the installation. These divisions of the installation are both required to monitor the LUCs. Having these divisions of the installation collocated at DPW facilitates the monitoring of the LUCs from the real property and environmental aspects and allows for easier integration of the two elements of the LUCs.

3.2 Maintaining Land Use Controls.

3.2.1 Site Approval Process. All planning and construction projects at Fort Belvoir are required to seek site approval prior to construction. Fort Belvoir has a mechanism in place that is utilized to monitor LUCs. All work performed at Fort Belvoir involving ground disturbance requires site approval by DPW to ensure no LUCs are violated. Through this process DPW can assess the impacts of the construction projects on utilities, natural resources, chemical release sites, and in this case LUCs.

Prior to starting any construction at Fort Belvoir, a Dig Permit is required. During the dig permit approval process DPW evaluates if the project could impact, utilities, any historic structures or districts, natural resources such as wetlands or wildlife refuges among many others. In addition, DPW evaluates the past activities at the site including Solid Waste Management Units (SWMUs) and petroleum storage areas. The Dig Permit applicant is notified of any issues identified during the approval process and any required mitigation or avoidance.

Through these processes all planning and construction projects in the areas of M-26/FATTS and M-27 will be required to seek site approval prior to construction. In this manner all work performed at areas of M-26/FATTS and M-27 involving ground disturbance requires site approval by DPW (real property and environmental divisions) to ensure no LUCs are violated. Through this process Fort Belvoir can assess the impacts of the construction projects on utilities, natural resources, chemical release sites, and in this case LUCs.

3.2.2 Markers. Depending on the site, Fort Belvoir may install physical markers around the perimeter of sites involving LUCs. These markers will define the areas included in the LUCs. Appropriate construction offices will be notified of the existence of these markers. Marker locations will also be included into the LUC feature of the GIS and the LUCIP.

3.2.3 Inspections. Fort Belvoir incorporates inspection of areas included in LUCs into the routine inspection process to ensure proper maintenance of LUCs. Where groundwater restrictions are in place, Fort Belvoir inspects the area to ensure that no construction or well installation is located in the area included in the LUCs.

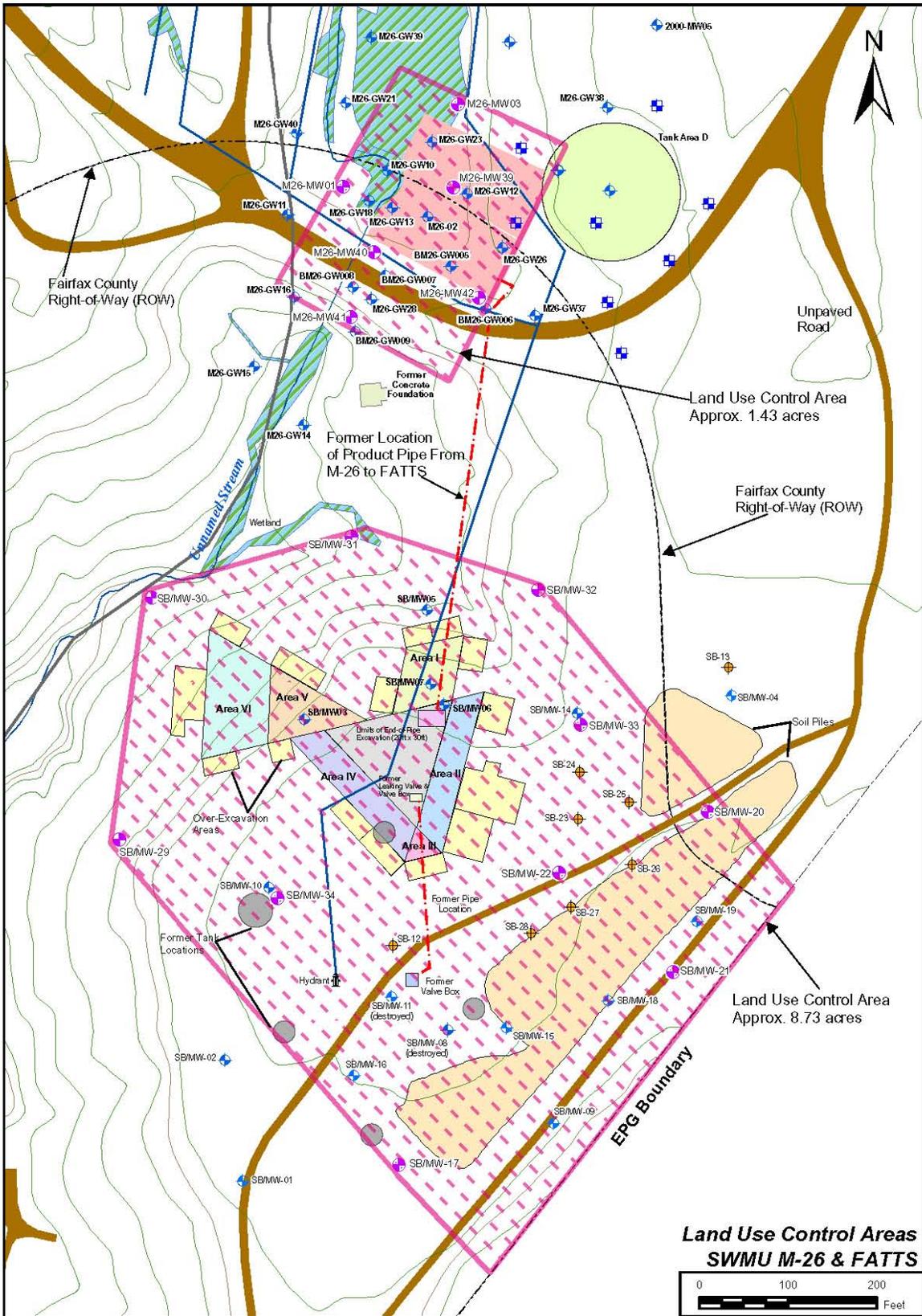
3.2.4 Training. Fort Belvoir provides training to personnel such as grounds, maintenance, and real property personnel regarding the physical location of the LUCs and how to care for the property subject to LUCs. Personnel are also informed of restricted activities.

3.2.5 Internal Notice. Fort Belvoir provides periodic notices of the LUCs. However, since Fort Belvoir DPW includes both the real property and environmental branches of the installation, internal notices are typically limited to within DPW.

3.2.6 Five Year Reviews and Remedial Actions. The environmental review process requires a five year evaluation of the remedies in place to determine the effectiveness of the remedy and to evaluate if additional or modification to the remedy in place is warranted. The effectiveness of the LUCs are also evaluated at the 5 year reoccurring review to determine if modification or termination is warranted.

3.3 Land Use Control Non-Compliance Monitoring. If during the installation inspection or through some other process it becomes apparent that a LUC is being violated, appropriate Environmental and Natural Resource Division (ENRD) and the real property installation officials are notified immediately. If the LUC violation results in exposure then the appropriate regulatory agency either EPA or DEQ, depending on the site, would also be notified. These officials take steps to ensure the integrity of the LUC is restored, including any required notifications and corrective actions.

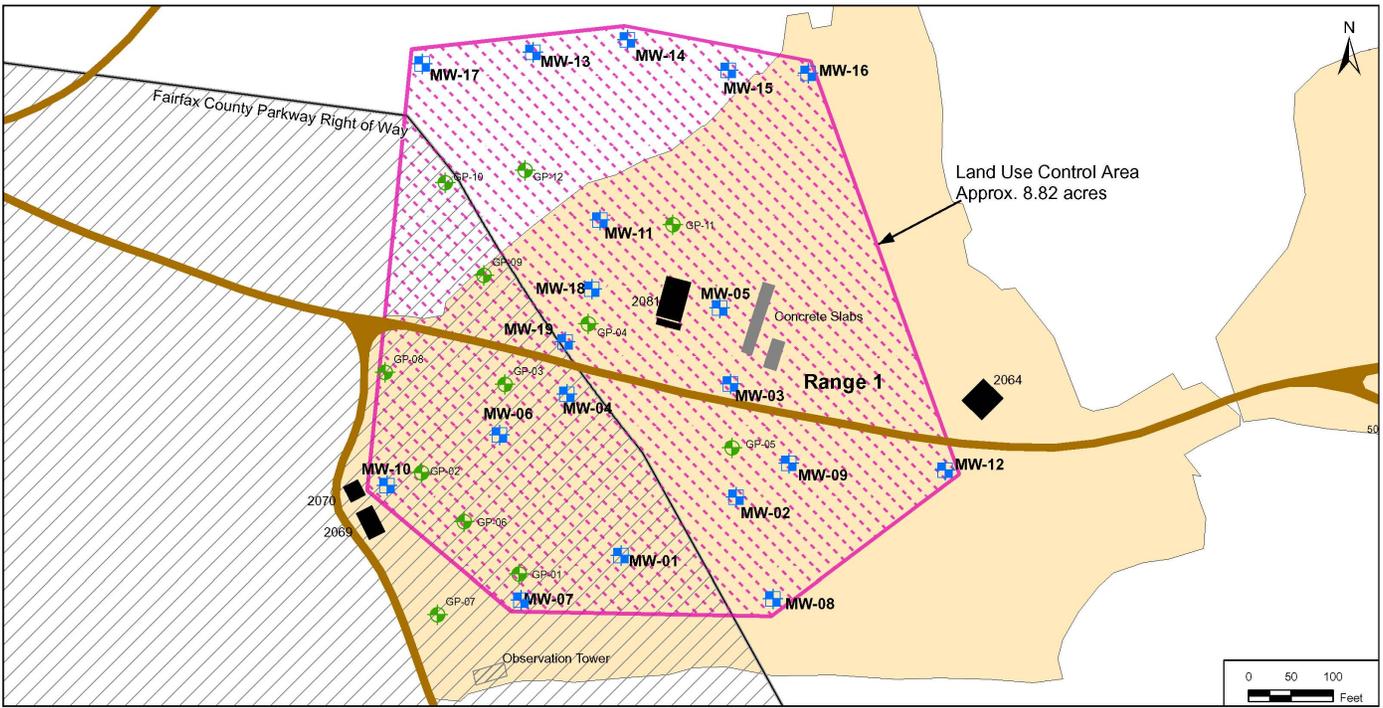
3.4 Land Use Compatibility. Use of and area subject to LUCs may change. Fort Belvoir ensures land use remains compatible with the LUCs. Fort Belvoir institutes a process to review and evaluate effect on human health and the environment of any proposed land use changes. If the land use change results in a change of risk assessment, adversely affects the effectiveness of the remedy or requires additional remedies, Fort Belvoir will consult with the appropriate regulatory authority including revisiting the decision document or equivalent, if necessary, to determine if an amendment is required for the proposed land use change.



LEGEND

- | | | | | |
|-----------------------|---------------|---------------------------------------|-------------------------|----------------------------|
| Unpaved Road | Contour 5ft | Former Pipe from SWMU M-26 | Historic Tank Location | Monitoring Wells |
| Soil Pile | Contour 10ft | Former Leaking Valve Box | Over Excavation Areas | Proposed Monitoring Wells |
| Former Valve Box | Water Line | Limits of M-26 End-of-Pipe Excavation | Earthen Berm/Tank Areas | Soil Borings |
| Phase I Excavation | Sanitary Line | Wetland | M-26 Excavation Area | Long Term Monitoring Wells |
| Land Use Control Area | | | | |





LEGEND

Long Term Monitoring Well	Fairfax County Parkway Right of Way	Unpaved Road
Other Existing Monitoring Well	Building	Concrete Slabs
Proposed Road	Land Use Control Area	

**Land Use Control Area
SWMU M-27**



Land Use Matrix

Extracted from
**Real Property Master Plan
Technical Manual**

United States Army

July 2007

B

Appendix

CLASS	FCG	Facility Category Group Description	UM	LAND USE CLUSTERS						
				Airfields	Ranges and Training	Industrial	Community	Professional/Institutional	Residential	Troop
P	F11110	RUNWAYS, FIXED WING	SY	A	N	N	N	N	N	N
D	F11120	RUNWAYS, ROTARY WING	SY	A	C	C	C	C	N	C
P	F11310	PARKING, FIXED WING AIRCRAFT	SY	A	N	N	N	N	N	N
P	F11320	PARKING, ROTARY WING AIRCRAFT	SY	A	C	N	C	N	N	N
P	F12100	AIRCRAFT FUELING FACILITIES	GM	A	C	N	C	N	N	N
P	F12200	MARINE FUELING FACILITIES	GM	N	N	A	N	N	N	N
P	F12300	VEHICLE FUELING FACILITIES	OL	A	N	A	N	N	N	A
P	F12460	MISC FUEL STORAGE	GA	A	N	A	N	N	N	A
D	F13115	INFORMATION SYSTEMS FACILITIES	SF	A	N	A	C	C	C	C
D	F13131	INFO PROC CTR	SF	A	N	A	C	C	C	C
D	F13135	PHOTO LAB	SF	N	N	A	N	C	N	C
P	F13185	PRINT PLANT	SF	N	N	A	N	N	N	N
P	F13300	NAVIGATION AIDS, BUILDINGS, AIR	SF	A	N	N	N	N	N	N
P	F13310	FLIGHT CONTROL TOWER	SF	A	N	N	N	N	N	N
P	F14110	OPERATIONS BUILDINGS, AIRFIELD	SF	A	N	N	N	N	N	N
P	F14112	AVIATION UNIT OPERATIONS BUILDINGS	SF	A	N	N	N	N	N	N
P	F14114	CIDC FACILITIES	SF	N	N	N	N	A	N	N
D	F14115	WEATHER STATION	SF	A	C	C	N	N	N	N
P	F14116	FORENSIC LAB	SF	C	C	A	N	A	N	N
P	F14121	MISSILE LAUNCHERS/STORAGE	SF	A	A	N	N	N	N	N
P	F14126	ANIMAL SHELTERS	SF	C	C	C	C	N	N	C
P	F14129	TRAINING AIDS SUPPORT CENTERS (TASC)	SF	N	A	A	N	N	N	A
D	F14161	EOC/SCIF FACILITIES	SF	C	N	C	N	A	N	C
P	F14175	INDUSTRIAL LAUNDRY	SF	N	N	A	N	N	N	N
D	F14182	HEADQUARTERS BUILDINGS, BRIGADE	SF	C	C	N	N	C	N	A
D	F14183	HEADQUARTERS BUILDINGS, BATTALION	SF	C	C	N	N	C	N	A
P	F14184	BATTALION HEADQUARTERS BUILDING TT	SF	C	A	N	N	C	N	C
D	F14185	HEADQUARTERS BUILDINGS, COMPANY	SF	C	C	N	N	C	N	A
P	F14186	COMPANY HEADQUARTERS TT	SF	C	A	N	N	C	N	C
P	F14187	BRIGADE HEADQUARTERS TT	SF	C	A	N	N	C	N	C
P	F14310	OPERATIONS BUILDINGS, SHIP	SF	C	C	A	N	C	N	C
P	F14962	CENTRAL WASH FACILITIES	EA	N	A	A	N	N	N	A
P	F15100	PIERS	SY	N	A	A	N	C	N	N
P	F15200	WHARFS	SY	N	A	A	N	C	N	N
P	F15500	SMALL CRAFT BERTHING	FB	N	A	A	N	C	N	N
P	F17115	BAND TRAINING FACILITIES	SF	N	N	C	C	C	N	C
D	F17120	GENERAL INSTRUCTION BUILDINGS	SF	C	C	C	C	A	N	C
D	F17121	FIRING RANGES, INDOOR	SF	N	A	A	N	N	N	C
P	F17125	PE TRAINING BUILDINGS	SF	N	N	N	N	A	N	N
P	F17131	COMPACT ITEM REPAIR INSTRUCTIONAL FACILITIES	SF	N	N	N	N	A	N	A
P	F17132	GENERAL ITEM REPAIR INSTRUCTIONAL FACILITIES	SF	N	N	N	N	A	N	A
P	F17133	VEHICLE MAINTENANCE INSTRUCTIONAL BUILDINGS	SF	N	N	C	N	A	N	A
D	F17134	AIRCRAFT MAINTENANCE INSTRUCTIONAL BUILDINGS	SF	C	N	C	N	A	N	A
P	F17135	LABORATORY INSTRUCTIONAL BUILDINGS	SF	N	N	C	N	A	N	A
P	F17136	AUTOMATION-AIDED INSTRUCTIONAL BUILDINGS	SF	N	N	C	N	A	N	A
P	F17137	MATERIAL HANDLING INSTRUCTIONAL BUILDINGS	SF	N	N	C	N	A	N	A
P	F17138	LIMITED USE INSTRUCTIONAL BUILDINGS	SF	N	N	C	N	A	N	A
D	F17140	TRAINING CENTERS—RESERVES	SF	C	N	A	N	N	N	A
D	F17142	TRAINING CENTERS—ARNG/USAR	SF	C	N	A	N	N	N	A
P	F17170	GAS CHAMBERS	SF	N	A	N	N	N	N	N
D	F17180	TRAINING CENTERS—NATIONAL GUARD	SF	C	N	A	N	N	N	A
D	F17200	SIMULATOR FACILITIES	SF	A	A	C	N	A	N	A
P	F17700	MANUEVER/TRAINING LAND—LIGHT	AC	N	A	N	N	N	N	N
P	F17720	MANUEVER/TRAINING LAND—HEAVY	AC	N	A	N	N	N	N	N
P	F17800	MISC RANGES	FP	N	A	N	N	N	N	N
P	F17801	RANGES RIFLE/MG ZERO	FP	N	A	N	N	N	N	N
P	F17802	FIELD FIRE RANGES	FP	N	A	N	N	N	N	N
P	F17804	RECORD FIRE RANGES	FP	N	A	N	N	N	N	N
P	F17807	NIGHT FIRE RANGES	FP	N	A	N	N	N	N	N
P	F17810	KNOWN DISTANCE (KD) RANGES	FP	N	A	N	N	N	N	N
P	F17811	SNIPER TRAINING RANGES	FP	N	A	N	N	N	N	N

A = Allowed
C = Conditional
N = Not Allowed
D = Dual-use
P = Primary

FCG INFORMATION				LAND USE CLUSTERS						
CLASS	FCG	Facility Category Group Description	UM	Airfields	Ranges and Training	Industrial	Community	Professional/ Institutional	Residential	Troop
P	F17816	BAYONET ASSAULT COURSE	LN	N	A	N	N	N	N	N
P	F17821	PISTOL QUALIFICATION COURSES	FP	N	A	N	N	N	N	N
P	F17831	MACHINE GUN QUALIFICATION RANGES	FP	N	A	N	N	N	N	N
P	F17834	FORTY MM (GRENADE) MACHINEGUN RANGES	FP	N	A	N	N	N	N	N
P	F17841	LIGHT ANTIARMOR WEAPONS RANGES	FP	N	A	N	N	N	N	N
P	F17844	HEAVY ANTIARMOR WEAPONS RANGES	FP	N	A	N	N	N	N	N
P	F17851	MORTAR SCALED RANGES	FP	N	A	N	N	N	N	N
P	F17852	MORTAR RANGES	FP	N	A	N	N	N	N	N
P	F17854	ARTILLERY SCALED RANGES	FP	N	A	N	N	N	N	N
P	F17855	ARTILLERY DIRECT RANGES	FP	N	A	N	N	N	N	N
P	F17856	ARTILLERY INDIRECT RANGES	FP	N	A	N	N	N	N	N
P	F17857	MLRS RANGES	FP	N	A	N	N	N	N	N
P	F17861	TANK GUNNERY RANGES (1.5-1.60), SCALED	FP	N	A	N	N	N	N	N
P	F17863	TANK GUNNERY RANGES, STATIONARY	LN	N	A	N	N	N	N	N
P	F17864	MULTIPURPOSE TRAINING RANGES	LN	N	A	N	N	N	N	N
P	F17866	MULTIPURPOSE RANGE COMPLEXES	LN	N	A	N	N	N	N	N
P	F17869	COMBAT ENGINEER VEHICLE RANGES	FP	N	A	N	N	N	N	N
P	F17871	AIR DEFENSE RANGES	FP	N	A	N	N	N	N	N
P	F17881	GRENADE RANGES NON-FIRING	FP	N	A	N	N	N	N	N
P	F17883	GRENADE RANGES LIVE	FP	N	A	N	N	N	N	N
P	F17884	GRENADE LAUNCHER RANGES	FP	N	A	N	N	N	N	N
P	F17885	DEMOLITION/FLAME RANGES	FP	N	A	N	N	N	N	N
P	F17886	HEAVY DEMOLITION RANGES	FP	N	A	N	N	N	N	N
P	F17888	ENGINEER QUALIFICATION RANGES	FP	N	A	N	N	N	N	N
P	F17891	INFILTRATION COURSES	LN	N	A	N	N	N	N	N
P	F17892	FIRE AND MOVEMENT RANGES	LN	N	A	N	N	N	N	N
P	F17893	SQUAD DEFENSE RANGES	FP	N	A	N	N	N	N	N
P	F17894	INFANTRY SQUAD BATTLE COURSES	LN	N	A	N	N	N	N	N
P	F17896	INFANTRY PLATOON BATTLE COURSES	FP	N	A	N	N	N	N	N
P	F17898	MOUT ASSAULT COURSES	FP	N	A	N	N	N	N	N
D	F17900	MISC TRAINING FACILITIES	EA	N	A	N	N	C	N	C
D	F17905	DIVING TANK	EA	N	A	N	N	C	N	C
P	F17910	AERIAL HARMONIZATION RANGES	EA	N	A	N	N	N	N	N
P	F17911	AERIAL GUNNERY RANGES	EA	N	A	N	N	N	N	N
P	F17913	AIR-GROUND RANGES	EA	N	A	N	N	N	N	N
P	F17950	CONF/OBSTACLE COURSE	EA	N	A	N	N	N	N	N
P	F17980	PARADE/DRILL FIELD	AC	N	N	N	A	N	N	A
P	F17981	FIRE FIGHT/RESCUE	EA	A	A	N	N	N	N	N
P	F17991	PERS/EQUIP DZ	AC	N	A	N	N	N	N	N
P	F17992	PE TRAINING FIELD	EA	C	A	N	A	C	A	A
P	F17995	MOUT FACILITIES (NON-LIVE FIRE)	EA	N	A	N	N	N	N	N
P	F17998	MISC TRAINING AREAS	AC	N	A	N	N	N	N	N
P	F21110	AIRCRAFT MAINTENANCE FACILITIES	SF	A	N	A	N	N	N	N
P	F21140	AIRCRAFT ENGINE TEST FACILITIES	SF	A	N	A	N	N	N	N
P	F21210	MISSILE, GUIDED, MAINTENANCE FACILITIES, DEPOT	SF	N	N	A	N	N	N	N
P	F21310	SHIP MAINTENANCE FACILITIES	SF	N	N	A	N	N	N	N
P	F21320	MARINE RAILWAY	SF	N	N	A	N	N	N	N
P	F21330	SHIP REPAIR SHOP	SF	N	N	A	N	N	N	N
P	F21335	SHIP REPAIR FAC	SF	N	N	A	N	N	N	N
P	F21406	VEHICLE MAINTENANCE TT	SF	N	A	N	N	N	N	N
P	F21407	ARNG MAINTENANCE FACILITIES	SF	C	N	A	N	N	N	A
P	F21409	ARMY RESERVE MAINTENANCE FACILITIES	SF	C	N	A	N	N	N	A
P	F21410	VEHICLE MAINTENANCE SHOPS	SF	C	N	A	N	N	N	A
P	F21440	DEPOT MAINTENANCE/REBUILD SHOPS	SF	C	N	A	N	N	N	C
P	F21500	DEPOT WEAPONS MAINTENANCE SHOPS	SF	C	C	A	N	N	N	N
P	F21512	WEAPON DEMIL DEPOT	SF	N	C	A	N	N	N	N
P	F21540	SPECIAL WEAPON DEPOT	SF	N	C	A	N	N	N	N
P	F21545	WEAPONS REPAIR FACILITIES	SF	N	C	A	N	N	N	N
P	F21600	DEPOT. AMMUNITION MAINTENANCE FACILITIES	SF	N	C	A	N	N	N	N
P	F21632	AMMO DEMO/MAINT	SF	N	C	A	N	N	N	N
P	F21670	AMMUNITION REPAIR, INSTALLATION	SF	N	C	A	N	N	N	N

A = Allowed
C = Conditional
N = Not Allowed
D = Dual-use
P = Primary

CLASS	FCG	Facility Category Group Description	UM	LAND USE CLUSTERS						
				Airfields	Ranges and Training	Industrial	Community	Professional/ Institutional	Residential	Troop
P	F21700	COMMUNICATIONS/ ELECTRONICS REPAIR SHOPS, DEPOT	SF	C	C	A	N	N	N	C
P	F21800	DOL/PROCURED ITEMS & EQUIPMENT MAINTENANCE SHOPS	SF	N	N	A	N	N	N	N
P	F21840	RAILROAD EQUIPMENT/ENGINE MAINTENANCE SHOP	SF	N	N	A	N	N	N	N
P	F21881	AIRBORNE EQUIPMENT/ PARACHUTE REPAIR SHOP	SF	N	N	A	N	N	N	N
P	F21885	VEHICLE MAINTENANCE DOL/DPW	SF	N	N	A	N	N	N	N
D	F21900	INSTALLATION MAINTENANCE/REPAIR FACILITIES	SF	C	N	A	C	C	C	C
P	F22100	AIRCRAFT PRODUCTION FACILITIES	SF	A	N	A	N	N	N	N
P	F22200	GUIDED MISSILE PRODUCTION FACILITIES	SF	N	C	A	N	N	N	N
P	F22400	TANK/AUTOMOTIVE PRODUCTION FACILITIES	SF	C	C	A	N	N	N	N
P	F22500	WEAPONS PRODUCTION FACILITIES	SF	C	C	A	N	N	N	N
P	F22600	AMMUNITION PRODUCTION FACILITIES	SF	C	C	A	N	N	N	N
D	F31000	RDT&E LABS	SF	C	C	A	N	C	N	N
D	F31060	MEDICAL RESEARCH LABS	SF	N	N	A	C	C	N	N
P	F31100	AIRCRAFT RDT&E FACILITIES	SF	A	C	A	N	N	N	N
P	F31200	MISSILE/SPACE RDT&E FACILITIES	SF	C	C	A	N	N	N	N
P	F31400	TANK/AUTOMOTIVE RDT&E FACILITIES	SF	C	C	A	N	N	N	N
P	F31500	WEAPONS/WEAPONS SYSTEMS RDT&E FACILITIES	SF	C	C	A	N	N	N	N
P	F31600	AMMUNITION RDT&E FACILITIES	SF	C	C	A	N	N	N	N
P	F31700	COMMUNICATION/ ELECTRONIC RDT&E FACILITIES	SF	C	C	A	N	A	N	N
P	F31800	PROPULSION RDT&E FACILITIES	SF	C	C	A	N	N	N	N
P	F39069	RDT&E RANGES	AC	N	A	N	N	N	N	N
P	F39080	RANGE FACILITIES, RDT&E	EA	N	A	N	N	N	N	N
P	F41100	BULK LIQUID FUEL STORAGE	BL	C	N	A	N	N	N	N
P	F41170	LUBRICANT STORAGE	BL	C	C	A	N	N	N	N
P	F42100	DEPOT AMMUNITION STORAGE	SF	C	C	A	N	N	N	N
P	F42200	INSTALLATION AMMUNITION STORAGE	SF	C	C	A	N	N	N	N
P	F42288	AMMO STORAGE OTHER THAN DEPOT OR UNIT	SF	C	C	A	N	N	N	N
P	F43100	DEPOT COLD STORAGE	SF	N	N	A	N	N	N	N
P	F43200	INSTALLATION COLD STORAGE	SF	N	N	A	N	N	N	N
P	F44100	ENCLOSED STORAGE, DEPOT	SF	N	N	A	N	N	N	N
P	F44130	HUMIDITY CONTROLLED STORAGE, DEPOT	SF	N	N	A	N	N	N	N
P	F44135	HAZARDOUS STORAGE, DEPOT	SF	C	N	A	N	N	N	N
P	F44180	COVERED STORAGE, DEPOT	SF	C	N	A	N	N	N	N
D	F44210	ENCLOSED STORAGE, INSTALLATION	SF	C	N	A	N	N	N	C
D	F44215	OXYGEN/ACETYL STORAGE	SF	C	N	A	N	N	N	C
P	F44222	COVERED STORAGE, INSTALLATION	SF	A	A	A	N	N	N	C
D	F44223	ARMS STORAGE-BN	SF	C	N	C	N	N	N	A
P	F44230	HUMIDITY CONTROLLED STORAGE, INSTALLATION	SF	C	N	A	N	N	N	C
P	F44288	ORGANIZATIONAL	SF	C	N	A	N	N	N	N
P	F51000	MEDICAL CENTERS/HOSPITALS	SF	N	N	N	A	A	N	N
P	F53020	MEDICAL LABORATORIES	SF	N	N	A	C	A	N	N
P	F53025	PHARMACY	SF	N	N	N	A	A	C	C
P	F53030	MORGUES	SF	C	N	A	N	A	N	N
P	F53040	VETERINARY FACILITIES	SF	C	N	A	A	A	N	N
P	F53060	MEDICAL WAREHOUSES	SF	C	N	A	N	C	N	N
P	F53080	FISHER HOUSES	SF	N	N	N	A	A	C	N
P	F54000	DENTAL FACILITIES	SF	N	N	N	A	A	A	A
P	F55000	DISPENSARIES AND CLINICS	SF	A	A	A	A	A	A	A
D	F60000	ADMINISTRATIVE FACILITIES	SF	A	C	C	C	A	C	A
P	F7110F	FAMILY HOUSING, FAMILIES	FA	N	N	N	A	C	A	N
P	F7201P	ARMY LODGING, SPACES	SF	N	N	N	A	A	C	A
P	F7210P	UNACCOMPANIED PERSONNEL HOUSING, ENLISTED SPACES	SF	N	N	N	C	C	A	A
D	F7211P	ANNUAL TRAINING/MOBILIZATION BARRACKS SPACES	SP	C	A	N	C	C	N	C
P	F7213P	SPACES	SF	N	N	N	N	N	N	A
P	F7214P	SPACES	SF	N	N	N	N	C	N	A
P	F7217P	UNACCOMPANIED PERSONNEL HOUSING, SR NCO SPACES	SF	N	N	N	C	C	N	A
P	F7218P	BASIC TRAINING BARRACKS SPACES	SF	C	N	N	C	C	N	A
P	F72200	UNACCOMPANIED PERSONNEL HOUSING DINING FACILITIES	SF	C	N	N	A	A	N	A
P	F72212	DINING FACILITIES, TT	SF	C	A	N	C	C	N	C
P	F7240P	UNACCOMPANIED PERSONNEL HOUSING, OFFICER SPACES	SP	C	N	N	C	C	A	N
P	F7242P	ANNUAL TRAINING OFFICERS QUARTERS, SPACES	SP	C	A	N	C	C	N	C

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FCG INFORMATION				LAND USE CLUSTERS						
CLASS	FCG	Facility Category Group Description	UM	Airfields	Ranges and Training	Industrial	Community	Professional/ Institutional	Residential	Troop
P	F73010	FIRE AND RESCUE FACILITIES	SF	A	A	A	A	A	A	A
P	F73015	CONFINEMENT FACILITIES	SF	C	N	A	N	N	N	N
P	F73016	POLICE/MP STATIONS	SF	C	N	A	A	A	N	N
P	F73017	RELIGIOUS FACILITIES	SF	N	N	N	A	A	A	A
P	F73018	RELIGIOUS EDUCATION FACILITIES	SF	N	N	N	A	A	A	C
P	F73028	DRUG COUNSELING FACILITIES	SF	N	N	C	A	A	C	C
P	F73030	LAUNDRY/ DRY CLEANING FACILITIES	SF	N	N	C	A	A	C	C
P	F73046	DEPENDENT SCHOOLS	SF	N	N	N	A	C	A	N
P	F73073	POSTAL FACILITIES	SF	N	N	N	A	A	A	C
P	F74003	NAF SALES OUTLET	SF	N	N	C	A	A	A	N
P	F74006	BANKS	SF	N	N	C	A	A	A	C
P	F74010	AUDITORIUMS, GENERAL PURPOSE	SF	N	N	N	A	A	A	A
P	F74011	BOWLING FACILITIES	SF	N	N	N	A	N	A	N
P	F74012	EATING FACILITIES NOT EXCHANGE MANAGED	SF	C	N	N	A	A	A	A
P	F74014	CHILD DEVELOPMENT CENTERS	SF	N	N	N	A	A	A	N
P	F74018	MWR CAR WASH	SF	N	N	C	A	C	A	N
P	F74020	MILITARY CLOTHING SALES	SF	N	N	C	A	C	A	N
P	F74021	COMMISSARIES	SF	N	N	N	A	C	N	N
P	F74022	NONAUTOMOTIVE SKILL CENTER FACILITIES	SF	N	N	C	A	N	A	N
P	F74023	CREDIT UNION	SF	N	N	N	A	A	A	C
P	F74024	AUTOMOTIVE SKILL CENTERS	SF	N	N	C	A	C	N	N
P	F74025	ARMY CONTINUING EDUCATION FACILITIES	SF	C	N	N	A	C	A	A
P	F74028	FITNESS FACILITIES	SF	C	N	N	A	C	A	A
P	F74033	COMMUNITY SERVICE CENTERS	SF	C	N	N	A	C	A	C
P	F74034	CONFERENCE CENTERS	SF	C	N	N	A	A	N	C
P	F74041	LIBRARY FACILITIES	SF	N	N	N	A	C	A	C
P	F74046	OPEN DINING FACILITIES	SF	C	N	N	A	C	A	C
D	F74051	EXCHANGE EATING FACILITIES	SF	C	N	N	A	A	A	C
D	F74052	EXCHANGE SERVICE STATIONS	SF	C	N	N	A	A	A	C
D	F74053	EXCHANGE RETAIL FACILITIES	SF	C	N	N	A	C	C	C
P	F74054	EXCHANGE SUPPORT FACILITIES	SF	C	N	A	C	C	N	N
P	F74055	EXCHANGE WAREHOUSE	SF	C	N	A	C	C	N	N
P	F74059	EXCHANGE CAR WASH	SF	C	N	N	A	C	A	N
P	F74065	REC EQUIPT CHECKOUT	SF	N	N	N	A	C	A	N
P	F74066	YOUTH SUPPORT FACILITIES	SF	N	N	N	A	C	A	N
P	F74068	RECREATION CENTER	SF	N	N	N	A	C	A	N
P	F74069	COMMUNITY FITNESS CENTER	SF	C	N	N	A	C	A	N
P	F74070	INDOOR RINKS	SF	C	N	N	A	C	A	N
P	F74072	INDOOR SWIM POOL	SF	N	N	N	A	C	A	N

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Transportation Management Plan

January 2008

Appendix C

Purpose

Travel Demand Management (TDM) is a series of demand side strategies designed to reduce traffic congestion. The purpose of this plan is to establish the policies, procedures, and infrastructure necessary for Fort Belvoir to meet their TDM goals.

The near-term goal for Fort Belvoir is a 10 percent reduction in Single Occupancy Vehicle (SOV) trips during peak hours as a result of TDM actions. This 10 percent goal correlates with the near-term period following the post-BRAC implementation phase. There is a broad range of TDM strategies widely used in Fairfax County and communities throughout the country. Fort Belvoir will need to use the full spectrum of these strategies to meet their TDM goals.

Summaries of TDM strategies, as set forth in the Federal Agency Transportation Management Program Handbook, are shown on the following pages, along with certain post-specific issues and observations. It is recommended that a comprehensive plan be developed on Fort Belvoir that uses all of these programs and strategies. An Employee Transportation Coordinator (ETC) would oversee the program and work with individual tenants on-post to apply programs to their offices. Another term for ETC is Transportation Demand Management Coordinator (TDMC), as referred to in the BRAC EIS for Fort Belvoir. The ETC would be responsible for implementing, promoting, monitoring, and evaluating a full range of TDM strategies as well as providing services such as pass sales, parking management, and the conduct of employee surveys. In addition, the ETC should represent Fort Belvoir's interests relative to transportation issues in dealing with various local, regional, and state agencies. This includes such things as negotiating with service providers for new or modified bus services, schedule changes, and bus stop locations and supporting improvements to the high occupancy vehicle (HOV) system to help bring about greater use of ridesharing.

Parking Management. Parking management is a set of strategies used to balance the supply and demand for parking. Parking management is one of the most powerful tools that can be used for modifying commute mode of choice. The decision of commuters to drive alone, carpool, vanpool, or use mass transit depends a great deal on the cost, availability, and the location of parking. Implementing a paid parking program can provide a major incentive to ridesharing, particularly when accompanied by discounts for carpool and vanpool vehicles.

Carpooling and Ride Matching. Carpool programs, or personalized ride matching, involves introducing and matching potential ridesharers. Most people are hesitant to rely solely on a match list and need help in approaching their ridesharing matches. In the case of ride matching, an ETC can serve an effective role in bringing the appropriate people together. Often, various forms of incentives are critical to the success of rideshare programs. One of the most significant incentives is to provide carpools with savings in travel time in comparison to SOVs. The provision of High Occupancy

Vehicle (HOV) lanes along with convenient access and egress are often critical to successful rideshare programs. Other incentives can include preferential parking locations and reduced-cost parking in cases where paid parking programs are put in place.

Vanpool Programs. Vanpooling can be an essential component of a Transportation Management Plan. It refers to an arrangement where several people (7-15) share the ride to work in a van. For the purpose of employer subsidies, a vanpool must have a seating capacity of at least six adults (not including the driver). At least 80 percent of the van mileage must be for the purposes of transporting employees between their residences and their place of employment, and on trips during which the number of employees transported is at least one-half of the adult seating capacity of such a vehicle (not including the driver). Vanpooling is most appropriate for employees who live at least 15 miles from the work place. The regional average trip length of vanpools is 29 miles. In the case of Fort Belvoir, commuters from locations such as Loudoun and Stafford Counties as well as portions of Prince William County are potential candidates for vanpooling.

Transit Services. Although transit usage varies greatly among metropolitan areas, a relatively small percentage of American commuters use public transit. Buses and rail transport could play a much larger role in our daily commute if more information were readily available regarding access and scheduling. Although traditional transit services cannot meet all transportation needs in a cost-effective manner, the ETC can help market transit services along with other transportation alternatives. Public transit is usually available in the form of bus and rail service, including regional park and ride services, express services, and limited stop services, as well as local community-based bus routes, shuttles, and circulators. A key to increasing utilization of transit services is to provide convenient access to and from the services that are provided. This includes services that come within convenient walking distance of major destinations and the provision of passenger amenities such as adequate walking paths and sheltered waiting areas. In cases where regional rail and bus services cannot efficiently be routed to provide direct access to major destinations, they must be supplemented by local shuttle and circulator services that can provide the needed access. Locations such as transfer centers need to be provided to accommodate coordination between the regional and local services.

Economic Incentives – Subsidies. Subsidies are beneficial in that they make driving in a single occupant vehicle less attractive and more costly than other transportation modes. Subsidies can significantly increase the average passenger occupancy and reduce trips, especially in conjunction with increases in parking prices. Providing subsidies works best when the solo drivers have to pay to park, while the ridesharers pay less and are therefore rewarded for choosing an alternative to driving alone.

Guaranteed Ride Home. A Guaranteed Ride Home (GRH) program is key in implementing a successful Transportation Management Plan (TMP). Many drivers are leery of utilizing ridesharing and transit because they think that they cannot get home when an unexpected emergency arises or if they have to suddenly work overtime. A GRH program guarantees the ridesharers and transit riders a ride home or to the emergency location (e.g., sick child at school). It takes the fear and anxiety out of ridesharing and public transit usage.

Bicycling/Walking. In many areas, weather conditions, the unavailability of bicycle routes, the lack of worksite showers and lockers, and the remoteness of the worksite make it difficult for walking and bicycling. Nevertheless, these modes can play a role in providing alternatives to SOV usage, even if only on a seasonal basis for some. An ETC can effectively promote these options by providing access to information and helping to ensure that on-site facilities are provided to support them. The ETC would encourage each tenant at Fort Belvoir to incorporate such facilities as part of the design process for new buildings or renovations of existing buildings.

Telecommuting/Teleworking. Telecommuting refers to the option of working at home or at an office close to home on a full (four to five times a week) or part time (once every other week to two to three days per week) basis. Although computers and other telecommunications technologies facilitate telecommuting, the telephone is still the most basic tool for working at an alternate location. A number of telecommuting centers have been established in the region to serve as remote offices for employees wanting to work near home rather than commute to a more distant worksite.

Alternate Work Schedules. Alternate work schedules allow the scheduling of work hours outside the normal 9:00 AM to 5:00 PM pattern. When utilized properly, these programs have the potential to benefit both employees and employers. Several demographic and economic changes have made alternate work schedule programs very palatable. These changes include: the increase in multiple worker families with multiple demands, a high incidence of single parents, and the need for flexibility on the part of a large, aging population. Alternate work schedules can help manage transportation demand in a number of ways. One is by allowing employees to work only four days per week or nine days in a two-week period, thus reducing the total number of commute trips. Another is to allow commuters to work earlier or later than the traditional peak period, thereby allowing them to commute during less congested time periods. While alternate work schedules are normally implemented on a voluntary basis, it may be necessary to mandate specific work schedule patterns in order to meet the long term transportation demand management goals.

Commuter Centers. A Commuter Center is a location where employees can get information about the available commuting options, and it provides personalized service to commuters from a prime location. The Commuter Center should not be defined as

being in the ticket selling business -- the Center is in the people business. In other words, the Center's focus should be customer service. Just as the GRH program eliminates the fear and anxiety of ridesharing and transit use, a well-implemented Commuter Center should eliminate the inconvenience of finding accurate and timely information and services needed by the ridesharers and transit patrons. A physical "bricks and mortar" Commuter Center should be supplemented by an appropriate internet site that provides on-line access to information, products, and services.

Existing TDM Plan

As an installation in the National Capital Region, Fort Belvoir is required to implement a TDM plan for the installation and its tenant agencies. Fort Belvoir does not currently have an ETC or a TDM office at this point.

The goal for parking on the installation for new facilities is to provide parking spaces for 60 percent of the total number of employees. However, as it currently occurs, many more than 60 percent of the employees drive alone to work, requiring many to park on the grass, on the side of roads, and in areas where buildings have been torn down.

A current TDM measure on Fort Belvoir is the use of transit subsidies allocated under a Federal Government program. This program has provided money to employees at Fort Belvoir for over five years to encourage transit use and carpooling.

Research performed by TransCore for Fort Belvoir in 2003 indicates that there is potential for reducing single occupancy vehicle demand with TDM strategies.

Surveys sent via email to all employees and residents of Fort Belvoir along with other surveys and anecdotal information suggest that the public transit percentage for Fort Belvoir employees is currently no more than two percent, with ridesharing accounting for somewhere in the range of five to ten percent.

For planning purposes, it is conservative to conclude that 85 percent of employees drive alone and that only two percent ride transit. (The remaining 13 percent includes those who are carpooling, walking, or using other modes of transportation.) To meet the 10 percent transit goal, this 85 percent must be reduced by approximately nine percent for an overall reduction of approximately eight percent.

Proposed Travel Demand Management Plan to Meet Goals. The purpose of this section is to set forth specific TDM measures to be implemented on Fort Belvoir as part of the overall Transportation Master Plan. Currently, 85 percent of Fort Belvoir employees drive alone. The short term (2015) and long term (2030) goals are for this percentage to drop to 77 percent and 51 percent, respectively. An active plan of policies, procedures, and new facilities is necessary to meet these goals.

Individual tenants on Fort Belvoir should be required to have a TDM program and plan. An outline of such a work plan is as follows:

- Strategy description/objectives
- Identification of transportation mode(s) impact by strategy
- Description of current and forecasted levels of participation
- Marketing plan
- Performance measures and monitoring procedures
- Budget
- Timetable
- Responsibilities and staff time allocation
- Priorities

Several measures can be accomplished with command support and an installation coordinator; the remaining goals require additional funding or implementation by local, state, or transit agencies.

Encourage and Require Carpooling, Ride Matching,

Vanpooling. A post-wide ETC with responsibility for the various ridesharing programs is necessary for the effective implementation of these strategies at Fort Belvoir. The ETC can help employees plan their ridesharing commute to and from work. Additionally, after such a program is implemented, it must be supervised by the coordinator so that the program is run efficiently and made readily available to all employees. The ETC actively promotes the advantages of carpooling and vanpooling as well as telecommuting and transit. The ETC must also provide a link to regional programs and resources supporting these systems and services.

To meet the long term 40 percent TDM goal, nearly as many employees will need to arrive via carpool or vanpools as driving alone. Additional HOV facilities will be needed to meet this goal. Particularly critical to the achievement of these goals is the provision of HOV access at I-95 and the Fairfax County Parkway to provide a connection from the HOV lanes to Fort Belvoir. This additional access will provide I-95 HOV facility users a connection to Fort Belvoir from the south via a new ramp to the Fairfax County Parkway. Carpool and vanpool commuters as well as express buses in the I-95 corridor will thus be able to access Fort Belvoir in the morning and be able to access the HOV lanes southbound in the afternoon. Actions to meet goals:

- Command emphasis and resources for Carpooling Coordinator;
- Active promotion and advertising program;
- Monitoring and incentive programs for tenant agencies.

Encourage Telecommuting and Telecommuting Centers

Telecommuting Centers are located throughout the Washington Metro area, and several are on the I-95 corridor in the vicinity of Fredericksburg and Woodbridge. This measure's implementation and application will need to be managed by individual agencies. Telecommuting and the use of commuter centers require managers to perform additional planning. Classified work and operations centers are more difficult to integrate. Actions to meet goals:

- Include telecommuting incentives and goals in overall TDM plan;
- Identification of agency or institutional barriers to telecommuting and the adoption of agency-specific policies.

Provide Alternate Work Schedules. Two alternate work schedule strategies should be used: compressed work week and flexible working hours. The compressed work week allows employees to have a day off each week or every two weeks in exchange for working longer hours on the other days of the week. Flexible working hours allow employees to alter their arrival and departure times to accommodate commuting schedules and to help reduce peak period congestion. Actions to meet goals:

- Identify institutional or agency barriers to alternate work schedules;
- Include alternate work schedule incentives and goals in the overall TDM plan.

Parking Management. Cost, availability, and location of parking will greatly influence mode choice. Parking Management balances the number of parking spaces relative to the availability of transit and other services. Part of the balancing effort might include the implementation of a paid parking program to use as an additional disincentive for SOV usage.

A Parking Cash Out program provides employees with a choice: receive a parking space or receive the cash equivalent of the space. This program is beneficial to employees because they can receive this money tax-free. It is beneficial to employers because of tax reductions (give money for transportation options rather than salary increase).

Clustered parking is a technique whereby parking spaces are limited and built in clusters, providing more space and paths for pedestrians. Related to this concept is the idea of providing preferential parking locations for carpoolers and vanpoolers. Actions to meet goals:

- Research Parking Cash Out program for DoD employees along with a general paid parking program;
- Require clustered parking and structured parking for new facilities on Post;
- Implement a preferential parking program for carpoolers and vanpoolers;
- Enforce current parking prohibitions.

Transit Services. Providing adequate transit options is one of the most essential parts of a successful TDM plan. Currently, the principal bus services to Fort Belvoir are along U.S. Route 1 and between the Post and the Franconia-Springfield Transportation Center.

To increase transit use, new routes connecting the Post to major concentrations of employees must be implemented. In addition, an efficient on-Post circulation system must be put in place, direct shuttles connecting Fort Belvoir to the regional rail transit network must be provided, and efficient collection and transfer points must be created.

Particularly critical among the new routes are services linking Fort Belvoir to the I-95 corridor in Prince William County and to western Fairfax County along the Route 50 and Fairfax County Parkway corridors. These are areas that have been identified in various studies and surveys as having major concentrations of Fort Belvoir employees, but with no or very poor transit connections to the Post.

Park and ride lots are located throughout Fairfax and Prince William Counties. Currently, these lots provide adequate bus and HOV service to high density centers such as the Pentagon and downtown District of Columbia. As Fort Belvoir becomes a high density employment center, it too needs to have efficient connections to these park and ride lots. The lots to be served should have direct service to Fort Belvoir, preferably with access to HOV lanes. As indicated above, in addition to these new services, there is also a need to connect Fort Belvoir to the regional rail system. This connection includes shuttles connecting the Post to both the Lorton VRE station and the Franconia-Springfield Transportation Center. To the extent possible, these shuttles should operate along dedicated rights-of-way and operate non-stop between the rail stations and various locations at Fort Belvoir. Reducing the amount of time required to travel between the rail stations and Fort Belvoir will make the existing rail lines a more attractive alternative and help the Post meet its TDM goals for non-SOV access. To accomplish this objective, multiple shuttle routes will be required in order to provide timely connections to each of the major employment centers within the Post.

These shuttles, as well as the new bus routes, must be supplemented by an efficient on-Post circulation system enabling transit riders to obtain direct access to major employment locations throughout Fort Belvoir. On-Post sites to be served include EPG, North Post, and both upper and lower South Post. The circulation system should include the establishment of convenient bus stop locations, passenger shelters, and a coordinated pedestrian trail system linking the stops to the various buildings on Post.

In order for the various services to be brought together and in order for the regional bus routes, the shuttles, and the on-Post circulation system to effectively serve the employees, some form of transit center must be developed. This center would provide a location for coordinated transfers to be made between services in a sheltered environment. In addition, the transit center would be equipped to provide real-time transit information to help encourage transit ridership. Actions to meet goals:

- Feasibility study of new regional bus routes to Fort Belvoir (in conjunction with WMATA, Fairfax Connector, PRTC, and VDOT);
- Improve bus facilities such as bus stops;
- Research policy and legal requirements for off-Post shuttle service;
- In conjunction with VDOT, WMATA, and Fairfax DOT, initiate feasibility studies for facilities shown in the following section.

Transit /HOV Facilities to meet TDM Concept. In order for ridesharing and transit to contribute to the meeting of the TDM concept goals, a number of facilities and other physical improvements will need to be implemented. This section provides additional detail on several of these needed improvements.

Express Bus Service on U.S. Route 1. The first phase of this service began in September 2004. It consists of new buses operating on a new route with less frequent stops. The Fairfax DOT/WMATA plan is to add features to the U.S. Route 1 corridor to help the buses avoid traffic congestion.

Bus Rapid Transit (BRT) related improvements on U.S. Route 1. Under this program, in order to further enhance bus service along Route 1, various roadway improvements will be made, including upgraded bus stops and queue jumpers. The buses will also be provided with signal prioritization.

Transit Transfer Station. A Fort Belvoir Transit Center needs to be established to provide a location for transfers among the various local and regional services and to serve as a possible terminus for the Route 1 BRT service. The center needs to provide for bus loading areas, sheltered passenger areas, and the provision of information and other passenger amenities.

Bus Rapid Transit to Franconia-Springfield Transportation Center. This project will be a joint effort with WMATA. The purpose of this project is to take advantage of the existing Fort Belvoir rail corridor that connects to the CSX corridor. This corridor will serve as a direct route for shuttle services between Fort Belvoir and the Franconia-Springfield Transportation Center. The implementation of direct shuttle service will greatly enhance the attractiveness of Metrorail and VRE services for Fort Belvoir commuters. While additional analysis will be required, it is likely that a connection between the Fort Belvoir rail corridor and Loisdale Drive will need to be constructed to provide access to Franconia-Springfield.

Lorton VRE Park & Ride. This project will provide additional parking at the Lorton VRE Station and will improve access from the VRE to Fort Belvoir. Current bus services between the Lorton VRE Station and Fort Belvoir are not fully coordinated in terms of the schedules, and they operate over local streets, thereby requiring additional time. Dedicated access from the VRE station would make the VRE line a commuter option that does not use U.S. Route 1 or other congested roadways. This long-term project is necessary to meet the demands of the six million square feet scenario.

I-95 High Occupancy Toll (HOT) Lanes/Park & Ride. Significant transit improvements along the I-95 corridor are anticipated in conjunction with the implementation of the I-95 HOT Lanes. While not fully defined at this time, Fort Belvoir needs to coordinate with this effort to ensure that its transit needs are considered.

Burke Park & Ride. This project is undefined; however, the concept includes possible new express bus routes that would serve Fort Belvoir from western Fairfax County, western Prince William County, and Loudoun County.

Franconia-Springfield Parkway (VA 7900) SOV Connection. This project would provide additional connectivity between I-95 and the Franconia-Springfield Parkway. It would add a north-to-west connection between these highway facilities, thereby improving access to the EPG site.

On-Post Shuttle System. An oft-cited reason for not utilizing transit and ridesharing is the need for a car during the day. The provision of an on-Post shuttle bus system that operates throughout the day can help address this issue. Such a system would provide employees a means of traveling from one building to another to attend meetings and would provide a means of access to nearby retail and restaurant facilities for lunch or lunchtime errands. The system should also connect to the local and regional bus routes during the day to help facilitate non-auto access to various regional destinations.

I-95 to FCP HOV connection. Access between the I-95 HOV lanes and the Fairfax County Parkway is essential for ridesharing and transit to Fort Belvoir to reach the levels needed for the Post to meet its TDM goals. This connection would allow ridesharers to access both EPG and Main Post from the I-95 HOV lanes and would provide incentives for new regional express bus routes that would not be forced to operate in the local lanes. An earlier study by VDOT confirmed the feasibility of this concept, but detailed plans need to be developed. Actions to meet goals:

- For projects already in the Constrained Long Range Plan and Washington Metropolitan Council of Governments (MwCOG) 2030 plan, Fort Belvoir needs to monitor these projects and support implementation. This pertains primarily to U.S. Route 1 improvements as well as the I-95 HOT Lanes project;
- For other projects, Fort Belvoir needs to partner with VDOT, Fairfax County DOT, and WMATA to add these projects to the MwCOG 2030 plan;
- Partner with VDOT or Fairfax DOT to conduct a feasibility study of an I-95 to FCP HOV connection.

Improve Bicycle and Pedestrian Accessibility. Although Fort Belvoir has an extensive network of recreational trails, there are currently no bicycle trails that consistently separate bicycles from traffic. The proposed regional bicycle corridor located along U.S. Route 1 will run through Fort Belvoir. It is hoped that in the future, the funded off-road shared-use path along Telegraph Road will be built and that a detailed plan for improved bicycle and pedestrian access throughout the Post will be developed and implemented.

Actions to meet goals:

- Implement the Fort Belvoir trails plan;
- Include bicycle facilities in all road reconstruction;
- Provide bicycle racks/lockers for commuters to secure their bicycles once they have reached their place of employment.

Monitor the Plan. Monitoring the progress of a TDM plan is crucial to improving performance, productivity, and controlling costs. A successful evaluation uses procedures such as surveys, studies, and detailed program reviews that help determine one or more of the following:

- Extent to which the program has achieved its stated objectives (e.g., increases in the average number of persons per vehicle);
- Extent to which the accomplishment of the objectives can be attributed to the TMP (direct and indirect effects);
- Degree of consistency of program implementation to plan (relationship of planned activities to actual activities);
- Relative effectiveness of different strategies (which ones worked, which did not, how well, etc.).

In order to meet these goals, active monitoring of the program by the ETC is crucial, with support at all levels of command. Monitoring activities should include such items as traffic and parking utilization counts, mode of access surveys, shuttle system ridership counts, and summaries of the number of employees taking part in various programs such as alternate work schedules, guaranteed ride home, etc.

There are minimal TDM measures currently being used on Fort Belvoir. The gradual implementation of simple TDM measures such as carpooling, telecommuting, and improved transit facilities, coupled with proper monitoring of a well-planned TDM strategy, will help the installation achieve its goals for reduced congestion.

Potential Storm Water Management Methods

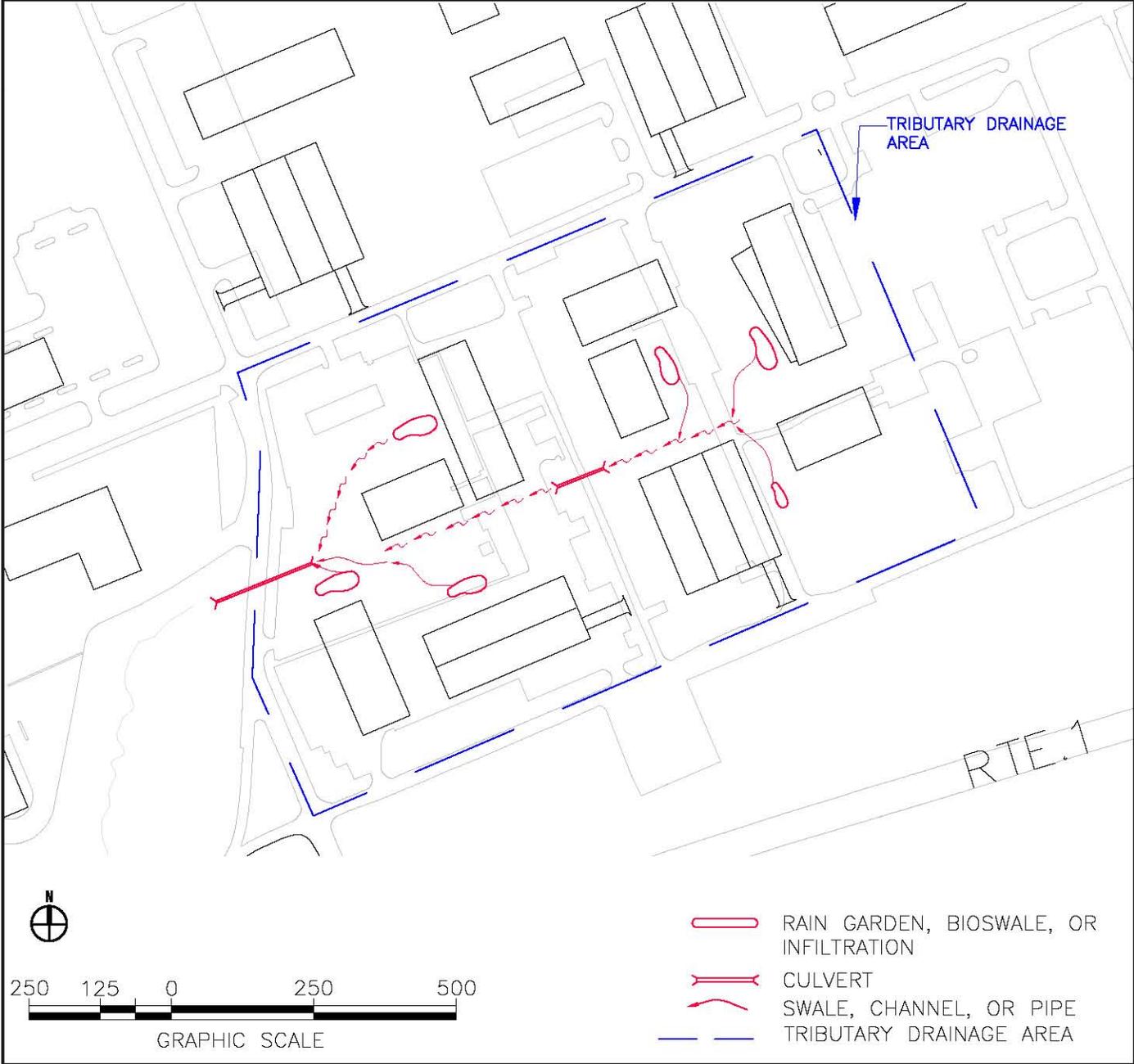
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Appendix D

Quality and quantity control may be provided in a single facility; such facilities typically must be sized to hold 1 to 1.5 inches depth of runoff over the tributary drainage area. A one acre site would need to provide 43560 SF/12 or 5400 cubic feet of volume. These facilities can be landscaped but are often viewed as undesirable due to both aesthetic and maintenance concerns. These facilities can be constructed for single buildings (Figure D-1); or for a group of buildings (Figure D-2). Large regional facilities to serve an entire watershed, as shown in Figure D-3, are an efficient means of providing storm water management; however this approach requires that all onsite drainage be sized for full anticipated development from any upstream areas. A major disadvantage to this approach is that such large facilities must usually be constructed in existing stream valleys, with potentially significant impacts on wetlands and Resource Protection Areas.

A second type of storm water management facility is broadly referred to as "Low Impact Design" (LID). These include methods such as bioswales, rain gardens, infiltration trenches, and green roofs. Their primary function is to reduce the amount of runoff or to slow runoff velocities they also retain water and release it at a slower rate. These typically do not have large storage capacity and may not be able to provide the required quantity storage, particularly in denser development. Figure D-4 illustrates a combination of LID facilities such as rain gardens, located near new buildings, with supplementary quantity storage. Drainage conveyance facilities (pipes or channels) between the developed areas and the quality and quantity control facilities must be designed to handle the full expected flow at each point.

Figure D-1- Possible Methods of Storm Water Quality and Quantity Control



For dense urban development, underground vaults (Figure D-5) may be required to provide storm runoff quality and quantity control facilities. These are costly to construct and maintain but may be the only method available to provide the required storm water control.

Location of storm water management facilities is a critical component in providing adequate quality and quantity control. Generally, facilities should be located near the downstream portion of the area which they serve, located so that runoff from at least two thirds of the area they serve can reach them. Quality control

facilities must be sized to treat the entire area which drains to them. As such, one quality control facility should not drain into a second quality control facility. Quantity control facilities, to some extent, can be oversized to provide storage for other adjacent areas which do not drain to them and may be provided in series.

Figure D-2- Possible Methods of Storm Water Quality and Quantity Control

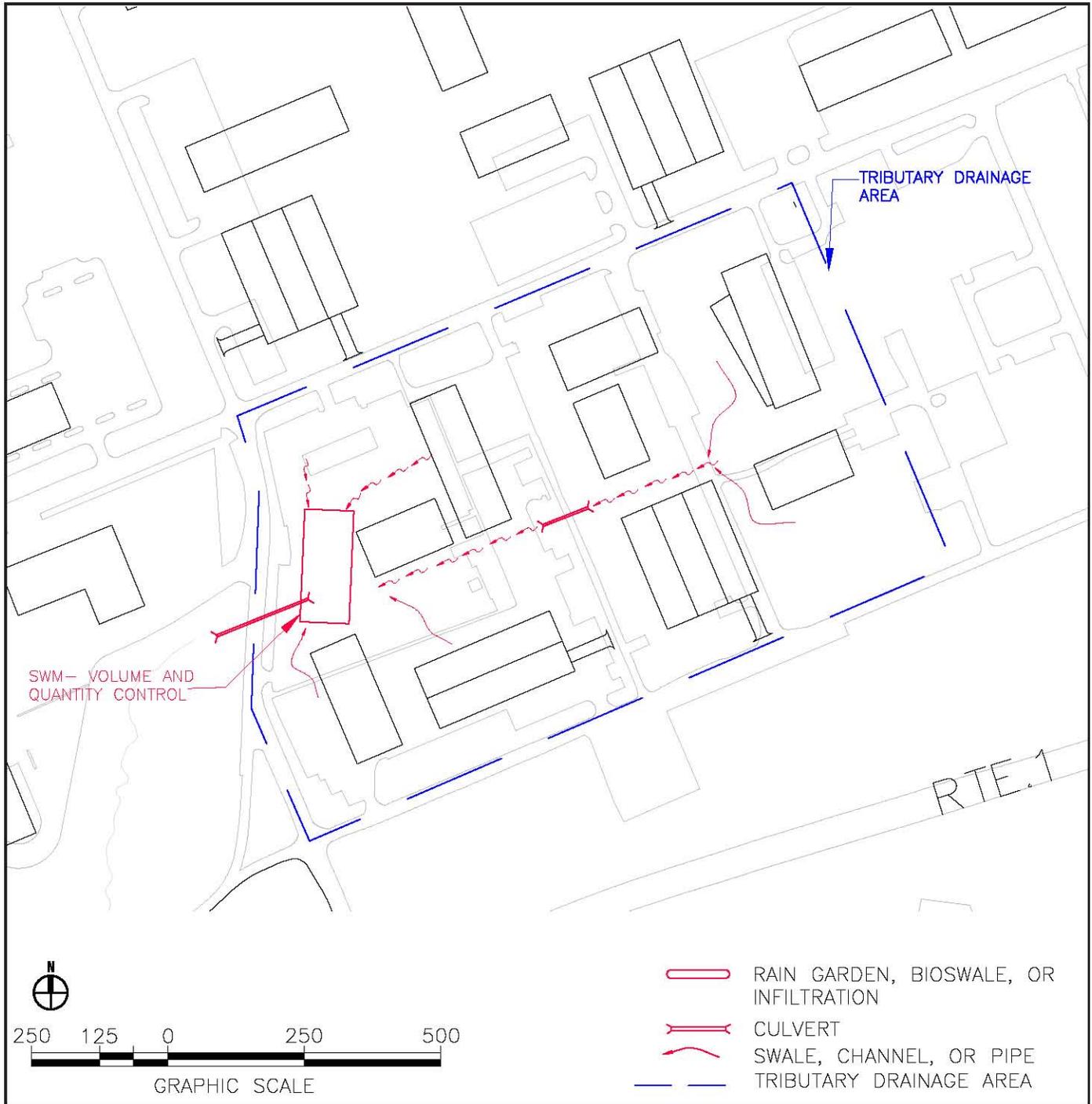


Figure 4.13- Possible Methods of Storm Water Quality and Quantity Control

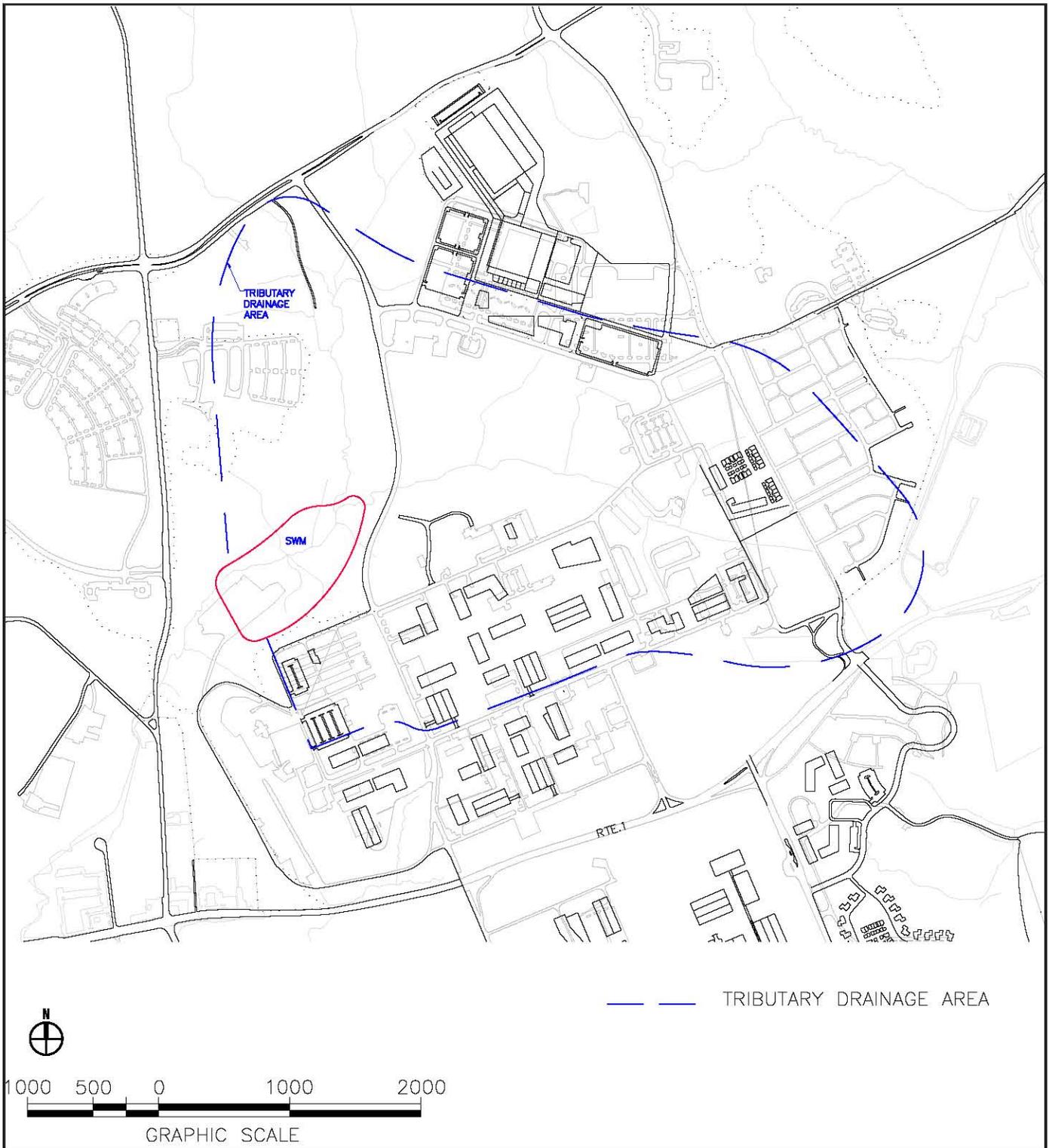


Figure 4.14- Possible Methods of Storm Water Quality and Quantity Control

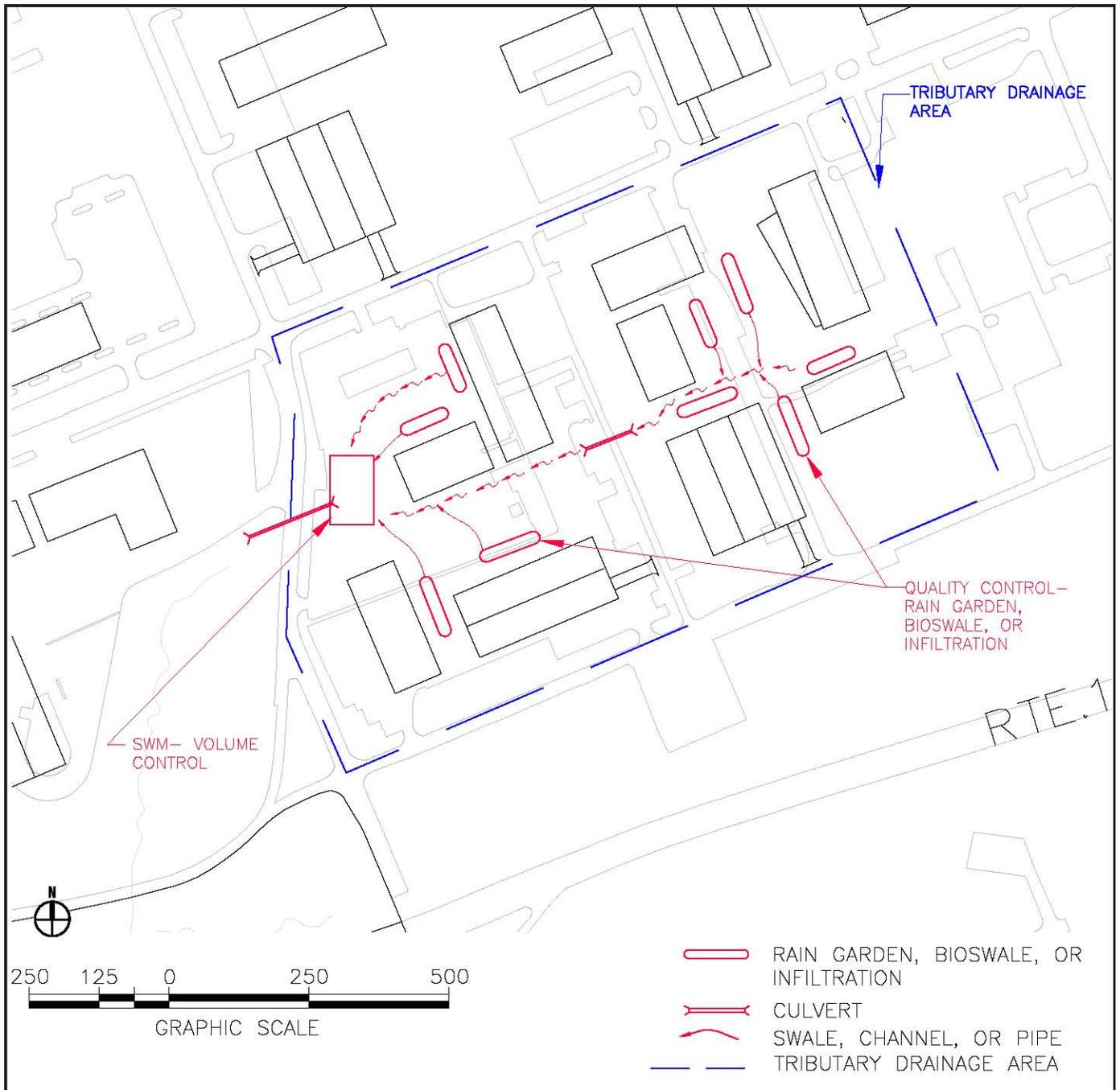


Figure 4.15- Possible Methods of Storm Water Quality and Quantity Control

