

Arlington National Cemetery

Southern Expansion Site – Viewshed Study and Impact Assessment

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Introduction

EAC/Archaeology, Inc. (EAC/A) prepared a viewshed study to identify the following for the Arlington National Cemetery (ANC) Southern Expansion Project: a preliminary Visual Area of Potential Effect (APE), historic resources within that preliminary Visual APE and vantage points for the evaluation of the visual impact of the proposed work. Following the acceptance of the Preferred Alternative, an Impact Assessment was made which is included in this report. This report documents the methodology and the results of this viewshed study, and presents the findings of the impact assessment. This report finds that there would be no adverse effects to any of the historic properties within the viewshed of the proposed work.

Study Purpose

As mandated by Congress, the Navy Annex/Federal Office Building 2 (FOB2) complex in Arlington County, Virginia, was transferred to the Secretary of the Army for use by the ANC. ANC proposes to increase its burial capacity and Arlington County, Virginia, proposes to increase its regional multimodal transportation capacity through land exchanges and roadway realignments in this area known as the Southern Expansion site. The Southern Expansion site involves approximately 60 acres, and encompasses the existing Air Force Memorial (AFM). The site is bound on the south by Interstate 395 (I-395), on the north by ANC, on the west by the Foxcroft Heights residential neighborhood and a VDOT maintenance yard, and on the east by the ramps connecting Columbia Pike to Route 27.

An Environmental Assessment is being prepared to evaluate alternatives for expansion and to consider potential effects of the expansion. One of the considerations is the effect of the expansion on historic resources which are protected under Section 106 of the National Historic Preservation Act of 1966 (NHPA). Section 106 of the NHPA outlines a historic preservation review process and requires Federal agencies to consider the effects of their projects on historic resources. Both direct and indirect effects to historic resources must be considered. The potential for the proposed Southern Expansion Site to affect the views to and from numerous historic resources prompted the need for a viewshed study and impact assessment.

The primary purpose of this study was to identify a Preliminary Visual APE, or the APE for Visual Effects. In general, the APE is defined in the regulations implementing the Section 106 review process as "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking" [36 CFR Part 800.16(d)].

The second purpose of this study was to identify all the properties listed on or eligible for listing on the National Register of Historic Places (NRHP) which are located within the Preliminary Visual APE, and hence may be visually affected by the project.

The final purpose was to examine the area within the APE for Visual Effects for the ANC Southern Expansion site. Digital images were taken from the proposed work areas outward to assess the impact of the planned work on historic properties within the boundary of ANC, and historic properties outside the boundary that are in view of the proposed work. Site visits were made on October 10 and 11, 2016.

Proposed Action

The Preferred Alternative involves roadway realignment, including closure of Southgate Road; roadway safety and operation; and cemetery development (**Figure 1**). This includes land transfers and realignment of roadways and ramps to increase burial capacity of the cemetery. Cemetery improvements would include supporting infrastructure such as water fountains, waterlines, sanitary sewer, storm drainage, underground electrical and communications/ information systems, landscaping, retaining walls, perimeter fencing, vehicle and pedestrian access roads and walks, and security systems. The number of burial spaces would balance the Cemetery's expected usage trends for above- and below-ground interment and inurnment spaces. The Proposed Action that may affect the Visual APE includes the following specific work:

- The re-alignment of Columbia Pike;
- The installation of a new access road for traffic to and from the Joint Base Myer-Henderson Hall at the western edge of the former Navy Annex site abutting the Foxcroft Heights neighborhood.
- The installation of cemetery improvements including supporting infrastructure such as water fountains, waterlines, sanitary sewer, storm drainage, underground electrical and communications/ information systems, landscaping, retaining walls, perimeter fencing, vehicle and pedestrian access roads and walks, and security systems.
- In installation of new burial spaces consisting of in-ground caskets, in-ground urns, and above-ground urns;
- The installation of an emergency access from existing Southgate Road into the western side of the property;
- The removal and relocation of Patton Drive and the boundary wall;
- The installation of two distinct roadway networks on each side of the Air Force Memorial;
- The installation of a pedestrian entry on the south side of the property;
- The installation of an eight-foot tall boundary wall required at the perimeter of the ANC;
- The expansion of the service complex area and the installation of a separate access for this;
- The movement of the Visitor Education Center eastward toward the Pentagon;
- And the installation of a vehicle and pedestrian entry from the southeast corner of the property.



Figure 1: Proposed Work at ANC Southern Expansion Site

The Preferred Alternative would affect historic resources. The boundary wall is a contributing element, including sections that have been modified in the past as well as more recently constructed sections. This includes the complete assembly of the masonry wall surmounted by a metal fence and three associated gates. By definition, any demolition of a contributing element would be considered an adverse effect, and require mitigation. While the entire length of the wall being removed should constitute an adverse effect, in this case the boundary wall is proposed to be relocated to reflect the expansion of the cemetery grounds. Therefore, the demolition of this section of wall - east of the South/Clayton Gate - is seen as a potential adverse effect. The details of the proposed boundary wall are yet to be developed, but should match the appearance and characteristics of the existing boundary wall. An eight-foot tall section with niches and columbaria is being considered.

Two of the gates within this section of the boundary wall proposed for removal are at the Service Complex. Although the removal of these gates should constitute an adverse effect, but in this case a new gate is proposed in the new boundary wall. Similar to the existing, the new gate would provide access to the cemetery, primarily for service vehicles, minimizing the adverse effect. Various gates are proposed along the new boundary wall for service vehicles, emergency access, and pedestrians. These gates are yet to be designed, but should reflect the characteristics of the existing gates.

At the existing boundary wall there are areas that currently serve as a retaining wall. In addition, there are also two segments of retaining walls independent of the boundary wall, along Patton Drive. With the removal and relocation of Patton Drive these retaining walls may no longer be required. The current diagram does not indicate how the grades would be altered to address these areas of change. These

changes would likely involve removal of historic resources and changes to the current contours, resulting in a potential adverse effect. The impact can be minimized if the expansion maintains the picturesque landscape of gently rolling hills following the natural contours.

Likewise, the removal of Patton Drive from Clayton Drive to the intersection with Eisenhower, would be an adverse effect. With its relocation to the south, however, it would continue to serve as the main road through this section of the cemetery, thus resulting in a potential adverse effect. Additional circulation roads are proposed to provide access to the expanded interment areas. These access roads shall be designed to match the other roads in the cemetery and be laid out to maintain the picturesque nature of the cemetery to prevent any adverse effect. The proposed expansion affects several roads outside the cemetery, the impact outside of the cemetery is not being evaluated for adverse effect since the focus of this report was limited to the existing boundary wall and adjacent features only. The scope of work for the cemetery expansion includes removal of Southgate Road and reconfiguring the outside roads such as Columbia Pike, South Joyce Street and the ramps connecting to South Washington Boulevard.

One additional alternative (Maintain Boundary Wall and Patton Drive in Current Location) was considered but eliminated from detailed analysis as it did not meet the purpose and need for the Proposed Action. This alternative would keep the historic southern boundary wall and Patton Drive in their current locations; the boundary wall and Patton Drive would not be deconstructed/removed. This alternative was considered but eliminated because it would not maximize burial space and would not allow for a seamless transition between ANC and the Southern Expansion.

Background

The Arlington National Cemetery was listed on the National Register under Criteria A, B, and C: under Criterion A for the “commemoration of our nation’s military;” under Criterion B for graves of important people that relate to the history of the country or region; and under Criterion C as a cemetery that reflects the “design characteristics associated with the picturesque/rural cemetery movements or the establishment of national cemeteries” and more specifically, design elements that reflect the influence of the McMillan Plan, the Commission of Fine Arts, and/or the City Beautiful Movement (Smith et al. 2014).

Methodology

The viewshed, also known as a line-of-sight map, is developed using cells in an elevation model (raster data) and observer points (vector data). A straight line is interpolated between the source (observer point) and every other cell within the elevation model. If the height of cells along this line exceeds the height at the source, the line of sight is interrupted.

High-resolution Digital Elevation Models (DEMs) were the primary tools used to conduct this study. DEMs derived from Light Detection and Ranging (LiDAR) sensors provide high-resolution, three-dimensional (3-D) geospatial data. This data provides a way to see urban areas in rich 3-D views and also supports automated extraction of urban features like buildings and trees.

Data Collection

Spatial data was collected from five sources. The most important dataset for this study was the LiDAR data obtained from the Army Geospatial Center of the US Army Corps of Engineers. This dataset covered the entire cemetery and much of the surrounding area at a one-meter resolution in UTM projection. Shapefiles representing trees and buildings derived from these data were also included in this package. Additional shapefiles, including sites and districts included in the National Register of Historic Places, were

obtained from the District of Columbia Open Data website, the National Park Service Integrated Resource Management Applications Portal, and the Arlington County, Virginia, geographic information system (GIS) data download portal. Finally, HNTB provided EAC/A with terrestrial LiDAR data collected which had been used to create a 3-D visualization fly-through. The information derived from this dataset provided a useful comparison with the current study, which derives its data from airborne LiDAR.

The Digital Elevation Model (DEM)

Building the DEM started with the one-meter-resolution bare earth model derived from the LiDAR data provided by the Army Geospatial Center. A bare earth DEM was generated to simulate the winter condition when trees are bare and the observer can see the furthest. Due to security concerns, rectangular and circular gaps in the LiDAR dataset replaced sensitive areas. These gaps were filled in with a DEM derived from two-foot (0.61-meter) contours for Washington DC retrieved from the District of Columbia Open Data website. Next, building shape and height data was added to the bare earth values, creating a DEM representing all of the ground topography and buildings of Arlington and Washington. The area in the immediate vicinity of the Southern Expansion was field checked to ensure that the building data was accurate.

Creating the Viewshed

The Preliminary Visual APE was developed in four steps. The first step utilized the Viewshed analysis tool, an ability of many GIS platforms to calculate visibility of two given points on the surface of a DEM. Two separate visibility areas were calculated using the Visibility Tool and the Observer Points Tool in the Spatial Analyst extension of ArcGIS Desktop 10.3. The first viewshed was calculated using a four observer points in the highest, most visible parts of the Southern Expansion Site, identifying every one-meter-square area an individual standing at that point could see, or outward visibility. The second calculation identified all areas from which an individual could see these four points in the Southern Expansion Site, or inward visibility. All visibility measurements in this report also factored in an observer height offset of 1.75 meters (5.7 feet), the height of an average person, and corrections for earth curvature and light refraction. These two visibility areas (inward and outward), kept separate for the various analyses conducted throughout this report, comprise together the Preliminary Visual APE.

Both inward and outward visibility areas, which included all areas visible to and from the Southern Expansion Site, contained points as far away as four miles (**Figure 2**). The wedge shape of the Visual APE, facing to the north and east is due mainly to anthropogenic features in the vicinity rather than the natural topography of the Arlington Hills. Much more of the Preliminary Visual APE is on the Washington side of the Potomac than on the Arlington side.

Views to the west are substantially obstructed by the Sheraton Hotel and the Foxcroft Heights neighborhood; and views to the south are blocked by buildings and towers immediately to the south and in Pentagon City. This was a fact observed both in the digital modelling and in the field. The Sheraton Hotel and the Foxcroft Heights neighborhood block any view to the west from the whole of the plateau (**Figure 3**). Buildings and towers immediately to the south block the view towards Pentagon City, although some of the skyline is still visible to the southeast (**Figure 4**). Given the elevation of the Southern Expansion and the lack of vegetation in the model, this was expected. However, seeing something on a clear day in winter and the ability to process and interpret what one is seeing are two different things. Therefore, both the inward and outward visibility areas were refined.

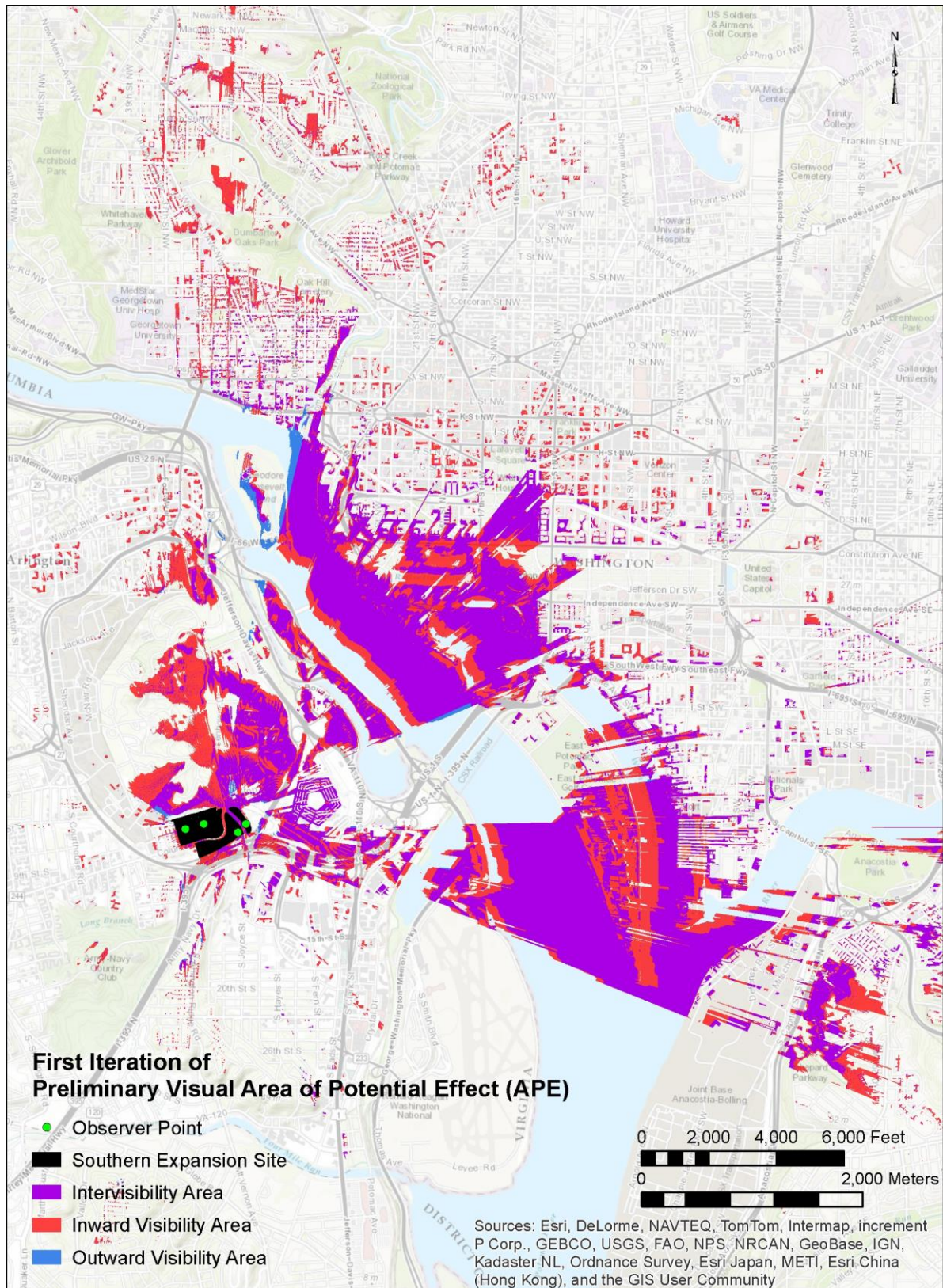


Figure 2: First Iteration of Preliminary Visual APE



Figure 3: View from Promontory on Southern Expansion Site to West



Figure 4: View from Promontory on Southern Expansion Site to Southwest

Visual APE – Inward Visibility Area

The inward visibility area was reduced to account for acuity of vision. Acuity of vision is the ability of an individual to discern visual details (NDT Resource Center 2014). Visual acuity is dependent on a number of optical and neural factors, but normal visual acuity is usually defined as 20/20. Normal vision implies that at 20 feet (6 meters), a human eye is able to discern separate contours which are 1.75 mm apart. This translates to the discernment of details separated by a visual angle of one arc minute (or 1/60th of a degree), projected across the retina of the eye. Visual resolution, or the smallest number of visual degrees an eye can detect, can be derived from visual acuity. Visual acuity was used to calculate a visual resolution angle in the following formulae:

$$\text{Visual Resolution (in degrees)} = (1 / \text{Visual Acuity}) \times (1 / 60)$$

1 / Visual Acuity indicates how many arc minutes the human eye can detect. The multiplication by 1/60 converts the number from arc minutes into degrees. Visual acuity here is interpreted as normal 20/20 vision (which equals 1 arc minute), so

$$\text{Visual Resolution} = (1 \times (20/20)) \times (1/60) = 0.0167 \text{ degrees}$$

Visual resolution was then used to calculate the smallest objects discernable from various distances using the following formula:

$$\text{Smallest Object Discernable} = 2 \times d \times \text{TAN}(r / 2)$$

where d = the distance between the eye and the object;
and r = the visual resolution in degrees.

This formula essentially bisects the angle of vision which creates a right triangle, making it easy to determine the maximum length or width of a particular object at a given distance (NDT Resource Center 2014; **Figure 5, this report**).

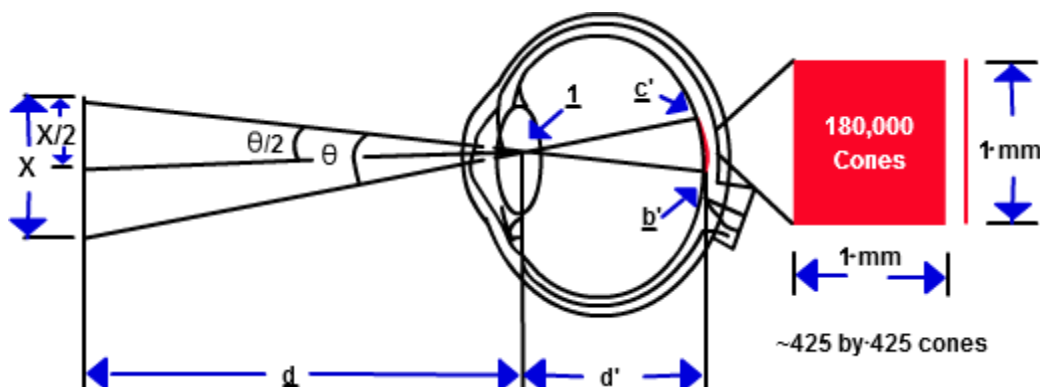


Figure 5: Diagram of formula for smallest object discernable, where x = the height of the object, d = distance, and θ = visual resolution in degrees (NDT Resource Center 2014)

Distances based on the height on an object were calculated for the visual resolution of a person with normal (20/20) vision (**Table 1**). These distances were considered when establishing the limit of the inward visibility area.

Table 1: Visual Resolution for 20/20 Vision

Distance	Smallest Size Object Discernable
1 mile (5280 feet)	1.53589 feet
1.5 miles (7920 feet)	2.30844 feet
2 miles (10560 feet)	3.07178 feet
2.5 miles (13200 feet)	3.839732 feet

The sight of head stones is fundamental to visually processing and understanding the cemetery from afar. According to the website of the National Cemetery Administration, the height of the headstones at ANC is 26 inches (Army National Cemeteries Program 2012). Thus, the threshold of visual perception was set at 1.5 miles, and all visible areas beyond this threshold were removed from the inward visibility area.

A third step involved the removal of all residual visible areas, classified as isolated visible areas ("spots") which are less than 50 square meters in size, from the Preliminary Visual APE. If these areas were not obscured by vegetation, weather, or other factors, they would still be difficult to interpret. As such, these small patches of visible area were considered secondary in importance to larger, contiguous areas of visible terrain. The remaining area after these steps were taken is the finalized inward visibility area for the Preliminary Visual APE (**Figure 6**).

Visual APE – Outward Visibility Area

The concept of visual acuity was more difficult to apply when looking outward because of the variation in the sizes of object being viewed. Therefore, a more nuanced approach comparing modeled lines of sight with actual photographs was used to refine the outward visibility area. An observer standing on the promontory of the Southern Expansion Site looking outward toward Washington would experience too many obstructions to fully appreciate and comprehend every element of the historic cityscape. Buildings, vegetation, construction work, as well as other factors on any given day have the potential to obscure parts of the historic city that may be fundamentally important to individual interpretations. Further refining the Visual APE to reflect these possibilities was accomplished by evaluating sample lines of sight to consider the individual standing on the Southern Expansion Site looking outward. Four sample lines of sight were used to document the visibility from certain vantage points within the Southern Expansion Site. These lines of sight were also photographed in the field to demonstrate the visibility of prominent features noted in the digital modeling.

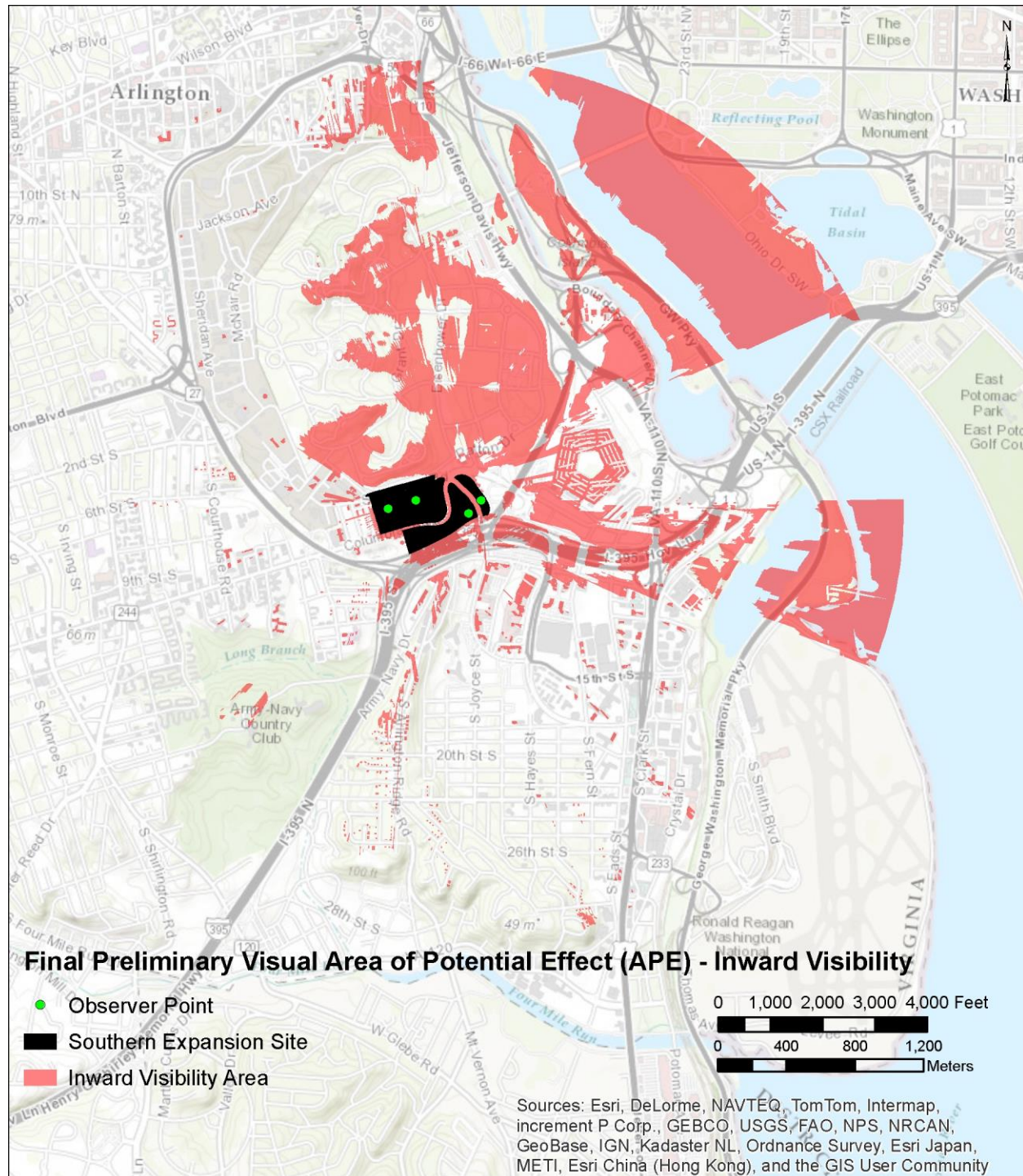


Figure 6: Final Preliminary Visual APE – Inward Visibility

The first line of sight originated from the highest vantage point of the Southern Expansion Site looking to the north (**Figures 7 and 8**). The first line of sight overlooks a large part of the ANC to the north, although the view is currently obscured by vegetation making only small areas of the southern slope of the cemetery visible. A line of sight analysis indicates that without vegetation, Theodore Roosevelt Island and the Waterfront Center in Georgetown would be visible. In this case, the sight line does not seem feasible given the amount of vegetation throughout the cemetery. Even during the winter months, the ability to see over the entire length of the ANC would be hindered or interfered with by the thick patch of branches. Numerous photographs taken during the field visit confirm that any views from the north side of the main parcel would likely be obstructed at any point during the year. Therefore, Theodore Roosevelt Island and all areas north were removed from the outward visibility area of the Preliminary Visual APE.



Figure 7: View from High Point on Southern Expansion Site Facing North (Line of Sight 1)

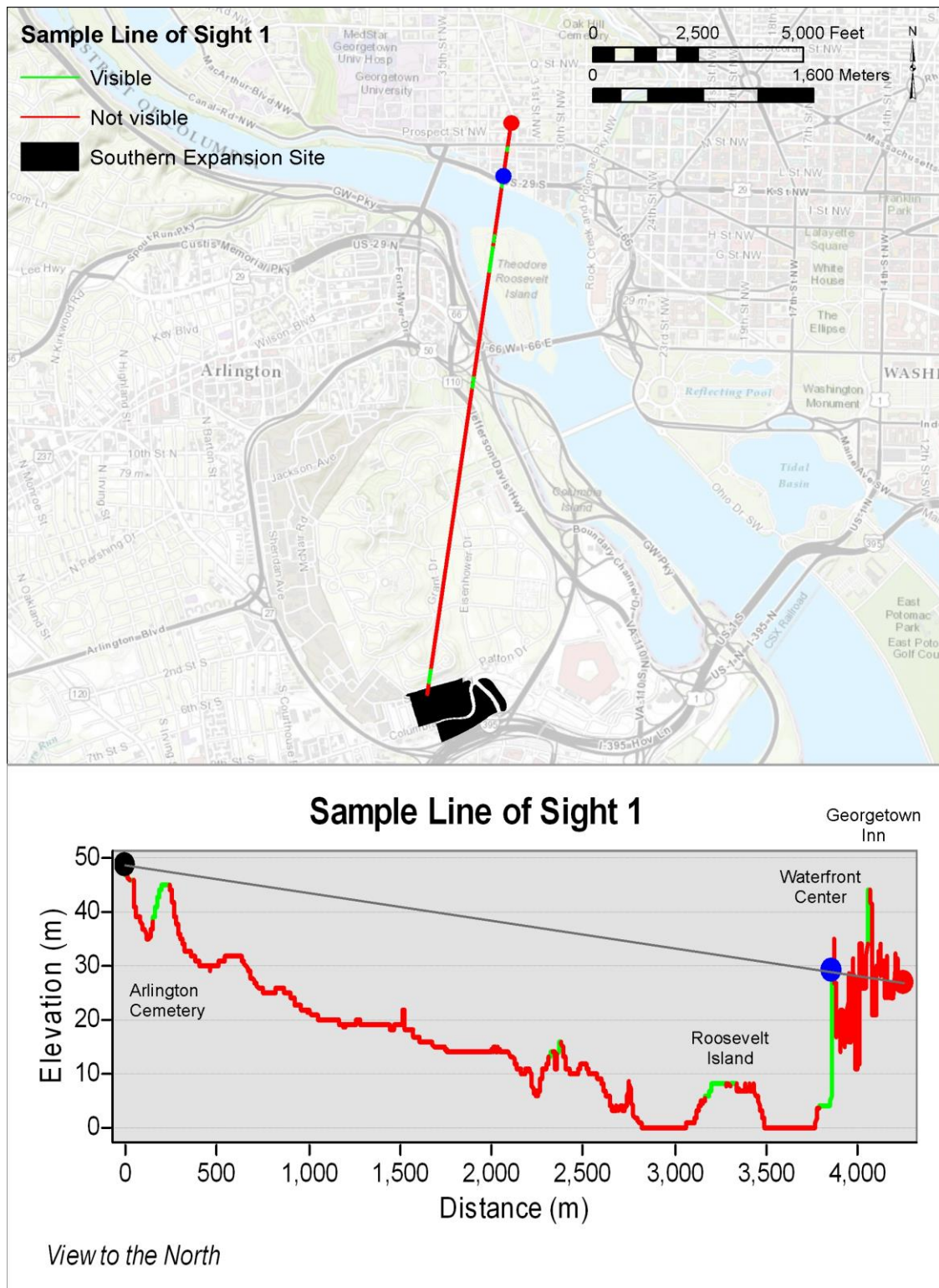


Figure 8: Sample Line of Sight 1

The second line of sight originated from the promontory at the east side of the plateau, looking to the northeast (**Figures 9 and 10**). Much more of Washington was visible in the second line of sight. From the eastern promontory of the Southern Expansion Site, there was an excellent view over the cemetery all the way to its edge as the terrain slopes down into the Potomac River. Although the river itself was not visible during the field visit, it is expected that it could be in the winter months. The sight line then extends across the opposite bank of the Potomac, Independence Avenue, and then Constitution Avenue. On the other side of Constitution Avenue, the upper stories and roofs of the taller buildings are visible, including the U.S. Department of the Interior, Constitution Hall, the White House, before reaching the U.S. Department of Commerce. While the roofs of a number of historic buildings were visible in the site visit, it is expected that more surface area of these buildings and other buildings in the vicinity would be visible during the winter months. Numerous buildings further away are also visible in the skyline, but details are difficult to discern.

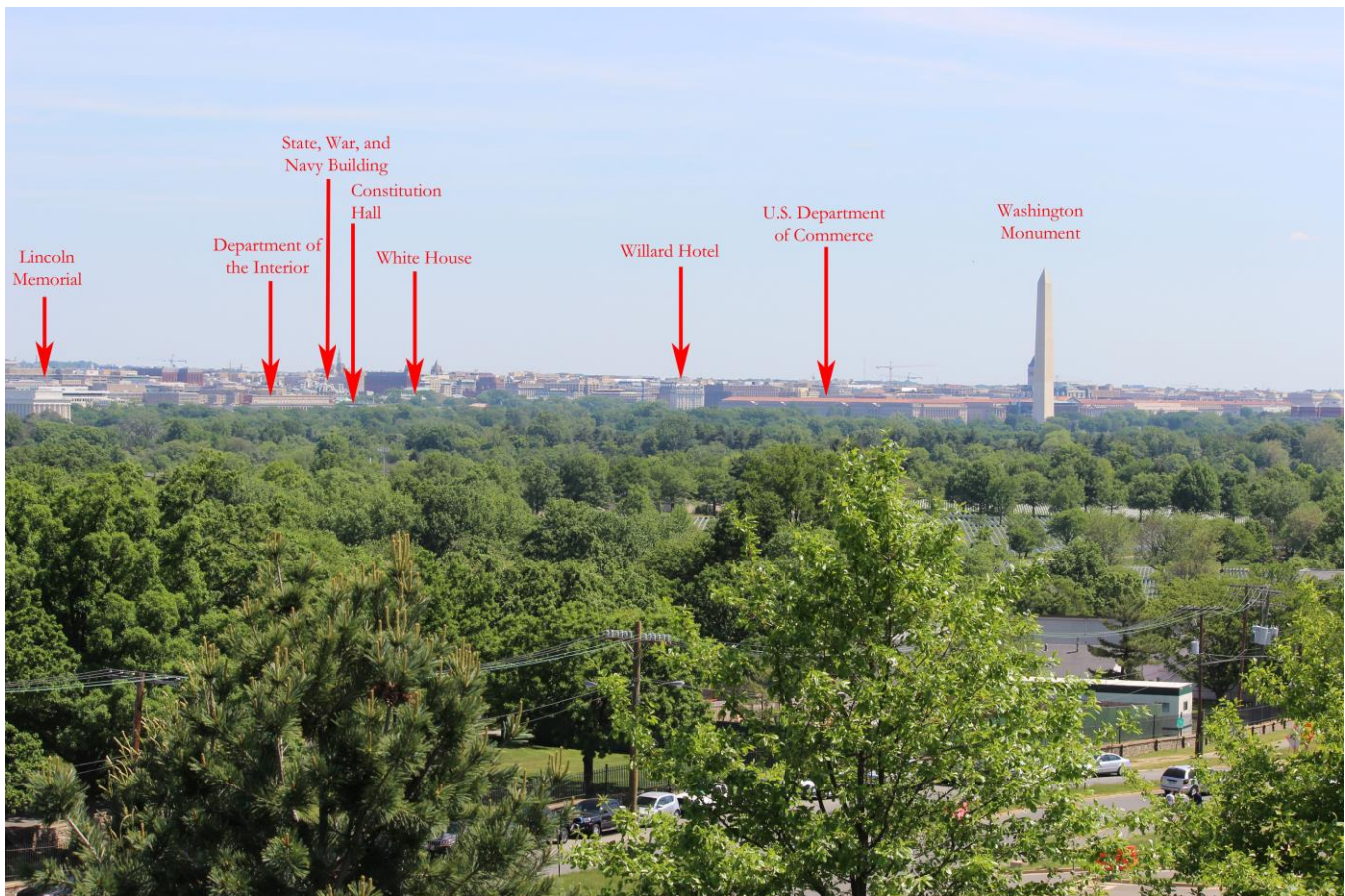


Figure 9: View from Promontory on Southern Expansion Site facing Northeast (Line of Sight 2)

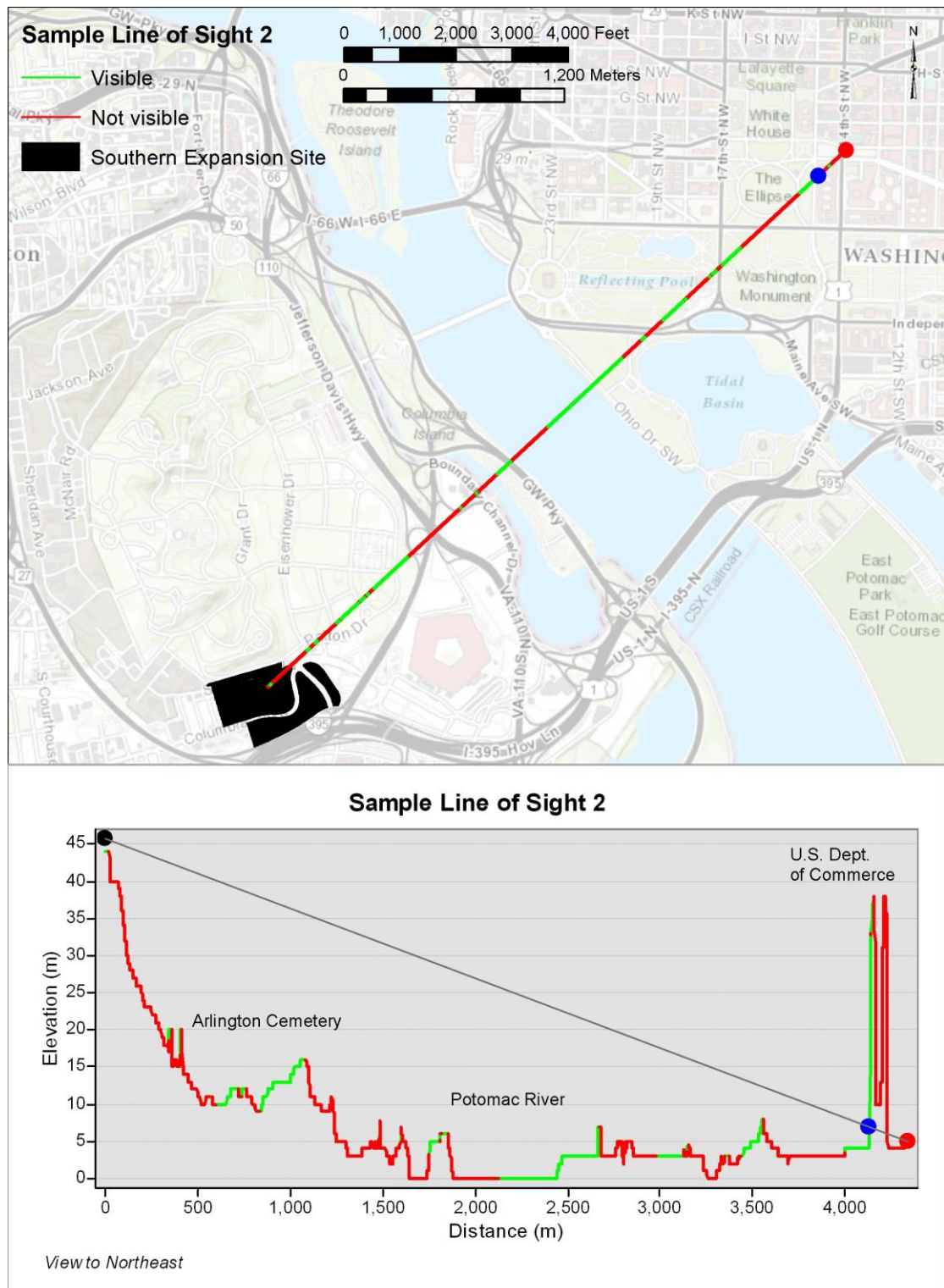


Figure 10: Sample Line of Sight 2

The third line of sight originated from the promontory at the east side of the plateau, looking to the east (**Figures 11 and 12**). The promontory at the east edge of the main parcel offers a very good view of the Pentagon, which also includes the South Parking Lots, the heating and refrigeration facility, and Interstate 395 (I-395) as it crosses the Potomac. This unobstructed view of I-395 indicates that motorists moving along the southbound lanes of I-395 would also be able to see the Southern Expansion Site. The surface of Mount Vernon Memorial Highway is visible in the middle distance. Although both banks of the Potomac, East Potomac Park, and the opposite bank of the Washington Channel sloping up to Fort Lesley J. McNair are barely distinguishable in the distance, the Buzzard Point Power Plant with its three stacks is a prominent feature in the background. From this vantage point, it was also possible to see the roof of the Capitol Building and the Jefferson Memorial over the roof of the Pentagon by turning further toward the north.



Figure 11: View from Promontory on Southern Expansion Site facing East (Line of Sight 3)

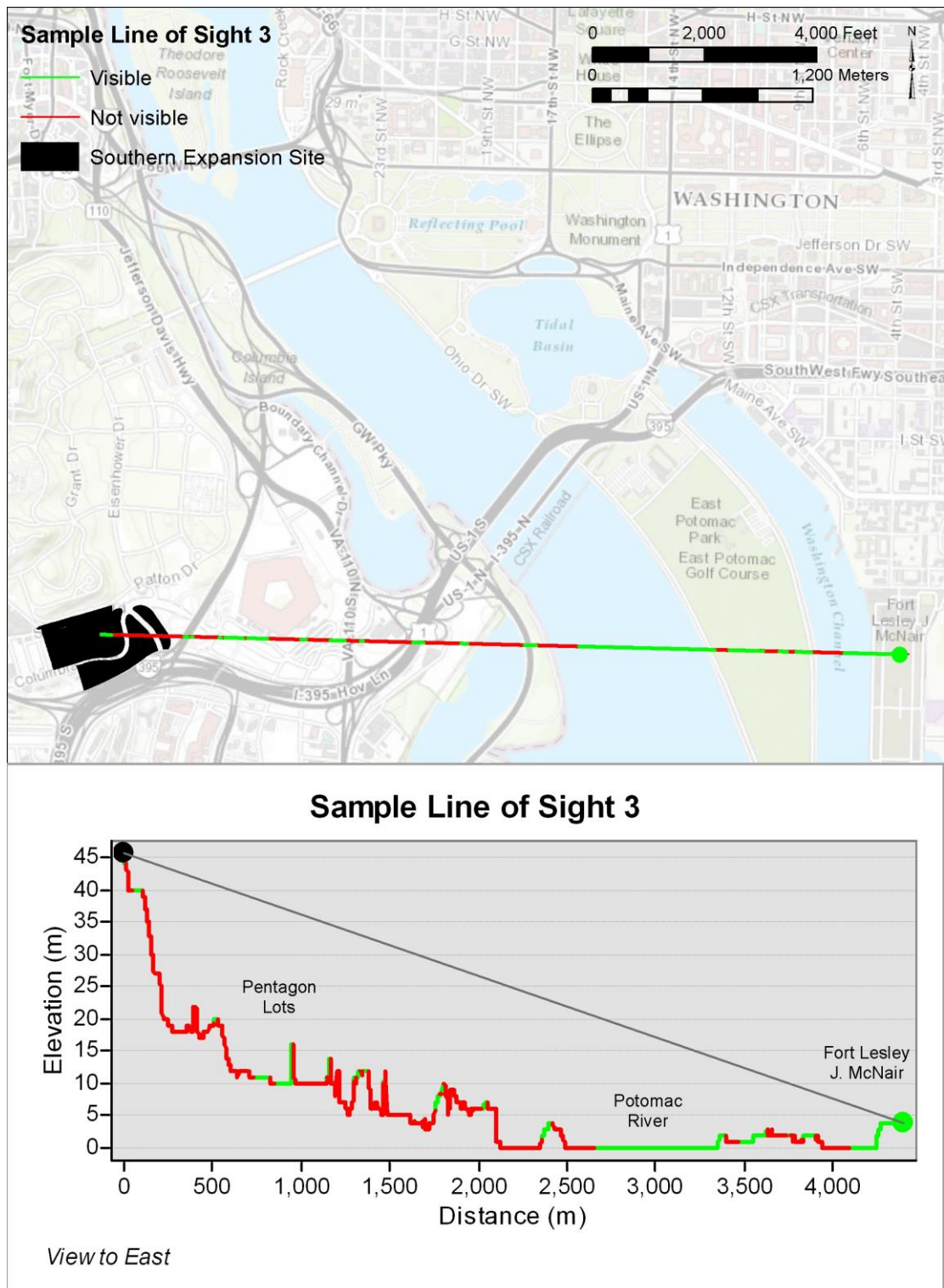


Figure 12: Sample Line of Sight 3

The fourth line of sight originated from the highest vantage point of the Southern Expansion Site looking to the southeast (**Figures 13 and 14**). To the south, I-395, is visible along with the Pentagon City skyline. Due to obscuring vegetation, the banks of the Potomac River were not visible during the field visit, but this is a possibility during winter months. The Anacostia Hills form the backdrop for the view, and projections from the top of the hills such as the distant towers visible in **Figure 13** would be highly distinguishable given the contrast with the sky.



Figure 13: View from High Point on Southern Expansion Site facing Southeast (Line of Sight 4)

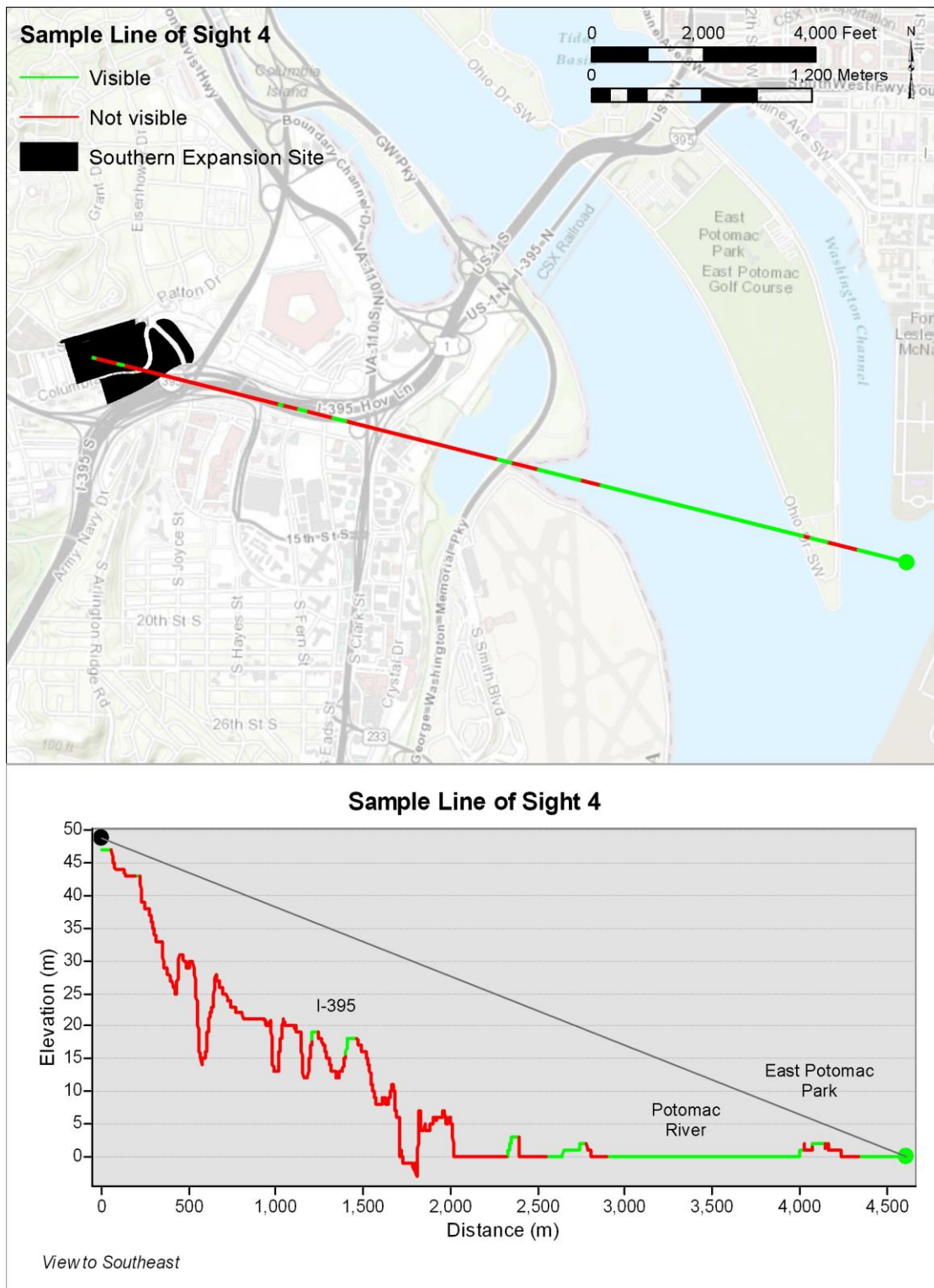


Figure 14: Sample Line of Sight 4

After refining the outward visibility by removing certain areas to the north based on the results of the field visit, spots were once again removed, and the remaining area was considered the finalized outward visibility area for the Preliminary Visual APE (Figure 15).

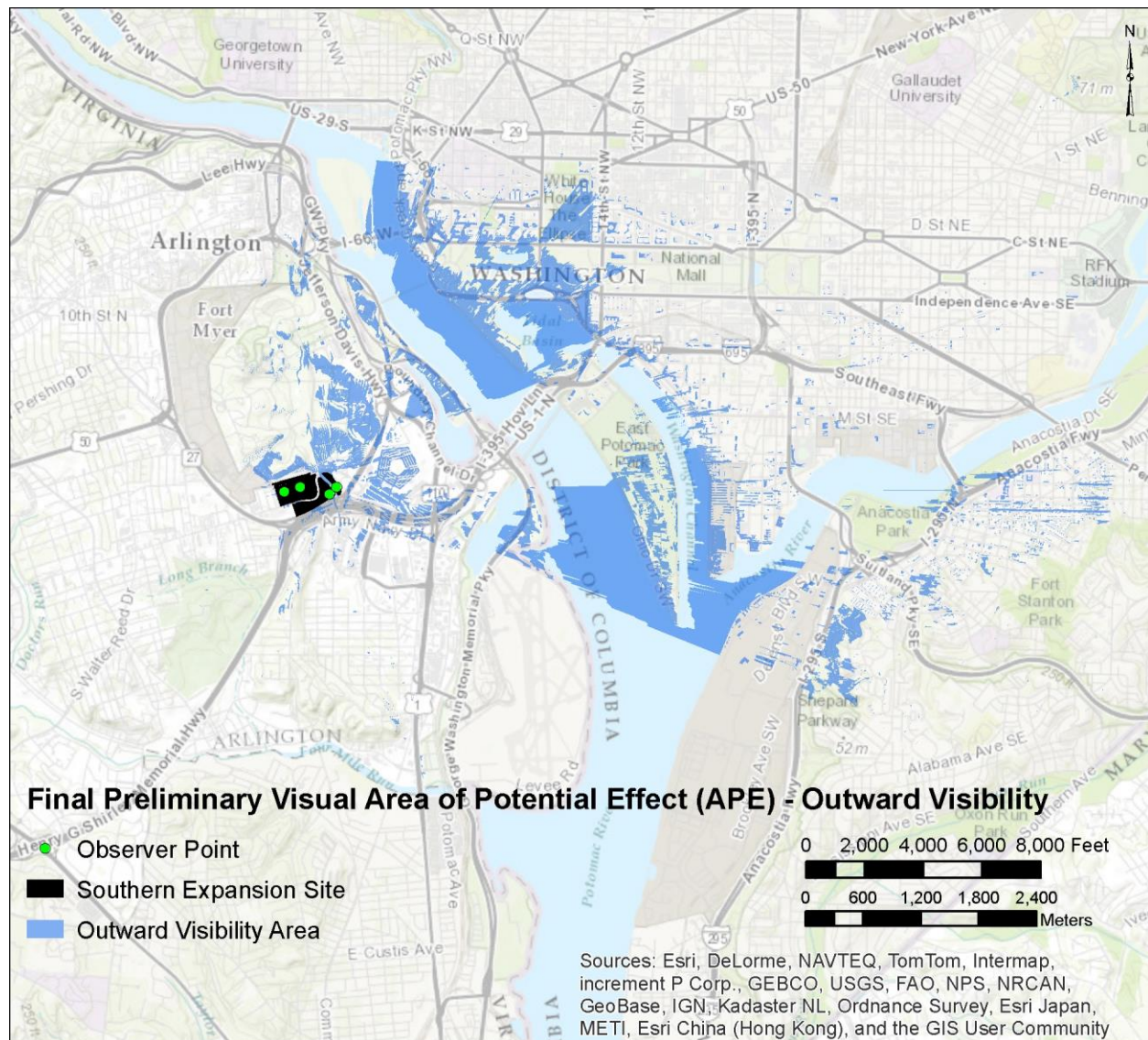


Figure 15: Final Preliminary Visual APE – Outward Visibility

Historic Resources within the Visual APE

Historic resources within the Preliminary Visual APE fall into two categories with regard to Section 106 evaluation. Some historic resources, specifically those which fall within the inward visibility area, possess potential to be visually affected by the alternatives to the ANC Southern Expansion Site. Other historic resources falling within the outward visibility area need only be considered as parts of the panoramic vista from the Southern Expansion Site toward Washington. Although over 50 historic properties fall within the outward visibility area, a few were selected based on their importance and their prominence.

Historic resources within the inward visibility area were selected by applying two criteria. First, only properties that were listed in the NRHP or were eligible for listing on the NRHP were considered in this

study. Second, individual properties, structures, or buildings were favored, leaving out the more expansive historic districts in which they might form one component. Furthermore, only individual components in historic districts which contributed to NRHP status were included in this list. The historic districts themselves were considered too large a scale for this level of analysis since districts are meant to convey linkage and continuity of the individual components, and no one whole district was wholly within the Preliminary Visual APE. The only exception to this rule was the ANC Historic District itself, since the Southern Expansion Site is visible from too numerous contributing objects and structures.

Beyond the ANC Historic District, a total of 15 historic resources meeting the two criteria outlined in the previous paragraph fall within the inward visibility area for the Southern Expansion Site. These resources are listed in **Table 2** and their locations are shown on **Figure 16**. It is notable that using this method eliminated all of the NRHP-eligible properties, leaving only NRHP-listed properties.

Table 2: Relevant Historic Resources within the Inward Visibility Area

Number	Location	NRHP Status
0	Arlington National Cemetery (ANC)	Listed
1	Arlington Memorial Bridge	Listed
2	Arlington Memorial Bridge-Related Features, Rock Creek & Potomac Parkway Terminus	Listed
3	Arlington Memorial Bridge-Related Features, The Watergate	Listed
4	Arlington Ridge Park (ARP), Iwo Jima Memorial, The United States Marine Corps War Memorial	Listed (ARP)*
5	Arlington Ridge Park, Netherlands Carillion and Panthers	Listed (ARP)
6	Arlington Ridge Park, Nevius Tract	Listed (ARP)
7	Arlington House	Listed, Contributing to ANC
8	George Washington Memorial Highway / Mount Vernon Memorial Highway	Listed
9	George Washington Memorial Parkway	Listed
10	Lincoln Memorial (and Statue of Lincoln)	Listed
11	LBJ Memorial and Grove	Listed
12	Pentagon Office Building Complex	Listed
13	Hume School	Listed
14	Arlington Memorial Bridge-Related Features, Boundary Channel Bridge	Listed
15	Arlington Memorial Bridge-Related Features, Columbia Plaza	Listed

*ARP = Arlington Ridge Park

Historic resources that fall only within the outward visibility area of the Preliminary Visual APE are much more numerous, but must also be considered with respect to how they affect the overall historic character of the cemetery. The Navy Annex/FOB2 Property Transfer EA identifies the importance of the panoramic vista toward Washington from the Southern Expansion Site (Government Service IPT 2011: 49); and the ANC ICRMP identifies the contributing views from the ANC to the Washington Monument, which is visible from the Southern Expansion Site (Smith, Tooker, and Haynes 2013: Attachment C).

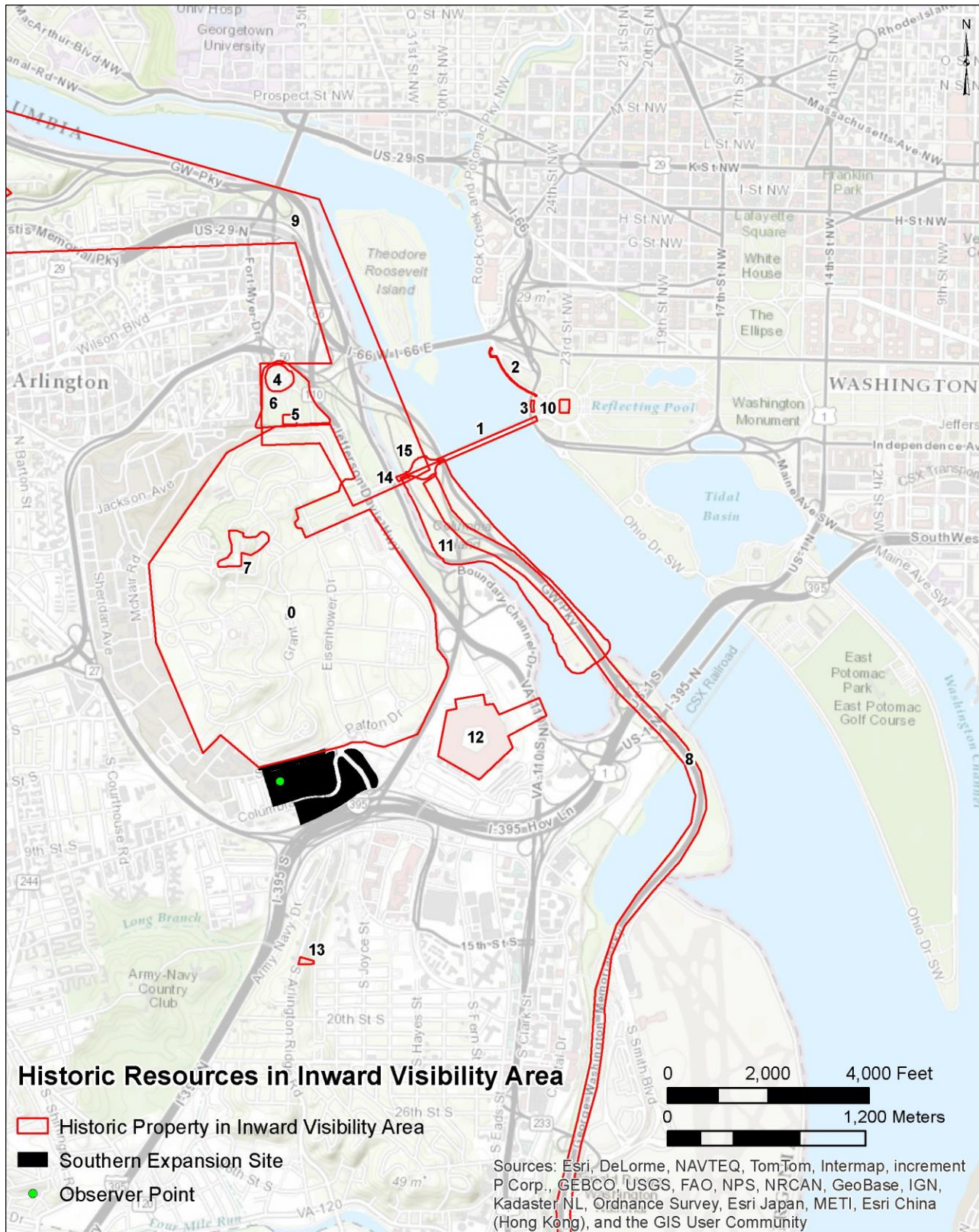


Figure 16: Relevant Historic Resources within the Inward Visibility Area

Over 50 historic properties listed on or eligible for listing in the National Register fall within the outward visibility area. While each of these properties holds significant value, it is the view of the historic

Washington skyline as a whole that is the most important sight from the highest points of the Southern Expansion Site. Nevertheless, a few prominent features along the Potomac shoreline and beyond demand individual attention. These features were selected based on guidelines established in previous documentation as well as a more subjective field viewing documented in the photographic plates in this report. The six most prominent and important historic properties visible from the four observer points in the Southern Expansion Site are listed in **Table 3**. It is emphasized that while views to these historic properties need to be considered with respect the ANC Historic District, the properties themselves may not be affected by the alternatives to the Southern Expansion Site.

Table 3: Prominent Historic Resources within the Outward Visibility Area

Historic Resource	Justification	NRHP Status
Lincoln Memorial	Specified in ANC ICRMP	Listed
Netherlands Carillon (Arlington Ridge Park)	Specified in ANC ICRMP	Listed
Pentagon Office Building Complex	Specified in ANC ICRMP	Listed
Washington Monument	Specified in ANC ICRMP	Listed
Jefferson Memorial	Specified in Navy Annex/FOB2 Property Transfer EA	Listed
National Mall (and associated buildings)	Specified in Navy Annex/FOB2 Property Transfer EA	Listed

Vantage Points for the Viewshed Study

Vantage points for future viewshed analysis were identified by reviewing previous documentation and considering the historic resources within the Preliminary Visual APE - inward and outward. Based on the ANC ICRMP, the Navy Annex/FOB2 Property Transfer EA, and the ANC RPMP Programmatic EA, 37 views (vantage points with specific orientations) were evaluated. After evaluation of these views, and the resulting elimination of some vantage points based on lack of visibility, several additional vantage points within the Preliminary Visual APE were assessed. In the end, 32 vantage points were identified for future analysis.

First, the ANC ICRMP was used as a guide for the major viewsheds of the cemetery that contribute to its status on the National Register (Smith, Tooker, and Haynes 2013: Figure 14; **Figure 17, this report**). Analysis showed that only five of these views could potentially be affected by the Southern Expansion Site. The three views of the Air Force Memorial from the southern area of the ANC now also include part of the Southern Expansion Site (View 1 in **Table 4** and **Figure 17**). The more distant view from the Lincoln Memorial and the eastern Potomac shoreline (Views 10 and 11) may also be affected by the Southern Expansion Project. These views are meant to take in all of ANC rather than a specific point within the cemetery. Although the Southern Expansion Site is visible from several other locations identified in **Figure 17** of the ANC ICRMP, none of these views are oriented toward the Southern Expansion Site, and thus the alternatives for the site would have no effect on these views.

Table 4: Initial Views Considered for Future Analysis

View No.	Location	Importance	Affected
1	ANC - View of Air Force Memorial 1	Contributing View/Vista in ANC ICRMP	Y
2	ANC - View of Air Force Memorial 2	Contributing View/Vista in ANC ICRMP	Y
3	ANC - View of Air Force Memorial 3	Contributing View/Vista in ANC ICRMP	Y
4	ANC - View to Arlington House from Kennedy Gravesite 1	Contributing View/Vista in ANC ICRMP	N
5	ANC - View to Arlington House from Kennedy Gravesite 2	Contributing View/Vista in ANC ICRMP	N
6	ANC - View to Arlington House from Kennedy Gravesite 3	Contributing View/Vista in ANC ICRMP	N
7	ANC - View to Arlington House from Memorial Amphitheater	Contributing View/Vista in ANC ICRMP	N
8	ANC - View from Memorial Bridge	Contributing View/Vista in ANC ICRMP	N
9	ANC - View from Memorial Avenue	Contributing View/Vista in ANC ICRMP	N
10	ANC - View from Lincoln Memorial	Contributing View/Vista in ANC ICRMP	Y
11	ANC - View from Washington D.C. Potomac Shoreline	Contributing View/Vista in ANC ICRMP	Y
12	ANC - View of Lincoln Memorial and Washington Monument from Arlington House	Contributing View/Vista in ANC ICRMP	N
13	ANC - View to Main Gates 1	Contributing View/Vista in ANC ICRMP	N
14	ANC - View to Main Gates 2	Contributing View/Vista in ANC ICRMP	N
15	ANC - View to Memorial Amphitheater 1	Contributing View/Vista in ANC ICRMP	N
16	ANC - View to Memorial Amphitheater 2	Contributing View/Vista in ANC ICRMP	N
17	ANC - View to Memorial Amphitheater 3	Contributing View/Vista in ANC ICRMP	N
18	ANC - View to Netherlands Carillon	Contributing View/Vista in ANC ICRMP	N
19	ANC - View of Old Amphitheater 1	Contributing View/Vista in ANC ICRMP	N
20	ANC - View of Old Amphitheater 2	Contributing View/Vista in ANC ICRMP	N
21	ANC - View of Old Amphitheater 3	Contributing View/Vista in ANC ICRMP	N
22	ANC - View of the Pentagon from Pentagon Monument	Contributing View/Vista in ANC ICRMP	N
23	ANC - View to Spanish-American War Memorial from U.S.S. Maine Memorial	Contributing View/Vista in ANC ICRMP	N
24	ANC - View to U.S.S. Maine Memorial from Memorial Amphitheater	Contributing View/Vista in ANC ICRMP	N
25	ANC - View to U.S.S. Maine Memorial from Spanish-American War Memorial	Contributing View/Vista in ANC ICRMP	N
26	ANC - View To Fort Myer Gate and Chapel	Contributing View/Vista in ANC ICRMP	N
27	ANC - View of Washington Monument 1	Contributing View/Vista in ANC ICRMP	N
28	ANC - View of Washington Monument 2	Contributing View/Vista in ANC ICRMP	N
29	View from I-395 towards the Southern Expansion Site and the Air Force Memorial	Specified in ANC RPMP Programmatic EA	Y
30	View from Foxcroft Heights Park to ANC	Specified in ANC RPMP Programmatic EA	Y
31	View from the Pentagon toward ANC	Specified in ANC RPMP Programmatic EA	Y
32	View from the Pentagon toward Air Force Memorial	Specified in ANC RPMP Programmatic EA	Y
33	View from Southgate Road to ANC and the Southern Expansion Site	Specified in Navy Annex/FOB2 Property Transfer EA	Y
34	View from the Monumental Core toward the Southern Expansion Site	Specified in Navy Annex/FOB2 Property Transfer EA	N
35	View from the Tidal Basin toward the Southern Expansion Site	Specified in Navy Annex/FOB2 Property Transfer EA	Y
36	View from the Washington Channel Waterfront Park toward the Southern Expansion Site	Specified in Navy Annex/FOB2 Property Transfer EA	N
37	View from the base of the Washington Monument toward the Southern Expansion Site	Specified in Navy Annex/FOB2 Property Transfer EA	N

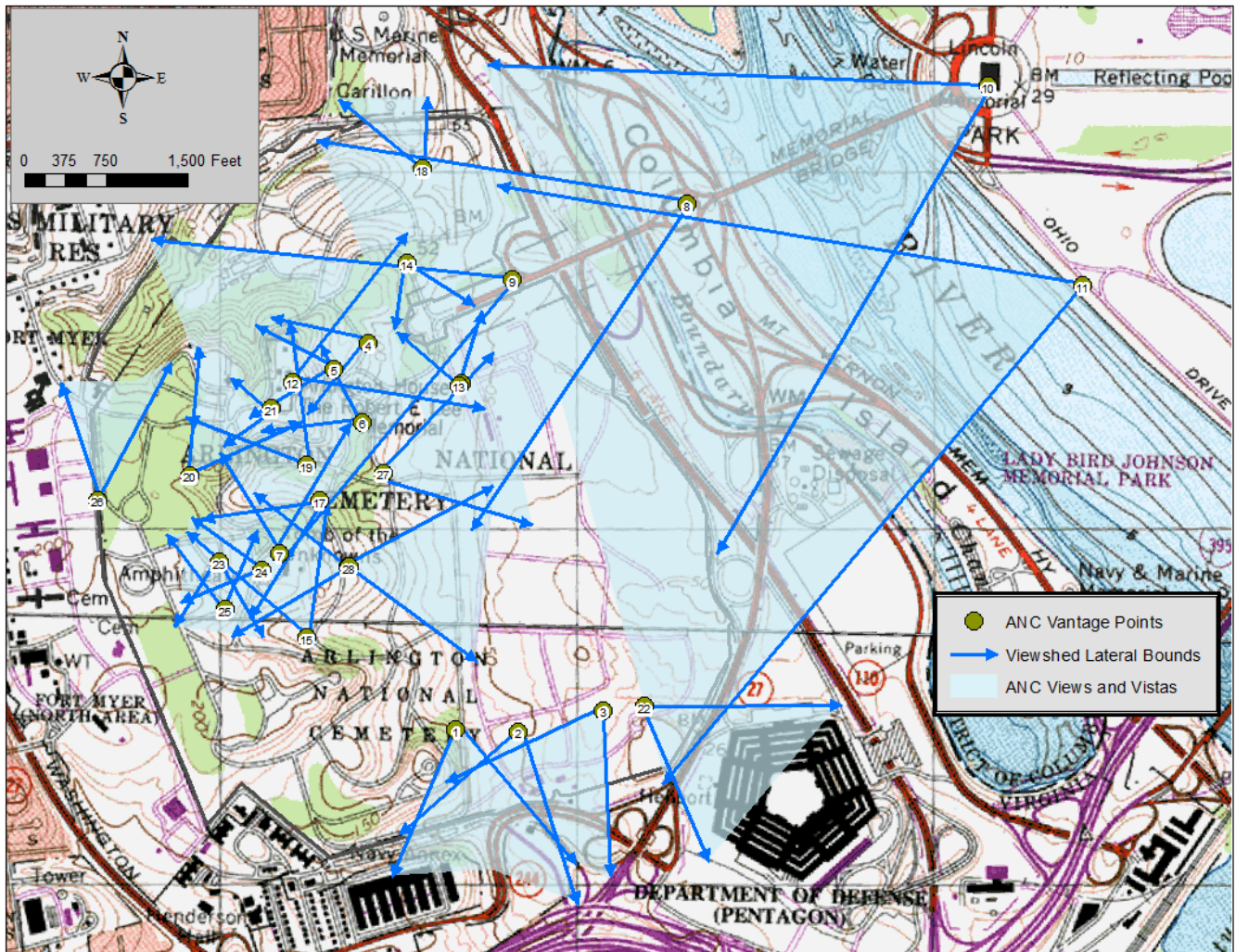


Figure 17: ANC Views and Vistas Identified in ANC ICRMP (Smith, Tooker, and Haynes 2013)

Views identified in the ANC RPMP Programmatic EA and the Navy Annex/FOB2 Property Transfer EA were also initially considered (HNTB 2014: Figure 3-18). Four views were specified in the ANC RPMP Programmatic EA (Views 29 to 32). All of these views could potentially be affected by the alternatives at the Southern Expansion Site. An additional five views identified in the Navy Annex/FOB2 Property Transfer EA were considered, but three of them were found to lie outside of the inward visibility area due to the fact that they were located greater than 1.5 miles away from the Southern Expansion Site (Views 34, 36, and 37).

The Navy Annex/FOB2 Property Transfer EA concluded that the Southern Expansion Site is visible from the eastern end of the Tidal Basin; barely visible from the Washington Channel waterfront Park; and potentially be visible from the base of the Washington Monument during winter months (Government Services IPT 2011:3-17). These views were later eliminated. Upon the EAC/A field visit conducted for this viewshed study, vegetation completely obscured the view to the entirety of the Southern Expansion Site save for the very top of the Air Force Memorial (**Figure 18**). EAC/A is, however, inclined to agree with the previous assessment since the horizon to the southwest was primarily obstructed by a thin line of vegetation between the Washington Monument and the Tidal Basin.

Nevertheless, since this is beyond the 1.5-mile limit to the inward visibility area, it is not anticipated that sufficient detail of the cemetery would be discernable.



Figure 18: View from Washington Monument to southeast

It is also notable that the viewing platforms at 500 feet above the entry level of the Washington Monument do not offer views of the Southern Expansion Site. As demonstrated in photos taken through the west and south-facing windows on the platform, although much of the northern part of ANC is visible in the west view, the Southern Expansion Site itself lies in between these panoramas is not visible (**Figures 19 and 20**).



Figure 19: West view from the top of the Washington Monument (Ambrose 2014)



Figure 20: South view from the top of the Washington Monument (Ambrose 2014)

As a second step, a sample of 21 additional vantage points was selected from which the highest point of the Southern Expansion Site is visible. These were selected based on their proximity to historic properties and sites, and their distribution throughout the inward visibility area, offering a diversity of views from within and outside of the ANC Historic District. The final 32 vantage points outside of the ANC Southern Expansion Site have been analyzed below. Potential changes to the views from these vantage points have been evaluated. All of the vantage point locations identified for the study are listed in **Table 5** and illustrated in **Figure 21**.

Table 5: Visible Vantage Points

Point No.	Location	Justification
1	View of Air Force Memorial from ANC	Contributing View/Vista in ANC ICRMP
2	View of Air Force Memorial from ANC	Contributing View/Vista in ANC ICRMP
3	View of Air Force Memorial from ANC	Contributing View/Vista in ANC ICRMP
4	ANC Kennedy Gravesite	Contributing object to ANC Historic District
5	ANC Argonne Cross	Contributing object to ANC Historic District
6	ANC Columbarium	Contributing object to ANC Historic District
7	Arlington House	Listed on National Register
8	ANC Main Gates	Contributing object to ANC Historic District
9	ANC President Taft Gravesite	Contributing object to ANC Historic District
10	ANC Memorial Amphitheater	Contributing object to ANC Historic District
11	ANC Lodge #2	Contributing object to ANC Historic District
12	ANC Sir John Dill Monument	Contributing object to ANC Historic District
13	ANC Old Amphitheater and Civil War Unknowns	Contributing object to ANC Historic District
14	View of Pentagon from Pentagon Memorial	Contributing View/Vista in ANC ICRMP
15	ANC Chaplains Hill	Contributing object to ANC Historic District
16	ANC High Point 3, Section 11	Prominent vantage point identified in ANC RPMP Programmatic EA
17	ANC McClellan Gate	Contributing object to ANC Historic District
18	Arlington Memorial Bridge, West	Listed on National Register
19	View of ANC from Lincoln Memorial	Contributing View/Vista in ANC ICRMP
20	View of ANC from Potomac Shoreline	Contributing View/Vista in ANC ICRMP
21	View from I-395 Northbound towards the Southern Expansion Site	Specified in ANC RPMP Programmatic EA
22	View from Foxcroft Heights Park to ANC	Specified in ANC RPMP Programmatic EA
23	View from Pentagon toward ANC	Specified in ANC RPMP Programmatic EA
24	View from Pentagon toward Air Force Memorial	Specified in ANC RPMP Programmatic EA
25	Southgate Road	Specified in Navy Annex/FOB2 Property Transfer EA
26	View from the Tidal Basin toward the Southern Expansion Site	Specified in Navy Annex/FOB2 Property Transfer EA
27	Netherlands Carillon	Listed on National Register; contributing object to Arlington Ridge Park Site
28	Arlington Ridge Park, U.S. Marine Corps War Memorial	Listed on National Register; contributing object to Arlington Ridge Park Site
29	Arlington Memorial Bridge, East	Listed on National Register
30	George Washington Memorial Parkway, Gravelly Point	Listed on National Register
31	Arlington Memorial Bridge "Watergate"	Listed on National Register
32	George Washington Memorial Parkway, Lady Bird Johnson Park	Listed on National Register

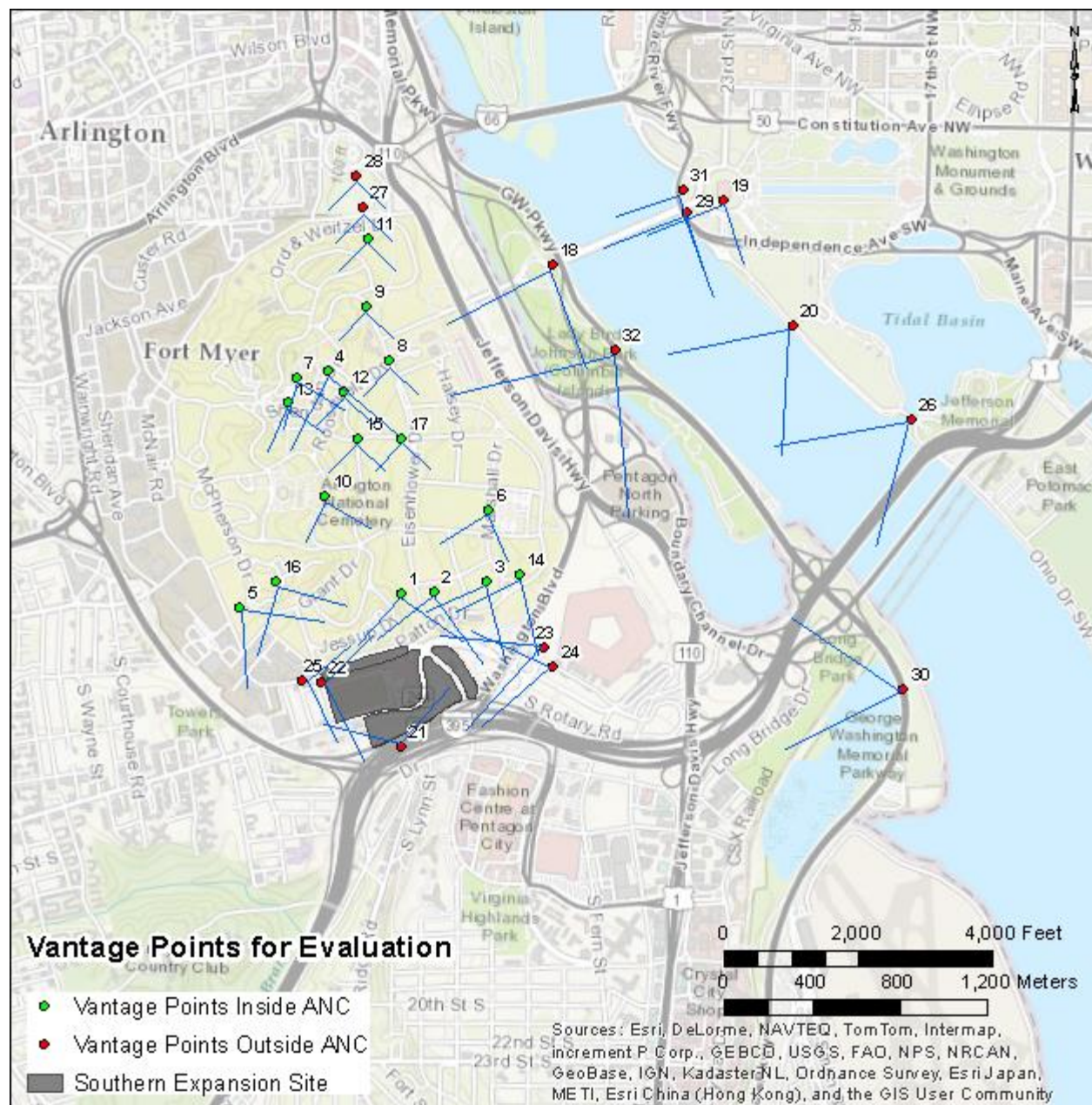


Figure 21: Visible Vantage Points used in the Viewshed Study

Three views of the Air Force Memorial from the southern area of the ANC are significant to Criterion A for military association (Vantage Points 1, 2, and 3). Any development in the Southern Expansion Site would be visible from contributing vantage points at the southern end of ANC when looking toward both the Air Force Memorial and the Pentagon (Vantage Points 1, 2, 3, 5, 14, and 16; **Figures 22, 23, 24, 25, 26, and 27**). During a walk along Patton Drive at the southern perimeter of the current ANC, or Grant Drive and Bradley Drive further to the north, the observer is struck by the prominence of the Air Force Memorial through gaps in the vegetation (**Figures 22, 23, 24, and 25**), although the view is obscured from Vantage Points 5 and 16. The slope along the northern edge of the Southern Expansion site is the most visible area from here, with large portions of the top of the site obscured. The Proposed Action would only present an adverse effect to the property if the boundary wall is removed.



Figure 22: Vantage Point 1, facing south

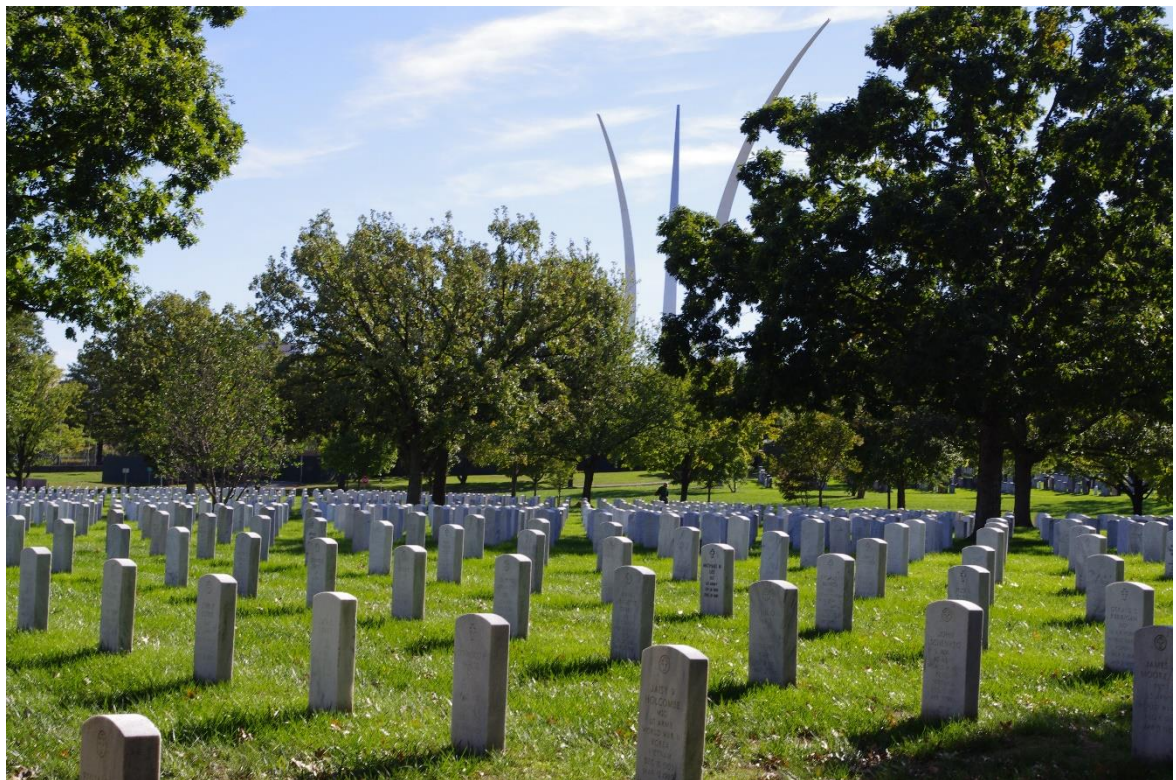


Figure 23: Vantage Point 2, facing southwest



Figure 24: Vantage Point 3, facing southwest



Figure 25: Vantage Point 5, facing southeast



Figure 26: Vantage Point 14, facing southwest



Figure 27: Vantage Point 16, facing southeast

A walk north through the remainder of Arlington National Cemetery revealed that with current vegetation, it would not be possible to see the ground of the Southern Expansion Site from any of the other vantage points within the ANC (Vantage Points 4, 6, 7, 8, 9, 10, 11, 12, 13, 15, and 17; **Figures 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, and 38**). The Proposed Action would present no adverse effects to these resources.



Figure 28: Vantage Point 4, facing southeast



Figure 29: Vantage Point 6, facing southwest



Figure 30: Vantage Point 7, facing south



Figure 31: Vantage Point 8, facing southeast



Figure 32: Vantage Point 9, facing southeast



Figure 33: Vantage Point 10, facing southeast



Figure 34: Vantage Point 11, facing southwest



Figure 35: Vantage Point 12, facing south



Figure 36: Vantage Point 13, facing south

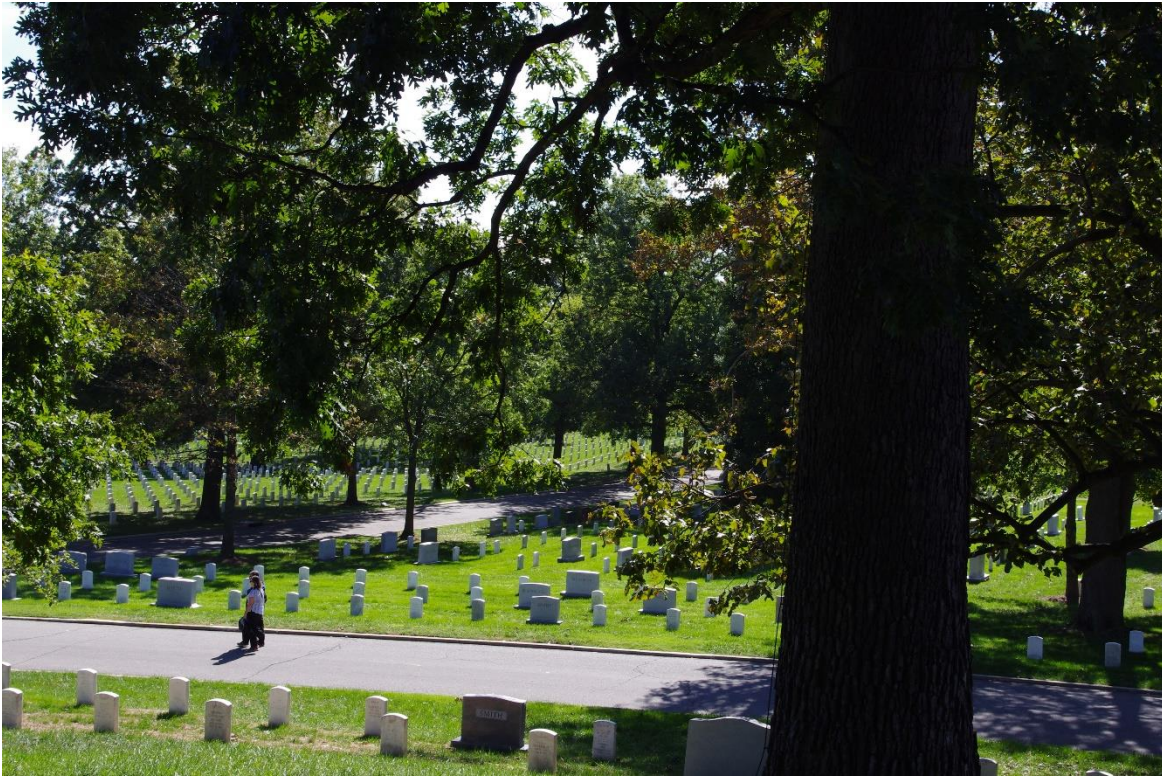


Figure 37: Vantage Point 15, facing south



Figure 38: Vantage Point 17, facing south

Two views from Columbia Island were considered - one from the western end of Arlington Memorial Bridge (Vantage Point 18) and one from Lady Bird Johnson Park along George Washington Memorial Parkway (Vantage Point 32). Neither the Air Force Memorial nor the ground of the ANC Southern Expansion were visible due to vegetation (**Figures 39 and 40**). A view of the ANC Southern Expansion from further to the south of the island, along George Washington Memorial Parkway, was also obscured by vegetation (Vantage Point 30, **Figure 41**). The Proposed Action would present no adverse effects to these resources.



Figure 39: Vantage Point 18 facing west



Figure 40: Vantage Point 32, facing southwest



Figure 41: Vantage Point 30, facing west

More distant views that were considered included several from across the Potomac River. The Lincoln Memorial and the eastern Potomac shoreline (Views 19 and 20) both contribute to Criteria A and C. ANC

is included in the architectural plan of the monumental core, which includes the Capitol, National Mall, the Washington Monument, and the Lincoln Memorial. The contributing view from Washington to the cemetery provides a historical perspective up to the Arlington House. The visual axis extends from the Lincoln Memorial, along Arlington Memorial Bridge and Memorial Avenue to the Hemicycle, Arlington House, and the wooded skyline beyond it (Adam Smith, Megan Tooker, Susan Enscoe, "Arlington National Cemetery Historic District," National Register of Historic Places Registration Form, 2014). In 1902, a Senate Park Commission emphasized the symbolic significance of linking north and south, Lincoln and Lee, and Maryland to Virginia.

A visit to these locations revealed that the grounds of the ANC Southern Expansion would be obscured by vegetation from these locations (**Figures 42 and 43**). The top of the Air Force Memorial would, however, be visible from Vantage Point 20. The Proposed Action would present no adverse effects to these resources.



Figure 42: Vantage Point 19, facing southwest



Figure 43: Vantage Point 20, facing southwest

Views from the Tidal Basin, near the Jefferson Memorial (Vantage Point 26), the eastern end of the Arlington Memorial Bridge (Vantage Point 29), and the Watergate next to the Arlington Memorial Bridge (Vantage Point 31), were also considered. Previously, the Navy Annex/FOB2 Transfer EA stated that the Southern Expansion Site was visible from the Tidal Basin (Vantage Point 26). However, like Vantage Point 20, vegetation obscured the grounds of the ANC Southern Expansion, and only the top of the Air Force Memorial is visible (**Figure 44**). Neither the Air Force Memorial nor the ANC Southern Expansion are visible from the Vantage Points 29 and 31 (**Figures 45 and 46**). The Proposed Action would present no adverse effects to these resources.



Figure 44: Vantage Point 26; facing southwest



Figure 45: Vantage Point 29, facing southwest



Figure 46: Vantage Point 31, facing southwest

Several views from the vicinity of the ANC Southern Expansion were considered due to specifications made in the ANC RPMP Programmatic Environmental Assessment (Vantage Points 21, 22, 23, and 24) and in the Navy Annex / FOB2 Property Transfer Environmental Assessment (Vantage Point 25). The surface of the ANC Southern Expansion is highly visible from I-395 to the south of the site (Vantage Point 21, **Figure 47**). The Proposed Action would present no adverse effects to these resources.



Figure 47: Vantage Point 21, facing north (Google Streetview)

Foxcroft Heights Park (Vantage Point 22), at the northeast end of the neighborhood, offers an expansive view of the highest part of the Southern Expansion Site as well as the Air Force Memorial, the tallest buildings in the skyline of Washington DC, and the distant Anacostia Hills (**Figures 48 and 49**). This view is available because there is currently no visual obstruction between the east side of the park and the Southern Expansion Site. An observer walking down South Oak Street in the Foxcroft Heights neighborhood proper is also able to discern the site through gaps between the houses, fences, and trees. The Proposed Action would present no adverse effects to these resources.



Figure 48: Vantage Point 22, facing southeast



Figure 49: Vantage Point 22, view to East from Foxcroft Heights Park (Vantage Point 22)

Views from the Pentagon, a National Historic Landmark, toward the ANC Southern Expansion are specified in ANC RPMP Programmatic EA (Vantage Points 23 and 24). The views from the western and southwestern edges of the Pentagon provide an expansive view of both the Air Force Memorial and the ANC to the north (**Figures 50 and 51**). Currently, much of this is obscured by vegetation. Even during the winter months, however, the terraced western edge of the Southern Expansion Site would obscure the higher part of the site. The parcels of the Southern Expansion Site on either side of Joyce Street should remain visible, even if their southernmost ends are obscured by I-395. The view of these parcels improves as an individual moves northward toward Vantage Point 23. The re-alignment of Columbia Pike is likely the only part of the Proposed Action that would be visible from this vantage point. The Proposed Action would present no adverse effects to the Pentagon.



Figure 50: Vantage Point 23, facing west



Figure 51: Vantage Point 24, facing west

The narrow passage between the ANC and the Southern Expansion Site occupied by Southgate Road (Vantage Point 25) offers views up the slopes on both sides (**Figures 52, 53, and 54**). The level area on top of the main parcel cannot currently be seen from within this passage looking up (**Figure 53**). If the vegetation were managed, however, the edge of this area might be visible from below. A unique view of these slopes is also available by looking down the narrow passage from the east or west end (Vantage Point 25), utilities and traffic notwithstanding (**Figure 54**). The Proposed Action would present no adverse effects to these vantage points.



Figure 52: Vantage Point 25 at S. Ode Street and Southgate Road, facing southeast



Figure 53: Vantage Point 25 at Southgate Road, View to South



Figure 54: Vantage Point 25, Southgate Road, View to East (Vantage Point 25)

Finally, two views from Arlington Ridge Park to the north of the cemetery were considered (Vantage Points 27 and 28). As expected, the vegetation obscures the entirety of the view to the south, and no part of the ANC Southern Expansion is visible (**Figures 55 and 56**). The Proposed Action would present no adverse effects to these vantage points.

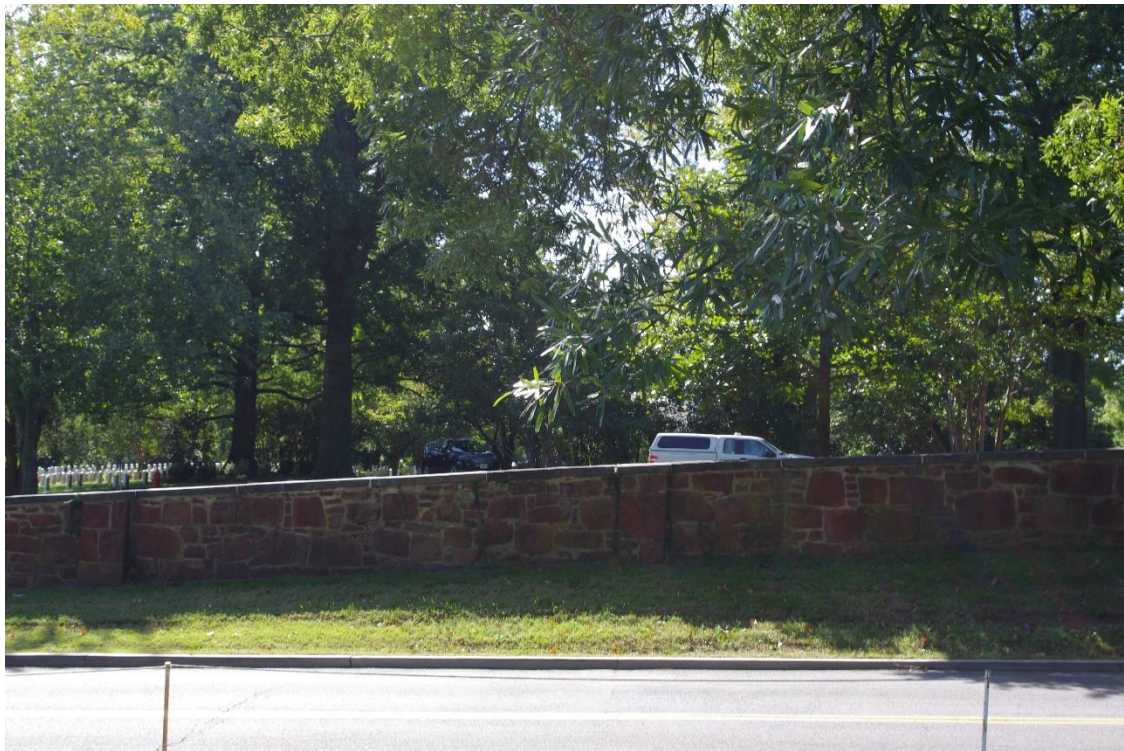


Figure 55: Vantage Point 27, facing south



Figure 56: Vantage Point 28, facing south

It is well-documented that the Air Force Memorial is the most prominent and recognizable feature in the vicinity of the Southern Expansion Site from a distance. However, since large portions of the site were

obscured during the field visit due to vegetation, digital modeling was used to determine which surface areas of the Southern Expansion Site would be most visible from the vantage points. The Visibility Tool in ArcGIS utilized the 32 vantage points identified on **Table 5** and **Figure 21** together creating a raster surface which indicated the most visible areas of the Southern Expansion site from these points. Each square meter of the Southern Expansion Site was assigned a value based on the number of points from which it was visible. The analysis revealed that most of the sloping areas were highly visible from these points, while the higher, more level areas of the plateau were not as visible (**Figure 57**). The most visible area of the Southern Expansion Site from the vantage points is the southeast corner of the site on either side of Joyce Street, containing a low land which gradually slopes up toward the Air Force Memorial. Also highly visible is the sloping ground on either side of Columbia Pike on its north-south orientation between the northern end of the site and where it bends to the west; the abrupt promontory separating the main parcel and the Air Force Memorial area; and the north-facing slope of the main parcel as it descends toward Southgate Road.

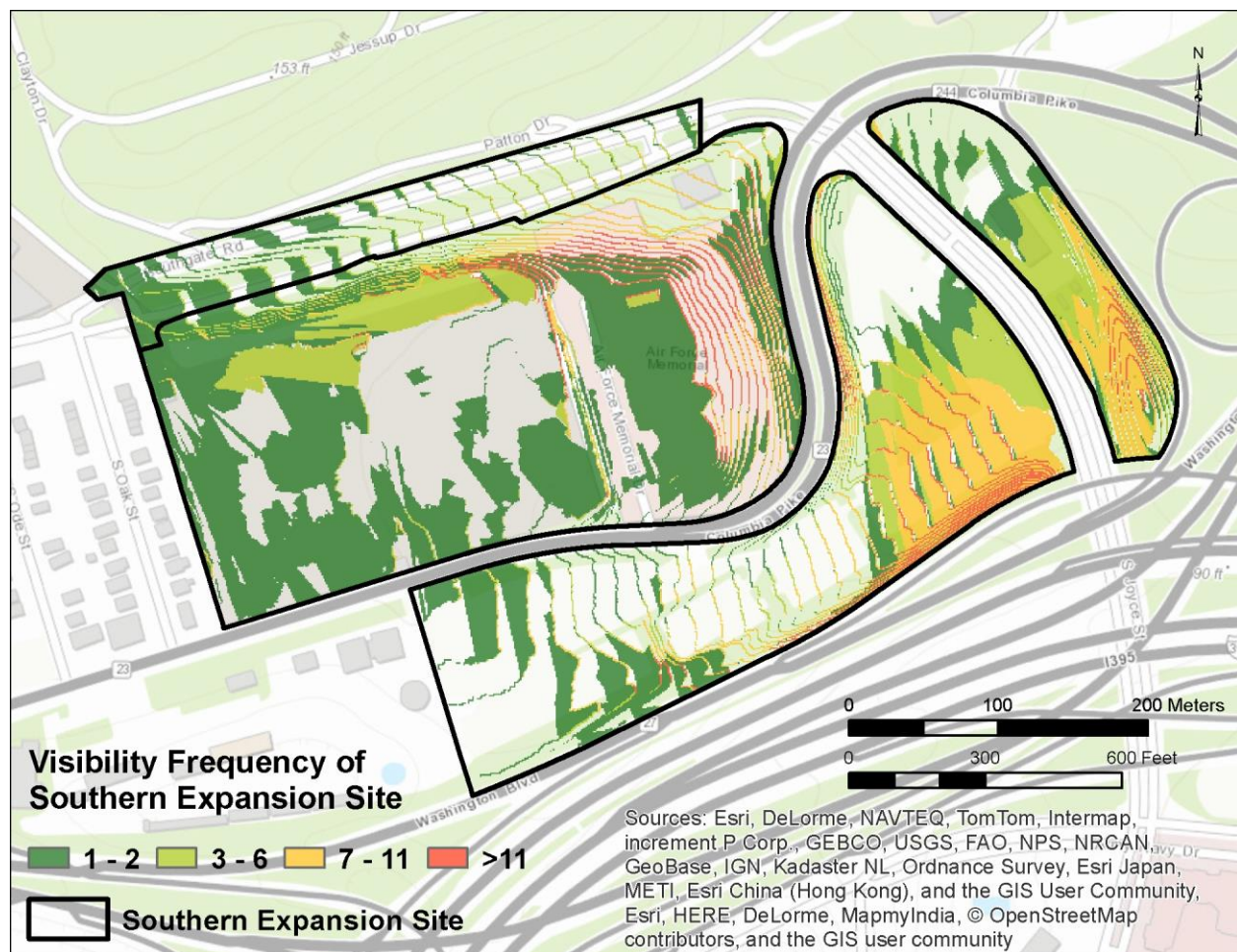


Figure 57: Visibility Frequency from All Vantage Points

The visibility of the slopes and the eastern parcels explains the marked discrepancy between the findings in the current viewshed analysis and the initial conclusion of the Navy Annex/FOB2 EA, which found that the Southern Expansion Site was not visible from the Lincoln Memorial and the U.S. Marine Corps Memorial during the spring/summer (Government Services IPT 2011: 3-17). Individuals were likely sighting the now-demolished building sitting on top of the Southern Expansion Site, not the slopes leading up to the promontory which are now bare.

Visual APE – Outward Visibility Area

The ANC Southern Expansion site is a continuation of an existing historic property, and thus the same views and vistas that contribute to the ANC NRHP status are also important looking outward from here. From promontory at the east side of the ANC Southern Expansion, looking to the northeast, much of Washington is visible. The sight line extends across the opposite bank of the Potomac, Independence Avenue, and then Constitution Avenue. On the other side of Constitution Avenue, the upper stories and roofs of the taller buildings are visible, including the U.S. Department of the Interior, Constitution Hall, the White House, before reaching the U.S. Department of Commerce. Numerous buildings further away are also visible in the skyline, but details are difficult to discern.

The view from the ANC to the Lincoln Memorial is specified in the ANC ICRMP (**Figure 58**); and the views from the ANC to the Jefferson Memorial and the National Mall are specified in the Navy Annex / FOB2 Property Transfer Environmental Assessment (**Figures 59 and 60**). The view from the ANC Southern Expansion to the east offers a very good view of the Pentagon, which also includes the South Parking Lots, the heating and refrigeration facility, and Interstate 395 (I-395) as it crosses the Potomac. From this vantage point, it was also possible to see the roof of the Lincoln Memorial in the foreground. The roofs of both the Capitol Building and the Jefferson Memorial are visible in the background. The buildings along the National Mall are barely visible.



Figure 58: View to Lincoln Memorial from ANC Southern Expansion



Figure 59: View of Washington Monument from ANC Southern Expansion



Figure 60: View of National Mall area from ANC Southern Expansion

Summary and Conclusion

This report contains the comprehensive evaluation of visual effects of the ANC Southern Expansion on historic properties. The Preferred Alternative which involves the removal of the existing boundary wall and Patton Drive would result in a potential adverse effect. The potential adverse effect applies only to the area of the cemetery wall and roadway that is being removed. Besides this one physical effect, this report demonstrates that very few areas will be visually affected by the proposed alternative for the ANC Southern Expansion site, and of those, no adverse effects are expected.

The proposed alternatives for the Cemetery expansion will have no adverse effect on any historic property or district listed on the National Register of Historic Places or National Park within the APE, other than the afore-mentioned section of the cemetery wall that will be removed for the expansion. This includes effects to the views and vistas to and from these properties.

A full set of photographs taken for the duration of this project is on the attached CD-ROM.

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